9/12

FIG. 10A

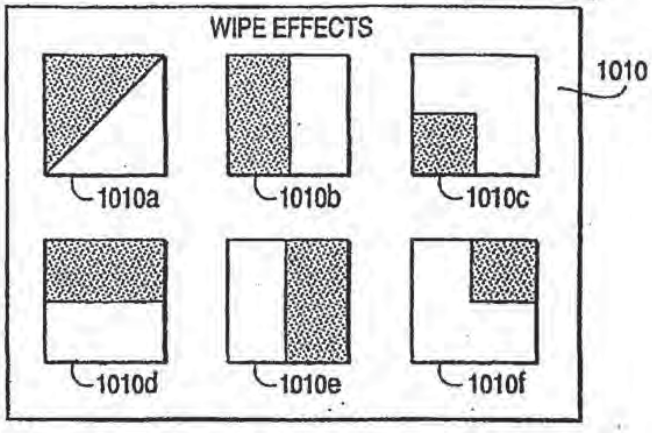
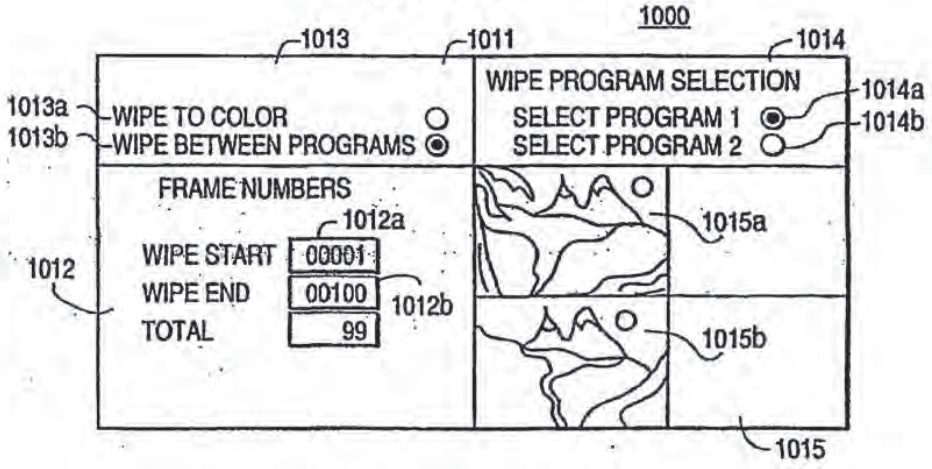


FIG. 10B



10/12

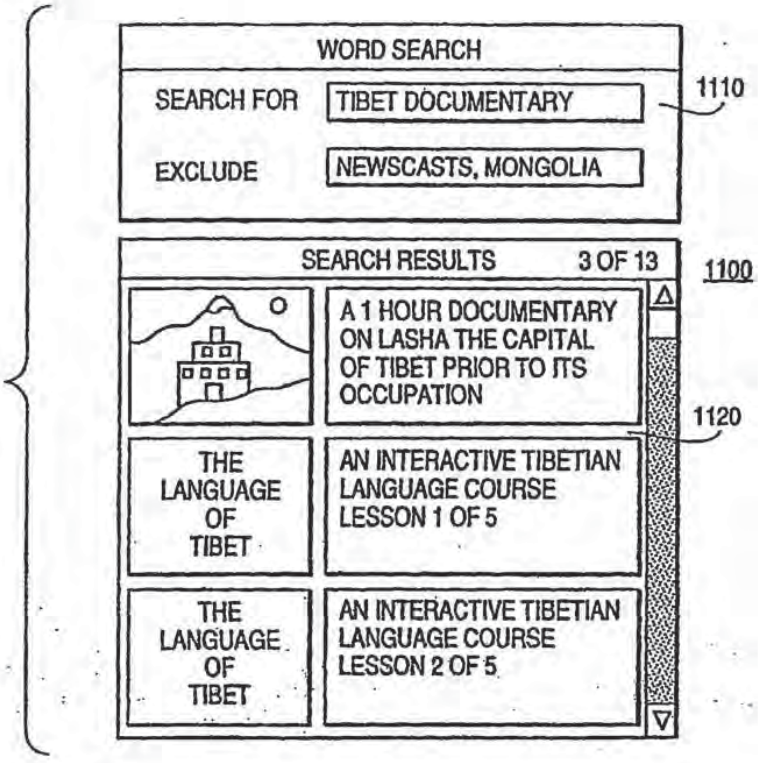
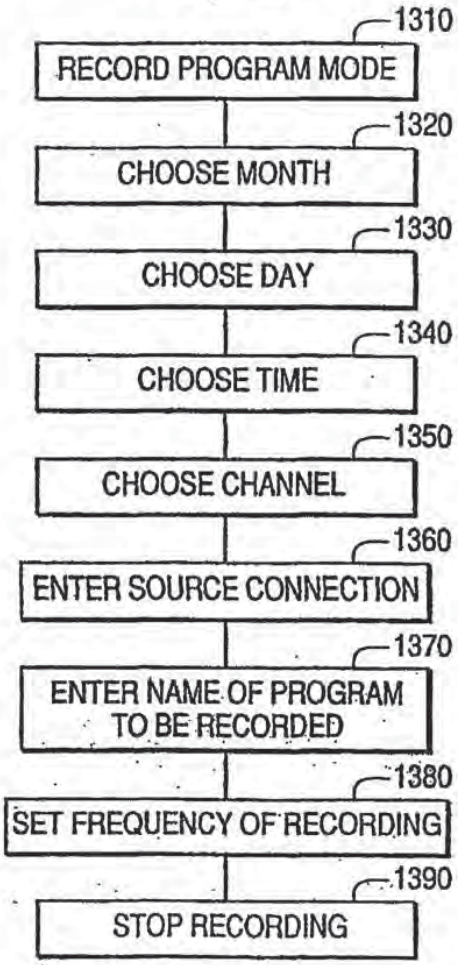

WORD SEARCH
SEARCH FOR
TIBET DOCUMENTARY
EXCLUDE
NEWSCASTS, MONGOLIA
1110
SEARCH RESULTS 3 OF 13
1100
A 1 HOUR DOCUMENTARY ON LASHA THE CAPITAL OF TIBET PRIOR TO ITS OCCUPATION
1120
THE LANGUAGE OF TIBET
AN INTERACTIVE TIBETIAN LANGUAGE COURSE LESSON 1 OF 5
THE LANGUAGE OF TIBET
AN INTERACTIVE TIBETIAN LANGUAGE COURSE LESSON 2 OF 5

FIG. 11

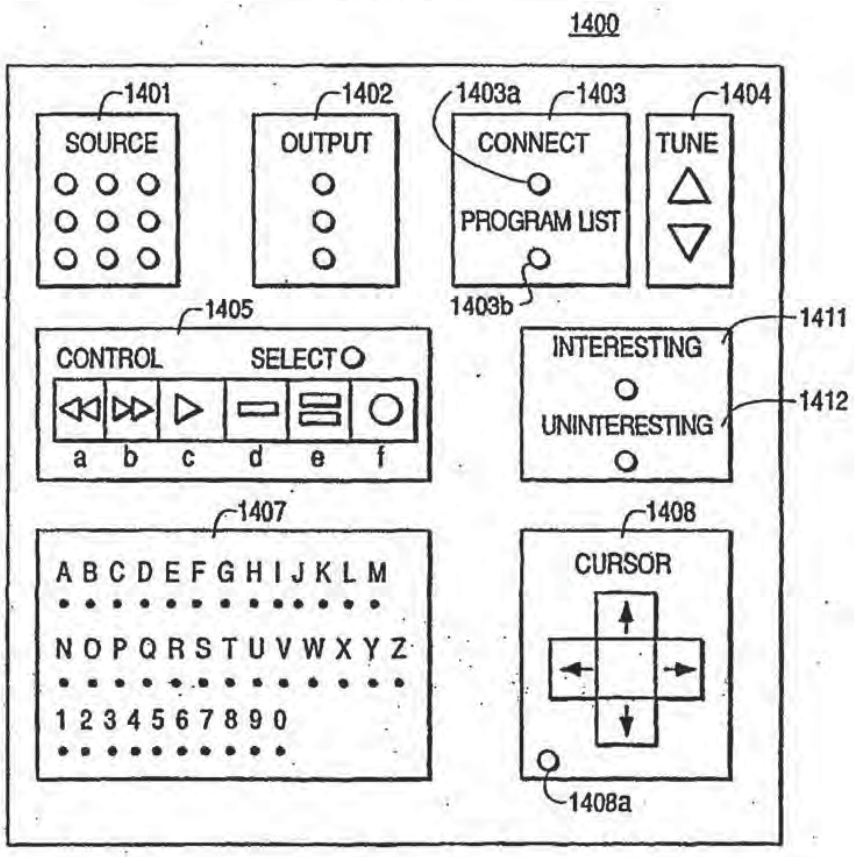
111a

FIG. 13


1310
RECORD PROGRAM MODE
1320
CHOOSE MONTH
1330
CHOOSE DAY
1340
CHOOSE TIME
1350
CHOOSE CHANNEL
1360
ENTER SOURCE CONNECTION
1370
ENTER NAME OF PROGRAM TO BE RECORDED
1380
SET FREQUENCY OF RECORDING
1390
STOP RECORDING

1a1a

FIG. 14


1400
1401
SOURCE
1402
OUTPUT
1403a
1403
CONNECT
PROGRAM LIST
1403b
1404
TUNE
1405
CONTROL
SELECT
a b c d e f
1411
INTERESTING
1412
UNINTERESTING
1407
A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z
1 2 3 4 5 6 7 8 9 0
1408
CURSOR
1408a

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(22) Date of filing: **12.10.1993**

(54) Arrangement for storing an information signal in a memory and retrieving the information signal from said memory

Gerät zur Speicherung eines Datensignals in einem Speicher und zur Wiedergabe des Datensignals aus diesem Speicher

Appareil de mémorisation d'un signal d'information dans une mémoire et de recouvrement du signal d'information de la mémoire en question

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(56) References cited:
WO-A-90/08999 **WO-A-91/13695**

- **COMPUTER DESIGN, vol.25, no.6, March 1986, LITTLETON, MASSACHUSETTS US pages 87 - 92 WINTERSTEIN 'CACHE DESIGN BOOSTS SMD DISK DRIVE PERFORMANCE'**

TIVO 454228

EP 0 594 241 B1

Description

[0001] The invention relates to an arrangement for storing an information signal in a memory and retrieving the information signal from said memory, the arrangement including the memory, an input terminal for receiving the information signal, an output terminal for supplying a delayed version of the information signal, an input buffer memory, having an input coupled to the input terminal and an output coupled to an input of said memory, and an output buffer memory having an input coupled to the output of said memory and an output coupled to said output terminal.

[0002] Published international patent application no. WO91/13695 discloses the temporary storage of a video signal in a memory. Using this known arrangement, an information signal can be stored in the memory and an information signal previously stored in said memory can be retrieved simultaneously from said memory. The memory can be in the form of an optical disk or a magnetic disk, such as a hard disk or a disk-array. The arrangement can be used in a television apparatus or a videorecorder so as to store a video signal in the memory.

[0003] One application of the arrangement is where live television signal transmissions are continuously recorded and a history is maintained as far back as the extent of the memory will permit. For some applications, the memory capacity of the memory can be such that it permits the storage of a video signal having a length of a few minutes. For other applications a memory capacity corresponding to a length of about 15 minutes is considered a minimum practical amount.

[0004] The arrangement offers a number of interesting features to a user.

[0005] Individual choice of the time at which a program is watched. For example, suppose at ten past eight the viewer wants to start watching the eight o'clock news (from the beginning, of course). Using the arrangement, provided the right channel has been monitored, the viewer jumps back ten minutes in time, as it were, and watches the news from the start. Unlike the case where the programme is recorded on a conventional video recorder, the viewer does not have to wait until the program has finished before watching it.

[0006] Continuity after an interruption. If the viewer is interrupted while watching a programme, for example by a telephone call or a call at the door, he can resume watching the program from the point at which he was interrupted. This functionality is not possible with a conventional video-recorder.

[0007] A practical solution to program overlap. Suppose a programme on one channel doesn't finish until ten minutes after the start of a programme on another channel. The prior art permits one to watch both programmes without the use of a video recorder. During the first programme, the viewer ensures that the channel of the second programme is being monitored. After the first programme has ended, the viewer switches to the other channel and jumps back to the start of the programme. An important advantage over using a video recorder is that one does not have to wait until the recording has finished before the programme can be watched.

[0008] Individual replays, including slow motion. The viewer can see a replay of an event just seen, (or just missed, or not fully understood) and then continue watching the programme from the point where the replay was started. Moreover, the replays can be watched in slow motion.

[0009] Belated decision to record on video recorder possible. A viewer may decide after watching a programme for ten minutes that the programme is worth recording onto video. With the arrangement, he can retrospectively start video-recording, whilst continuing to watch the programme live.

[0010] Additional features of the arrangement are:

[0011] A means of accelerating the viewing of a historical programme. If the viewer is not watching live, e. g. due to a later programme start or an interruption, he can catch up with the live broadcast by accelerating the playback. An acceleration factor of a few per cent is practically unnoticed by the viewer. The circuitry (disk read-out, demultiplexing, data decompression, d/a conversion etc.) must be capable of processing the data at the accelerated rate. The sound can be specially processed so that the speed is accelerated without an undue increase in tone.

[0012] A means of fast-accelerating over a historical programme. In this case not all television picture data is necessarily processed - some may be skipped and not be passed on for demultiplexing and decompression.

[0013] A fast reverse function.

[0014] A picture-in-picture (PIP) processing unit to enable combinations of live and historical programmes to be displayed using picture-in-picture formats.

[0015] In order to enable an uninterrupted storage of a live television programme in the main memory, and enable an uninterrupted and simultaneous retrieval of the historical programme from the main memory, an input buffer memory and an output buffer memory are present. Data arriving for storage in the main memory, whilst the main memory is temporarily busy for another operation, will be stored in the input buffer memory, and will be stored at a later moment in the main memory by retrieving the data from the input buffer memory. Data will also be requested regularly from the main memory to be displayed on a TV screen as a historical programme. Again, the main memory may be temporarily busy for another operation, so data must be readily available in the output buffer memory, so as to provide continuity of viewing for the user.

[0016] The invention as claimed in claim 1 provides for an improvement in relation to the memories included in the arrangement. For that purpose, the input buffer memory and the output buffer memory are combined into one single buffer memory.

[0017] The invention is based on the following recognition. In an ideal operation of the input buffer memory, the control of the data transfer through the input buffer memory should be such that, in order to absorb a maximum amount of data without a transfer of data from the input buffer memory to the main memory, the input buffer memory should be empty. Further, in an ideal operation of the output buffer memory, the control of the data transfer through the output buffer memory should be such that, in order to provide a maximum amount of data to be displayed on the screen without a transfer of data from the main memory to the output buffer memory, the output buffer memory should be full. These requirements offer the possibility to combine the input buffer memory and the output buffer memory into one shared memory, to be used as efficiently as possible under the administration realized by a microprocessor.

[0018] The invention is specifically useful in the situation where the main memory is a hard-disk arrangement, and where the hard-disk arrangement has a single magnetic head for storing the information signal on and retrieving the information signal from the hard disk included in the hard-disk arrangement. It should however be noted that also in disk arrangements having more than one head, situations can occur where an uninterrupted storage on or retrieval from the disk is not possible, such as in the case where a head has to jump to another storage location and information flow interruption can not be corrected by another head. Further, it should be noted that, where the description discloses the storage of a single information signal in and retrieval of said information signal from the main memory, it is equally well possible to apply the inventive concept to the storage and retrieval of a number of two or more information signals in/from the main memory, eg. derived from different program channels.

[0019] The invention will be further described in the following figure description, in which

figure 1 discloses an embodiment of the arrangement,
figure 2 discloses a more simplified embodiment,
figure 3 discloses a buffer memory in the form of a FIFO, and
figure 4 discloses a buffer memory in the form of a reversible FIFO.

[0020] Figure 1 discloses an embodiment of the arrangement. One or more television signals first pass through a channel selector 1, which selects which transmissions, according to their channel, are to be stored, and which transmissions, according to their channel, are required for live display. The transmissions which are selected to be stored are digitized by means of a/d (analogue to digital) converters 2. The digital data is then compressed in real time by a data compressor 3. The output of each channel after being compressed by the data compressor 3 is placed in a buffer 4, of which there is at least one per selected channel. The buffers 4 also act as a multiplexer because they can be read out in such a way as to convert several parallel data streams into one data stream (although the different streams are separately administered). The information contained in the buffers 4 will be transferred to the buffer memory 35 under supervision of a microprocessor 24 by a DMA (direct memory access) controller 31, and is identifiable as input destined for a main memory 36, which is in the form of a band disk arrangement. The microprocessor 24 initiates the data transfer from the buffer 4 to the buffer memory 35, and performs memory allocation in the buffer memory. The microprocessor 24 runs ROM-(read-only memory) 22 based software and makes use of a working RAM (random access memory) 23 for temporary variables, the administration of the buffer memory 35, storage of user commands and the user status etc. Input data in the buffer memory 35 is transferred to the main memory 36 as soon as it is convenient under supervision of the microprocessor 24 by another DMA controller 32.

[0021] The stored data in main memory 36 is in due course transferred to the buffer memory 35 under supervision of the microprocessor 24 by DMA controller 32. DMA controller 32 cannot at the same time be required or used for transferring data in the opposite direction. As television data is actually required to be displayed on the television screen, it is transferred under supervision of the microprocessor 24 by DMA controller 33 to a buffer 14. The process of transfer of data from main memory 36 to the buffer memory 35, and from the buffer memory 35 to the buffers 14 takes place separately for channels which the viewer has selected as historical channels to be viewed or recorded or used for any other purpose. An adequate supply of data per channel must always be present in the buffer memory 35 to be able to keep up with the demand. Data is taken from the buffers 14 and is decompressed by a data decompressor 13, and is converted to an analogue signal by a d/a (digital to analogue) converter 12. The output of the d/a converter 12 can be sent to a video recorder or television. An acceleration controller 41 has various tasks - it controls the acceleration rate at which data is required, including providing for slow motion and frozen frames and frame stepping. It also provides for fast forward and fast reverse functions. The DMA controller 33, buffers 14, data decompressor 13 and d/a (digital to analogue) converters 12 should all be capable of working slightly faster (say 15%) than real time, so that an accelerated playback can be provided without loss of data until the acceleration controller 41 generates an accelerated display at a standard frame-rate. Live transmissions and historical transmissions can be simultaneously displayed using PIP = (picture-in-picture) techniques by a PIP/postprocessor 42.

[0022] It may be advantageous to combine the buffer memory 35 and working RAM (random access memory) 23 into one memory.

[0023] The buffer memory 35 enables a single head hard disk to cope with the dual task of writing the TV signal being monitored and simultaneously reading out the signal to be displayed.

[0024] Referring now to figure 2, conceptually, when the arrangement is in operation, there is a flow of data as follows.

[0025] Data arrives at the input terminal 50 for storage on the main memory 36, but as the disk in the main memory 36 may be temporarily busy for another operation, the data arriving will be buffered in input buffer 35a, by applying the data to the input 59a of said input buffer 35a. As soon as the disk is capable of receiving the data, the data stored in the input buffer 35a is supplied to the output 51a of the buffer 35a and applied to the input 54 of the main memory 36, for storage on the disk.

[0026] Data will also be regularly requested from the main memory disk 36 to be displayed on the TV screen. Again the disk may be temporarily busy for another operation. Data stored in the output buffer 35b is now supplied to the output 51b and thus applied to the output terminal 53 so as to enable continuity of viewing for the user. As soon as the disk is capable of supplying data, the data stored on the disk is supplied to the output 56 of the main memory 36 and applied to the input 59b of the output buffer memory 35b, for storage in the output buffer 35b.

[0027] In particular, the input buffer 35a is needed to buffer the incoming data while the disk is being read, and the output buffer 35b is needed to provide a continuous output of data while the disk is being written to. The input buffer 35a and the output buffer 35b are combined into one shared memory 35.

[0028] It will be shown that the input buffer part and the output buffer part in the buffer memory 35 can be realized using a FIFO or alternatively a reversible queue mechanism. These structures are now discussed.

[0029] Figure 3 shows a buffer memory, such as the input buffer memory 35a in the form of a FIFO. The output buffer memory has the same construction. Figure 3 shows basic FIFO queue control using a two-entry FIFO queue control block 60, including two pointer locations, the pointers stored in the locations pointing to the beginning and the end of the queue. The pointers in the control block 60 are set to some suitable constant such as zero to indicate an empty queue, see figure 3a. Memory blocks 51a, 52a, ..., 58a and 59a are chained in one direction. All memory blocks include a memory space 70 for storing the data and a pointer location 71, as indicated in the memory block 52a. The pointer P1 in the control block 60 points to the address where the memory block 59a is stored. As this memory block is the block lastly stored, its pointer has a constant value, such as zero. The pointer P2 in the control block 60 points to the address where the memory block 51a is stored. This memory block is the block containing the oldest information stored in the buffer memory. Its pointer points to the address where the next memory block 52a is stored. The pointer 71 of the memory block 52a points to the address where the next memory block is stored. In this way, the pointer of block 58a points to the address where the block 59a is stored.

[0030] Memory blocks, such as the memory block 72, are added to the queue at the end of the chain. This is realized by setting P1 in control block 60 to the address where the memory block 72 is stored. Further, the pointer in memory block 72 becomes zero, and the pointer in memory block 59a will be set to the address where the memory block 72 is stored. Memory blocks, such as the memory block 51a, are taken from the queue at the start of the chain. This is realized by setting P2 in the control block 60 to the address where the memory block 52a is stored. In this way memory blocks can be added to and taken from the queue without the need to follow the whole chain of memory blocks. The pointer administration can be maintained in a short, fixed period of time.

[0031] A basic administration of the buffer memory 35 is possible using 3 FIFO queues, namely one FIFO queue (FIFO number 1) for the free memory blocks in the common buffer memory 35, one FIFO (FIFO number 2) for the input buffer memory part in the common buffer memory 35 and one FIFO (FIFO number 3) for the output buffer memory part of the common buffer memory 35.

[0032] A memory block is allocated for input by taking it from FIFO number 1 and adding it to FIFO number 2. A memory block is deallocated from input after its contents have been written to main memory 36 by taking it from FIFO number 2 and adding it to FIFO number 1. A memory block is allocated for output by taking it from FIFO number 1 and adding it to FIFO number 3. A memory block is deallocated from output after its data has been transferred to the output terminal 53 by taking it from FIFO number 3 and adding it to FIFO number 1. For this scheme to work properly, there must be adequate memory available in the buffer memory 35. It is important not to allow too much output memory to be allocated, as the amount of free memory for input will then be insufficient. The amount of memory needed, and the maximum amount of memory to ever be allocated to output data are mainly dependent on the seek time and data transfer time of the main memory 36.

[0033] The FIFO queue control blocks, such as the control block 60, can be located in fixed locations of working RAM 23 or the buffer memory 35.

[0034] Separate channels can be separately administered by defining one FIFO for free memory blocks and two FIFOs per channel (one for the input buffer part and one for the output buffer part, for each channel).

[0035] It may be possible to economise on memory by allowing the situation to occur exceptionally where there are no free memory blocks to allocate for input. In this case the most recently filled output buffer memory block is taken from FIFO number 3 and added to FIFO

number 1. An indication is set that in due course this data must be re-read from main memory 36. This process can be repeated if more input buffer memory blocks are needed. A snag is that in order to deallocate the most recent buffer in a FIFO queue as administered in Figure 3, the entire chain of memory blocks must be followed in order to find the most-recent-but-one memory block, which is to become the most recent memory block. This problem can be solved by using a reversible FIFO queue for the output buffer part, as illustrated in Figure 4. Reversible queues are an extension to the FIFO of figure 3, in that the memory blocks are linked in both directions. This enables a consistent queue administration to be maintained for use as FIFO (First-In First-Out) or LIFO (Last-In First-Out) without needing to follow the whole chain of pointers. For that purpose, the memory blocks include two pointer locations 71 and 73, for pointing towards a subsequent and a previous memory block respectively. The memory block 61 can again be the block including the oldest information, and the block 69 then comprises the most information most recently stored.

[0036] If the reference numerals in Figure 3 that carry an index 'a' are amended so as to carry an index 'b', the buffer memory of Figure 3 thus obtained describes the output buffer memory 35b.

Claims

1. An arrangement for intermediate storage of a video signal, said arrangement comprising: input means (50) for receiving sequential video signal elements at a first average speed; first-in-first-out input bridging buffer memory means (35a) having an input (59a) fed by said input means, having random access functionality for receiving said video signal elements and having an output interface (51a); mass memory disc means (36) having cross-track random access functionality for effecting said intermediate storage, and having write head means fed by said output interface (51a) and furthermore read head means; first-in-first-out output bridging buffer memory means (35b) having random access functionality and having an input interface (59b) fed by said read head means; output means (53) having an input fed by said first-in-first-out output bridging buffer memory means (35b) for outputting said sequential video signal elements at a second average speed; and wherein said input bridging buffer memory means and output bridging buffer memory means are exchangeably mapped on a single bridging buffer, for through said random access functionality and said cross-track random access functionality effecting an arbitrarily selectable intermediate storage time.

2. An arrangement as claimed in Claim 1, incorporated in a television receiver apparatus that has a video output for connection to a video recorder apparatus.

3. An arrangement as claimed in Claim 1, wherein said write head means and read head means are located in a single head.

4. An arrangement as claimed in Claim 1, wherein said mass memory disc means are magnetic and/or optical storage hard disc means.

5. An arrangement as claimed in Claim 1 wherein said input means are arranged for operating at a first average speed and said output means are arranged for then operating at a second average speed that is higher than said first average speed.

6. An arrangement as claimed in Claim 1 wherein said input means are arranged for operating at a first average speed and said output means are arranged for selectably operating at a second average speed that is either controllably higher or controllably lower than said first average speed.

7. An arrangement as claimed in Claims 5 or 6, wherein said second average speed corresponds to an appropriate human user viewing speed.

8. An arrangement as claimed in Claim 1, wherein said storage disc means allow current storage of at least a five minutes long stream of video signal elements.

9. An arrangement as claimed in Claim 1, wherein said input means, said output means and said mass memory disc means are arranged for accepting at least two independent streams of video signal elements in parallel.

10. An arrangement as claimed in Claim 1, wherein said input means and said mass memory disc means are arranged for accepting at least two independent streams of video signal elements in parallel.

11. An arrangement as claimed in Claim 1, combined with a supplementary video recording apparatus, wherein said output means are arranged for belatedly activating said video recording apparatus after said intermediate storage having commenced at an earlier instant.

12. An arrangement as claimed in Claim 1, combined with a video receiver apparatus and a video display apparatus, and being arranged for broadcaster-independent replay and/or slow-motion replay.

13. An arrangement as claimed in Claim 1 combined with a multi-channel video-receiver apparatus and

a supplementary single-channel video-recording apparatus, wherein said input means and said mass memory disc means are arranged for accepting at least two independent streams of video signal elements in parallel and said output means are arranged for belatedly activating said supplementary video recording apparatus with respect to a second channel after said intermediate storage having commenced at an earlier instant during overlap of said second channel with a first channel during the latter's being stored on said supplementary video recorder.

14. An arrangement as claimed in Claim 1 combined with a video-receiver apparatus and a video display apparatus, wherein said input means and said mass memory disc means are arranged for accepting a first stream of video signal elements in parallel to receiving at least a second independent stream of video signal elements next to said first stream of video signal elements by said video receiver apparatus, and said output means are arranged for belatedly activating said video display apparatus with respect to said first stream after said intermediate storage having commenced at an earlier instant during overlap of said first and second streams and said second stream's being displayed on said video display apparatus.

15. An arrangement as claimed in Claim 1 combined with a video-receiver apparatus and a video display apparatus, and for receiving a stream of video signal elements, and comprising inputting means for receiving an intermission control signal at a first particular time instant, and second inputting means for subsequently receiving a continue control signal at a second particular time instant, and said output means are arranged for belatedly activating said video display apparatus as from said second particular time instant on for displaying said stream of video signal elements as having been stored since said first particular time instant.

Patentansprüche

1. Anordnung zur unmittelbaren Speicherung eines Videosignals, wobei die genannte Anordnung umfaßt: Eingangsmittel (50) zum Empfangen sequentieller Videosignalelemente bei einer ersten mittleren Geschwindigkeit; FIFO-Eingangsüberbrükkungspufferspeichermittel (35a), mit einem von den genannten Eingangsmitteln gespeisten Eingang (59a), mit der Funktionalität des wahlfreien Zugriffs zum Empfangen der genannten Videosignalelemente und mit einer Ausgangsschnittstelle (51a); Massenspeicherplattenmitteln (36) mit der Funktionalität des wahlfreien Querspurzugriffs zum Bewirken der genannten Zwischenspeicherung und mit von der genannten Ausgangsschnittstelle (51a) gespeisten Schreibkopfmitteln und weiterhin Lesekopfmitteln; FIFO-Ausgangsüberbrückungspufferspeichermitteln (35b) mit der Funktionalität des wahlfreien Zugriffs und mit einer von den genannten Lesekopfmitteln gespeisten Eingangsschnittstelle (59b); Ausgangsmitteln (53) mit einem von den genannten FIFO-Ausgangsüberbrückungspufferspeichermitteln (35b) gespeisten Eingang zum Ausgeben der genannten sequentiellen Videosignalelemente bei einer zweiten mittleren Geschwindigkeit; und wobei die genannten Eingangsüberbrückungspufferspeichermittel und Ausgangsüberbrückungspufferspeichermittel austauschbar auf einen einzelnen Überbrückungspuffer abgebildet werden, um über die genannte Funktionalität des wahlfreien Zugriffs und die genannte Funktionalität des wahlfreien Querspurzugriffs eine willkürlich wählbare Zwischenspeicherdauer zu bewirken.

2. Anordnung nach Anspruch 1, aufgenommen in einem Fernsehgerät, das einen Videoausgang zum Anschluß an ein Videorecordergerät hat.

3. Anordnung nach Anspruch 1, wobei die genannten Schreibkopfmittel und Lesekopfmittel in einem einzigen Kopf liegen.

4. Anordnung nach Anspruch 1, wobei die genannten Massenspeicherplattenmittel Festplattenmittel zur magnetischen und/oder optischen Speicherung sind.

5. Anordnung nach Anspruch 1, wobei die genannten Eingangsmittel für einen Betrieb bei einer ersten mittleren Geschwindigkeit ausgebildet sind und die genannten Ausgangsmittel ausgebildet sind, um dann bei einer zweiten mittleren Geschwindigkeit zu arbeiten, die höher ist als die genannte erste mittlere Geschwindigkeit.

6. Anordnung nach Anspruch 1, wobei die genannten Eingangsmittel für einen Betrieb bei einer ersten mittleren Geschwindigkeit ausgebildet sind und die genannten Ausgangsmittel für einen selektiven Betrieb bei einer zweiten mittleren Geschwindigkeit ausgebildet sind, die entweder regelbar höher oder regelbar niedriger ist als die genannte erste mittlere Geschwindigkeit.

7. Anordnung nach Anspruch 5 oder 6, wobei die genannte zweite mittlere Geschwindigkeit einer geeigneten Betrachtungsgeschwindigkeit eines menschlichen Benutzers entspricht.

8. Anordnung nach Anspruch 1, wobei die genannten Speicherplattenmittel die laufende Speicherung zu-

mindest eines fünf Minuten langen Stroms aus Videosignalelementen zulassen.

9. Anordnung nach Anspruch 1, wobei die genannten Eingangsmittel, die genannten Ausgangsmittel und die genannten Massenspeicherplattenmittel ausgebildet sind, um zumindest zwei unabhängige Ströme von Videosignalelementen parallel zu akzeptieren.

10. Anordnung nach Anspruch 1, wobei die genannten Eingangsmittel und die genannten Massenspeicherplattenmittel ausgebildet sind, um zumindest zwei unabhängige Ströme von Videosignalelementen parallel zu akzeptieren.

11. Anordnung nach Anspruch 1, kombiniert mit einem zusätzlichen Videoaufnahmegerät, wobei die genannten Ausgangsmittel ausgebildet sind, um dieses Videorecordergerät spät zu aktivieren, nachdem die genannte Zwischenspeicherung zu einem früheren Zeitpunkt begonnen hat.

12. Anordnung nach Anspruch 1, kombiniert mit einem Videoempfangsgerät und einem Videowiedergabegerät und ausgebildet zum rundfünkanbieterunabhängigen Abspielen und/oder zum Abspielen in Zeitlupe.

13. Anordnung nach Anspruch 1, kombiniert mit einem Mehrkanalvideoempfangsgerät und einem zusätzlichen Einkanalvideoaufnahmegerät, wobei die genannten Eingangsmittel und die genannten Massenspeicherplattenmittel ausgebildet sind, um zumindest zwei unabhängige Ströme von Videosignalelementen parallel zu akzeptieren und die genannten Ausgangsmittel ausgebildet sind, um dieses zusätzliche Videoaufnahmegerät in bezug auf einen zweiten Kanal spät zu aktivieren, nachdem die genannte Zwischenspeicherung zu einem früheren Zeitpunkt während des Überlappens dieses zweiten Kanals mit einem ersten Kanal beim Speichern des letzteren auf dem genannten zusätzlichen Videorecorder begonnen hat.

14. Anordnung nach Anspruch 1, kombiniert mit einem Videoempfangsgerät und einem Videowiedergabegerät, wobei die genannten Eingangsmittel und die genannten Massenspeicherplattenmittel ausgebildet sind, um einen ersten Strom von Videosignalelementen zu akzeptieren, wobei parallel zumindest ein zweiter unabhängiger Strom von Videosignalelementen außer dem genannten ersten Strom von Videosignalelementen mit diesem Videoempfangsgerät empfangen wird, und die genannten Ausgangsmittel ausgebildet sind, um dieses Videowiedergabegerät in bezug auf den genannten ersten Strom spät zu aktivieren, nachdem die genannte Zwischenspeicherung zu einem früheren Zeitpunkt während des Überlappens dieser ersten und zweiten Ströme begonnen hat und die genannten zweiten Ströme auf dem genannten Videowiedergabegerät wiedergegeben werden.

15. Anordnung nach Anspruch 1, kombiniert mit einem Videoempfangsgerät und einem Videowiedergabegerät und zum Empfangen eines Stroms von Videosignalelementen und mit Eingabemitteln zum Empfangen eines Intermissionssteuersignals zu einem ersten speziellen Zeitpunkt und zweiten Eingabemitteln zum anschließenden Empfangen eines kontinuierlichen Steuersignals zu einem zweiten speziellen Zeitpunkt, und wobei die genannten Ausgangsmittel ausgebildet sind, um das genannte Videowiedergabegerät von dem genannten zweiten speziellen Zeitpunkt an spät zu aktivieren, zur Wiedergabe des genannten Stroms aus Videosignalelementen, wie sie seit dem ersten speziellen Zeitpunkt gespeichert worden sind.

Revendications

1. Montage pour le stockage intermédiaire d'un signal vidéo, ledit montage comprenant : des moyens d'entrée (50) pour recevoir des éléments de signal vidéo séquentiels à une première vitesse moyenne; des premiers moyens de mémoire tampon de pontage premier entré, premier sorti (35a) comportant une entrée (59a) alimentée par lesdits moyens d'entrée, présentant une fonctionnalité d'accès direct pour recevoir lesdits éléments de signal vidéo et comportant une interface de sortie (51a); des moyens de disque de mémoire de masse (36) présentant une fonctionnalité d'accès direct transversale pour effectuer ledit stockage intermédiaire, et comportant des moyens de tête d'écriture alimentés par ladite interface de sortie (5 la) et en outre des moyens de tête de lecture; des moyens de mémoire tampon de pontage de sortie premier entré, premier sorti (35b) présentant une fonctionnalité d'accès direct et comportant une interface d'entrée (59b) alimentée par lesdits moyens de tête de lecture; des moyens de sortie (53) comportant une entrée alimentée par lesdits moyens de mémoire tampon de pontage de sortie premier entré, premier sorti (35b) pour produire lesdits éléments de signal vidéo séquentiels à une deuxième vitesse moyenne; et dans lequel lesdits moyens de mémoire tampon de pontage d'entrée et lesdits moyens de mémoire tampon de pontage de sortie sont cartographiés de manière échangeable sur un seul tampon de pontage, pour, par le biais de ladite fonctionnalité d'accès direct et ladite fonctionnalité d'accès direct transversale, appliquer un temps de stockage intermédiaire pouvant être sélectionné de manière arbitraire.

2. Montage suivant la revendication 1, intégré dans un téléviseur qui comporte une sortie vidéo pour une connexion à un appareil d'enregistrement vidéo.

3. Montage suivant la revendication 1, dans lequel lesdits moyens de tête d'écriture et les moyens de tête de lecture sont situés dans une seule tête.

4. Montage suivant la revendication 1, dans lequel lesdits moyens de disque de mémoire de masse sont des moyens de disque dur de stockage magnétique et/ou optique.

5. Montage suivant la revendication 1, dans lequel lesdits moyens d'entrée sont agencés pour fonctionner à une première vitesse moyenne et lesdits moyens de sortie sont agencés pour fonctionner ensuite à une deuxième vitesse moyenne qui est supérieure à ladite première vitesse moyenne.

6. Montage suivant la revendication 1, dans lequel lesdits moyens d'entrée sont agencés pour fonctionner à une première vitesse moyenne et lesdits moyens de sortie sont agencés pour fonctionner de manière sélective à une deuxième vitesse moyenne qui est soit supérieure de manière commandable à ladite première vitesse moyenne ou inférieure de manière commandable à celle-ci.

7. Montage suivant la revendication 5 ou 6, dans lequel ladite deuxième vitesse moyenne correspond à une vitesse d'observation appropriée à un utilisateur humain.

8. Montage suivant la revendication 1, dans lequel lesdits moyens de disque de stockage permettent un stockage actuel d'au moins un flux d'éléments de signal vidéo de cinq minutes.

9. Montage suivant la revendication 1, dans lequel lesdits moyens d'entrée, lesdits moyens de sortie et lesdits moyens de disque de mémoire de masse sont agencés pour accepter au moins deux flux indépendants d'éléments de signal vidéo en parallèle.

10. Montage suivant la revendication 1, dans lequel lesdits moyens d'entrée et lesdits moyens de disque de mémoire de masse sont agencés pour accepter au moins deux flux indépendants d'éléments de signal vidéo en parallèle.

11. Montage suivant la revendication 1, combiné à un appareil d'enregistrement vidéo supplémentaire, dans lequel lesdits moyens de sortie sont agencés pour activer tardivement ledit appareil d'enregistrement vidéo après que ledit stockage intermédiaire a débuté à un moment antérieur.

12. Montage suivant la revendication 1, combiné à un appareil de réception vidéo et à un appareil d'affichage vidéo, et agencé pour une relecture indépendante de la station de diffusion et/ou une relecture au ralenti.

13. Montage suivant la revendication 1, combiné à un appareil de réception vidéo à plusieurs canaux et à un appareil d'enregistrement vidéo à un seul canal supplémentaire, dans lequel lesdits moyens d'entrée et lesdits moyens de disque de mémoire de masse sont agencés pour accepter au moins deux flux indépendants d'éléments de signal vidéo en parallèle et lesdits moyens de sortie sont agencés pour activer tardivement ledit appareil d'enregistrement vidéo supplémentaire par rapport à un deuxième canal après que ledit stockage intermédiaire a débuté à un moment antérieur durant le chevauchement entre ledit deuxième canal et un premier canal pendant le stockage de ce dernier sur ledit enregistreur vidéo supplémentaire.

14. Montage suivant la revendication 1, combiné à un appareil de réception vidéo et à un appareil d'affichage vidéo, dans lequel lesdits moyens d'entrée et lesdits moyens de disque de mémoire de masse sont agencés pour accepter un premier flux d'éléments de signal vidéo parallèlement à la réception d'au moins un deuxième flux d'éléments de signal vidéo indépendant à la suite dudit premier flux d'éléments de signal vidéo par ledit appareil de réception vidéo, et lesdits moyens de sortie sont agencés pour activer tardivement ledit appareil d'affichage vidéo par rapport audit premier flux après que le stockage intermédiaire a débuté à un moment antérieur pendant le chevauchement entre l'affichage desdits premier et deuxième flux sur ledit appareil d'affichage vidéo.

15. Montage suivant la revendication 1, combiné à un appareil de réception vidéo et à un appareil d'affichage vidéo, et pour recevoir un flux d'éléments de signal vidéo, et comprenant des moyens d'entrée pour recevoir un signal de commande d'interruption à un premier instant particulier, et des deuxièmes moyens d'entrée pour recevoir par la suite un signal de commande de continuation à un deuxième instant particulier, lesdits moyens de sortie étant agencés pour activer tardivement ledit appareil d'affichage vidéo à partir dudit deuxième instant particulier pour afficher ledit flux d'éléments de signal vidéo tel que stocké depuis ledit premier instant particulier.

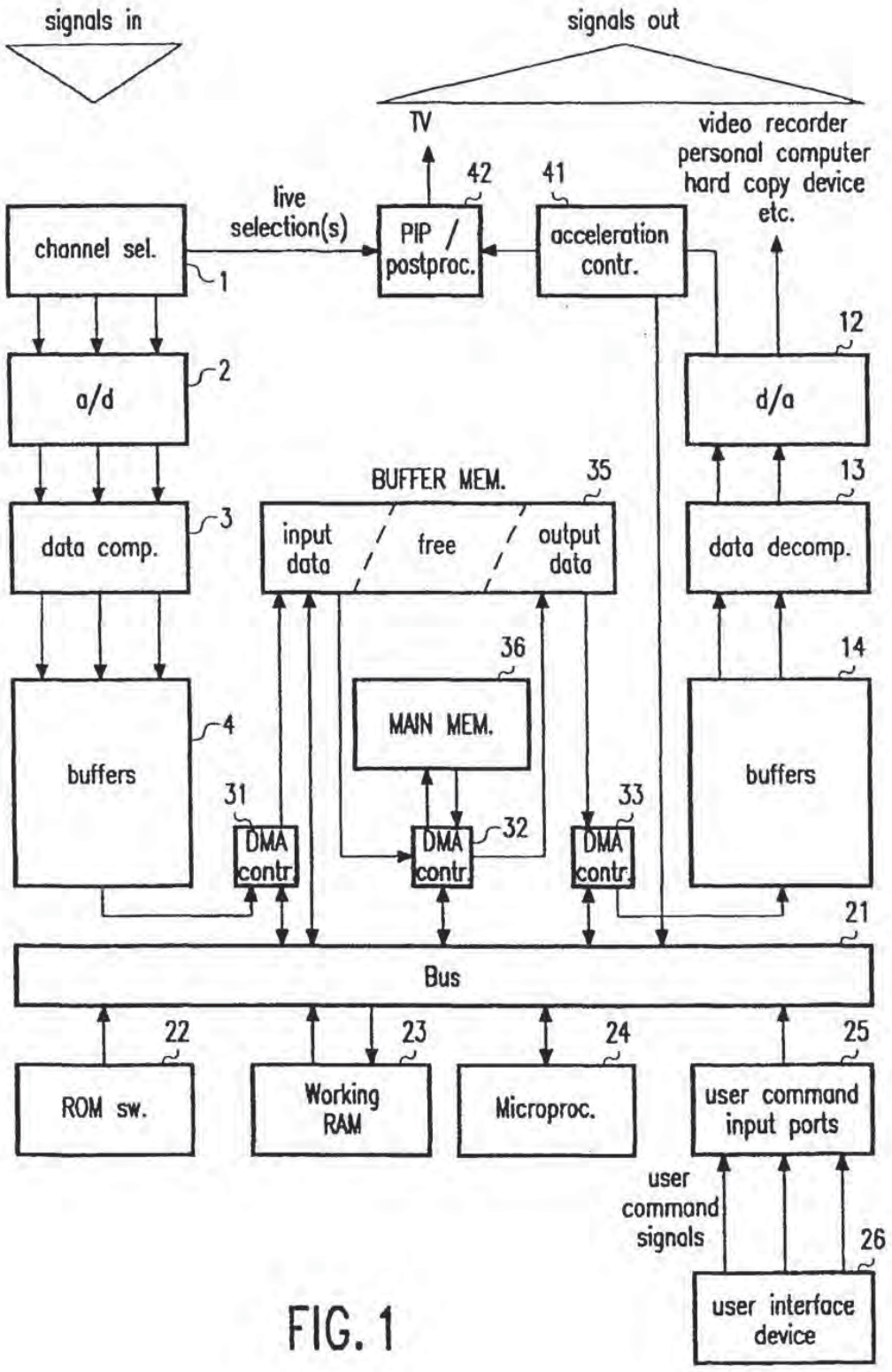

FIG. 1

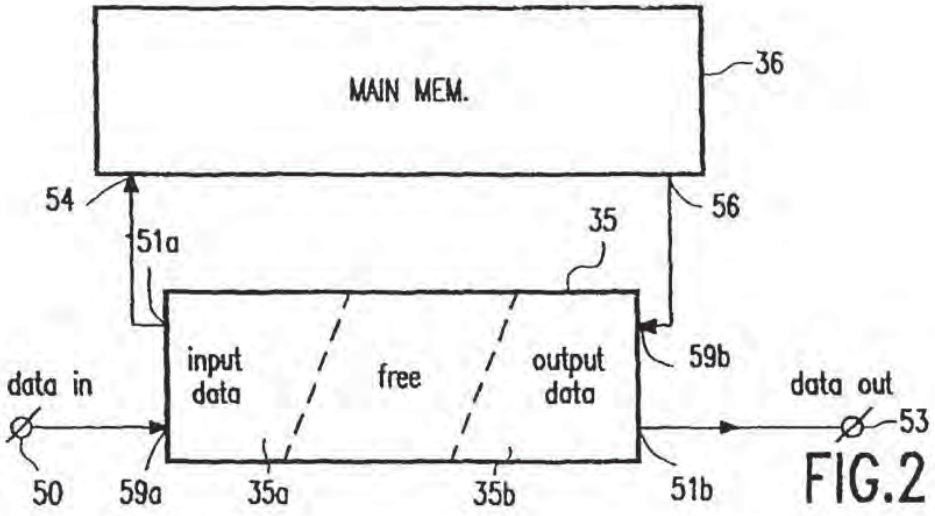

FIG.2

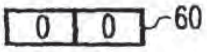

FIG.3a

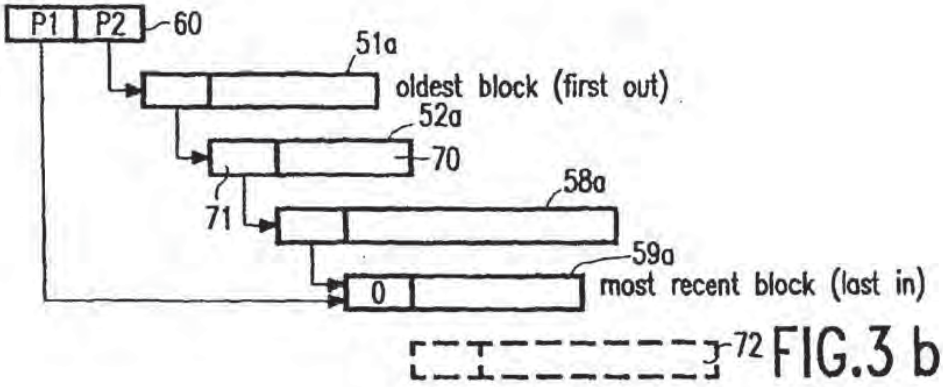

FIG.3b

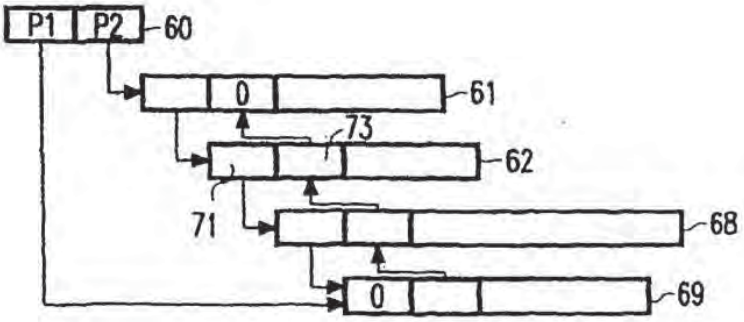

FIG.4

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(54) Arrangement for storing an information signal in a memory and retrieving the information signal from said memory.

(57) An arrangement for storing an information signal in a main memory (36) and retrieving the information signal from said main memory includes the memory (36), an input buffer memory (35a) and an output buffer memory (35b). The input buffer memory and the output buffer memory are combined into one single buffer memory (35).

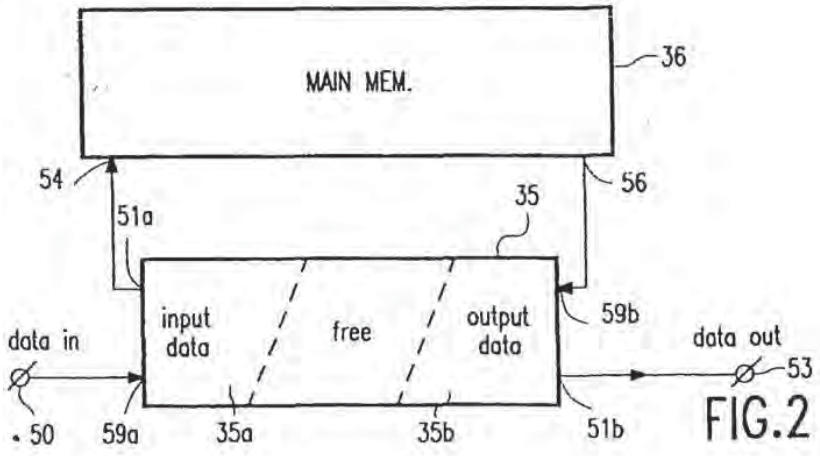

FIG.2

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HEADING A

The invention relates to an arrangement for storing an information signal in a memory and retrieving the information signal from said memory, the arrangement including the memory, an input terminal for receiving the information signal, an output terminal for supplying a delayed version of the information signal, an input buffer memory, having an input coupled to the input terminal and an output coupled to an input of said memory, and an output buffer memory having an input coupled to the output of said memory and an output coupled to said output terminal.

HEADING B

Published international patent application no. WO91/13695 discloses the temporary storage of a video signal in a memory. Using this known arrangement, an information signal can be stored in the memory and an information signal previously stored in said memory can be retrieved simultaneously from said memory. The memory can be in the form of an optical disk or a magnetic disk, such as a hard disk or a disk-array. The arrangement can be used in a television apparatus or a videorecorder so as to store a video signal in the memory.

One application of the arrangement is where live television signal transmissions are continuously recorded and a history is maintained as far back as the extent of the memory will permit. For some applications, the memory capacity of the memory can be such that it permits the storage of a video signal having a length of a few minutes. For other applications a memory capacity corresponding to a length of about 15 minutes is considered a minimum practical amount.

The arrangement offers a number of interesting features to a user.

Individual choice of the time at which a program is watched. For example, suppose at ten past eight the viewer wants to start watching the eight o'clock news (from the beginning, of course). Using the arrangement, provided the right channel has been monitored, the viewer jumps back ten minutes in time, as it were, and watches the news from the start. Unlike the case where the programme is recorded on a conventional video recorder, the viewer does not have to wait until the program has finished before watching it.

Continuity after an interruption. If the viewer is interrupted while watching a programme, for example by a telephone call or a call at the door, he can resume watching the program from the point at which he was interrupted. This functionality is not possible with a conventional video-recorder.

A practical solution to program overlap. Suppose a programme on one channel doesn't finish until ten minutes after the start of a programme on another channel. The invention permits one to watch both programmes without the use of a video recorder. During the first programme, the viewer ensures that the channel of the second programme is being monitored. After the first programme has ended, the viewer switches to the other channel and jumps back to the start of the programme. An important advantage over using a video recorder is that one does not have to wait until the recording has finished before the programme can be watched.

Individual replays, including slow motion. The viewer can see a replay of an event just seen, (or just missed, or not fully understood) and then continue watching the programme from the point where the replay was started. Moreover, the replays can be watched in slow motion.

Belated decision to record on video recorder possible. A viewer may decide after watching a programme for ten minutes that the programme is worth recording onto video. With the arrangement, he can retrospectively start video-recording, whilst continuing to watch the programme live.

Additional features of the arrangement are:

A means of accelerating the viewing of a historical programme. If the viewer is not watching live, e.g. due to a later programme start or an interruption, he can catch up with the live broadcast by accelerating the playback. An acceleration factor of a few per cent is practically unnoticed by the viewer. The circuitry (disk read-out, demultiplexing, data decompression, d/a conversion etc.) must be capable of processing the data at the accelerated rate. The sound can be specially processed so that the speed is accelerated without an undue increase in tone.

A means of fast-accelerating over a historical programme. In this case not all television picture data is necessarily processed - some may be skipped and not be passed on for demultiplexing and decompression.

A fast reverse function.

A picture-in-picture (PIP) processing unit to enable combinations of live and historical programmes to be displayed using picture-in-picture formats.

In order to enable an uninterrupted storage of a live television programme in the main memory, and enable an uninterrupted and simultaneous retrieval of the historical programme from the main memory, an input buffer memory and an output buffer memory are present. Data arriving for storage in the main memory, whilst the main memory is temporarily busy for another operation, will be stored in the input buffer memory, and will be stored at a

later moment in the main memory by retrieving the data from the input buffer memory. Data will also be requested regularly from the main memory to be displayed on a TV screen as a historical programme. Again, the main memory may be temporarily busy for another operation, so data must be readily available in the output buffer memory, so as to provide continuity of viewing for the user.

HEADING C

The invention provides for an improvement in relation to the memories included in the arrangement. For that purpose, the arrangement is characterized in that the input buffer memory and the output buffer memory are combined into one single buffer memory.

The invention is based on the following recognition. In an ideal operation of the input buffer memory, the control of the data transfer through the input buffer memory should be such that, in order to absorb a maximum amount of data without a transfer of data from the input buffer memory to the main memory, the input buffer memory should be empty. Further, in an ideal operation of the output buffer memory, the control of the data transfer through the output buffer memory should be such that, in order to provide a maximum amount of data to be displayed on the screen without a transfer of data from the main memory to the output buffer memory, the output buffer memory should be full. These requirements offer the possibility to combine the input buffer memory and the output buffer memory into one shared memory, to be used as efficiently as possible under the administration realized by a microprocessor.

The invention is specifically useful in the situation where the main memory is a hard-disk arrangement, and where the hard-disk arrangement has a single magnetic head for storing the information signal on and retrieving the information signal from the hard disk included in the hard-disk arrangement. It should however be noted that also in disk arrangements having more than one head, situations can occur where an uninterrupted storage on or retrieval from the disk is not possible, such as in the case where a head has to jump to another storage location and information flow interruption can not be corrected by another head. Further, it should be noted that, where the description discloses the storage of a single information signal in and retrieval of said information signal from the main memory, it is equally well possible to apply the inventive concept to the storage and retrieval of a number of two or more information signals in/from the main memory, eg. derived from different program channels.

HEADING D

The invention will be further described in the following figure description, in which

figure 1 discloses an embodiment of the arrangement,

figure 2 discloses a more simplified embodiment,

figure 3 discloses a buffer memory in the form of a FIFO, and

figure 4 discloses a buffer memory in the form of a reversible FIFO.

HEADING E

Figure 1 discloses an embodiment of the arrangement. One or more television signals first pass through a channel selector 1, which selects which transmissions, according to their channel, are to be stored, and which transmissions, according to their channel, are required for live display. The transmissions which are selected to be stored are digitized by means of a/d (analogue to digital) converters 2. The digital data is then compressed in real time by a data compressor 3. The output of each channel after being compressed by the data compressor 3 is placed in a buffer 4, of which there is at least one per selected channel. The buffers 4 also act as a multiplexer because they can be read out in such a way as to convert several parallel data streams into one data stream (although the different streams are separately administered). The information contained in the buffers 4 will be transferred to the buffer memory 35 under supervision of a microprocessor 24 by a DMA (direct memory access) controller 31, and is identifiable as input destined for a main memory 36, which is in the form of a band disk arrangement. The microprocessor 24 initiates the data transfer from the buffer 4 to the buffer memory 35, and performs memory allocation in the buffer memory. The microprocessor 24 runs ROM-(read-only memory) 22 based software and makes use of a working RAM (random access memory) 23 for temporary variables, the administration of the buffer memory 35, storage of user commands and the user status etc. Input data in the buffer memory 35 is transferred to the main memory 36 as soon as it is convenient under supervision of the microprocessor 24 by another DMA controller 32.

The stored data in main memory 36 is in due course transferred to the buffer memory 35 under supervision of the microprocessor 24 by DMA controller 32. DMA controller 32 cannot at the same time be required or used for transferring data in the opposite direction. As television data is actually required to be displayed on the television screen, it is transferred under supervision of the micropro-

cessor 24 by DMA controller 33 to a buffer 14. The process of transfer of data from main memory 36 to the buffer memory 35, and from the buffer memory 35 to the buffers 14 takes place separately for channels which the viewer has selected as historical channels to be viewed or recorded or used for any other purpose. An adequate supply of data per channel must always be present in the buffer memory 35 to be able to keep up with the demand. Data is taken from the buffers 14 and is decompressed by a data decompressor 13, and is converted to an analogue signal by a d/a (digital to analogue) converter 12. The output of the d/a converter 12 can be sent to a video recorder or television. An acceleration controller 41 has various tasks - it controls the acceleration rate at which data is required, including providing for slow motion and frozen frames and frame stepping. It also provides for fast forward and fast reverse functions. The DMA controller 33, buffers 14, data decompressor 13 and d/a (digital to analogue) converters 12 should all be capable of working slightly faster (say 15%) than real time, so that an accelerated playback can be provided without loss of data until the acceleration controller is reached 41 which generates an accelerated display at a standard frame-rate. Live transmissions and historical transmissions can be simultaneously displayed using PIP = (picture-in-picture) techniques by a PIP/postprocessor 42.

It may be advantageous to combine the buffer memory 35 and working RAM (random access memory) 23 into one memory.

The buffer memory 35 enables a single head hard disk to cope with the dual task of writing the TV signal being monitored and simultaneously reading out the signal to be displayed.

Referring now to figure 2, conceptually, when the arrangement is in operation, there is a flow of data as follows.

Data arrives at the input terminal 50 for storage on the main memory 36, but as the disk in the main memory 36 may be temporarily busy for another operation, the data arriving will be buffered in input buffer 35a, by applying the data to the input 59a of said input buffer 35a. As soon as the disk is capable of receiving the data, the data stored in the input buffer 35a is supplied to the output 51a of the buffer 35a and applied to the input 54 of the main memory 36, for storage on the disk.

Data will also be regularly requested from the main memory disk 36 to be displayed on the TV screen. Again the disk may be temporarily busy for another operation. Data stored in the output buffer 35b is now supplied to the output 51b and thus applied to the output terminal 53 so as to enable continuity of viewing for the user. As soon as the disk is capable of supplying data, the data stored on the disk is supplied to the output 56 of the main memory 36 and applied to the input 59b of the output buffer memory 35b, for storage in the output buffer 35b.

In particular, the input buffer 35a is needed to buffer the incoming data while the disk is being read, and the output buffer 35b is needed to provide a continuous output of data while the disk is being written to. The input buffer 35a and the output buffer 35b are combined into one shared memory 35.

It will be shown that the input buffer part and the output buffer part in the buffer memory 35 can be realized using a FIFO or alternatively a reversible queue mechanism. These structures are now discussed.

Figure 3 shows a buffer memory, such as the input buffer memory 35a in the form of a FIFO. The output buffer memory has the same construction. Figure 3 shows basic FIFO queue control using a two-entry FIFO queue control block 60, including two pointer locations, the pointers stored in the locations pointing to the beginning and the end of the queue. The pointers in the control block 60 are set to some suitable constant such as zero to indicate an empty queue, see figure 3a. Memory blocks 51a, 52a, ..., 58a and 59a are chained in one direction. All memory blocks include a memory space 70 for storing the data and a pointer location 71, as indicated in the memory block 52a. The pointer P1 in the control block 60 points to the address where the memory block 59a is stored. As this memory block is the block lastly stored, its pointer has a constant value, such as zero. The pointer P2 in the control block 60 points to the address where the memory block 51a is stored. This memory block is the block containing the oldest information stored in the buffer memory. Its pointer points to the address where the next memory block 52a is stored. The pointer 71 of the memory block 52a points to the address where the next memory block is stored. In this way, the pointer of block 58a points to the address where the block 59a is stored.

Memory blocks, such as the memory block 72, are added to the queue at the end of the chain. This is realized by setting P1 in control block 60 to the address where the memory block 72 is stored. Further, the pointer in memory block 72 becomes zero, and the pointer in memory block 59a will be set to the address where the memory block 72 is stored. Memory blocks, such as the memory block 51a, are taken from the queue at the start of the chain. This is realized by setting P2 in the control block 60 to the address where the memory block 52a is stored. In this way memory blocks can be added to and taken from the queue without the

need to follow the whole chain of memory blocks. The pointer administration can be maintained in a short, fixed period of time.

A basic administration of the buffer memory 35 is possible using 3 FIFO queues, namely one FIFO queue (FIFO number 1) for the free memory blocks in the common buffer memory 35, one FIFO (FIFO number 2) for the input buffer memory part in the common buffer memory 35 and one FIFO (FIFO number 3) for the output buffer memory part of the common buffer memory 35.

A memory block is allocated for input by taking it from FIFO number 1 and adding it to FIFO number 2. A memory block is deallocated from input after its contents have been written to main memory 36 by taking it from FIFO number 2 and adding it to FIFO number 1. A memory block is allocated for output by taking it from FIFO number 1 and adding it to FIFO number 3. A memory block is deallocated from output after its data has been transferred to the output terminal 53 by taking it from FIFO number 3 and adding it to FIFO number 1. For this scheme to work properly, there must be adequate memory available in the buffer memory 35. It is important not to allow too much output memory to be allocated, as the amount of free memory for input will then be insufficient. The amount of memory needed, and the maximum amount of memory to ever be allocated to output data are mainly dependent on the seek time and data transfer time of the main memory 36.

The FIFO queue control blocks, such as the control block 60, can be located in fixed locations of working RAM 23 or the buffer memory 35.

Separate channels can be separately administered by defining one FIFO for free memory blocks and two FIFOs per channel (one for the input buffer part and one for the output buffer part, for each channel).

It may be possible to economise on memory by allowing the situation to occur exceptionally where there are no free memory blocks to allocate for input. In this case the most recently filled output buffer memory block is taken from FIFO number 3 and added to FIFO number 1. An indication is set that in due course this data must be re-read from main memory 36. This process can be repeated if more input buffer memory blocks are needed. A snag is that in order to deallocate the most recent buffer in a FIFO queue as administered in Figure 3, the entire chain of memory blocks must be followed in order to find the most-recent-but-one memory block, which is to become the most recent memory block. This problem can be solved by using a reversible FIFO queue for the output buffer part, as illustrated in Figure 4. Reversible queues are an extension to the FIFO of figure 3, in that the memory blocks are linked in both directions. This enables a consistent queue administration to be maintained for use as FIFO (First-In First-Out) or LIFO (Last-In First-Out) without needing to follow the whole chain of pointers. For that purpose, the memory blocks include two pointer locations 71 and 73, for pointing towards a subsequent and a previous memory block respectively. The memory block 61 can again be the block including the oldest information, and the block 69 then comprises the most information most recently stored.

If the reference numerals in Figure 3 that carry an index 'a' are amended so as to carry an index 'b', the buffer memory of Figure 3 thus obtained describes the output buffer memory 35b.

Claims

1. An arrangement for storing an information signal in a memory (36) and retrieving the information signal from said memory, the arrangement including the memory (36), an input terminal (50) for receiving the information signal, an output terminal (51) for supplying a delayed version of the information signal, an input buffer memory (35a), having an input (52) coupled to the input terminal and an output (53) coupled to an input (54) of said memory (36), and an output buffer memory (35b) having an input (55) coupled to the output (56) of said memory and an output (57) coupled to said output terminal (51), characterized in that the input buffer memory and the output buffer memory are combined into one single buffer memory (35).

2. Arrangement as claimed in claim 1, characterized in that the memory (36) is a hard-disk memory arrangement.

3. Arrangement as claimed in claim 2, characterized in that the hard-disk arrangement (36) has a single magnetic head for storing the information signal on and retrieving the information signal from the hard disk included in the hard-disk arrangement.

4. Arrangement as claimed in claim 1, 2 or 3, characterized in that the buffer memory (35) is a random access memory.

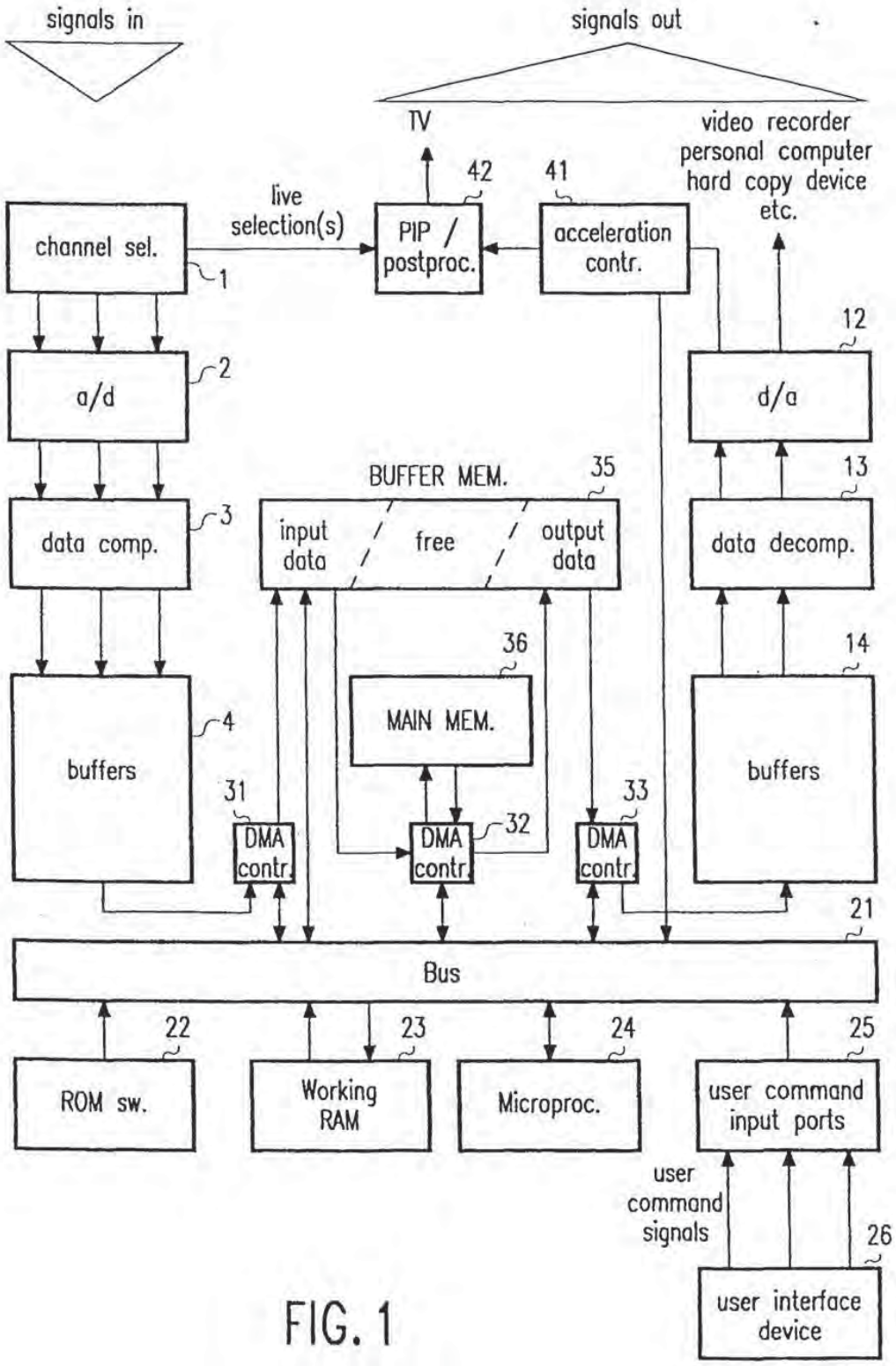

FIG. 1

TIVO 454225

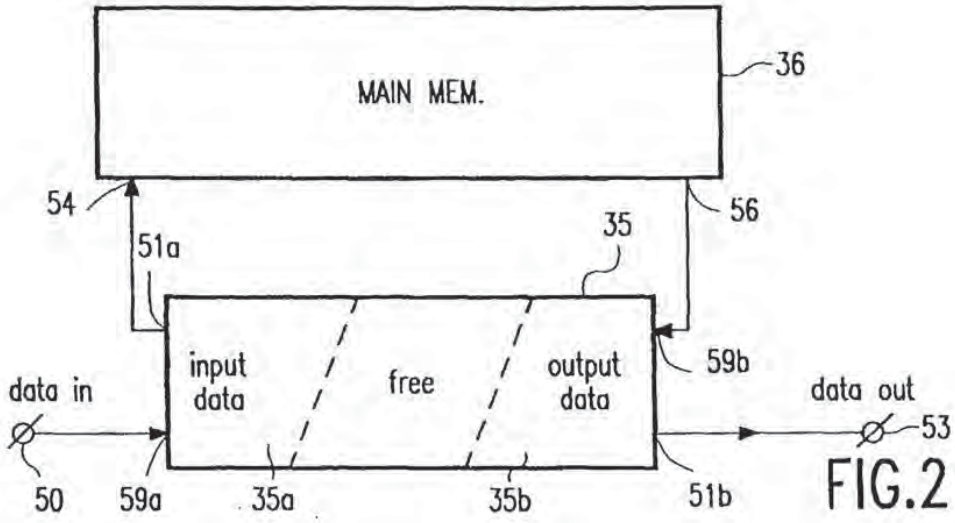

FIG.2

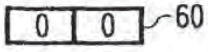

FIG.3a

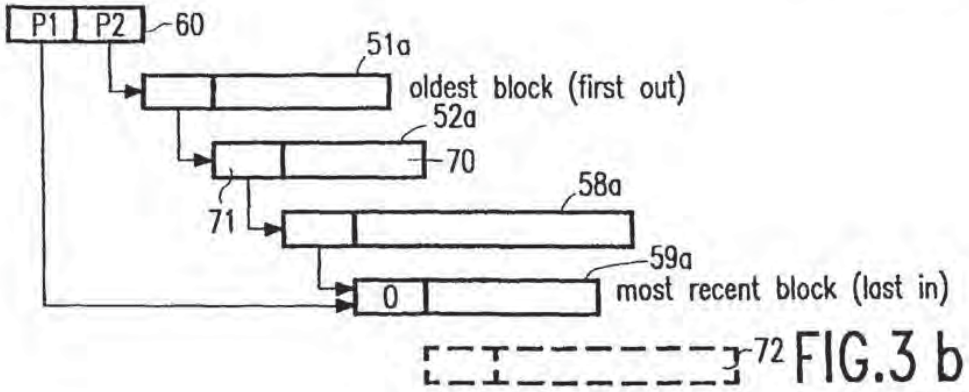

FIG.3 b

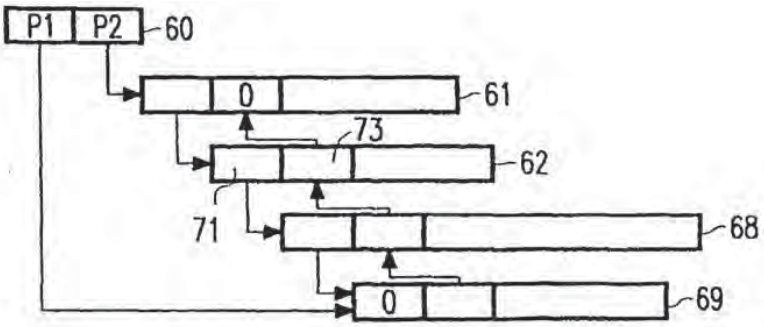

FIG.4

TIVO 454226

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 20 2871

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	COMPUTER DESIGN, vol.25, no.6, March 1986, LITTLETON, MASSACHUSETTS US pages 87 - 92 WINTERSTEIN 'CACHE DESIGN BOOSTS SMD DISK DRIVE PERFORMANCE'	1,2,4	G06F5/06 G06F3/06 H04N5/907
Y	* page 89, column 2, line 39 - page 90, column 2, line 16; figure 2 *	3	
Y	WO-A-90 08999 (STORAGE TECHNOLOGY CORPORATION) * page 16, line 24 - page 18, line 18; figure 2 *	3	
D,A	WO-A-91 13695 (THOMSON CONSUMER ELECTRONIC) * page 1 - page 4, line 31 *	1-4	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

G06F
H04N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	21 January 1994	Materne, A

CATEGORY OF CITED DOCUMENTS

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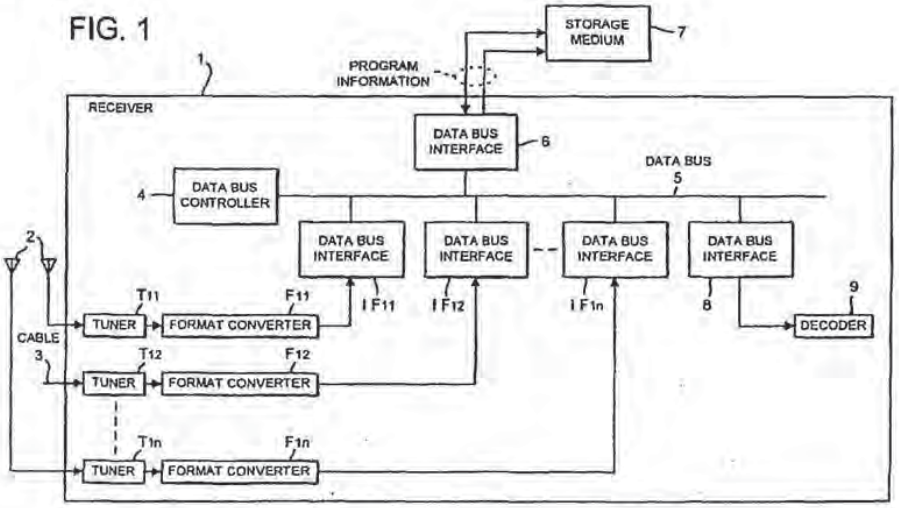
(54) Digital signal receiver

(57) Digital signal receiver for recording a plurality of program streams at the same time period with a single storage medium. The transport streams from the tuners T11 through T1n are converted into the program streams at the format conversion circuits F11 through F1n, then converted into the data forms corresponding to the data bus 5 in the data bus interfaces IF11 through IF1n, so as to output them to the data bus 5. Therefore, the data having a plurality of programs at the same time are transmitted on the data bus 5 in a multiplexed state. The data bus interface circuit 6 restores the data from the data bus 5 into the original data and supplies it to the storage medium 7. Accordingly, the storage medium 7 is able to record the program streams of a plurality of programs at the same time period.

FIG. 1



EP 0 785 675 A2

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Description

The present invention relates to a digital signal receiver that is suited for recording the digital data transmitted by using the transport streams which is possible to transmit the multi-programs.

Recently, digital processings of image data or audio data have become widespread. The digitization is employed in systems for television broadcasting and television conference, for transmitting a moving picture or sound such as a video telephone, or for recording the moving picture or sound in a magnetic disc, optical disc or magnetic tape and reproducing them. In these systems a high efficiency coding is adapted to make good use of channels and recording media.

As the high efficiency coding a MPEG (Moving Picture Experts Group) 2 is a typical system. In a JTC (Joint Technical Committee) of an ISO (International Organization for Standardization) and an IEC (International Electro Technical Commission), the MPEG2 is a coding standard advancing its standardization as ISO/IEC 13818. In the MPEG2, a MPEG2 system which standardizes the system for multiplexing the data stream of the image data or audio data is defined for using the data streams of the encoded image data or audio data for various applications not limited to the coding standard. The MPEG2 system has two data stream standards depending on applications using the data stream, i.e., a transport stream on the assumption of adaptation to the broadcasting or communication (hereinafter referred to as TS (Transport Stream)) and a program stream on the assumption of the adaptation to the storage or recording (hereinafter referred to as PS (Program Stream)).

The transport stream is taken into account that a plurality of programs are transmitted by one stream it can use a plurality of reference times each programs. It is expected to be adapted for broadcasting or communicating applications. On the other hand, the program stream is expected to be adapted widely as a standard recording format of a storage medium such as a magnetic disc, optical disc or magnetic tape. Here, these are standards for input signals of the decoder, and MPEG2 does not standardize the encode method of the signal.

Now, it is provided that the program transmitted by the digital broadcasting or digital communication is recorded, and in this case, a plurality of programs are transmitted by using the MPEG2 system transport streams. In this case, a plurality of programs are transmitted by using the MPEG2 system transport streams. In this case, to record the predetermined program the program portion which is desired to be recorded is extracted from the transport streams, and the extracted portion is converted into the program stream and recorded to the recording medium.

Thus, by using the transport stream in the broadcasting or communication it is possible to transmit a plurality of programs by one stream. In the case that the receiver has a plurality of tuner functions and also has a function for receiving the streams or programs transmitted from a plurality of transponders, it can receive the programs transmitted in the same time period by the transport stream.

However, since the transport stream is converted into the program stream at the recording time it had a problem that it needed the recording media as many as the programs to be recorded in order to record the transmitted programs at the same time.

Here, it may be possible to record the transmitted transport stream as it is, not converting into the program streams. However, in this case, undesired programs are also recorded together with the desired programs. Further, since the program stream is recognized as a standard format to the recording medium it is not a common.

Further, even when the transport stream is recorded as it is, if there are a plurality of programs to be recorded within the transport streams a plurality of recording media are necessary for recording these transport streams.

As described above, conventionally, in case of recording a plurality of programs transmitted by using the transport stream it has a problem that it needed the recording medium as many as the programs to be recorded.

The present invention has been made in view of the problems shown above and it is the object of the present invention to provide a digital signal receiver capable of recording a plurality of programs transmitted by using the transport stream to one recording medium.

In order to achieve the above object, the digital signal receiver according to a first aspect of the present invention includes a plurality of demodulation units for selecting and demodulating a specific frequency band from transmitted digital signals so as to obtain a transport stream which is constructed by multiplexing a plurality of programs, a format conversion unit for converting a plurality of transport streams from the demodulation units into program streams each having a single program, a data bus unit having a data bus for transmitting data, a plurality of first bus interface units for converting the program streams from the format conversion unit into data formats corresponding to the data bus and outputting them to the data bus at different timings each, and a second bus interface unit for converting the data which are sent by a multiplex transmission via the data bus into the original data formats and supplying them to a specific recording unit.

In order to achieve the above object, the digital signal receiver according to a second aspect of the present invention includes a plurality of demodulation units for selecting and demodulating a specific frequency band from transmitted digital signals so as to obtain a transport stream which is constructed by multiplexing a plurality of programs, a format conversion unit for converting a plurality of transport streams from the demodulation units into program streams each having a single program, a data bus unit having a data bus for transmitting data, a plurality of first bus interface units for con-

verting the program streams from the format conversion unit into data formats corresponding to the data bus and outputting them to the data bus at different timings each, a plurality of first bus interface units for converting the program streams from the format conversion unit into data formats corresponding to the data bus and outputting them to the data bus at different timings each, and a fourth bus interface unit for converting the data transmitted to the data bus from a plurality of the first bus interface unit or the data transmitted to the data bus from the third interface unit into the data which have the same formats as the data formats of the program streams so as to supply a specific decoding unit.

In order to achieve the above object, the digital signal receiver according to a third aspect of the present invention includes a plurality of demodulation units for selecting and demodulating a specific frequency band from transmitted digital signals so as to obtain a transport stream which is constructed by multiplexing a plurality of programs, a data bus unit having a data bus for transmitting data, a plurality of first bus interface units for converting a plurality of the transport streams from the demodulation units into the data formats corresponding to the data bus and outputting them to the data bus at different timings, a third bus interface unit for transmitting and receiving the data between the data bus, and converting the data formats between the data which are sent by a multiplex transmission via the data bus and the data which have the same formats as the data formats of the transport streams, a format conversion unit for transmitting and receiving the data between the third bus interface unit, transmitting and receiving the data between the specific recording/reproducing unit, and converting the format between the data containing transport streams and the data containing at least one program stream which is consisted of a signal program, and a fourth bus interface unit for converting the data transmitted to the data bus from a plurality of the first bus interface unit or the data transmitted to the data bus from the third interface into the data which have the same formats as the data formats of the transport streams so as to supply a specific decoding unit.

In order to achieve the above object, the digital signal receiver according to a fourth aspect of the present invention includes a plurality of demodulation units for selecting and demodulating a specific frequency band from transmitted digital signals so as to obtain a transport stream which is constructed by multiplexing a plurality of programs, an encoding unit for producing new transport streams by a time division multiplex of a plurality of the transport streams obtained from the demodulation units, a data bus unit having a data bus for transmitting the data, a first bus interface unit for converting the transport streams from the encoding unit into data formats corresponding to the data bus, a third bus interface unit for transmitting and receiving the data between the data bus, and converting the data formats between the data which are sent by a multiplex transmission via the data bus and the data which have the same formats as the data formats of the transport streams, a format conversion unit for transmitting and receiving the data between the third bus interface unit, and also between the specific recording/reproducing unit, and converting the format between the data having a plurality of the transport streams and the data having at least one program stream which is consisted of a single program, and a fourth bus interface unit for converting the data transmitted to the data bus from the first bus interface unit or the data transmitted to the data bus from the third interface into the data which have the same formats as the data formats of the transport streams so as to supply a specific decoding unit.

In order to achieve the above object, the digital signal receiver according to a fifth aspect of the present invention includes a data bus unit having a data bus for transmitting the data, at least one receiving unit having a conversion unit for converting transport streams constructed by multiplexing a plurality of programs which are obtained by selecting and demodulating the specific frequency bands from the transmitted digital signals into the program streams each having a simple program, and the first bus interface unit for converting the output of the conversion unit into the data formats which are data transmittable via the data bus, at least one recording/reproducing unit having the third bus interface unit for transmitting and receiving the data between the data bus and also between the specific recording/reproducing unit, and converting the data formats between the data which are sent by a multiplex transmission via the data bus and the data having the same data formats as the program streams, and at least one decoding unit having the fourth bus interface unit for converting the data transmitted to the data bus from the at least one receiving unit or the data transmitted to the data bus from the at least one recording/reproducing unit into the data having the same formats as the program streams so as to supply them to the specific decoding unit.

In order to achieve the above object, the digital signal receiver according to a sixth aspect of the present invention includes a data bus unit having a data bus for transmitting the data, at least one receiving unit having a unit for obtaining the transport streams constructed by multiplexing some programs by selecting and demodulating the specific frequency bands from the transmitted digital signals, and the first bus interface unit for converting the outputs of the unit mentioned above into the data formats which are data transmittable via the data bus, at least one recording/reproducing unit having the third bus interface unit for transmitting and receiving the data between the data bus, and converting the data formats between the data multiplexed trammeled via the data bus and the data having the same data formats as the transport streams, and unit for transmitting and receiving the data between the third bus interface unit, converting the format between the data containing the transport streams and the data containing at least one

program stream which is constructed by simple programs, and transmitting and receiving the data between the specific recording/reproducing unit, and at least one decoding unit having the fourth bus interface unit for converting the data transmitted to the data bus from the at least one receiving unit or the data transmitted to the data buses from at least one recording/reproducing unit into the data having the same formats as the transport streams so as to supply them to the specific decoding unit.

In order to achieve the above object, the digital signal receiver according to a seventh aspect of the present invention includes a data bus unit having a data bus for transmitting the data, at least one receiving unit having producing unit for producing new transport streams by the time-division multiplex of the transport streams constructed by multiplexing some programs which are obtained by selecting and demodulating the specific frequency band from the transmitted digital signals, and the first bus interface unit for converting the outputs of the producing unit into the data formats which are data transmittable via the data bus, at least one recording/reproducing unit having the third bus interface unit for transmitting and receiving the data between the data bus, and converting the data formats between the data multiplexed trammeled via the data bus and the data having the same data formats as the transport streams, and a unit for transmitting and receiving the data between the third bus interface unit, converting the format between the data containing the transport streams and the data containing at least one program stream which is consisted of a single program, and transmitting and receiving the data between the specific recording/reproducing unit, and at least one decoding unit having the fourth bus interface unit for converting the data transmitted to the data bus from at least one receiving unit or the data transmitted to the data bus from at least one recording/reproducing unit into the data having the same formats as the transport streams so as to supply them to the specific decoding unit.

According to the first aspect of the digital signal receiver, it is possible to obtain the plurality of transport streams from the transmitted digital signals by the plurality of demodulation unit. These transport streams are converted into the plurality of program streams by the format conversion unit. A plurality of the first bus interface unit convert the program streams into the data formats corresponding to the data bus and output them to the data bus by different timings. Accordingly, the program steams having the plurality of programs at the same time period present on the data bus. The second bus interface unit restores the data sent by the multiplex transmission through the bus into the original data formats and supplies them to the specific recording unit. Accordingly, the program stream having the plurality of programs is recorded at the same time period by the recording unit.

According to the second aspect of the digital signal receiver, data sent by the multiplex transmission via the data bus converted into the original data formats by the third bus interface unit and supplied to the recording unit. Further, the reproduced data from the recording/reproducing unit is converted into the data formats corresponding to the data bus by the third bus interface unit so as to output to the data bus. The fourth bus interface unit converts the data transmitted to the data bus from the plurality of the first bus interface unit or the data transmitted to the data bus from the third bus interface unit into the data having the same data formats as the data formats of the program streams so as to supply them to the specific decoding unit. Accordingly, in the decoding unit, the data associated to the transmitting data or the reproduced data from the recording/reproducing unit is decoded.

According to the third aspect of the digital signal receiver, the plurality of the first bus interface unit convert the transport streams into the data formats corresponding to the data bus so as to output the data bus at different timings each. Accordingly, the data having the plurality of transport streams present on the data bus. The third bus interface unit converts the data on the data bus into the original data formats and outputs them to the format conversion unit. By the format conversion unit the data containing at least one program stream are obtained and supplied to the recording/reproducing unit. Further, reproduced data from the recording/reproducing unit are converted into the data having the same data format as that of the transport streams, then converted into the data formats corresponding to the data bus by the third bus interface unit so as to output to the data bus. The forth bus interface unit converts the data transmitted to the data bus from the plurality of the first bus interface unit or the data transmitted to the data bus from the third bus interface unit into the data having the same data formats as that of the transport streams so as to supply them to the specific decoding unit. Accordingly, in the decoding unit, the transmitted data or the reproduced data from the recording/reproducing unit is decoded.

According to the fourth aspect of the digital signal receiver, by the encoding unit, new transport streams to which the plurality of transport streams are multiplexed are produced. The transport streams from the encoding unit are converted into the data formats corresponding to the data bus so as to output to the data bus by the first bus interface unit. Accordingly, the data having the plurality of transport streams present on the data bus. The third bus interface unit converts the data on the data bus into the original data formats and supplies them to the format conversion unit. By the format conversion unit the data containing at least one program stream are obtained and supplied to the recording/reproducing unit. Further, the reproduced data from the recording/reproducing unit are converted into the data having the same data formats as that of the transport streams by the format conversion unit and converted into the data formats

corresponding to the data bus by the third bus interface unit, so as to be output to the data bus. The fourth bus interface unit converts the data transmitted to the data bus from the first bus interface or the data transmitted to the data bus from the third bus interface unit into the data having the same data formats as that of the transport streams and supplies them to the specific decoding unit. Accordingly, in the decoding unit, the transmitted data or the reproduced data from the recording/reproducing unit is decoded.

According to the fifth aspect of the digital signal receiver, the receiving unit, recording/reproducing unit and decoding unit have each first, third and fourth bus interface unit. The receiving unit, recording/reproducing unit and decoding unit can transmit the data using the data bus by the first, third and fourth bus interface unit. The transport streams are obtained from the digital signals transmitted from the receiving unit, which are converted into the program streams, then converted into the data formats corresponding to the data bus so as to output to the data bus. By defining the plurality of the receiving units, the data containing the plurality of the program streams flow on the data bus. The recording/reproducing unit records the data sent by the multiplex transmission on the data bus after converting them into the original data formats.

According to the sixth aspect of the digital signal receiver, the receiving unit converts the transport streams into the data formats corresponding to the data bus. By using the plurality of the receiving unit, the data containing the plurality of the transport streams flow on the data bus. The recording/reproducing unit records the data sent by the multiplex transmission on the data bus after converting them into the original data formats.

According to the seventh aspect of the digital signal receiver, the receiving unit produce new transport streams by multiplexing the plurality of transport streams and converts them into the data formats corresponding to the data bus. Accordingly, the data containing the plurality of transport streams bus flow on the data bus. The recording/reproducing unit records the data sent by the multiplex transmission on the data bus after converting them into the original data formats.

Additional objects and advantages of the present invention will be apparent to persons skilled in the art from a study of the following description and the accompanying drawings, which are hereby incorporated in and constitute a part of this specification.

For a better understandings of the present invention and many of the attendant advantages thereof, reference will now be made by way of example to the accompanying drawings, wherein:

FIGURE 1 is a block diagram showing one embodiment of the digital signal receiver according to the present invention;
FIGURE 2 is a diagram for explaining the format converters F11 through F1n in FIGURE 1;
FIGURE 3 is a diagram for explaining the data bus interfaces IF11 through IF1n in FIGURE 1;
FIGURE 4 is a diagram for explaining the operation of the embodiment;
FIGURE 5 is a diagram for explaining the recording example of the storage medium;
FIGURE 6 is a block diagram showing the modification of the FIGURE 1;
FIGURE 7 is a block diagram showing other embodiment of the present invention;
FIGURE 8 is a block diagram showing the modification of the FIGURE 7;
FIGURE 9 is a block diagram showing other embodiment of the present invention; and
FIGURE 10 is a block diagram showing the transformed embodiment from that shown in FIGURE 9.

Embodiments of the present invention will be explained hereinafter in reference to the drawings. FIGURE 1 is a block diagram showing one embodiment of the digital signal receiver according to the present invention.

The receiver 1 has n tuners T11 through T1n (n is a natural number). High frequency (RF) signals led to antennas 2, 2 and RF signals from a cable 3 are input to the tuners T11 through T1n. In FIGURE 1, a ground wave input from the antenna 2 or a cable input from the cable 3 is input to each tuner. However, the kinds of input supply are not limited to such inputs. Further, the number of the tuner are also not limited neither.

The tuners T11 through T1n obtain the specific digital signal by selecting and demodulating the specific frequency bands. The output digital signals from the tuners T11 through T1n construct the transport streams. The outputs of the tuners T11 through T1n are supplied to format converters F11 through F1n. The format converters F11 through F1n select the specific programs associated to the user operation among the input transport streams and convert them into the program streams so as to output them.

FIGURE 2 is a explaining diagram for explaining the format conversion by the format converters F11 through F1n in FIGURE 1. FIGURE 2a shows the transport stream, FIGURE 2b shows the PES, and FIGURE 2c shows the program stream.

In the embodiments of the present invention, the transport stream means the transport streams defined in the ISO/IEC13818, and the program stream means the program stream defined in the ISO/IEC13818 for instance.

As shown in FIGURE 2a, the transport stream is consisted of 188 bytes containing four bytes header (shown in slanting lines) of fixed-length packets. The transport stream includes a multiplexed unit of a plurality of programs, each program has different packets according to it being video data, audio data or other digital data. Each header of each packet contains a packet ID for showing the type of the packet, where a different nu-

merical value is assigned according to the types.

For conversion between the transport stream and the program streams a stream called PES (Packetized Elementary Stream) packet defined in ISO/IEC 13818 is used.

The PES packet is constructed by extracting the each type of packet of the same program from the TS packet. And PES header is added to the end of a payload (information).

As shown in FIGURE 2c, the program stream includes a package of groups of a plurality of PES packets. And a package header is added to the end of it. The format converters F11 through F1n generates the package data by synthesizing PES from the input transport streams and obtains the program streams by adding the header to the generated package data. As mentioned above, the format converters F11 through F1n converts the transport streams into the program streams by using the PES as an intermediate format. In the process of the conversion from the transport stream to the PES, desired programs are selected. The program streams from the format converters F11 through F1n are supplied to data bus interfaces If11 through IF1n.

The data bus interfaces If11 through IF1n become the interface for transmitting and receiving the data between the data bus 5, That is, the data bus interfaces IF11 through IF1n, which have the memory capacity of each bus standard and register (not shown) performs buffering and control the transmitting and receiving the data between other data bus interfaces and data bus 5 and also control the velocity of them.

The data bus 5 transmits the data between each modules such as the stream decoders inside the receiver 1, or between apparatuses outside the receiver 1. The bus interfaces IF11 through IF1n convert the data streams into the data formats defined to the data bus and output them.

FIGURE 3 is a explanation diagram showing the example of the data formats on the data bus 5.

The-data bus interfaces IF11 through IF1n, as shown in FIGURE 3, divide the input program stream (FIGURE 3a) into data length m bytes defined to the bus, and add the k bytes header to the end of the divided m bytes. The header contains the address information of the bus interfaces in the data transmitting origin, data length of the data following the header, the data reproducing order information and the error correct information.

Here, the data formats of the bus are not limited to the example shown in FIGURE 3. It may be any formats if it assures the transmitting and receiving of the data. For, instance, it may be the format which recognizes the data origin and the data termination of the data in the header part, as shown in FIGURE 3, and it may be the format corresponding to the bus standard which recognizes the data before the transmission of the data between the interfaces.

A data bus controller 4 controls the data transfer on the data bus 5. The data controlled by the data bus controller 4 and transmitted to the data bus 5 by the proper data transfer rate from the data bus interfaces If11 through IF1n are transmitted to the bus interface of the destination terminal.

In the embodiment, the data bus controller 4 transmits the outputs of the data bus interfaces If11 through IF1n via the data bus 5 by the time-division multiplex.

The data transmitted via the data bus 5 is supplied to the data bus interface 6 in the data termination. The bus interface 6, which has a memory capacity defined by the data bus 5 to make it impossible to arbitrate the bus mastership between other data bus interfaces or a register, performs buffering. The data bus interface 6 restores the original program stream from the input data and outputs them to a storage medium 7, and also outputs the header information to the storage medium 7 as a program information. Further, the data bus interface 6 converts the data from the storage medium 7 into the data format as corresponding to the data bus 5 and outputs them on the data bus 5.

The storage medium 7 detects that which program data the transmitted data are, where they are obtained from the tuners T11 through T1n, or where they are output from the data bus interfaces IF11 through IF1n based on the program information, and records each program stream as changing the recording position according to each program. For instance, if the storage medium 7 is an optical disc recorder or a hard disc apparatus it changes the recording positions of the program streams according to each disc sector.

On the other hand, the data on the data bus 5 is also supplied to the data bus interface 8. The data bus interface 8, which has a memory capacity defined by the data bus 5 to make it impossible to arbitrate the bus mastership between other data bus interfaces or a register, performs buffering. The data bus interface 8 selects the program streams which are associated to the user operation from the header information of the input data and input them to the decoder 9. The decoder 9 restores the video data, audio data or other data of the program by decoding the program stream and supplies them to the display (not shown) so as to display the desired program.

Next, the operation of the embodiment constructed like this will be explained hereinafter referring to FIGURES 4 and 5. FIGURE 4 is a flow chart for explaining the data transfer on the data bus 5. FIGURE 5 is a flow chart for explaining the recording example of the storage medium.

The RF signals from the antenna 2 and the cable 3 are supplied to the tuners T11 through T1n, and where these are demodulated by being selected the specific frequency band. The output digital signals of the tuners T11 through T1n are the transport streams. The outputs from the tuners T11 through T1n are supplied to the format converters F11 through F1n.

The format converters F11 through F1n selects the

specific programs which are associated to the user operation from the input transport streams and convert them into the program streams. The program streams from the format converters F11 through F1n are supplied to each data bus interfaces IF11 through IF1n.

The data bus interfaces IF11 through IF1n divide the input program stream shown in FIGURE 3a into m bytes units and adds k bytes header to the end of the m bytes unit as shown in FIGURE 3b so as to output them. FIGURES 4a through 4c shows the outputs from the data bus interfaces IF11 through IF1n. The left inclined slanting line zones show one unit (m+k bytes) of the data which is based on the program streams corresponding the programs selected by the format converter F11 from the outputs of the tuner T11. Similarly, the right inclined slanting line zones show one unit (m+k bytes) of the data which is based on the program streams corresponding the programs selected by the format converter F12 from the outputs of the tuner T12. Further, the cross-hatch parts show one unit (m+k bytes) of the data which is based on the program streams corresponding the programs selected by the format converter F13 from the outputs of the tuner T13.

As shown in FIGURES 4a through 4c, the outputs of the data bus interfaces FII through F13 are controlled by the data bus controller 4 so as to be output on the data bus 5 by different timings. Therefor, the multiplexed data are transmitted on the data bus 5 as shown in FIGURE 4d. That is, in the example of FIGURE 4, the data based in the three programs at the same time are transmitted via the data bus 5.

Now, it is provided that these three programs are recorded in the storage medium 7.
In this case, the data on the data bus 5 are supplied to the data bus interface 6. The data bus interface 6 separates the header from the each one unit data shown in FIGURE 4d, outputs the program streams to the storage medium 7 and also outputs the header to the storage medium 7 as a program information. The storage medium 7 records the program streams of three programs supplied from the data bus interface 6.

Now, the disc apparatus is adapted as the storage medium 7. The FIGURE 5 is explaining the recording on the disc in this case. The programs 1, 2 and 3 of FIGURE 5 correspond to each outputs from the format converters F11 through F1n. The storage medium 7 performs the recording and reproducing to the disc 11. The storage medium 7 divides the data into areas divided in the track or sector units and records them. That is, it divides the disc 11 into 8 sectors, that is, 8 areas in round direction so as to record.

Here, the recording data write-in rate writes in the data by program units, as same as the data bus 5 transmission rate. For instance, in the specific two tracks as shown in FIGURE 5 among the 8 areas the area 12 records the program 2, the area 15 records the program 3, the area 14 records the programs 2 and 3, and the area 15 records the programs 1 and 2. As mentioned above, since the data transmitted from the data bus 5 via the data bus interface 6 is constructed by a plurality of programs are time-multiplexed it changes the disc write-in areas according to the change of programs so as to record a plurality of programs at the same time period.

Further, it can select only specific programs from the received plurality of transport streams and display them. For instance, it is provided that the specific program in the transport stream received the tuner T11 is displayed. The format converter F11 selects the TS packet of the program to be displayed from the input transport streams to generate PES. Further, the format converter F11 packages the PES and adds the package header to make the program stream.

This program stream is supplied to the data bus interface IF and output in the format corresponding to the data bus 5 by adding the header which is designated to the data bus interface 8. The data bus interface 8 takes-in the data specified as a data termination from the data transmitted from the data bus 5 and restores the data into the original program streams by eliminating the header so as to output them to the decoder 9.

The decoder 9 decodes the programs streams so as to obtain the video data, audio data and other data. These data are supplied to the display (not shown) and displayed.

Further, in the embodiment, it can be possible to reproduce and display the programs recorded in the storage medium 7. That is, in this case, the storage medium 7 reproduces the desired programs which are associated to the user operation. The program streams of this program is divided into m bytes units in the data bus interface 6 and output in the format corresponding to the data bus 5 by adding the k bytes header by m bytes units. In this case, that the data termination is the data bus interface 8 is specified by the header.

Accordingly, to the data bus interface 8 the program stream reproduced by the storage medium 7 is supplied. Other operations are as same as the display time of the receiving data.

As mentioned above in the embodiment, according to transmit the program streams of a plurality of programs obtained from the transport streams via the data bus by time-division multiplexed it is possible to record a plurality of program streams at the same time period by a storage medium.

By the way, in the embodiment shown in FIGURE 1 receiver is contalning a plurality of tuners and decoders. However, one receiver needs not to have all these circuits. FIGURE 6 shows the circuit example which has the same construction as FIGURE 1 by combining units, each of which has a part of circuit. In FIGURE 6 the same components as those shown in FIGURE 1 are assigned with the same marks and their explaining are omitted.

A tuner section UII includes a tuner T11, a format converter F11 and a data bus interface IF11. As same

as this, a tuner section U12 includes a tuner T12, a format converter F12 and a data bus interface IF12. The tuner section U1n includes a tuner T1n, a format converter F1n and a data bus interface IF1n.

A data bus section B11 includes a data bus controller 4 and a data bus 5. A recording section K11 includes a data bus interface 6 and a storage medium 7. And, a decoder section D11 includes a data bus interface 8 and a decoder 9.

As mentioned above, in FIGURE 6 the data bus section B11 is independent. The n tuner sections U11 through U1n, the recording section K11 and the decode section D11 have each the bus interfaces IF11 through IF1n, 6 and 8, and they are connected to the data bus 5 of the data bus section B11 via each data bus interface. Therefore, the circuit construction of FIGURE 6 becomes as same as the FIGURE 1.

According to such a construction mentioned above, it becomes very easy to improve or extend each unit. For instance, since the improvement or changing number of the tuner section, or extension of the decoder sections are also easy it is possible to make the desirable surroundings by connecting the units desired by users.

FIGURE 7 is a block diagram showing the other embodiment of the present invention. In FIGURE 7 the same components as those shown in FIGURE 1 are assigned with the same marks and the explanation of them are omitted. In the embodiment of FIGURE 1 the transport streams from the tuners T11 through T1n are converted into the program streams, them they are supplied over the data bus. However, in the embodiment of FIGURE 7 it is different from that of FIGURE 1 that the transport streams are supplied on the data bus and it adapts the receiver 21 which has one format converter.

The output transport stream from the tuners T11 through T1n are supplied to each data bus interfaces IF11 through IF1n. Also in this embodiment, the transport stream means the one defined in ISO/IEC 13818, and the program stream means the one defined in ISO/IEC 13818.

The data bus interfaces IF11 through IF1n, which have the same construction as the embodiment shown in FIGURE 1, divide the input data into m bytes and add k bytes header to the end of the divided each m bytes so as to output them in the data formats corresponding to the data bus 5. In this embodiment, the inputs of the data bus interfaces IF11 through IF1n are transport streams. That is, n transport streams in maximum are time-division multiplexed in the data formats corresponding to the data bus 5 and flowed on the data bus 5.

The data bus interface 6 takes-in the data transmitted on the data bus 5 and restores them into the original data formats so as to output them to the format converter 22.. The format converter 22 performs the format conversion to the transport stream part in the input data and makes program streams of the desired programs so as to output them to the storage medium 7. Further, the format converter 22 outputs the header information to the storage medium 7 as the program information.

As shown in FIGURE 2, the packet ID showing the packet types is assigned to the header part of the transport stream. To this packet IDs different values according to each packet type are assigned, and different values are assigned to different transport streams. So, by discriminating the packet ID it is possible to make the program streams of a plurality of programs which are desired to be recorded from a plurality of transport streams and output them to the storage medium 7 in the state which are time-division multiplexed.

On the other hand, the data bus interface 8 restores the transport streams on the data bus 5 into the original data formats and output them to the decoder 23. The decoder 23 decodes the transport streams and outputs the video data, audio data and other data of the desired programs to the displayed (not shown).

Next, the operation of the embodiment in such structure as described above is explained.

The RF signals from the antenna 2 and the cable 3 are applied to the tuners T11 through T1n, and the transport streams in the specific frequency band are selected. These transport streams are converted into the data formats corresponding to the data bus 5 in the data bus interfaces IF11 through IF1n and controlled by the data bus controller 4 so as to be transmitted to the data bus 5 in the time-division multiplexed state.

Now, it is provided that a plurality of desired programs in the received transport streams are recorded. In this case, the data bus interfaces IF11 through IF1n for outputting the transport streams containing the programs to be recorded specifies the data bus interface 6 as a data termination. The data bus interface 6 takes-in the specified transport streams and restores them into the original data formats, then outputs them to the format converter 22.

The format converter 22 detects the packet ID contained in the input data and makes the program streams of a plurality of programs which are desired to be recorded so as to output them to the storage medium 7. Further, the format converter 22 outputs the header information to the storage medium 7 as the program information. Therefore, in the storage medium 7 a plurality of program streams are recorded at the same time period.

Further, in the embodiment, the displays associated to the receiving data and the reproduced data from the storage medium 7 are possible. In the case of display associated to the receiving data, the data bus interface 8 extracts the transport streams specified from the data on the data bus 5 and outputs them to the decoder 23. The decoder 23 decodes the input transport streams and supplies them to the displayed.

On the other hand, in the case of display associated to the reproduce data from the storage medium 7, the storage medium 7 reproduces the program streams of the programs which are displayed. The format converter

22 performs the format conversion to the program streams from the storage medium 7 and makes the transport streams. The transport streams are converted into the formats corresponding to the data bus 5 in the data bus interface 6 and transmitted on the data bus 5. In this case, the data bus interface 6 adds the header information which specifies the data bus interface 8 as the data termination of the transport streams.

The data bus interface 8 takes- in the transport streams of the programs which are to be displayed from the data bus 5 and converts the data formats of them so as to output the to the decoder 23. Other operations are same as the display time of the receiving data.

As mentioned above, in the embodiment, it has the same effect as the embodiment shown in FIGURE 1, and it also has the effect that it can obtain the multiplexed data of the program streams of a plurality of programs contained in a plurality of transport streams by a system of format converter.

Further in the embodiment, as same as the embodiment shown in FIGURE 1, 1 receiver needs not to have all circuits. FIGURE 8 shows the circuit having the same construction as that shown in FIGURE 7 by combining the units, each of which have a part of circuit. In FIGURE 8 the same components as those shown in FIGURE 7 are assigned with the same marks.

The tuner section U21 includes a tuner T11 and a data bus interface IF11. As same as this, the tuner section U22 includes a tuner T12 and a data bus interface IF12, while the tuner section U2n includes a tuner T1n and a data bus interface IF1n.

The data bus section B21 includes a data bus controller 4 and a data bus 5, while the recording section K21 includes a data bus interface 6, a format converter 22 and a storage medium 7. Further, the decoding section D21 includes a data bus interface 8 and a decoder 23.

Accordingly, in FIGURE 8 the data bus section B21 is independent. The n tuner sections U21 through U2n, the recording section K21 and the decoder section D21 have each data bus interfaces IF11 through IF1n, 6, and 8, and each if these sections are connected to the data bus 5 of the data bus section B21 via each bus interface. Accordingly, the circuit construction shown in FIGURE 8 becomes as same as that shown in FIGURE 7.

According to such a construction mentioned above, it will be easy to improve and extend each unit. For instance, since the improvement or changing of the number of the tuner sections or extension of the decoder section are easy it can obtain the desired surroundings by connecting the units which are desired by user.

FIGURE 9 is a block diagram showing other embodiment of the present invention. In FIGURE 9 the same component as those shown in FIGURE 7 are assigned with the same marks, and the explanation of them are omitted. In embodiment shown in FIGURE 7 each transport streams are converted into the data formats corresponding to the data bus 5 in each data bus interfaces IF11 through IF1n, them they are multiplexed and transmitted on the data bus 5. However, in the embodiment shown in FIGURE 7, it is adapting the receiver 31 for making one transport stream by time-division multiplexing a plurality of transport streams, then converting the transport streams into the data format corresponding to the data bus 5.

That is, the transport streams from the tuners T11 through T1n are applied to the multiplexer (hereinafter referred to as the MUX) 32 via each buffers BU11 through BU1n. Also in this embodiment, the transport stream means that defined in the ISO/IEC 13818, and the program stream means that defined in the ISO/IEC 13818.

The buffers BU11 through BU1n holds the transport streams for a time and output them to the MUX 32. The MUX 32 time-division multiplexed the input n transport streams in maximum and makes new transport streams. The transport streams from the MUX 32 are supplied to the data bus interface 33.

The data bus interface 33, which has a memory which has a capacity corresponding to the bus standard or register (not shown), performs the buffering and also performs transfer controls and data rate controls for data transferred between other data bus interfaces which communicates data with the data bus 5. The data bus interface 33 divides the input transport streams into data length m bytes defined by the bus, adds the k bytes header to the end of the divided m bytes and converts them into the data forms corresponding to the data bus 5 so as to output them on the data bus 5.

Next, the operation of the embodiment constructed as mentioned above will be explained.

The transport streams from the tuners T11 through T1n are applied to each buffers BU11 through BU1n and held for a time, then applied to the MUX 32. The MUX 32 makes new transport streams by time-division multiplexing a plurality of input transport streams. The transport streams are converted into the data formats corresponding to the data bus 5 in the data bus interface 33, then transmitted on the data bus 5.

When a plurality of programs contained in the received transport streams are recorded the data on the data bus 5 are restored to the original data formats in the data bus interface 6 and supplied to the format converter 22. The format converter 22 discriminates the packet ID contained in the data streams from the data bus interface 6 and makes the program streams of a plurality of desired programs. These programs are supplied to the storage medium 7 in the multiplexed states.

Other operations are as same as the embodiment shown in FIGURE 7.

Further, also in the embodiment as same as that shown in FIGURE 7, the receiver needs not to have all circuits. FIGURE 10 shows the circuits having the same structure as that shown in FIGURE 9 by combining the units, each of which has a part of the circuit.

In FIGURE 10 the same components as those

shown in FIGURE 9 are assigned with the same marks, and the explanation of them are omitted.

The tuner section U31 includes tuners TII through TIn, buffers BU11 through BU1n and a data bus interface 33. Further, the data bus section B31 includes the data bus controller 4 and the data bus 5, while the recording section K31 includes the data bus interface 6, the format converter 22 and the storage medium 7. Further, the decoder section D31 includes the data bus interface 8 and the decoder 23.

As mentioned above, in FIGURE 10 the data bus section B31 is separated. The tuner section U31, recording section K31 and the decoder section D31 have data bus interfaces 31, 6 and 8, and each of these sections is connected to the data bus 5 of the data bus section B31 via each data bus interface. Accordingly, the circuit construction shown in FIGURE 10 becomes as same as that shown in FIGURE 9.

According to such a construction as mentioned above, also in the embodiment it can obtain the desired ' surroundings by converting the units which are desired by user.

As described above, the digital signal receiver according to the present invention has the effect that the a plurality of programs transmitted by using the transport streams are recorded to one recording medium at the same time.

While there have been illustrated and described what are at present considered to be preferred embodiments of the present invention, it will be understood by those skilled in the art that various changes and modifications may be made, and equivalents may be substituted for elements thereof without departing from the true scope of the present invention. In addition, many modifications may be made to adapt a particular situation or material to the teaching of the present invention without departing from the central scope thereof. Therefor, it is intended that the present invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out the present invention, but that the present invention includes all embodiments falling within the scope of the appended claims.

The foregoing description and the drawings are regarded by the applicant as including a variety of individually inventive concepts, some of which may lie partially or wholly outside the scope of some or all of the following claims. The fact that the applicant has chosen at the time of filing of the present application to restrict the claimed scope of protection in accordance with the following claims is not to be taken as a disclaimer or alternative inventive concepts that are included in the contents of the application and could be defined by claims differing in scope from the following claims, which different claims may be adopted subsequently during prosecution, for example, for the purposes of a divisional application.

Claims

1. A digital signal receiver comprising;

   a plurality of demodulating means each for selecting and demodulating a specific band from received signals to obtain a transport stream formed from a plurality of multiplexed program signals;
   data bus means having a data bus for transmitting data;
   first data bus interface means for feeding a time multiplexed transport stream or streams output from the demodulating means or time multiplexed program streams obtained from the transport streams from the demodulating means;
   second data bus interface means for receiving selected data signals from said data bus; and
   recording means for receiving and recording time separated signals from different programs selected from program streams directly from said second data bus interface or after conversion into program streams of transport streams from said second data bus interface means.

2. A digital signal receiver according to claim 1 having third data bus interface means connected to said data bus for receiving signals from said first interface means via the data bus or from the recording means via the second interface means and the data bus; and having decoding means for decoding specific program signals from said third data bus interface means.

3. A digital signal receiver characterized by that it is provided with:

   a plurality of demodulation means for selecting and demodulating a specific frequency band from transmitted digital signals so as to obtain a transport stream which is constructed by multiplexing a plurality of programs;
   format conversion means for converting a plurality of transport streams from the demodulation means into program streams each having a single program;
   data bus means having a data bus for transmitting data;
   a plurality of first bus interface means for converting the program streams from the format conversion means into data formats corresponding to the data bus and outputting them to the data bus at different timings each; and
   second bus interface means for converting the data which are sent by a multiplex transmission via the data bus into the original data formats and supplying them to a specific recording

means.

4. A digital signal receiver characterized by that it is provided with:

a plurality of demodulation means for selecting and demodulating a specific frequency band from transmitted digital signals so as to obtain a transport stream which is constructed by multiplexing a plurality of programs;
format conversion means for converting a plurality of transport streams from the demodulation means into program streams each having a single program;
data bus means having a data bus for transmitting data;
a plurality of first bus interface means for converting the program streams from the format conversion means into data formats corresponding to the data bus and outputting them to the data bus at different timings each; and
fourth bus interface means for converting the data transmitted to the data bus from a plurality of the first bus interface means or the data transmitted to the data bus from third interface means into the data which have the same formats as the data formats of the program streams so as to supply a specific decoding means.

5. A digital signal receiver characterized by that it is provided with:

a plurality of demodulation means for selecting and demodulating a specific frequency band from transmitted digital signals so as to obtain a transport stream which is constructed by multiplexing a plurality of programs;
data bus means having data bus for transmitting data;
a plurality of first bus interface means for converting a plurality of the transport streams from the demodulation means into the data formats corresponding to the data bus and outputting them to the data bus at different timings;
third bus interface means for transmitting and receiving the data between the data bus, and converting the data formats between the data which are sent by a multiplex transmission via the data bus and the data which have the same formats as the data formats of the transport streams;
format conversion means for transmitting and receiving the data between the third bus interface means, transmitting and receiving the data between the specific recording/reproducing means, and converting the format between the data containing transport streams and the data containing at least one program stream which is consisted of a signal program; and
fourth bus interface means for converting the data transmitted to the data bus from a plurality of the first bus interface means or the data transmitted to the data bus from the third interface into the data which have the same formats as the data formats of the transport streams so as to supply a specific decoding means.

6. A digital signal receiver characterized by that it is provided with:

a plurality of demodulation means for selecting and demodulating a specific frequency band from transmitted digital signals so as to obtain a transport stream which is constructed by multiplexing a plurality of programs;
encoding means for producing new transport streams by a time division multiplex of a plurality of the transport streams obtained from the demodulation means;
data bus means having a data bus for transmitting the data;
first bus interface means for converting the transport streams from the encoding means into data formats corresponding to the data bus;
third bus interface means for transmitting and receiving the data between the data bus, and converting the data formats between the data which are sent by a multiplex transmission via the data bus and the data which have the same formats as the data formats of the transport streams;
format conversion means for transmitting and receiving the data between the third bus interface means, and also. between the specific recording/reproducing means, and converting the format between the data having a plurality of the transport streams and the data having at least one program stream which is consisted of a single program; and
fourth bus interface means for converting the data transmitted to the data bus from the first bus interface means or the data transmitted to the data bus from the third interface into the data which have the same formats as the data formats of the transport streams so as to supply a specific decoding means.

7. A digital signal receiver characterized by that it is provided with:

data bus means having a data bus for transmitting the data;
at least one receiving unit having a conversion means for converting transport streams constructed by multiplexing a plurality of programs

which are obtained by selecting and demodulating the specific frequency bands from the transmitted digital signals into the program streams each having a simple program, and the first bus interface means for converting the output of the conversion means into the data formats which are data transmittable via the data bus;

at least one recording/reproducing unit having the third bus interface means for transmitting and receiving the data between the data bus and also between the specific recording/reproducing means, and converting the data formats between the data which are sent by a multiplex transmission via the data bus and the data having the same data formats as the program streams; and

at least one decoding unit having the fourth bus interface means for converting the data transmitted to the data bus from the at least one receiving unit or the data transmitted to the data bus from the at least one recording/reproducing unit into the data having the same formats as the program streams so as to supply them to the specific decoding means.

8. A digital signal receiver characterized by that it is provided with:

data bus means having data bus for transmitting the data;

at least one receiving unit having means for obtaining the transport streams constructed by multiplexing some programs by selecting and demodulating the specific frequency bands from the transmitted digital signals, and the first bus interface means for converting the outputs of the means mentioned above into the data formats which are data transmittable via the data bus;

at least one recording/reproducing unit having the third bus interface means for transmitting and receiving the data between the data bus, and converting the data formats between the data multiplexed trammeled via the data bus and the data having the same data formats as the transport streams, and means for transmitting and receiving the data between the third bus interface means, converting the format between the data containing the transport streams and the data containing at least one program stream which is constructed by simple programs, and transmitting and receiving the data between the specific recording/reproducing means; and

at least one decoding unit having the fourth bus interface means for converting the data transmitted to the data bus from the at least one receiving unit or the data transmitted to the data buses from at least one recording/reproducing unit into the data having the same formats as the transport streams so as to supply them to the specific decoding means.

9. A digital signal receiver characterized by that it is provided with:

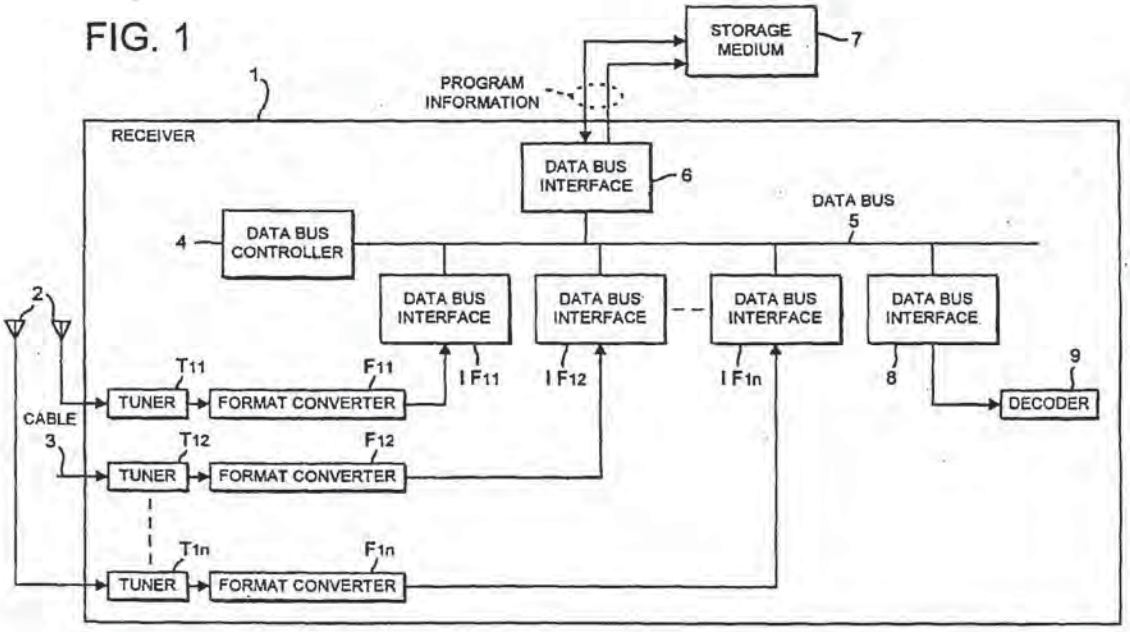
data bus means having a data bus for transmitting the data;

at least one receiving unit having producing means for producing new transport streams by the time-division multiplex of the transport streams constructed by multiplexing some programs which are obtained by selecting and demodulating the specific frequency band from the transmitted digital signals, and the first bus interface means for converting the outputs of the producing means into the data formats which are data transmittable via the data bus;

at least one recording/reproducing unit having the third bus interface means for transmitting and receiving the data between the data bus, and converting the data formats between the data multiplexed trammeled via the data bus and the data having the same data formats as the transport streams, and means for transmitting and receiving the data between the third bus interface means, converting the format between the data containing the transport streams and the data containing at least one program stream which is consisted of a single program, and transmitting and receiving the data between the specific recording/reproducing means; and

at least one decoding unit having the fourth bus interface means for converting the data transmitted to the data bus from at least one receiving unit or the data transmitted to the data buses from at least one recording/reproducing unit into the data having the same formats as the transport streams so as to supply them to the specific decoding means.

FIG. 1



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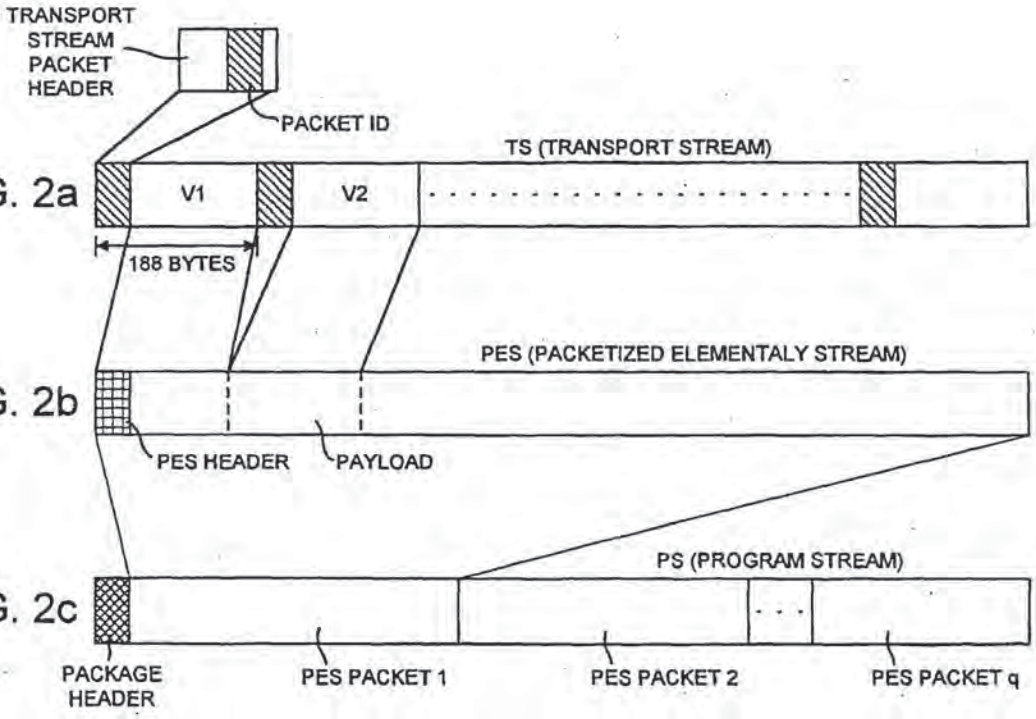

FIG. 2a

FIG. 2b

FIG. 2c

FIG. 3a

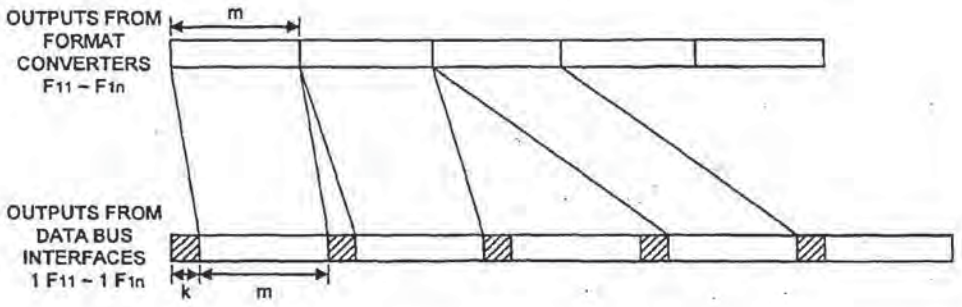
OUTPUTS FROM
FORMAT
CONVERTERS
F11 ~ F1n
m

FIG. 3b

OUTPUTS FROM
DATA BUS
INTERFACES
1 F11 ~ 1 F1n
k
m

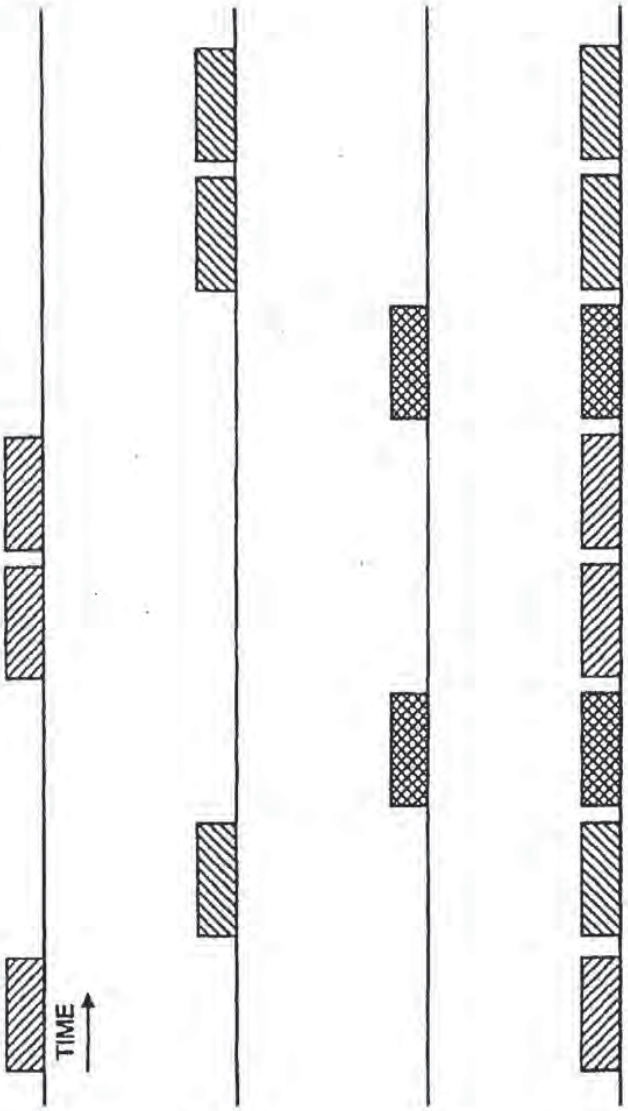

FIG. 4a

FIG. 4b

FIG. 4c

FIG. 4d

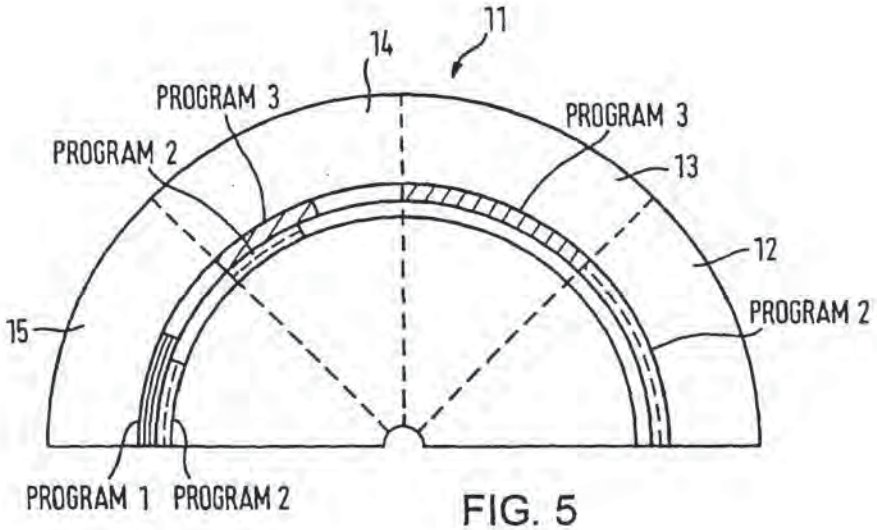
11
14
PROGRAM 3
PROGRAM 3
PROGRAM 2
13
12
PROGRAM 2
15
PROGRAM 1
PROGRAM 2

FIG. 5

FIG. 6

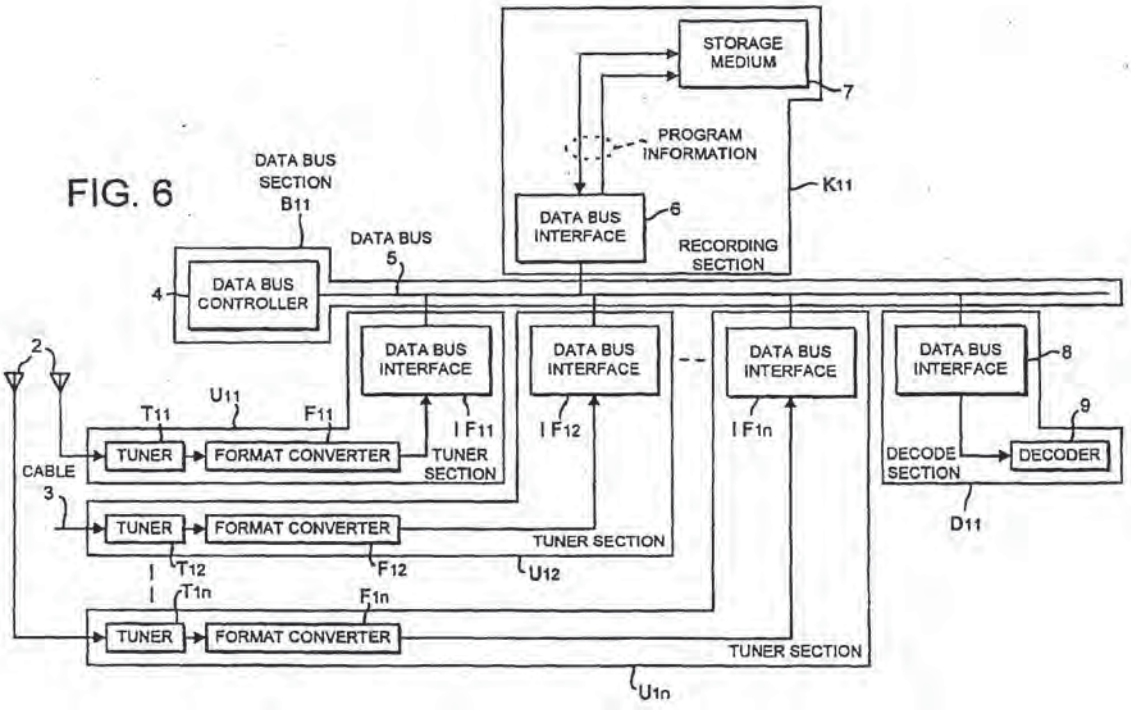

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FIG. 7

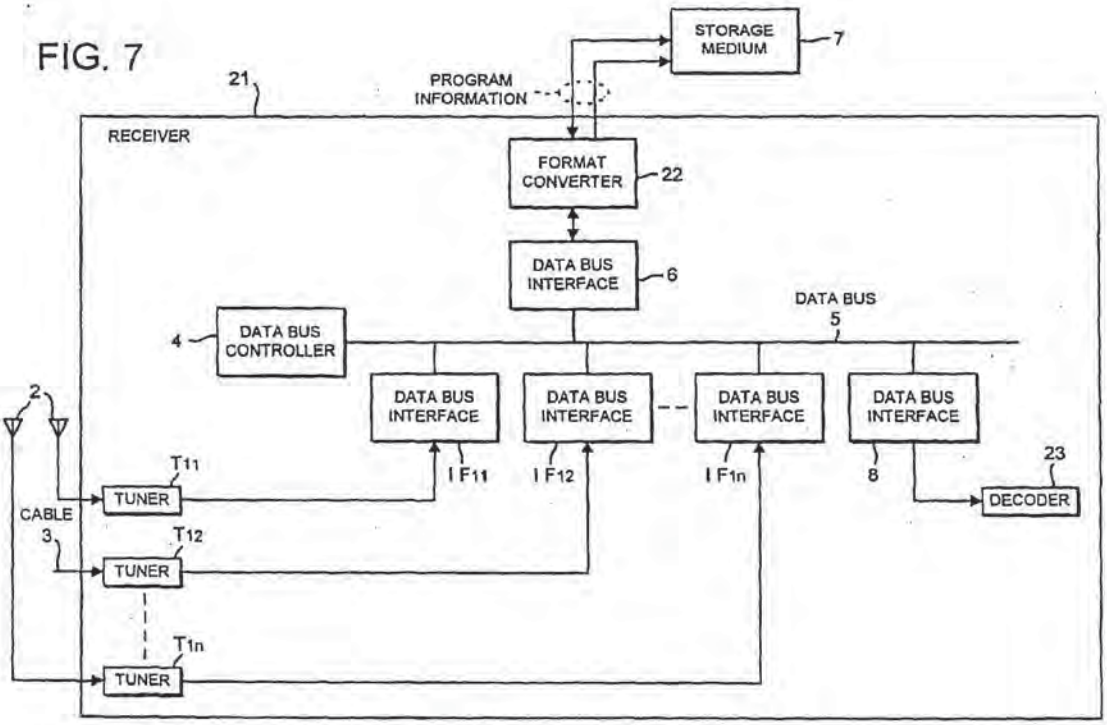

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FIG. 8

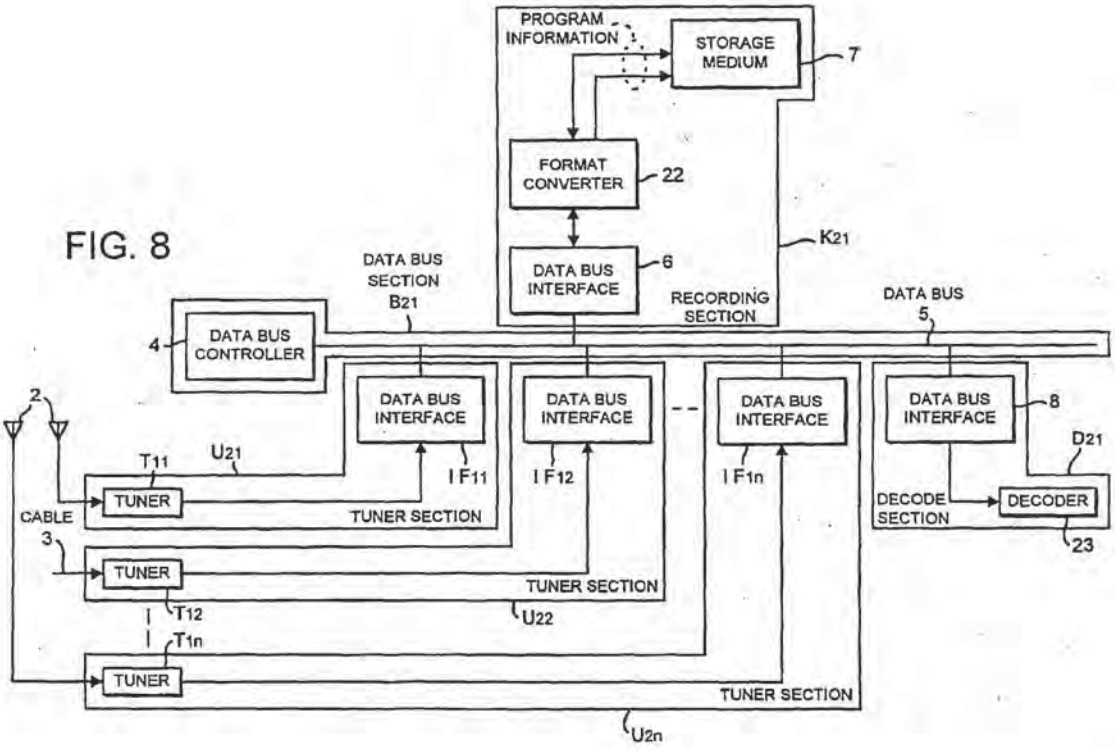

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FIG. 9

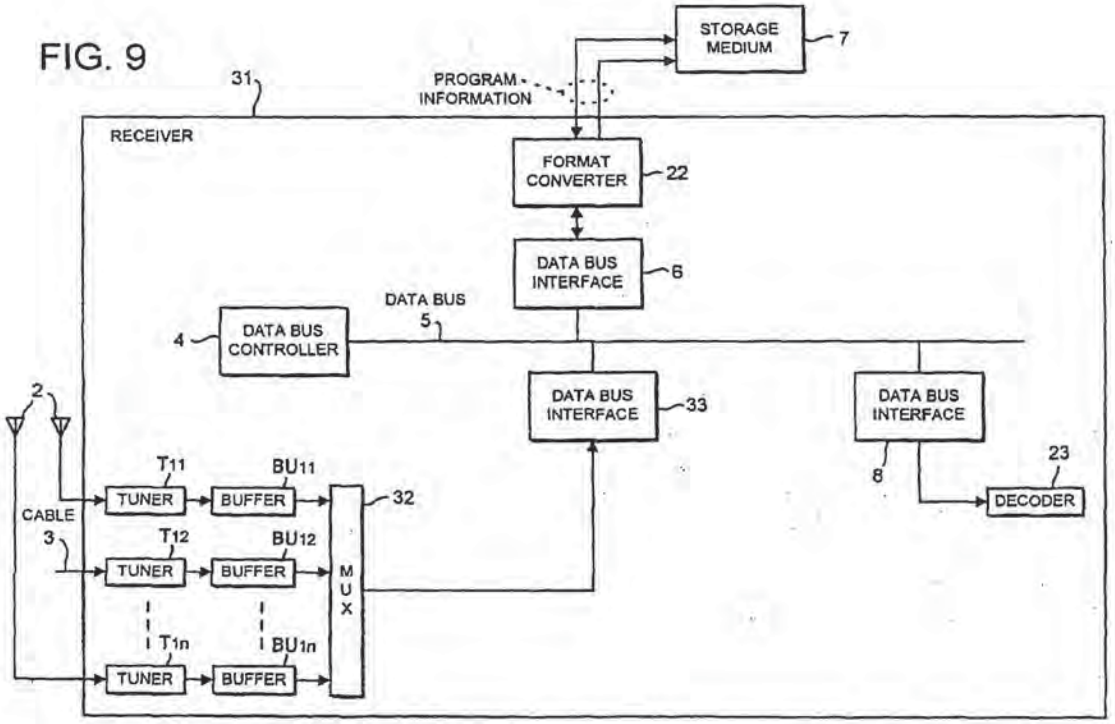

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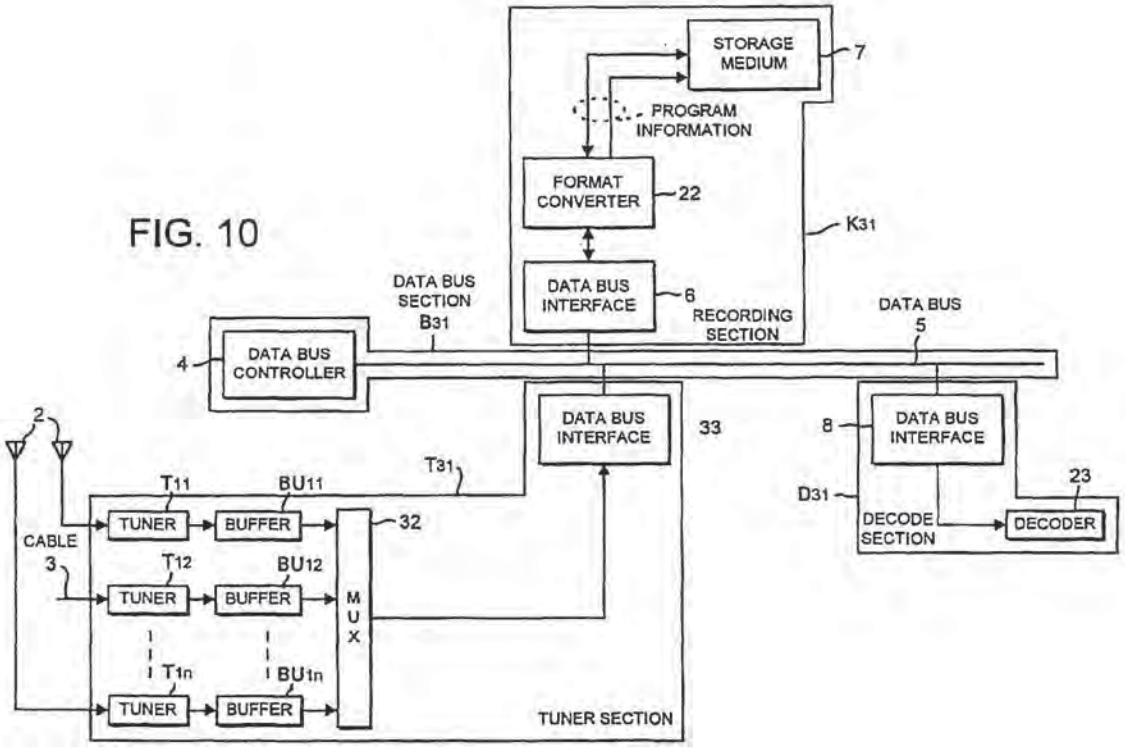
FIG. 10



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(54) Apparatus and method for recording and reproducing data

Gerät und Verfahren zur Aufzeichnung und Wiedergabe von Daten

Appareil et méthode pour enregistrer et reproduire des données

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- **PATENT ABSTRACTS OF JAPAN vol. 18, no. 234 (E-1543), 28 April 1994 & JP-A-06 022273 (VICTOR CO. OF JAPAN, LTD.), 28 January 1994,**
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- **PATENT ABSTRACTS OF JAPAN vol. 18, no. 608 (E-1633), 18 November 1994 & JP-A-06 233234 (FUJITSU GENERAL LTD.), 19 August 1994,**

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention:

[0001] The present invention relates to an apparatus and a method for recording and reproducing video and sound for providing a "time-shift reproduction" function and a "time-shift fast-forward reproduction" function.

2. Description of the Related Art:

[0002] In recent years, the popularization of satellite broadcasting, CATVs and the like has caused a considerable increase in the number of broadcasting channels. As a result, very frequently TV audiences want to watch several TV programs broadcasted in the same time period. Moreover, home-use video apparatuses have also been popularized. Therefore, it is desirable to develop a method for utilizing such apparatuses more efficiently.

[0003] A television broadcast recording and reproducing apparatus according to the preamble of present claim 1 is known from the document JP-A-07 030 851. This document describes such recorder having an A/D converter for digitally storing a television program in an IC memory. A controller is provided for controlling the recording of the digital data in the IC memory. This data is recorded sequentially in an FIFO form with time data.

[0004] Figure **16** shows an exemplary conventional apparatus for recording and reproducing video and sound, in which a TV set is connected with a video cassette recorder (VCR).

[0005] Hereinafter, the respective components shown in Figure 16 will be described.

[0006] Broadcast receiving sections **1** and **2** receive a broadcast. Typically, the broadcast receiving section **1** is a tuner incorporated into a TV set, and the broadcast receiving section **2** is a tuner incorporated into a VCR.

[0007] A video/sound recording section **3** converts the video and the sound output from the broadcast receiving section **2** into a recording signal so as to record the recording signal on a magnetic tape. The magnetic tape is driven by a magnetic tape driving section **4**.

[0008] A video/sound reproducing section **5** converts the recording signal recorded on the magnetic tape, thereby reproducing the video and the sound. The video and the sound reproduced by the video/sound reproducing section **5** are supplied to a selective output section **6**.

[0009] The selective output section **6** selectively outputs one of the output from the broadcast receiving section **1** and the output from the video/sound reproducing section **5**. The selection in the selective output section **6** is manually determined by a user.

[0010] A video display section **7** displays the video selected by the selective output section **6**. A sound output section **8** outputs the sound selected by the selective output section **6**.

[0011] However, in order to reproduce a program now being recorded, a conventional apparatus having the above-described configuration is required to suspend the recording operation once, rewind the magnetic tape and then start the reproducing operation. Therefore, such an apparatus has the following problems.

(1) During recording of a program which is now being broadcasted, it is impossible to reproduce the program from the beginning while continuing recording of the program.

(2) In the case where watching and listening of a program now being broadcasted must be suspended, it is impossible to reproduce the program from the point at which watching and listening of the program was suspended while continuing recording of the program.

(3) In the case where watching and listening of a program now being broadcasted must be suspended, it is impossible to fast-forward reproduce the program from the point at which watching and listening of the program was suspended while continuing recording of the program.

[0012] In addition, it is impossible for a conventional apparatus to simultaneously record a plurality of programs on one and the same magnetic tape. Therefore, in order to simultaneously record a plurality of programs, it has been necessary to provide the same number of recording and reproducing apparatuses as the number of programs.

SUMMARY OF THE INVENTION

[0013] The present invention thus concerns an apparatus for recording and reproducing data, as well as a corresponding method, as defined in the appended claims.

[0014] Thus, the invention described herein makes possible the advantages of (a) providing a recording/reproducing apparatus and method which provides a "time-shift reproduction" function for solving the above-mentioned problems (**1**) and (**2**) and a "time-shift fast-forward reproduction" function for solving the above-mentioned problem (**3**); and (b) providing a recording/reproducing apparatus and method capable of simultaneously recording and reproducing data from a plurality of channels.

[0015] These and other advantages of the present invention will become apparent to those skilled in the art upon reading and understanding the following detailed description with reference to the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Figure **1** is a block diagram showing a config-

uration for an apparatus **100** for recording and reproducing video and sound according to a first example of the present invention.

[0017] Figure **2** is a diagram showing a specific configuration for the memory section **30** in the apparatus **100**.

[0018] Figure **3** is a diagram showing another specific configuration for the memory section **30** in the apparatus **100**.

[0019] Figures **4A** to **4D** are time charts showing an operation of the apparatus **100** in association with the "time-shift reproduction" function.

[0020] Figures **5A** to **5D** are time charts showing another operation of the apparatus **100** in association with the "time-shift reproduction" function.

[0021] Figure **6** is a block diagram showing a configuration for an apparatus **200** for recording and reproducing video and sound according to a second example of the present invention.

[0022] Figure **7** is a block diagram showing a configuration for an apparatus **300** for recording and reproducing video and sound according to a third example of the present invention.

[0023] Figure **8** is a block diagram showing a configuration for an apparatus **400** for recording and reproducing video and sound according to a fourth example of the present invention.

[0024] Figure **9** is a block diagram showing a configuration for an apparatus **500** for recording and reproducing video and sound according to a fifth example of the present invention.

[0025] Figures **10A** to **10D** are time charts showing another operation of the apparatus **500** in association with the "time-shift fast-forward reproduction" function.

[0026] Figure **11** is a block diagram showing a configuration for an apparatus **600** for recording and reproducing video and sound according to a sixth example of the present invention.

[0027] Figure **12** is a block diagram showing a configuration for an apparatus **700** for recording and reproducing video and sound according to a seventh example of the present invention.

[0028] Figure **13** is a block diagram showing a configuration for an apparatus **800** for recording and reproducing video and sound according to an eighth example of the present invention.

[0029] Figure **14** is a block diagram showing a configuration for an apparatus **900** for recording and reproducing video and sound according to a ninth example of the present invention.

[0030] Figure **15** is a block diagram showing a configuration for an apparatus **1000** for recording and reproducing video and sound according to a tenth example of the present invention.

[0031] Figure **16** is a block diagram showing a configuration for a conventional apparatus for recording and reproducing video and sound.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0032] Hereinafter, the present invention will be described by way of illustrative examples with reference to the accompanying drawings.

Example 1

[0033] Figure **1** shows a configuration for an apparatus **100** for recording and reproducing video and sound according to a first example of the present invention. The apparatus **100** has a "time-shift reproduction" function. The "time-shift reproduction" function is herein defined as a function of, during recording of a program which is now being broadcasted, reproducing the program from the beginning while continuing recording of the program.

[0034] For example, the "time-shift reproduction" function is effectively applicable to a case where a first half of a program is desired to be watched again while continuing recording of the second half of the program. A user can reproduce the first half of the program from the beginning without waiting for the completion of recording of the second half of the program.

[0035] In addition, the "time-shift reproduction" function is also effectively applicable to a case where a program is to be recorded from nine p.m. to eleven p.m. using a preset timer during the user's absence (such a recording will be referred to as an "absence recording"); the user comes home at a time during the absence recording (for example, at nine-thirty); and the user wants to start to reproduce the absence-recorded program before eleven o'clock. The user can reproduce the absence-recorded program from the beginning without waiting for the completion of recording of the program.

[0036] Moreover, the "time-shift reproduction" function is also effectively applicable to a case where watching and listening of a program now being broadcasted must be suspended and a user later wants to restart watching and listening to the program from the point at which watching and listening of the program was suspended. The user can reproduce the program from the point at which watching and listening of the program was suspended without waiting for the completion of recording of the program.

[0037] Hereinafter, the respective components of the apparatus **100** will be described with reference to Figure **1**.

[0038] A broadcast receiving section **10** receives a broadcast of video and sound. In general, the broadcast receiving section **10** is configured so as to receive broadcasts of a plurality of channels. The broadcast receiving section **10** selects one channel from a plurality of channels in response to a channel selection signal supplied from an input section **14**, so as to output video and sound corresponding to the selected channel to a video/sound recording section **22** and a selective output

section **50**. The channel selection signal is input from the input section **14** to the broadcast receiving section **10** via a line **101**.

[0039] The video/sound recording section **22** inquires of a memory region management section **31** where the video and the sound supplied from the broadcast receiving section **10** are to be recorded in a memory section **30**, and obtains information indicating a position at which the video and the sound are to be recorded as a reply to the inquiry. The video/sound recording section **22** records the video and the sound at the position indicated by the information in the memory section **30**. This positional information is determined by the memory region management section **31**, and is referred to when a time-shift reproduction is made by a video/sound reproducing section **40**, as will be described later. This positional information is, for example, an address on a recording medium.

[0040] A recording start signal, a recording end signal and a time-shift reproduction end signal are input from the input section **14** to the video/sound recording section **22** via a line **102**. The video/sound recording section **22** starts a recording operation in response to the recording start signal, and ends the recording operation in response to the recording end signal or the time-shift reproduction end signal.

[0041] The memory section **30** has a function of performing the reproduction operation of the video and the sound recorded in the memory section **30** in parallel with performing the recording operation of video and sound in the memory section **30**. For example, the memory section **30** may be an optical disk driving apparatus having a recording head and a reproducing head which can be driven independently from each other, or a hard disk driving apparatus including a plurality of such heads.

[0042] Figure **2** shows a specific configuration for the memory section **30**. The memory section **30** includes: a recording head **112** for recording data on a recording medium **110**; a reproducing head **114** for reproducing the data recorded on the recording medium **110**; a recording controller **116** for controlling the recording head **112**; and a reproducing controller **118** for controlling the reproducing head **114**.

[0043] The recording controller **116** receives data to be written on the recording medium **110** and the information, e.g., an address on the recording medium **110**, indicating a position at which the data is to be written, from the video/sound recording section **22**. The recording controller **116** controls the position of the recording head **112** based on the positional information and writes the data into the recording medium **110** via the recording head **112**.

[0044] The reproducing controller **118** receives information, e.g., an address on the recording medium **110**, indicating a position of the recording medium **110** from which the data is to be read out, from the video/sound reproducing section **40**. The reproducing controller **118** controls the position of the reproducing head **114** based on the positional information and reads out the data corresponding to the positional information from the recording medium **110** via the reproducing head **114**.

[0045] Thus, the recording controller **116** and the reproducing controller **118** can be controlled independent of each other. As a result, the recording head **112** and the reproducing head **114** can also be controlled independent of each other. Therefore, it becomes possible to perform the reproduction operation of the video and the sound recorded on the recording medium **110** in parallel with the recording operation of the video and the sound on the recording medium **110**.

[0046] Figure **3** shows another specific configuration for the memory section **30**. The memory section **30** includes an arbitrating section **122** and a random access memory **120**.

[0047] The arbitrating section **122** receives a write command from the video/sound recording section **22** and a read command from the video/sound reproducing section **40**. The arbitrating section **122** arbitrates between the write command and the read command, thereby sequentially outputting the write command and the read command to the random access memory **120**. As a result, a simultaneous access to the random access memory **120** is prevented. By setting the cycle of the write command and the read command to be given to the random access memory **120** to be sufficiently small, it is possible to consider that the operation of writing the data onto the random access memory **120** can be performed substantially in parallel with the operation of reading out the data from the random access memory **120**. Therefore, under such a configuration, it is also possible to perform the operation of reproducing the video and the sound recorded in the memory section **30** in parallel with the operation of recording the video and the sound in the memory section **30**.

[0048] Referring back to Figure **1**, the video/sound reproducing section **40** reproduces the video and the sound supplied from the memory section **30**. A reproduction start signal, a reproduction end signal, a time-shift reproduction start signal and a time-shift reproduction end signal are input from the input section **14** to the video/sound reproducing section **40** via a line **103**.

[0049] The video/sound reproducing section **40** starts and ends a normal reproduction operation in response to the reproduction start signal and the reproduction end signal, respectively. In response to the time-shift reproduction start signal, the video/sound reproducing section **40** receives positional information on the video and the sound recorded in the memory section **30** from the memory region management section **31** and then starts to reproduce the video and the sound based on the positional information. In response to the time-shift reproduction end signal, the video/sound reproducing section **40** ends the reproduction operation.

[0050] The memory region management section **31** manages the memory region of the video and the sound recorded in the memory section **30**, and determines a

memory region where a video and a sound is newly recorded. More specifically, the memory region management section **31** has a region R for storing therein the information, e.g., an address on the recording medium, indicating a position in the memory section **30** at which the video and the sound are recorded.

[0051] When the recording start signal is input to the video/sound recording section **22**, the video/sound recording section **22** starts the recording operation. The video/sound recording section **22** inquires of the memory region management section **31** where the video and the sound supplied from the broadcast receiving section **10** are to be recorded in the memory section **30**, and obtains information indicating a position at which the video and the sound are to be recorded as a reply to the inquiry. The memory region management section **31** determines a position at which the video and the sound are to be recorded, and stores information indicating the position in the region **R**.

[0052] In the situation where the recording start signal is input to the video/sound recording section **22** again after the recording operation is once ended, new positional information is overwritten in the region **R** in the memory region management section **31**. Thus, the memory region management section **31** holds only the latest positional information.

[0053] When the time-shift reproduction start signal is input to the video/sound reproducing section **40**, the video/sound reproducing section **40** reads out positional information by reference to the region **R** in the memory region management section **31**, thereby starting to reproduce the video and the sound from the position indicated by the positional information.

[0054] The selective output section **50** selectively outputs at least one of the video and the sound output from the broadcast receiving section **10** and the video and the sound output from the video/sound reproducing section **40**. The selective output section **50** may selectively output either one of the output from the broadcast receiving section **10** and the output from the video/sound reproducing section **40**, or may output both the output from the broadcast receiving section **10** and the output from the video/sound reproducing section **40** by applying priority orders to the two outputs.

[0055] The priority order is used to determine a mode for displaying a video in a video display section **60** or a mode for outputting a sound in a sound output section **70**. For example, it is assumed that the selective output section **50** applies a priority order "1" to the output from the broadcast receiving section **10** and a priority order "2" to the output from the video/sound reproducing section **40**. In this case, the video display section **60** displays the video output from the broadcast receiving section **10** on a main screen and the video output from the video/sound reproducing section **40** on a sub-screen, for example. In a similar manner, the video display section **60** can employ an arbitrary display mode in accordance with the priority order. The sound output section **70** outputs the sound output from the broadcast receiving section **10** at a higher loudness level and the sound output from the video/sound reproducing section **40** at a lower loudness level, for example. In a similar manner, the sound output section **70** can employ an arbitrary output mode in accordance with the priority order.

[0056] The selection in the selective output section **50** is made in response to a video/sound selection signal input from the input section **14** via a line **104**. The video/sound selection signal is used by a user for manually switching the output from the broadcast receiving section **10** and the output from the video/sound reproducing section **40**. The selection in the selective output section **50** is also made in response to the time-shift reproduction start signal and the time-shift reproduction end signal input from the input section **14** via the line **104**.

[0057] Next, referring to Figures **4A** to **4D**, the operation of the apparatus **100** will be described in association with the "time-shift reproduction" function.

[0058] Figures **4A** to **4D** show a temporal relationship among the output from the broadcast receiving section **10** (input data); the input to the memory section **30** (recording data); the output from the memory section **30** (reproduced data); and the output from the selective output section **50** (output data).

[0059] In Figures **4A** to **4D**, each of the numbered squares indicates one unit for recording and reproduction. For example, this square may represent one frame or one field. In addition, this square may represent analog data or digital data.

[0060] When a recording start signal is input from the input section **14** at a time **T1**, the recording start signal is supplied to the video/sound recording section **22** via a line **102**. As a result, the video/sound recording section **22** starts the recording operation. Consequently, the input data (data 1, 2, 3, 4, ...) are sequentially recorded in the memory section **30** (Figures **4A** and **4B**).

[0061] When a time-shift reproduction start signal is input from the input section **14** at a time **T2**, the time-shift reproduction start signal is supplied to the video/sound reproducing section **40** via a line **103** and to the selective output section **50** via a line **104**. As a result, the video/sound reproducing section **40** starts the reproduction operation from the head of the recorded data. Consequently, the recorded data (data 1, 2, 3, 4, ...) are sequentially reproduced as reproduced data from the time **T2** (Figure **4C**). In addition, the selective output section **50** automatically changes the output thereof so that at least the reproduced data is selectively output. As a result, at least the reproduced data is output from the selective output section **50** as the output data (Figure **4D**).

[0062] When a time-shift reproduction end signal is input from the input section **14** at a time **T3**, the time-shift reproduction end signal is supplied to the video/sound recording section **22** via the line **102**, to the video/sound reproducing section **40** via the line **103**, and to the selective output section **50** via the line **104**. As a result,

the video/sound recording section **22** ends the recording operation; the video/sound reproducing section **40** ends the reproduction operation; and the selective output section **50** automatically changes the output thereof so that at least the output immediately before the time-shift reproduction start sinal is input is selectively output.

[0063] Thus, the reproduction operation of the video and the sound recorded in the memory section **30** can be performed in parallel with the recording operation of the video and the sound in the memory section **30** from the time **T2** to the time **T3**.

[0064] In the operation exemplified in Figures **4A** to **4D**, the data **9** to **12** are recorded in the memory section **30**. However, the data **9** to **12** are not reproduced by the video/sound reproducing section **40**. Accordingly, as shown in Figures **5A** to **5D**, even if the video/sound recording section **22** is made to end the recording operation at a time **T4** by inputting the recording end signal from the input section **14** at the time **T4**, the same operation as that shown in Figures **4A** to **4D** can be performed.

[0065] Thus, by inputting the recording end signal at the time **T4**, it is possible to prevent redundant data from being recorded in the memory section **30**. For example, in the case where the length of a program to be recorded is known beforehand, it is possible to input such a recording end signal in good time.

[0066] It is noted that the recording start signal and the recording end signal may be manually input by a user, or may be automatically input at a preset time by utilizing a known function of absence recording.

[0067] In the first example described above, a time-shift reproduction start signal and a time-shift reproduction end signal are provided separately from a reproduction start signal and a reproduction end signal which have conventionally been used. A method for realizing the generation of such signals most easily, is a method in which the input section **14** generates the reproduction start signal and the reproduction end signal in the case where the user inputs a reproduction start command and a reproduction end command to the input section **14**, respectively, and the input section **14** generates the time-shift reproduction start signal and the time-shift reproduction end signal in the case where the user inputs a time-shift reproduction start command and a time-shift reproduction end command to the input section **14**, respectively. However, it may be too complex for the user to distinguish the reproduction start command from the time-shift reproduction start command and distinguish the reproduction end command from the time-shift reproduction end command, and to input these commands to the input section **14**.

[0068] By additionally providing a state judging section **15** (not shown) for judging whether or not the apparatus **100** is in the recording state, it becomes possible to eliminate the necessity of distinction between the reproduction start command and the time-shift reproduction start command and the distinction between the reproduction end command and the time-shift reproduction end command.

[0069] The state judging section **15** judges whether or not the apparatus **100** is in the recording state. Such a judgement is accomplished, for example, by monitoring the recording start signal and the recording end signal input from the input section **14** to the video/sound recording section **22**. When the reproduction start command is input by the user to the input section **14**, the input section **14** inquires whether or not the apparatus **100** is in the recording state of the state judging section **15**. In response to the inquiry, the state judging section **15** answers a judgement result to the input section **14**. In the case where the judgement result indicates that the apparatus **100** is not in the recording state, the input section **14** generates a reproduction start signal. The reproduction start signal is supplied to the video/sound reproducing section **40**. On the other hand, in the case where the judgement result indicates that the apparatus **100** is in the recording state, the input section **14** generates a time-shift reproduction start signal. The time-shift reproduction start signal is supplied to the video/sound reproducing section **40** and the selective output section **50**.

[0070] Also, the state judging section **15** judges which of the reproduction start signal and the time-shift reproduction start signal was generated more recently. Such a judgement is accomplished, for example, by monitoring the reproduction start signal and the time-shift reproduction start signal generated by the input section **14**. When a reproduction end command is input by the user to the input section **14**, the input section **14** inquires which of the reproduction start signal and the time-shift reproduction start signal was generated more recently of the state judging section **15**. In response to the inquiry, the state judging section **15** answers a judgement result to the input section **14**. In the case where the judgement result indicates that it was the reproduction start signal, the input section **14** generates a reproduction end signal. The reproduction end signal is supplied to the video/sound reproducing section **40**. On the other hand, in the case where the judgement result indicates that it was the time-shift reproduction signal, the input section **14** generates a time-shift reproduction end signal. The time-shift reproduction end signal is supplied to the video/sound recording section **22**, the video/sound reproducing section **40** and the selective output section **50**.

[0071] In this way, the same operation as those shown in Figures **4A** to **4D** and Figures **5A** to **5D** can be performed without using the time-shift reproduction start command and the time-shift reproduction end command. The state judging section **15** may be incorporated in the input section **14**.

Example 2

[0072] Figure **6** shows a configuration for an appara-

tus **200** for recording and reproducing video and sound according to a second example of the present invention. The configuration of the apparatus **200** is the same as that of the apparatus **100** shown in Figure **1** except that a video/sound compression section **21** and a video/sound expansion section **41** are additionally provided for the apparatus **200**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

[0073] The video/sound compression section **21** compresses the video and the sound output from the broadcast receiving section **10** by a predetermined method. The video/sound expansion section **41** expands the video and the sound output from the video/sound reproducing section **40** by a predetermined method. An arbitrary method can be employed as the compression method or as the expansion method. For example, a compression method or an expansion method in compliance with a standard MPEG1 or MPEG2 can be employed.

[0074] In the second example, not only the effects of the first example can be attained but also the amount of data to be recorded in the memory section **30** can be reduced by compressing the output from the broadcast receiving section **10**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the first example as the memory section **30**. In the case of using the same memory section **30** as that of the first example in this second example, it is possible to considerably increase the recordable time of the memory section **30**.

Example 3

[0075] Figure **7** shows a configuration for an apparatus **300** for recording and reproducing video and sound according to a third example of the present invention. The apparatus **300** has a "time-shift reproduction" function corresponding to multiple channels. The "time-shift reproduction" function corresponding to multiple channels is herein defined as a function of, during recording of programs of a plurality of channels which are now being broadcasted, reproducing a plurality of recorded programs from the beginning while continuing recording the plurality of programs.

[0076] Hereinafter, the respective components of the apparatus **300** will be described with reference to Figure **7**.

[0077] An N-channel broadcast receiving section **12** receives video and sound of a N number of channels now being broadcasted, where N is a positive integer.

[0078] An M-channel selection section **13** selects a M number of channels from the N number of channels in response to a channel selection signal supplied from an input section **16**, thereby outputting the video and the sound corresponding to the selected M number of channels to an M-channel video/sound recording section **23**. The channel selection signal is input from the input section **16** to the M-channel selection section **13** via a line **301**, where M is a positive integer and $N \geq M$.

[0079] The M-channel video/sound recording section **23** inquires of a memory region management section **33** where the video and the sound corresponding to the M number of channels selected by the M-channel selection section **13** are to be recorded in a memory section **32**, and obtains information indicating a position at which the video and the sound are to be recorded as a reply to the inquiry. The M-channel video/sound recording section **23** records the video and the sound at the position indicated by the information in the memory section **32**. This positional information is determined by the memory region management section **33**, and is referred to when a time-shift reproduction is made by a P-channel video/sound reproducing section **42** as will be described later. This positional information is, for example, an address on a recording medium.

[0080] A recording start signal, a recording end signal and a time-shift reproduction end signal are input from the input section **16** to the M-channel video/sound recording section **23** via a line **302**. The M-channel video/sound recording section **23** starts a recording operation in response to the recording start signal, and ends the recording operation in response to the recording end signal or the time-shift reproduction end signal.

[0081] The memory section **32** has a function of performing the reproduction operation of the video and the sound recorded in the memory section **32** in parallel with performing the recording operation of video and sound in the memory section **32**. For example, the memory section **32** may be an optical disk driving apparatus having a M number of recording heads and a P number of reproducing heads which can be driven independently from each other, or a hard disk driving apparatus including a plurality of such heads. Alternatively, the memory section **32** may be a random accessible semiconductor memory. The memory section **32** can be configured in the same way as the memory section **30** described with reference to Figures **2** and **3**.

[0082] The P-channel video/sound reproducing section **42** selects a P number of channels among a plurality of channels recorded in the memory section **32** in response to the channel selection signal supplied from the input section **16**, thereby reproducing the video and the sound corresponding to the selected P number of channels. The P number of channels may be selected among the M number of channels which are being recorded in the memory section **32** and/or a plurality of channels which were previously recorded in the memory section **32**. The channel selection signal is input from the input section **16** to the P-channel video/sound reproducing section **42** via a line **303**, where P is a positive integer.

[0083] A reproduction start signal, a reproduction end signal, a time-shift reproduction start signal and a time-shift reproduction end signal are input from the input section **16** to the P-channel video/sound reproducing

section **42** via a line **303**.

[0084] The P-channel video/sound reproducing section **42** starts and ends a reproduction operation of the P number of channels in response to the reproduction start signal and the reproduction end signal, respectively. In response to the time-shift reproduction start signal, the P-channel video/sound reproducing section **42** receives positional information on the video and the sound recorded in the memory section **32** from the memory region management section **33** and then starts to reproduce the video and the sound of the number P of channels based on the positional information. In response to the time-shift reproduction end signal, the P-channel video/sound reproducing section **42** ends the reproduction operation of the P number of channels.

[0085] The memory region management section **33** manages the memory regions of the video and the sound corresponding to a plurality of channels recorded in the memory section **32**, and determines a memory region where a video and a sound are newly recorded. More specifically, the memory region management section **33** has a plurality of regions $\mathbf{R_1}$ to $\mathbf{R_{M+K}}$ for storing therein the information, e.g., an address on the recording medium, indicating the position in the memory section **32** at which the video and the sound corresponding to a plurality of channels are recorded.

[0086] When the recording start signal is input to the M-channel video/sound recording section **23**, the M-channel video/sound recording section **23** starts the recording operation of the M number of channels. The M-channel video/sound recording section **23** inquires of the memory region management section **33** where the video and the sound supplied from the M-channel selection section **13** are to be recorded in the memory section **32**, and obtain information indicating positions at which the video and the sound are to be recorded as a reply to the inquiry. The memory region management section **33** determines positions at which the video and the sound are to be recorded, and stores information indicating the positions in the regions $\mathbf{R_1}$ to $\mathbf{R_{M+K}}$.

[0087] In the case where the recording start signal is input to the M-channel video/sound recording section **23** again after the recording operation was once ended, new positional information is overwritten in the regions $\mathbf{R_1}$ to $\mathbf{R_{M+K}}$ in the memory region management section **33**. In this way, the memory region management section **33** holds only the latest positional information.

[0088] When the time-shift reproduction start signal is input to the P-channel video/sound reproducing section **42**, the P-channel video/sound reproducing section **42** reads out the positional information by reference to a P number of regions of the regions $\mathbf{R_1}$ to $\mathbf{R_{M+K}}$ in the memory region management section **33**, thereby starting to reproduce the video and the sound corresponding to the P number of channels from the position indicated by the positional information.

[0089] The selective output section **51** selectively outputs at least the video corresponding to a Q number of channels and the sound corresponding to one channel among the video and the sound corresponding to the N number of channels output from the N-channel broadcast receiving section **12** and the video and the sound corresponding to the P number of channels output from the P-channel video/sound reproducing section **42**, where Q is a positive integer and $N + P \geq Q$. Alternatively, the selective output section **51** can selectively output only the video corresponding to the number Q of channels and the sound corresponding to one channel among the output from the N-channel broadcast receiving section **12** and the output from the P-channel video/sound reproducing section **42**, or may output both the output from the N-channel broadcast receiving section **12** and the output from the P-channel video/sound reproducing section **42** by applying priority orders to the respective outputs.

[0090] The priority orders are used to determine a mode for displaying a video in a video display section **61** or a mode for outputting a sound in a sound output section **71**. For example, it is assumed that the selective output section **51** applies priority orders "P_1 to P_N" to the outputs from the N-channel broadcast receiving section **12** and priority orders "P_{N+1} to P_{N+P}" to the outputs from the P-channel video/sound reproducing section **42**. In this case, the video display section **61** displays a video having a priority order "P_i" on a screen having an area proportional to the priority order "P_i". In the same way, the video display section **61** can employ an arbitrary display mode in accordance with the priority orders. The sound output section **71** outputs a sound having a priority order "P_i" at a loudness level proportional to the priority order "P_i". Herein, i=1, 2, 3..., N+P. In a similar manner, the sound output section **71** can employ an arbitrary output mode in accordance with the priority orders. However, it is preferable for the sound output section **71** to set the loudness level of the sounds other than one selected sound to be zero in order to prevent the confusion of a plurality of sounds.

[0091] The selection in the selective output section **51** is made in response to a video/sound selection signal input from the input section **16** via a line **304**. The video/sound selection signal is used by a user for manually switching the output from the N-channel broadcast receiving section **12** and the output from the P-channel video/sound reproducing section **42**. The selection in the selective output section **51** is also made in response to the time-shift reproduction start signal and the time-shift reproduction end signal input from the input section **16** via the line **304**.

Example 4

[0092] Figure **8** shows a configuration for an apparatus **400** for recording and reproducing video and sound according to a fourth example of the present invention. The configuration of the apparatus **400** is the same as that of the apparatus **300** shown in Figure **7** except that

an M-channel video/sound compression section **24** and a P-channel video/sound expansion section **44** are additionally provided for the apparatus **400**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

[0093] The M-channel video/sound compression section **24** compresses the video and the sound of a M number of channels output from the M-channel selection section **13** by a predetermined method. The P-channel video/sound expansion section **44** expands the video and the sound of a P number of channels output from the P-channel video/sound reproducing section **42** by a predetermined method. An arbitrary method can be employed as the compression method or as the expansion method. For example, a compression method or an expansion method in compliance with a standard MPEG1 or MPEG2 can be employed.

[0094] In the fourth example, not only the effects of the third example can be attained but also the amount of data to be recorded in the memory section **32** can be reduced by compressing the output from the M-channel selection section **13**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the third example as the memory section **32**. In the case of using the same memory section **32** as that of the third example in this fourth example, it is possible to considerably increase the recordable time of the memory section **32**.

Example 5

[0095] Figure **9** shows a configuration for an apparatus **500** for recording and reproducing video and sound according to a fifth example of the present invention.

[0096] The apparatus **500** has a "time-shift fast-forward reproduction" function. The "time-shift fast-forward reproduction" function is herein defined as a function of starting to record a program now being broadcasted at a point where watching and listening of the program was suspended; fast-forward reproducing later the video and the sound which have been recorded from the point where watching and listening of the program was suspended; automatically stopping the fast-forward reproduction at a point where the video and the sound fast-forward reproduced catch up with the video and the sound now being broadcasted; and then automatically switching the former into the latter.

[0097] The "time-shift fast-forward reproduction" function is effectively applicable, for example, to a case where watching and listening of a program now being broadcasted must be suspended and a user later wants to restart to watch and listen to the program from the point where watching and listening of the program was suspended.

[0098] The configuration of the apparatus **500** is the same as that of the apparatus **100** shown in Figure **1** except that a time code generating section **11**, a unit thin-out section **20** and a time code comparing section **52** are additionally provided for the apparatus **500**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

[0099] The time code generating section **11** generates a time code and then applies the time code to one unit of the video and the sound output from the broadcast receiving section **10**. When the video and the sound are digital data, the application of the time code is accomplished by adding a plurality of bits representing the time code to the digital data. When the video and the sound are analog data, the application of the time code is accomplished by inserting an analog signal representing the time code during an inter-frame vertical retrace line period, for example. The "time code" herein refers to information for identifying a time. The "one unit" of the video and the sound herein refers to one unit for recording and reproduction. For example, one unit for recording and reproduction may be either one frame or one field. Note that, in this example, an expression "video and sound" means video and sound with a time code applied but for some special limitation.

[0100] The unit thin-out section **20** thins out (or decimates) video and sound with a time code applied at a predetermined ratio. The predetermined ratio is input from the input section **14** to the unit thin-out section **20** via a line **105**. For example, in the case where the predetermined ratio is 50%, the unit thin-out section **20** thins out one of two units of the video and the sound output from the broadcast receiving section **10**. Such a thin-out unit may be either one frame or one field. In this way, the video and the sound thinned out by the unit thin-out section **20** are supplied to the video/sound recording section **22**. As a result, the video/sound recording section **22** records the thinned out video and sound in the memory section **30**.

[0101] The video/sound reproducing section **40** reproduces the video and the sound recorded in the memory section **30**. As described above, the video and the sound recorded in the memory section **30** have been thinned out by the unit thin-out section **20**. The video/sound reproducing section **40** performs a signal processing for the thinned out sound so that the thinned out sound is recognizable as a normal sound by a human being. Any known processing can be employed as the signal processing, e.g., shortening a shadow zone, smoothly connecting the reproduced sounds, or the like.

[0102] A time code comparing section **52** compares a time code **TC1** of the video and the sound output from the broadcast receiving section **10** with the time code **TC2** of the video and the sound output from the video/sound reproducing section **40**. In the case where the time indicated by the time code **TC2** is equal to or later than the time indicated by the time code **TC1**, the time code comparing section **52** stops the reproduction operation of the video/sound reproducing section **40** and

the recording operation of the video/sound recording section **22**, and changes the selection in the selective output section **50**.

[0103] The selective output section **50** selectively outputs at least one of the video and the sound output from the broadcast receiving section **10** and the video and the sound output from the video/sound reproducing section **40**. The selection in the selective output section **50** is made in response to a video/sound selection signal input from the time code comparing section **52**. In the case where the video and the sound which have been fast-forward reproduced have caught up with the video and the sound now being broadcasted, the video/sound selection signal is used to switch the video and the sound output from the video/sound reproducing section **40** into the video and the sound output from the broadcast receiving section **10**. The selection in the selective output section **50** is also made in response to a time-shift fast-forward reproduction start signal input from the input section **14** via a line **104**.

[0104] Next, referring to Figures **10A** to **10D**, the operation of the apparatus **500** will be described in association with the "time-shift fast-forward reproduction" function.

[0105] Figures **10A** to **10D** show a temporal relationship among the output from the broadcast receiving section **10** (input data); the input to the memory section **30** (recording data); the output from the memory section **30** (reproduced data); and the output from the selective output section **50** (output data).

[0106] In Figures **10A** to **10D**, each of the numbered squares indicates one unit for recording and reproduction. For example, this square may represent one frame or one field. In addition, this square may represent analog data or digital data. Above each numbered square, a time code which is added to the data indicated by the square is shown.

[0107] When a recording start signal is input from the input section **14** at a time **T1**, the recording start signal is supplied to the video/sound recording section **22** via a line **102**. As a result, the video/sound recording section **22** starts the recording operation. Input data (data 5, 7, 9, 11, ...) thinned out by the unit thin-out section **20** are supplied to the video/sound recording section **22**. Consequently, the input data thinned out by the unit thin-out section **20** are sequentially recorded in the memory section **30** (Figures **10A** and **10B**).

[0108] When a time-shift fast-forward reproduction start signal is input from the input section **14** at a time **T2**, the time-shift fast-forward reproduction start signal is supplied to the video/sound reproducing section **40** via a line **103** and to the selective output section **50** via a line **104**. As a result, the video/sound reproducing section **40** starts the reproduction operation from the head of the recorded data. Consequently, the recorded data (data 5, 7, 9, 11, ...) are sequentially reproduced as reproduced data from the time **T2** (Figure **10C**). In parallel with this reproduction operation, the video/sound recording section **22** continues the recording operation. In addition, in response to the time-shift fast-forward reproduction start signal, the selective output section **50** automatically switches the priority order corresponding to the input data into the priority order corresponding to the reproduced data so that the display of the reproduced data is given a priority. As a result, the reproduced data is output from the selective output section **50** as the output data in a higher priority than the input data (Figure **10D**).

[0109] During a period **P1**, the time indicated by the time code **TC2** of the video and the sound output from the video/sound reproducing section **40** is earlier than the time indicated by the time code **TC1** of the video and the sound output from the broadcast receiving section **10**. As a result, the video/sound recording section **22** continues the recording operation and the video/sound reproducing section **40** continues the reproduction operation.

[0110] The video and the sound which have been fast-forward reproduced catch up with the video and the sound now being broadcasted at a time **T3**. In the example shown in Figures **10B** and **10C**, the time (013) indicated by the time code **TC1** accords with the time (013) indicated by the time code **TC2** at the time **T3**. In such a case, the time code comparing section **52** supplies a recording end signal to the video/sound recording section **22**, a reproduction end signal to the video/sound reproducing section **40** and a video/sound selection signal to the selective output section **50**. As a result, the video/sound recording section **22** ends the recording operation in response to the recording end signal; the video/sound reproducing section **40** ends the reproduction operation in response to the reproduction end signal; and the selective output section **50** automatically switches the priority order corresponding to the reproduced data into the priority order corresponding to the input data in response to the video/sound selection signal so that the display of the input data is given a priority. As a result, the input data is output from the selective output section **50** as the output data in a higher priority than the reproduced data (Figure **10D**).

[0111] In this way, the reproduction operation of the video and the sound recorded in the memory section **30** can be performed in parallel with the recording operation of the video and the sound in the memory section **30** from the time **T2** to the time **T3**.

Example 6

[0112] Figure **11** shows a configuration for an apparatus **600** for recording and reproducing video and sound according to a sixth example of the present invention. The configuration of the apparatus **600** is the same as that of the apparatus **500** shown in Figure **9** except that a video/sound compression section **21** and a video/sound expansion section **41** are additionally provided for the apparatus **600**. Therefore, the same

components will be identified by the same reference numerals and the description thereof will be omitted herein.

[0113] The video/sound compression section **21** compresses the video and the sound thinned out by the unit thin-out section **20** by a predetermined method. The video/sound expansion section **41** expands the video and the sound output from the video/sound reproducing section **40** by a predetermined method. An arbitrary method can be employed as the compression method or as the expansion method. For example, a compression method or an expansion method in compliance with a standard MPEG1 or MPEG2 can be employed.

[0114] In the sixth example, not only the effects of the fifth example can be attained but also the amount of data to be recorded in the memory section **30** can be reduced by compressing the output from the unit thin-out section **20**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the fifth example as the memory section **30**. In the case of using the same memory section **30** as that of the fifth example in this sixth example, it is possible to considerably increase the recordable time of the memory section **30**.

Example 7

[0115] Figure **12** shows a configuration for an apparatus **700** for recording and reproducing video and sound according to a seventh example of the present invention. The configuration of the apparatus **700** is the same as that of the apparatus **500** shown in Figure **9** except that the unit thin-out section **20** prior to the video/sound recording section **22** is omitted but a unit thin-out section **45** is additionally provided posterior to the video/sound reproducing section **40** for the apparatus **700**. Therefore, the same components will be identified by the same reference humerals and the description thereof will be omitted herein.

[0116] The apparatus **700** does not perform thin-out processing during the recording operation. As a result, the output from the broadcast receiving section **10** is recorded in the memory section **30** without being thinned out at all. On the other hand, the unit thin-out section **45** thins out the video and the sound reproduced by the video/sound reproducing section **40** at a predetermined ratio during the reproduction operation. The predetermined ratio is input from the input section **14** to the unit thin-out section **45** via a line **106**. For example, in the case where the predetermined ratio is 50%, the unit thin-out section **45** thins out one of two units of the video and the sound output from the video/sound reproducing section **40**. Such a thin-out unit may be either one frame or one field. In this way, the video and the sound thinned out by the unit thin-out section **45** are supplied to the time code comparing section **52**.

[0117] In the seventh example, not only the effects of the fifth example can be attained, but also it is possible to freely set or change the reproduction speed by performing the thin-out processing for the video and the sound during the reproduction operation. As a result, a reproduction satisfying the users' needs can be performed easily.

Example 8

[0118] **Figure 13** shows a configuration for an apparatus **800** for recording and reproducing video and sound according to an eighth example of the present invention. The configuration of the apparatus **800** is the same as that of the apparatus **700** shown in Figure **12** except that a video/sound compression section **21** is additionally provided and the unit thin-out section **45** is replaced by a pair of sections consisting of a video/sound expansion section **41** and a unit thin-out section **46**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

[0119] The video/sound compression section **21** compresses the video and the sound output from the broadcast receiving section **10** by a predetermined method. The video/sound expansion section **41** expands the video and the sound output from the video/sound reproducing section **40** by a predetermined method. The unit thin-out section **46** performs a thin-out processing in collaboration with the video/sound expansion section **41**. For example, in the case where a compression method for performing an inter-frame or an inter-field coding such as MPEG1 or MPEG2 is employed, the function of the unit thin-out section **46** and the function of the video/sound expansion section **41** are accomplished only by expanding a number I of frames, because the expansion and the unit thin-out can be simultaneously performed by expanding only the I frames and outputting. As a result, it is possible to efficiently perform the unit thin-out.

[0120] In the eighth example, not only the effects of the seventh example can be attained, but also the amount of data to be recorded in the memory section **30** can be reduced by compressing the output from the broadcast receiving section **10**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the seventh example as the memory section **30**. In the case of using the same memory section **30** as that of the seventh example in this eighth example, it is possible to considerably increase the recordable time of the memory section **30**.

Example 9

[0121] Figure **14** shows a configuration for an apparatus **900** for recording and reproducing video and sound according to a ninth example of the present invention. The configuration of the apparatus **900** is the same as that of the apparatus **700** shown in Figure **12** except that a unit thin-out section **20** is additionally pro-

vided prior to the video/sound recording section **22** for the apparatus **900**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

[0122] The apparatus **900** performs thin-out processing during both the recording operation and the reproduction operation.

[0123] The unit thin-out section **20** thins out the video and the sound output from the broadcast receiving section **10** at a predetermined ratio during the recording operation. The predetermined ratio is input from the input section **14** to the unit thin-out section **20** via a line **105**. The video and sound thinned out by the unit thin-out section **20** are recorded in the memory section **30**.

[0124] The unit thin-out section **45** thins out the video and the sound reproduced by the video/sound reproducing section **40** at a predetermined ratio during the reproduction operation. The predetermined ratio is input from the input section **14** to the unit thin-out section **45** via a line **106**. The video and sound thinned out by the unit thin-out section **45** are supplied to the time code comparing section **52**. The thin-out ratio in the unit thin-out section **20** and the thin-out ratio in the unit thin-out section **45** can be adjusted independently.

[0125] In the ninth example, not only the effects of the seventh example can be attained, but also the amount of data to be recorded in the memory section **30** can be reduced by recording the thinned out video and sound in the memory section **30**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the seventh example as the memory section **30**. In the case of using the same memory section **30** as that of the seventh example in this ninth example, it is possible to considerably increase the recordable time of the memory section **30**.

Example 10

[0126] Figure **15** shows a configuration for an apparatus **1000** for recording and reproducing video and sound according to a tenth example of the present invention. The configuration of the apparatus **1000** is the same as that of the apparatus **900** shown in Figure **14** except that a video/sound compression section **21** is additionally provided and the unit thin-out section **45** is replaced by a pair of sections consisting of a video/sound expansion section **41** and a unit thin-out section **46**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

[0127] The video/sound compression section **21** compresses the video and the sound output from the broadcast receiving section **10** by a predetermined method. The video/sound expansion section **41** expands the video and the sound output from the video/sound reproducing section **40** by a predetermined method. The unit thin-out section **46** performs thin-out processing in collaboration with the video/sound expansion section **41**. For example, in the case where a compression method for performing an inter-frame or an inter-field coding such as MPEG1 or MPEG2 is employed, the function of the unit thin-out section **46** and the function of the video/sound expansion section **41** are accomplished only by expanding a number I of frames, because the expansion and the unit thin-out can be simultaneously performed by expanding only the I frames and outputting. As a result, it is possible to efficiently perform unit thin-out.

[0128] In the tenth example, not only the effects of the ninth example can be attained, but also the amount of data to be recorded in the memory section **30** can be reduced by compressing the output from the broadcast receiving section **10**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the ninth example as the memory section **30**. In the case of using the same memory section **30** as that of the ninth example in this tenth example, it is possible to considerably increase the recordable time of the memory section **30**.

[0129] In all the foregoing Examples 1 to 10, all of the components can be embodied in physical devices. Alternatively, it is also possible to realize the functions of these components by using software controllable by a CPU. Those skilled in the art should readily understand that the functions other than that of the broadcast receiving section **10** and that of the memory section **30**, in particular, can be easily realized by software.

[0130] According to the present invention, it is possible to realize a "time-shift reproduction" function, during recording a program now being broadcasted, of reproducing the program from the beginning while continuing recording the program. As a result, in the case where watching and listening of a program now being broadcasted must be suspended, it is possible to restart to watch and listen to the program later from the point where watching and listening of the program was suspended. In addition, such a "time-shift reproduction" function corresponding to multiple channels is also realizable.

[0131] Moreover, according to the present invention, it is also possible to realize a "time-shift fast-forward reproduction" function. As a result, in the case where watching and listening of a program now being broadcasted must be suspended, it is possible to restart to watch and listen to the program later from the point where watching and listening of the program was suspended. By thinning out data during the recording operation, the amount of data to be recorded in the memory section **30** can be reduced. In addition, by thinning out data during the reproduction operation, it is possible to freely set or change the reproduction speed during the reproduction operation. As a result, it is possible to easily perform a reproduction operation satisfying the users' needs.

[0132] Furthermore, by compressing data during the

recording operation and by expanding data during the reproduction operation, the amount of data to be recorded in the memory section **30** can be reduced.

Claims

1. An apparatus (100) for recording and reproducing data, comprising:

receiving means (10) for receiving input data;
recording means (22) for recording the input data on a recording medium (110);
memory means (30) for storing said recorded input data, said memory means comprising said recording medium (110);
managing means (31) for managing information indicating a position of the input data in said memory means (30);
reproducing means (40) for reproducing the data recorded on the recording medium (110), based on the information managed by the managing means (31) during recording of the input data on the recording medium;
selective output means (50) for selectively outputting at least one of the input data and the data reproduced by the reproducing means, and
input means (14) for inputting user control signals for controlling said recording means (22), said reproducing means (40) and said selective output means (50),

characterised in that said memory means (30) further comprises

- a recording head (112) for recording data on said recording medium (110);
- a reproducing head (114) for reproducing the recorded data;
- a recording controller (116) for controlling said recording head (112); and
- a reproducing controller (118) for controlling said reproducing head (114),

wherein said input means (14) are arranged to control the operation of at least said recording controller (116).

2. An apparatus according to claim 1, further comprising compression means (21) for compressing the input data and expansion means (41) for expanding the data reproduced by the reproducing means.

3. An apparatus according to claim 1, wherein the selective output means (50) comprises means (104) for applying a priority order to each of the input data and the reproduced data,

and wherein the apparatus further comprises display means (60) for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

4. An apparatus (300) for recording and reproducing data of a plurality of channels, comprising:

receiving means (12) for receiving input data of an N number of channels;
first selection means (13) for selecting an M number of channels among the N number of channels;
recording means (23) for recording on a recording medium the input data of the M number of channels selected by the first selection means;
memory means (32) for storing said recorded input data, said memory means comprising said recording medium (110);
managing means (33) for managing information indicating a position of the input data of the M number of channels in said memory means (32);
second selection means (303) for selecting a P number of channels among a plurality of channels recorded on the recording medium;
reproducing means (42) for reproducing the data of the P number of channels selected by the second selection means among the plurality of channels recorded on the recording medium, based on the information managed by the managing means (33), during recording of the input data of the M number of channels on the recording medium;
selective output means (51) for selectively outputting at least one of the input data of the N number of channels and the data of the P number of channels reproduced by the reproducing means (42), and
input means (14) for inputting user control signals for controlling said recording means (22), said reproducing means (40) and said selective output means (50),

wherein N, M and P are positive integers and wherein $N \geq M$, wherein said memory means (32) further comprises

- a recording head (112) for recording data on said recording medium (110);
- a reproducing head (114) for reproducing the recorded data;
- a recording controller (116) for controlling said recording head (112); and
- a reproducing controller (118) for controlling said reproducing head (114),

and wherein said input means (14) are arranged to control the operation of at least said recording controller (116).

5. An apparatus according to claim 4, further comprising compression means (24) for compressing the input data and expansion means (44) for expanding the data reproduced by the reproducing means.

6. An apparatus according to claim 4, wherein the selective output means (51) comprises means (304) for applying a priority order to each of the input data and the reproduced data,

and wherein the apparatus further comprises display means (61) for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

7. An apparatus according to claim 1, wherein said apparatus (500) further comprises:

time code generating means (11) for generating a time code and applying the time code to the input data;
thin-out means (20) for thinning out the input data with the time code at a predetermined ratio;
said recording means (22) arranged to record on said recording medium the input data with the time code which have been thinned out by the thin-out means;
said managing means (31) arranged to manage information indicating the position of the input data with the time code recorded on the recording medium;
said reproducing means (40) arranged to reproduce the data with the time code recorded on the recording medium, based on the information managed by the managing means, during recording of the input data with the time code on the recording medium;
comparing means (52) for comparing the time code of the input data with the time code of the data reproduced by the reproducing means; and
said selective output means (50) arranged to selectively output at least one of the input data and the data reproduced by the reproducing means based on a comparison result obtained by the comparing means.

8. An apparatus according to claim 7, further comprising compression means (21) for compressing the input data with the time code which have been thinned out by the thin-out means and expansion means (41) for expanding the data with the time code which have been reproduced by the reproducing means.

9. An apparatus according to claim 7, wherein the selective output means (50) comprises means (104) for applying a priority order to each of the input data with the time code and the reproduced data with the time code,

and wherein the apparatus further comprises display means (60) for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

10. An apparatus according to claim 1, wherein said apparatus further comprises:

time code generating means (11) for generating a time code and applying the time code to the input data;
said recording means (22) arranged to record on said recording medium the input data with the time code;
said managing means (31) arranged to manage information indicating the position of the input data with the time code recorded on the recording medium;
said reproducing means (40) arranged to reproduce the data with the time code recorded on the recording medium, based on the information managed by the managing means, during recording of the input data with the time code on the recording medium;
thin-out means (45) for thinning out the data with the time code reproduced by the reproducing means (40) at a predetermined ratio;
comparing means (52) for comparing the time code of the input data with the time code of the data thinned out by the thin-out means (45); and
said selective output means (50) arranged to selectively output at least one of the input data and the data thinned out by the thin-out means (45) based on a comparison result obtained by the comparing means.

11. An apparatus according to claim 10, further comprising compression means (21) for compressing the input data with the time code and expansion means (41) for expanding the data with the time code which have been reproduced by the reproducing means (40).

12. An apparatus according to claim 10, wherein the selective output means (50) comprises means (104) for applying a priority order to each of the input data with the time code and the thinned out data with the time code,

and wherein the apparatus further comprises

display means (60) for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

13. An apparatus according to claim 1, wherein said apparatus further comprises:

time code generating means (11) for generating a time code and applying the time code to the input data;
first thin-out means (20) for thinning out the input data with the time code at a first ratio;
said recording means (22) arranged to record on said recording medium the input data with the time code which have been thinned out by the first thin-out means;
said managing means (31) arranged to manage information indicating the position of the input data with the time code recorded on the recording medium;
said reproducing means (40) arranged to reproduce the data with the time code recorded on the recording medium, based on the information managed by the managing means (31), during recording of the input data with the time code on the recording medium;
second thin-out means (45) for thinning out the data with the time code reproduced by the reproducing means at a second ratio;
comparing means (52) for comparing the time code of the input data with the time code of the data thinned out by the second thin-out means (45); and
said selective output means (50) arranged to selectively output at least one of the input data and the data thinned out by the second thin-out means (45) based on a comparison result obtained by the comparing means (52).

14. An apparatus according to claim 13, further comprising compression means (21) for compressing the input data with the time code which have been thinned out by the first thin-out means and expansion means (41) for expanding the data with the time code which have been reproduced by the reproducing means.

15. An apparatus according to claim 13, wherein the selective output means (50) comprises means (104) for applying a priority order to each of the input data with the time code and the thinned out data with the time code;

and wherein the apparatus further comprises display means (60) for displaying an output from the selective output means (50) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

16. A method of recording and reproducing data, comprising the steps of:

(a) receiving input data;
(b) recording the input data on a recording medium;
(c) managing information indicating a position of the input data on the recording medium;
(d) reproducing the data recorded on the recording medium, based on the information managed in step (c), during recording of the input data on the recording medium such that said reproduction step is performed in parallel with said recording step;
(e) selectively outputting at least one of the input data and the data reproduced in the step (d); and

further comprising the step of inputting user control signals for controlling at least said recording step b).

17. A method according to claim 16, further comprising a step of compressing the input data and a step of expanding the reproduced data.

18. A method according to claim 16, wherein the step (e) comprises a step of applying a priority order to each of the input data and the reproduced data,

and wherein the method further comprises a step of displaying the selective output in the step (e) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

19. A method of recording and reproducing data of a plurality of channels, comprising the steps of:

(a) receiving input data of an N number of channels;
(b) selecting an M number of channels among the N number of channels;
(c) recording on a recording medium the input data of the M number of channels selected in the step (b);
(d) managing information indicating a position of the input data of the M number of channels recorded on the recording medium;
(e) selecting a P number of channels among a plurality of channels recorded on the recording medium;
(f) reproducing the data of the P number of channels selected in the step (e) among the plurality of channels recorded on the recording medium, based on the information managed in the step (d), during recording of the input data of the M number of channels on the recording medium such that said reproduction step is per-

formed in parallel with said recording step;
(g) selectively outputting at least one of the input data of the N number of channels and the reproduced data of the P number of channels,

wherein N, M and P are positive integers and wherein N ≥ M, and

further comprising the step of inputting user control signals for controlling at least said recording step b).

20. A method according to claim 19, further comprising a step of compressing the input data and a step of expanding the reproduced data.

21. A method according to claim 19, wherein the step (g) comprises a step of applying a priority order to each of the input data and the reproduced data,

and wherein the method further comprises a step of displaying the selective output in the step (g) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

22. A method according to claim 16, comprising, after step a) and before step b), the additional steps of:

(i) generating a time code and applying the time code to the input data;
(ii) thinning out the input data with the time code at a predetermined ratio;

and, after step d) and before step e), the additional step of

(iii) comparing the time code of the input data with the time code of the data reproduced in the step (d); and

wherein said step e) of selectively outputting at least one of the input data and the reproduced data is based on the comparison result obtained in the step (iii).

23. A method according to claim 22, further comprising a step of compressing the input data with the time code which have been thinned out in the step (ii) and a step of expanding the data with the time code which have been reproduced in the step (d).

24. A method according to claim 22, wherein the step (i) comprises a step of applying a priority order to each of the input data with the time code and the reproduced data with the time code,

and wherein the method further comprises a step of displaying the selective output in the step (e) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

25. A method according to claim 16, comprising, after step a) and before step b), the additional step of:

(i) generating a time code and applying the time code to the input data;

and after step d) and before step e) the following steps:
(ii) thinning out the data with the time code reproduced in the step (e) at a predetermined ratio; and
(iii) comparing the time code of the input data with the time code of the data thinned out in the step (ii);

wherein said step (e) of selectively outputting at least one of the input data and the data thinned out in the step (ii) is based on the comparison result obtained in the step (iii).

26. A method according to claim 25, further comprising a step of compressing the input data with the time code and a step of expanding the data with the time code which have been reproduced in the step (d).

27. A method according to claim 25, wherein the step (e) comprises a step of applying a priority order to each of the input data with the time code and the thinned out data with the time code,

and wherein the method further comprises a step of displaying the selective output in the step (e) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

28. A method according to claim 16, comprising, after step a) and before step b), the additional steps of:

(i) generating a time code and applying the time code to the input data;
(ii) thinning out the input data with the time code at a first ratio;

and after step d) and before step e), the following steps:
(iii) thinning out the data with the time code reproduced in the step (d) at a second ratio; and
(iiii) comparing the time code of the input data with the time code of the data thinned out in the step (iii);

wherein said step e) of selectively outputting at least one of the input data and the data thinned out in the step (iii) is based on a comparison result obtained in the step (iiii).

29. A method according to claim 28, further comprising a step of compressing the input data with the time code which have been thinned out in the step (ii) and a step of expanding the data with the time code which have been reproduced in the step (d).

30. A method according to claim 28, wherein the step (e) comprises a step of applying a priority order to each of the input data with the time code and the thinned out data with the time code,

and wherein the method further comprises a step of displaying the selective output in the step (e) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

Patentansprüche

1. Vorrichtung (100) zum Aufzeichnen und Wiedergeben von Daten mit:

einer Empfangsvorrichtung (10) zum Empfangen von Eingabedaten;
eine Aufzeichnungsvorrichtung (22) zum Aufzeichnen der Eingabedaten auf einem Aufzeichnungsmedium (110);
einer Speichervorrichtung (30) zum Speichern der aufgezeichneten Eingabedaten, wobei die Speichervorrichtung das Aufzeichnungsmedium (110) aufweist;
einer Verwaltungsvorrichtung (31) zur Verwaltung einer Information, welche eine Position der Eingabedaten in bzw. auf der Speichervorrichtung (30) verwaltet;
einer Wiedergabevorrichtung (40) zum Wiedergeben der Daten, welche auf dem Aufzeichnungsmedium (110) aufgezeichnet sind, basierend auf der Information, welche von der Verwaltungsvorrichtung (31) verwaltet wird während der Aufzeichnung der Eingabedaten auf dem Aufzeichnungsmedium;
einer selektiven Ausgabevorrichtung (50) zum selektiven Ausgeben von mindestens den Eingabedaten oder den Daten, welche von der Wiedergabevorrichtung wiedergegeben wurden, und
einer Eingabevorrichtung (14) zum Eingeben von Benutzer-Steuer-Signalen zum Steuern der Aufzeichnungsvorrichtung (22), der Wiedergabevorrichtung (40) und der selektiven Ausgabevorrichtung (50),

dadurch gekennzeichnet, dass die Speichervorrichtung (30) weiter aufweist:

- einen Aufzeichnungskopf (112) zum Aufzeichnen von Daten auf dem Aufzeichnungsmedium (110);
- einen Wiedergabekopf (114) zum Wiedergeben der aufgezeichneten Daten;
- eine Aufzeichnungssteuerung (116) zum Steuern des Aufzeichnungskopfes (112); und
- eine Wiedergabesteuerung (118) zur Steuerung des Wiedergabekopfes (114) wobei die Eingabevorrichtung (14) so angeordnet bzw. ausgelegt ist, dass sie die Arbeitsweise von mindestens der Aufzeichnungssteuerung (116) steuert.

2. Vorrichtung nach Anspruch 1 weiter aufweisend eine Kompressions-Vorrichtung (21) zum Komprimieren der Eingabedaten und eine Expansionsvorrichtung (41) zum Expandieren der Daten, welche von der Wiedergabevorrichtung wiedergegeben werden.

3. Vorrichtung nach Anspruch 1, wobei die selektive Ausgabevorrichtung (50) eine Vorrichtung (104) aufweist zum Anwenden bzw. Anlegen einer Prioritäts-Reihenfolge bei allen Eingabedaten und wiedergegebenen Daten

und wobei die Vorrichtung weiter eine Anzeigevorrichtung (60) aufweist zum Anzeigen einer Ausgabe von der selektiven Ausgabevorrichtung in einem vorgegebenen Modus bzw. Betriebsart, wobei der vorgegebene Modus verändert wird in Abhängigkeit von der Prioritäts-Reihenfolge.

4. Vorrichtung (300) zum Aufzeichnen und Wiedergeben von Daten von einer Mehrzahl von Kanälen mit:

einer Empfangsvorrichtung (12) zum Empfangen von Eingabedaten von einer Anzahl N von Kanälen;
einer ersten Auswählvorrichtung (13) zum Auswählen einer Anzahl M von Kanälen aus der Anzahl N von Kanälen;
einer Aufzeichnungsvorrichtung (23) zur Aufzeichnung der Eingabedaten der Anzahl M der Kanäle, welche von der ersten Auswählvorrichtung ausgewählt wurden, auf einem Aufzeichnungsmedium;
einer Speichervorrichtung (32) zum Speichern der aufgezeichneten Eingabedaten, wobei die Speichervorrichtung das Aufzeichnungsmedium (110) aufweist;
einer Verwaltungsvorrichtung (33) zum Verwalten einer Information, welche eine Position der Eingabedaten der Anzahl M der Kanäle in der Speichervorrichtung (32) anzeigt;
einer zweiten Auswählvorrichtung (303) zum Auswählen einer Anzahl P von Kanälen aus einer Mehrzahl von Kanälen, welche auf dem Aufzeichnungsmedium aufgezeichnet wurden;
einer Wiedergabevorrichtung (42) zur Wiedergabe der Daten der Anzahl P der Kanäle, welche ausgewählt wurde von der zweiten Auswählvorrichtung aus der Mehrzahl der Kanäle, welche auf dem Aufzeichnungsmedium aufgezeichnet wurden, basierend auf der Information, welche von der Verwaltungsvorrichtung

(33) verwaltet wird, während der Aufzeichnung der Eingabedaten der Anzahl M der Kanäle auf dem Aufzeichnungsmedium;
einer selektiven Ausgabevorrichtung (51) zum selektiven Ausgeben von mindestens den Eingabedaten der Anzahl N der Kanäle oder den Daten der Anzahl P der Kanäle, welche von der Wiedergabevorrichtung (42) wiedergegeben werden, und
einer Eingabevorrichtung (14) zum Eingeben von Benutzer-Steuer-Signalen zum Steuern der Aufzeichnungsvorrichtung (22), der Wiedergabevorrichtung (40) und der selektiven Ausgabevorrichtung (50),

wobei N, M und P positive ganze Zahlen sind und wobei N ≥M, wobei die Speichervorrichtung (32) weiter aufweist:

- einen Aufzeichnungskopf (112) zum Aufzeichnen von Daten auf dem Aufzeichnungsmedium (110);
- einen Wiedergabekopf (114) zum Wiedergeben der aufgezeichneten Daten;
- eine Aufzeichnungssteuerung (116) zum Steuern des Aufzeichnungskopfes (112); und
- eine Wiedergabesteuerung (118) zur Steuerung des Wiedergabekopfes (114)

und wobei die Eingabevorrichtung (14) so angeordnet bzw. ausgelegt ist, dass sie die Arbeitsweise von mindestens der Aufzeichnungssteuerung (116) steuert.

5. Vorrichtung nach Anspruch 4 weiter aufweisend eine Kompressionsvorrichtung (24) zum Komprimieren der Eingabedaten und eine Expansionsvorrichtung (44) zum Expandieren der Daten, welche von der Wiedergabevorrichtung wiedergegeben werden.

6. Vorrichtung nach Anspruch 4, wobei die selektive Ausgabevorrichtung (51) eine Vorrichtung (304) aufweist zum Anwenden bzw. Anlegen einer Prioritäts-Reihenfolge bei allen Eingabedaten und wiedergegebenen Daten
und wobei die Vorrichtung weiter eine Anzeigevorrichtung (61) aufweist zum Anzeigen einer Ausgabe von der selektiven Ausgabevorrichtung in einem vorgegebenen Modus bzw. Betriebsart, wobei der vorgegebene Modus verändert wird in Abhängigkeit von der Prioritäts-Reihenfolge.

7. Vorrichtung nach Anspruch 1, wobei die Vorrichtung (500) weiter aufweist:

eine Zeit-Code-Erzeugungsvorrichtung (11) zur Erzeugung eines Zeit-Codes und zum Anlegen bzw. Zuführen des Zeit-Codes an die Eingabedaten;
eine Ausdünn(thin-out)vorrichtung (20) zum Ausdünnen der Eingabedaten mit dem Zeit-Code bei einem vorgegebenen Verhältnis;
wobei die Aufzeichnungsvorrichtung (22) so ausgelegt ist, dass sie die Eingabedaten mit dem Zeit-Code auf dem Aufzeichnungsmedium aufzeichnet, welche von der Ausdünnvorrichtung ausgedünnt wurden;
wobei die Verwaltungsvorrichtung (31) so ausgelegt ist, dass sie eine Information verwaltet, welche die Position der Eingabedaten mit dem Zeit-Code, welche auf dem Aufzeichnungsmedium aufgezeichnet sind, angibt;
wobei die Wiedergabevorrichtung (40) so ausgelegt bzw. angeordnet ist, dass sie die Daten mit dem Zeit-Code, welche auf dem Aufzeichnungsmedium aufgezeichnet sind, wiedergibt, basierend auf der Information, welche von der Verwaltungsvorrichtung verwaltet wird, während der Aufzeichnung der Eingabedaten mit dem Zeit-Code auf dem Aufzeichnungsmedium;
eine Vergleichsvorrichtung (52) zum Vergleichen des Zeit-Codes der Eingabedaten mit dem Zeit-Code der Daten, welche von der Wiedergabevorrichtung wiedergegeben werden; und
wobei die selektive Ausgabevorrichtung (50) so ausgelegt ist, dass sie selektiv mindestens die Eingabedaten oder die Daten, welche von der Wiedergabevorrichtung wiedergegeben werden, ausgibt, basierend auf einem Vergleichsergebnis, welches von der Vergleichsvorrichtung erhalten wird.

8. Vorrichtung nach Anspruch 7 weiter aufweisend eine Kompressionsvorrichtung (21) zum Komprimieren der Eingabedaten mit dem Zeit-Code, welche ausgedünnt wurden von der Ausdünnvorrichtung und eine Expansionsvorrichtung (41) zum Expandieren der Daten mit dem Zeit-Code, welche von der Wiedergabevorrichtung wiedergegeben wurden.

9. Vorrichtung nach Anspruch 7, wobei die selektive Ausgabevorrichtung (50) eine Vorrichtung (104) aufweist zum Anlegen bzw. Festlegen einer Prioritäts-Reihenfolge für alle Eingabedaten mit dem Zeit-Code und die wiedergegebenen Daten mit dem Zeit-Code,
und wobei die Vorrichtung weiter eine Anzeigevorrichtung (60) aufweist zum Anzeigen einer Ausgabe von der selektiven Ausgabevorrichtung in einem vorgegebenen Modus bzw. Betriebsart, wobei der vorgegebene Modus in Abhängigkeit von der Prioritäts-Reihenfolge verändert wird.

10. Vorrichtung nach Anspruch 1, wobei die Vorrichtung weiter aufweist:

eine Zeit-Code-Erzeugungsvorrichtung (11) zum Erzeugen eines Zeit-Codes und zum Anlegen bzw. Zuführen des Zeit-Codes zu den Eingabedaten;
wobei die Aufzeichnungsvorrichtung (22) so auslegt ist, um auf dem Aufzeichnungsmedium die Eingabedaten mit dem Zeit-Code aufzuzeichnen;
wobei die Verwaltungsvorrichtung (31) so ausgelegt ist, dass sie eine Information verwaltet, welche die Position der Eingabedaten mit dem Zeit-Code angibt, welche auf dem Aufzeichnungsmedium aufgezeichnet sind;
wobei die Wiedergabevorrichtung (40) so ausgelegt ist um die Daten mit dem Zeit-Code wiederzugeben, welche auf dem Aufzeichnungsmedium aufgezeichnet sind, basierend auf der Information, welche von der Verwaltungsvorrichtung verwaltet wird, während der Aufzeichnung der Eingabedaten mit dem Zeit-Code auf dem Aufzeichnungsmedium;
eine Ausdünn(thin-out)vorrichtung (45) zum Ausdünnen der Daten mit dem Zeit-Code, welche von der Wiedergabevorrichtung (40) wiedergegeben werden, bei einem vorgegebenen Verhältnis;
eine Vergleichsvorrichtung (52) zum Vergleichen des Zeit-Codes der Eingabedaten mit dem Zeit-Code der Daten, welche von der Ausdünnvorrichtung (45) ausgedünnt wurden; und
wobei die selektive Ausgabevorrichtung (50) so ausgelegt ist, um selektiv mindestens die Eingabedaten oder die Daten, welche von der Ausdünnvorrichtung (45) ausgedünnt wurden, selektiv auszugeben, basierend auf einem Vergleichsergebnis, welches von der Vergleichsvorrichtung erhalten wurde.

11. Vorrichtung nach Anspruch 10 weiter aufweisend eine Kompressionsvorrichtung (21) zum Komprimieren der Eingabedaten mit dem Zeit-Code und eine Expansionsvorrichtung (41) zum Expandieren der Daten mit dem Zeit-Code, welche von der Wiedergabevorrichtung (40) wiedergegeben wurden.

12. Vorrichtung nach Anspruch 10, wobei die selektive Ausgabevorrichtung (50) eine Vorrichtung (104) aufweist zum Anlegen bzw. Festlegen einer Prioritäts-Reihenfolge für alle Eingabedaten mit dem Zeit-Code und die ausgedünnten Daten mit dem Zeit-Code,

und wobei die Vorrichtung weiter eine Anzeigevorrichtung (60) aufweist zum Anzeigen einer Ausgabe von der selektiven Ausgabevorrichtung in einem vorgegebenen Modus bzw. Betriebsart, wobei der vorgegebene Modus in Abhängigkeit von der Prioritäts-Reihenfolge verändert wird.

13. Vorrichtung nach Anspruch 1, wobei die Vorrichtung weiter aufweist:

eine Zeit-Code-Erzeugungsvorrichtung (11) zur Erzeugung eines Zeit-Codes und zum Anlegen bzw. Zuführen des Zeit-Codes an die Eingabedaten;
eine erste Ausdünn(thin-out)vorrichtung (20) zum Ausdünnen der Eingabedaten mit dem Zeit-Code bei einem ersten Verhältnis;
wobei die Aufzeichnungsvorrichtung (22) so ausgelegt ist, dass sie die Eingabedaten mit dem Zeit-Code auf dem Aufzeichnungsmedium aufzeichnet, welche von der ersten Ausdünnvorrichtung ausgedünnt wurden;
wobei die Verwaltungsvorrichtung (31) so ausgelegt ist, dass sie eine Information verwaltet, welche die Position der Eingabedaten mit dem Zeit-Code, welche auf dem Aufzeichnungsmedium aufgezeichnet sind, angibt;
wobei die Wiedergabevorrichtung (40) so angeordnet ist, dass sie die Daten mit dem Zeit-Code, welche auf dem Aufzeichnungsmedium aufgezeichnet sind, wiedergibt, basierend auf der Information, welche von der Verwaltungsvorrichtung (31) verwaltet wird, während der Aufzeichnung der Eingabedaten mit dem Zeit-Code auf dem Aufzeichnungsmedium;
eine zweite Ausdünnvorrichtung (45) zum Ausdünnen der Daten mit dem Zeit-Code, welche von der Wiedergabevorrichtung wiedergegeben wurden, bei einem zweiten Verhältnis;
eine Vergleichsvorrichtung (52) zum Vergleichen des Zeit-Codes der Eingabedaten mit dem Zeit-Code der Daten, welche von der zweiten Ausdünnvorrichtung (45) ausgedünnt wurden; und
wobei die selektive Ausgabevorrichtung (50) so ausgelegt ist, dass sie selektiv mindestens die Eingabedaten oder die Daten, welche von der zweiten Ausdünnvorrichtung (45) ausgedünnt werden, ausgibt, basierend auf einem Vergleichsergebnis, welches von der Vergleichsvorrichtung (52) erhalten wird.

14. Vorrichtung nach Anspruch 13 weiter aufweisend eine Kompressionsvorrichtung (21) zum Komprimieren der Eingabedaten mit dem Zeit-Code, welche ausgedünnt wurden von der ersten Ausdünnvorrichtung und eine Expansionsvorrichtung (41) zum Expandieren der Daten mit dem Zeit-Code, welche von der Wiedergabevorrichtung wiedergegeben wurden.

15. Vorrichtung nach Anspruch 13, wobei die selektive

Ausgabevorrichtung (50) eine Vorrichtung (104) aufweist zum Anlegen bzw. Festlegen einer Prioritäts-Reihenfolge für alle Eingabedaten mit dem Zeit-Code und die ausgedünnten Daten mit dem Zeit-Code,

und wobei die Vorrichtung weiter eine Anzeigevorrichtung (60) aufweist zum Anzeigen einer Ausgabe von der selektiven Ausgabevorrichtung (50) in einem vorgegebenen Modus bzw. Betriebsart, wobei der vorgegebene Modus in Abhängigkeit von der Prioritäts-Reihenfolge verändert wird.

16. Verfahren zur Aufzeichnung und Wiedergabe von Daten mit den Schritten:

a) Empfangen von Eingabedaten;
b) Aufzeichnen der Eingabedaten auf einem Aufzeichnungsmedium;
c) Verwalten einer Information, welche eine Position der Eingabedaten auf dem Aufzeichnungsmedium angibt;
d) Wiedergeben der Daten, welche auf dem Aufzeichnungsmedium aufgezeichnet wurden, basierend auf der Information, welche in Schritt (c) verwaltet wird, während der Aufzeichnung der Eingabedaten auf dem Aufzeichnungsmedium, so dass der Wiedergabe-Schritt parallel zu dem Aufzeichnungs-Schritt durchgeführt wird;
e) selektives Ausgeben von mindestens den Eingabedaten oder den Daten, welche bei Schritt (d) wiedergegeben wurden; und

weiter aufweisend den Schritt des Eingebens von Benutzer-Steuer-Signalen zum Steuern von mindestens dem Aufzeichnungsschritt (b).

17. Verfahren nach Anspruch 16, weiter aufweisend einen Schritt zum Komprimieren der Eingabedaten und einen Schritt zum Expandieren der wiedergegebenen Daten.

18. Verfahren nach Anspruch 16, wobei der Schritt (e) einen Schritt zum Anlegen bzw. Anwenden einer Prioritäts-Reihenfolge bei allen Eingabedaten und den wiedergegebenen Daten aufweist,

und wobei das Verfahren weiter einen Schritt zum Anzeigen der selektiven Ausgabe bei dem Schritt (e) in einem vorgegebenen Modus bzw. Betriebsart umfasst, wobei der vorgegebene Modus in Abhängigkeit von der Prioritäts-Reihenfolge verändert wird.

19. Verfahren zur Aufzeichnung und Wiedergabe von Daten von einer Mehrzahl von Kanälen mit den Schritten:

a) Empfangen von Eingabedaten von einer Anzahl N von Kanälen;
b) Auswählen einer Anzahl M von Kanälen aus der Anzahl N von Kanälen;
c) Aufzeichnen der Eingabedaten der Anzahl M der Kanäle, welche bei dem Schritt (b) ausgewählt wurden, auf einem Aufzeichnungsmedium;
d) Verwalten einer Information, welche eine Position der Eingabedaten der Anzahl M der Kanäle angibt, welche auf dem Aufzeichnungsmedium aufgezeichnet wurden;
e) Auswählen einer Anzahl P von Kanälen aus einer Mehrzahl von Kanälen, welche auf dem Aufzeichnungsmedium aufgezeichnet wurden;
f) Wiedergeben der Daten der Anzahl P der Kanäle, welche in dem Schritt (e) aus der Mehrzahl der Kanäle, welche auf dem Aufzeichnungsmedium aufgezeichnet wurden, ausgewählt wurden, basierend auf der Information, welche in dem Schritt (d) verwaltet wurde, während der Aufzeichnung der Eingabedaten der Anzahl M der Kanäle auf dem Aufzeichnungsmedium, so dass der Wiedergabe-Schritt parallel zu dem Aufzeichnungs-Schritt durchgeführt wird;
g) selektives Ausgeben von mindestens den Eingabedaten der Anzahl N der Kanäle oder den wiedergegebenen Daten der Anzahl P der Kanäle,

wobei N, M und P positive ganze Zahlen sind und wobei $N \geq M$ und

weiter aufweisend den Schritt des Eingebens von Benutzer-Steuer-Signalen zum Steuern von mindestens dem Aufzeichnungs-Schritt (b).

20. Verfahren nach Anspruch 19 weiter aufweisend einen Schritt zum Komprimieren der Eingabedaten und einen Schritt zum Expandieren der wiedergegebenen Daten.

21. Verfahren nach Anspruch 19, wobei der Schritt (g) einen Schritt des Anwendens bzw. Anlegens einer Prioritäts-Reihenfolge bei allen Eingabedaten und den wiedergegebenen Daten umfasst,

und wobei das Verfahren weiter einen Schritt zum Anzeigen der selektiven Ausgabe in dem Schritt (g) in einem vorgegebenen Modus bzw. Betriebsart umfasst, wobei der vorgegebene Modus in Abhängigkeit von der Prioritäts-Reihenfolge verändert wird.

22. Verfahren nach Anspruch 16 mit den zusätzlichen Schritten nach Schritt a) und vor Schritt b):

(i) Erzeugen eines Zeit-Codes und Anlegen bzw. Anwenden des Zeit-Codes bei den Eingabedaten;

(ii) Ausdünnen der Eingabedaten mit dem Zeit-Code bei einem vorgegebenen Verhältnis;

und nach dem Schritt d) und vor dem Schritt e) den zusätzlichen Schritt

(iii) Vergleichen des Zeit-Codes der Eingabedaten mit dem Zeit-Code der Daten, welche in dem Schritt (d) wiedergegeben wurden; und

wobei der Schritt e) der selektiven Ausgabe von mindestens den Eingabedaten oder den wiedergegebenen Daten auf dem Vergleichsergebnis basiert, welches in dem Schritt (iii) erhalten wurde.

23. Verfahren nach Anspruch 22 weiter aufweisend einen Schritt der Komprimierung der Eingabedaten mit dem Zeit-Code, welche ausgedünnt wurden in dem Schritt (ii) und einen Schritt der Expandierung der Daten mit dem Zeit-Code, welche in dem Schritt (d) wiedergegeben wurden.

24. Verfahren nach Anspruch 22, wobei der Schritt (i) einen Schritt umfasst zum Anlegen bzw. Anwenden einer Prioritäts-Reihenfolge bei allen Eingabedaten mit dem Zeit-Code und den wiedergegebenen Daten mit dem Zeit-Code,

und wobei das Verfahren weiter einen Schritt aufweist zum Anzeigen der selektiven Ausgabe bei dem Schritt (e) in einem vorgegebenen Modus bzw. Betriebsart, wobei der vorgegebene Modus in Abhängigkeit von der Prioritäts-Reihenfolge verändert wird.

25. Verfahren nach Anspruch 16, mit dem zusätzlichen Schritt nach Schritt a) und vor Schritt b):

(i) Erzeugen eines Zeit-Codes und Anlegen bzw. Anwenden des Zeit-Codes bei den Eingabedaten;

und nach Schritt d) und vor Schritt e) mit den folgenden Schritten:

(ii) Ausdünnen der Daten mit dem Zeit-Code, welche in dem Schritt (e) wiedergegeben wurden bei einem vorgegebenen Verhältnis; und

(iii) Vergleichen des Zeit-Codes der Eingabedaten mit dem Zeit-Code der bei dem Schritt (ii) ausgedünnten Daten;

wobei der Schritt (e) der selektiven Ausgabe von mindestens den Eingabedaten und den in dem Schritt (ii) ausgedünnten Daten auf dem Vergleichsergebnis basiert, welches bei dem Schritt (iii) erhalten wurde.

26. Verfahren nach Anspruch 25 weiter aufweisend einen Schritt der Komprimierung der Eingabedaten mit dem Zeit-Code und einen Schritt der Expandierung der Daten mit dem Zeit-Code, welche in dem Schritt (d) wiedergegeben wurden.

27. Verfahren nach Anspruch 25, wobei der Schritt (e) einen Schritt aufweist zum Anwenden bzw. Anlegen einer Prioritäts-Reihenfolge bei allen Eingabedaten mit dem Zeit-Code und den ausgedünnten Daten mit dem Zeit-Code,

und wobei das Verfahren weiter einen Schritt aufweist zum Anzeigen der selektiven Ausgabe bei dem Schritt (e) in einem vorgegebenen Modus bzw. Betriebsart, wobei der vorgegebene Modus in Abhängigkeit von der Prioritäts-Reihenfolge verändert wird.

28. Verfahren nach Anspruch 16 weiter aufweisend die zusätzlichen Schritte nach Schritt a) und vor Schritt b):

(i) Erzeugen eines Zeit-Codes und Anlegen bzw. Anwenden des Zeit-Codes bei den Eingabedaten;

(ii) Ausdünnen der Eingabedaten mit dem Zeit-Code bei einem ersten Verhältnis;

und nach Schritt d) und vor Schritt e) die folgenden Schritte:

(iii) Ausdünnen der Daten mit dem Zeit-Code, welche bei dem Schritt (d) wiedergegeben wurden, bei einem zweiten Verhältnis; und

(iiii) Vergleichen des Zeit-Codes der Eingabedaten mit dem Zeit-Code der bei dem Schritt (iii) ausgedünnten Daten;

wobei der Schritt e) der selektiven Ausgabe von mindestens den Eingabedaten oder den bei dem Schritt (iii) ausgedünnten Daten auf einem Vergleichsergebnis basiert, welches bei dem Schritt (iiii) erhalten wurde.

29. Verfahren nach Anspruch 28 weiter aufweisend einen Schritt der Komprimierung der Eingabedaten mit dem Zeit-Code, welche bei dem Schritt (ii) ausgedünnt wurden und einen Schritt der Expandierung der Daten mit dem Zeit-Code, welche bei dem Schritt (d) wiedergegeben wurden.

30. Verfahren Anspruch 28, wobei der Schritt (e) einen Schritt aufweist zum Anwenden bzw. Anlegen einer Prioritäts-Reihenfolge bei allen Eingabedaten mit dem Zeit-Code und den ausgedünnten Daten mit dem Zeit-Code,

und wobei das Verfahren weiter einen Schritt aufweist zum Anzeigen der selektiven Ausgabe bei dem Schritt (e) in einem vorgegebenen Modus bzw. Betriebsart, wobei der vorgegebene Modus in Abhängigkeit von der Prioritäts-Reihenfolge verändert wird.

Revendications

1. Dispositif (100) destiné à enregistrer et à reproduire

des données, comprenant :

un moyen de réception (10) destiné à recevoir des données d'entrée,
un moyen d'enregistrement (22) destiné à enregistrer les données d'entrée sur un support d'enregistrement (110),
un moyen de mémoire (30) destiné à mémoriser lesdites données d'entrée enregistrées, ledit moyen de mémoire comprenant ledit support d'enregistrement (110),
un moyen de gestion 31 destiné à gérer des informations indiquant une position des données d'entrée dans ledit moyen de mémoire (30),
un moyen de reproduction (40) destiné à reproduire les données enregistrées sur le support d'enregistrement (110), sur la base des informations gérées par le moyen de gestion (31) durant l'enregistrement des données d'entrée sur le support d'enregistrement,
un moyen de sortie sélective (50) destiné à fournir sélectivement en sortie au moins l'une des données d'entrée et des données reproduites par le moyen de reproduction, et
un moyen d'entrée (14) destiné à recevoir en entrée des signaux de commande de l'utilisateur destinés à commander ledit moyen d'enregistrement (22), ledit moyen de reproduction (40) et ledit moyen de sortie sélective (50),

caractérisé en ce que ledit moyen de mémoire (30) comprend en outre

- une tête d'enregistrement (112) destinée à enregistrer des données sur ledit support d'enregistrement (110),
- une tête de reproduction (114) destinée à reproduire les données enregistrées,
- un contrôleur d'enregistrement (116) destiné à commander ladite tête d'enregistrement (112), et
- un contrôleur de reproduction (118) destiné à commander ladite tête de reproduction (114),

dans lequel ledit moyen d'entrée (14) est agencé pour commander le fonctionnement d'au moins ledit contrôleur d'enregistrement (116).

2. Dispositif selon la revendication 1, comprenant en outre un moyen de compression (21) destiné à compresser les données d'entrée et un moyen d'expansion (41) destiné à expanser les données reproduites par le moyen de reproduction.

3. Dispositif selon la revendication 1, dans lequel le moyen de sortie sélective (50) comprend un moyen (104) destiné à appliquer un ordre de priorité à chacune des données d'entrée et des données reproduites,

et dans lequel le dispositif comprend en outre un moyen d'affichage (60) destiné à afficher une sortie provenant du moyen de sortie sélective dans un mode prédéterminé, le mode prédéterminé étant modifié conformément à l'ordre de priorité.

4. Dispositif (300) destiné à enregistrer et à reproduire des données d'une pluralité de canaux, comprenant :

un moyen de réception (12) destiné à recevoir des données d'entrée d'un nombre N de canaux,
un premier moyen de sélection (13) destiné à sélectionner un nombre M de canaux parmi le nombre N de canaux,
un moyen d'enregistrement (23) destiné à enregistrer sur un support d'enregistrement les données d'entrée du nombre M de canaux sélectionnés par le premier moyen de sélection,
un moyen de mémoire (32) destiné à mémoriser lesdites données d'entrée enregistrées, ledit moyen de mémoire comprenant ledit support d'enregistrement (110),
un moyen de gestion (33) destiné à gérer des informations indiquant une position des données d'entrée du nombre M de canaux dans ledit moyen de mémoire (32),
un second moyen de sélection (303) destiné à sélectionner un nombre P de canaux parmi une pluralité de canaux enregistrés sur le support d'enregistrement,
un moyen de reproduction (42) destiné à reproduire les données du nombre P de canaux sélectionnés par le second moyen de sélection parmi la pluralité de canaux enregistrés sur le support d'enregistrement, sur la base des informations gérées par le moyen de gestion (33), durant l'enregistrement des données d'entrée du nombre M de canaux sur le support d'enregistrement,
un moyen de sortie sélective (51) destiné à fournir sélectivement en sortie au moins l'une des données d'entrée du nombre N de canaux et des données du nombre P de canaux reproduits par le moyen de reproduction (42), et
un moyen d'entrée (14) destiné à recevoir en entrée des signaux de commande de l'utilisateur destinés à commander ledit moyen d'enregistrement (22), ledit moyen de reproduction (40) et ledit moyen de sortie sélective (50),

dans lequel N, M et P sont des nombres entiers positifs et dans lequel $N \geq M$, où ledit moyen de mémoire (32) comprend en outre

- une tête d'enregistrement (112) destinée à en-

registrer des données sur ledit support d'enregistrement (110),
- une tête de reproduction (114) destinée à reproduire les données enregistrées,
- un contrôleur d'enregistrement (116) destiné à commander ladite tête d'enregistrement (112), et
- un contrôleur de reproduction (118) destiné à commander ladite tête de reproduction (114),

et dans lequel ledit moyen d'entrée (14) est agencé pour commander le fonctionnement dudit au moins un contrôleur d'enregistrement (116).

5. Dispositif selon la revendication 4, comprenant en outre un moyen de compression (24) destiné à compresser les données d'entrée et un moyen d'expansion (44) destiné à expanser les données reproduites par le moyen de reproduction.

6. Dispositif selon la revendication 4, dans lequel le moyen de sortie sélective (51) comprend un moyen (304) destiné à appliquer un ordre de priorité à chacune des données d'entrée et des données reproduites,

et dans lequel le dispositif comprend en outre un moyen d'affichage (61) destiné à afficher une sortie provenant du moyen de sortie sélective dans un mode prédéterminé, le mode prédéterminé étant modifié conformément à l'ordre de priorité.

7. Dispositif selon la revendication 1, dans lequel ledit dispositif (500) comprend en outre :

un moyen de génération de code de temps (11) destiné à générer un code de temps et à appliquer le code de temps aux données d'entrée,
un moyen de réduction (20) destiné à réduire les données d'entrée avec le code de temps suivant un rapport prédéterminé,
ledit moyen d'enregistrement (22) agencé pour enregistrer sur ledit support d'enregistrement les données d'entrée avec le code de temps, qui ont été réduites par le moyen de réduction,
ledit moyen de gestion (31) agencé pour gérer des informations indiquant la position des données d'entrée avec le code de temps enregistrées sur le support d'enregistrement,
ledit moyen de reproduction (40) agencé pour reproduire les données avec le code de temps enregistrées sur le support d'enregistrement, sur la base des informations gérées par le moyen de gestion, durant l'enregistrement des données d'entrée avec le code de temps sur le support d'enregistrement,
un moyen de comparaison (52) destiné à comparer le code de temps des données d'entrée au code de temps des données reproduites par le moyen de reproduction, et
ledit moyen de sortie sélective (50) agencé pour fournir sélectivement en sortie au moins l'une des données d'entrée et des données reproduites par le moyen de reproduction sur la base d'un résultat de comparaison obtenu par le moyen de comparaison.

8. Dispositif selon la revendication 7, comprenant en outre un moyen de compression (21) destiné à compresser les données d'entrée avec le code de temps qui ont été réduites par le moyen de réduction et un moyen d'expansion (41) destiné à expanser les données avec le code de temps qui ont été reproduites par le moyen de reproduction.

9. Dispositif selon la revendication 7, dans lequel le moyen de sortie sélective (50) comprend un moyen (104) destiné à appliquer un ordre de priorité à chacune des données d'entrée avec le code de temps et aux données reproduites avec le code de temps,

et dans lequel le dispositif comprend en outre un moyen d'affichage (60) destiné à afficher une sortie provenant du moyen de sortie sélective dans un mode prédéterminé, le mode prédéterminé étant modifié conformément à l'ordre de priorité.

10. Dispositif selon la revendication 1, dans lequel ledit dispositif comprend en outre :

un moyen de génération de code de temps (11) destiné à générer un code de temps et à appliquer le code de temps aux données d'entrée,
ledit moyen d'enregistrement (22) agencé pour enregistrer sur ledit support d'enregistrement les données d'entrée avec le code de temps,
ledit moyen de gestion (31) agencé pour gérer des informations indiquant la position des données d'entrée avec le code de temps enregistré sur le support d'enregistrement,
ledit moyen de reproduction (40) agencé pour reproduire les données avec le code de temps enregistré sur le support d'enregistrement, sur la base des informations gérées par le moyen de gestion, durant l'enregistrement des données d'entrée avec le code de temps sur le support d'enregistrement,
un moyen de réduction (45) destiné à réduire les données avec le code de temps reproduit par le moyen de reproduction (40) suivant un rapport prédéterminé,
un moyen de comparaison (52) destiné à comparer le code de temps des données d'entrée au code de temps des données réduites par le moyen de réduction (45),
ledit moyen de sortie sélective (50) agencé pour fournir sélectivement en sortie au moins l'une des données d'entrée et des données ré-

duites par le moyen de réduction (45) sur la base d'un résultat de comparaison obtenu par le moyen de comparaison.

11. Dispositif selon la revendication 10, comprenant en outre un moyen de compression (21) destiné à compresser les données d'entrée avec le code de temps et un moyen d'expansion (41) destiné à expanser les données avec le code de temps qui ont été reproduites par le moyen de reproduction (40).

12. Dispositif selon la revendication 10, dans lequel le moyen de sortie sélective (50) comprend un moyen (104) destiné à appliquer un ordre de priorité à chacune des données d'entrée avec le code de temps et aux données réduites avec le code de temps,

et dans lequel le dispositif comprend en outre un moyen d'affichage (60) destiné à afficher une sortie provenant du moyen de sortie sélective dans un mode prédéterminé, le mode prédéterminé étant modifié conformément à l'ordre de priorité.

13. Dispositif selon la revendication 1, dans lequel ledit dispositif comprend en outre :

un moyen de génération de code de temps (11) destiné à générer un code de temps et à appliquer le code de temps aux données d'entrée,
un premier moyen de réduction (20) destiné à réduire les données d'entrée avec le code de temps suivant un premier rapport,
ledit moyen d'enregistrement (22) agencé pour enregistrer sur ledit support d'enregistrement les données d'entrée avec le code de temps qui ont été réduites par le premier moyen de réduction,
ledit moyen de gestion (31) agencé pour gérer des informations indiquant la position des données d'entrée avec le code de temps enregistré sur le support d'enregistrement,
ledit moyen de reproduction (40) agencé pour reproduire les données avec le code de temps enregistré sur le support d'enregistrement, sur la base des informations gérées par le moyen de gestion (31), durant l'enregistrement des données d'entrée avec le code de temps sur le support d'enregistrement,
un second moyen de réduction (45) destiné à réduire les données avec le code de temps reproduit par le moyen de reproduction suivant un second rapport,
un moyen de comparaison (52) destiné à comparer le code de temps des données d'entrée avec le code de temps des données réduites par le second moyen de réduction (45), et
ledit moyen de sortie sélective (50) agencé pour fournir sélectivement en sortie au moins l'une des données d'entrée et des données réduites par le second moyen de réduction (45) sur la base d'un résultat de comparaison obtenu par le moyen de comparaison (52).

14. Dispositif selon la revendication 13, comprenant en outre un moyen de compression (21) destiné à compresser les données d'entrée avec le code de temps qui ont été réduites par le premier moyen de réduction et un moyen d'expansion (41) destiné à expanser des données avec le code de temps, qui ont été reproduites par le moyen de reproduction.

15. Dispositif selon la revendication 13, dans lequel le moyen de sortie sélective (50) comprend un moyen (104) destiné à appliquer un ordre de priorité à chacune des données d'entrée avec le code de temps et des données réduites avec le code de temps,

et dans lequel le dispositif comprend en outre un moyen d'affichage (60) destiné à afficher une sortie provenant du moyen de sortie sélective (50) dans un mode prédéterminé, le mode prédéterminé étant modifié conformément à l'ordre de priorité.

16. Procédé d'enregistrement et de reproduction de données, comprenant les étapes consistant à :

(a) recevoir des données d'entrée,
(b) enregistrer les données d'entrée sur un support d'enregistrement,
(c) gérer des informations indiquant une position des données d'entrée sur le support d'enregistrement,
(d) reproduire les données enregistrées sur le support d'enregistrement, sur la base des informations gérées dans l'étape (c) durant l'enregistrement des données d'entrée sur le support d'enregistrement de sorte que ladite étape de reproduction est exécutée parallèlement à ladite étape d'enregistrement,
(e) fournir sélectivement en sortie au moins l'une des données d'entrée et des données reproduites dans l'étape (d), et

comprenant en outre l'étape consistant à recevoir en entrée des signaux de commande de l'utilisateur en vue de commander au moins ladite étape d'enregistrement b).

17. Procédé selon la revendication 16, comprenant en outre une étape consistant à compresser les données d'entrée et une étape consistant à expanser les données reproduites.

18. Procédé selon la revendication 16, dans lequel l'étape (e) comprend une étape consistant à appliquer un ordre de priorité à chacune des données d'entrée et des données reproduites,

et dans lequel le procédé comprend en outre

une étape consistant à afficher la sortie sélective dans l'étape (e) dans un mode prédéterminé, le mode prédéterminé étant modifié conformément à l'ordre de priorité.

19. Procédé d'enregistrement et de reproduction des données d'une pluralité de canaux, comprenant les étapes consistant à :

(a) recevoir des données d'entrée d'un nombre N de canaux,
(b) sélectionner un nombre M de canaux parmi le nombre N de canaux,
(c) enregistrer sur un support d'enregistrement les données d'entrée du nombre M de canaux sélectionnés dans l'étape (b),
(d) gérer des informations indiquant une position des données d'entrée du nombre M de canaux enregistrés sur le support d'enregistrement,
(e) sélectionner un nombre P de canaux parmi une pluralité de canaux enregistrés sur le support d'enregistrement,
(f) reproduire les données du nombre P de canaux sélectionnées dans l'étape (e) parmi la pluralité de canaux enregistrés sur le support d'enregistrement, sur la base des informations gérées dans l'étape (d), durant l'enregistrement des données d'entrée du nombre M de canaux sur le support d'enregistrement de sorte que ladite étape de reproduction est exécutée parallèlement avec ladite étape d'enregistrement,
(g) fournir sélectivement en sortie au moins l'une des données d'entrée du nombre N de canaux et des données reproduites du nombre P de canaux,

dans lequel N, M et P sont des nombres entiers positifs et dans lequel $N \geq M$, et

comprenant en outre l'étape consistant à recevoir en entrée des signaux de commande de l'utilisateur en vue de commander au moins ladite étape d'enregistrement b).

20. Procédé selon la revendication 19, comprenant en outre une étape consistant à compresser les données d'entrée et une étape consistant à expanser les données reproduites.

21. Procédé selon la revendication 19, dans lequel l'étape (g) comprend une étape consistant à appliquer un ordre de priorité à chacune des données d'entrée et des données reproduites,

et dans lequel le procédé comprend en outre une étape consistant à afficher la sortie sélective dans l'étape (g) dans un mode prédéterminé, le mode prédéterminé étant modifié conformément à l'ordre de priorité.

22. Procédé selon la revendication 16, comprenant, après l'étape a) et avant l'étape b), les étapes supplémentaires consistant à :

(i) générer un code de temps et appliquer le code de temps aux données d'entrée,
(ii) réduire les données d'entrée avec le code de temps suivant un rapport prédéterminé,

et, après l'étape d) et avant l'étape e), l'étape supplémentaire consistant à
(iii) comparer le code de temps des données d'entrée au code de temps des données reproduites dans l'étape d), et

où ladite étape e) consistant à fournir sélectivement en sortie au moins l'une des données d'entrée et des données reproduites est fondée sur le résultat de la comparaison obtenue à l'étape (iii).

23. Procédé selon la revendication 22, comprenant en outre une étape consistant à compresser les données d'entrée avec le code de temps, qui ont été réduites dans l'étape (ii) et une étape consistant à expanser les données avec le code de temps, qui ont été reproduites dans l'étape (d).

24. Procédé selon la revendication 22, dans lequel l'étape (i) comprend une étape consistant à appliquer un ordre de priorité à chacune des données d'entrée avec le code de temps et aux données reproduites avec le code de temps,

et dans lequel le procédé comprend en outre une étape consistant à afficher la sortie sélective dans l'étape (e) dans un mode prédéterminé, le mode prédéterminé étant modifié conformément à l'ordre de priorité.

25. Procédé selon la revendication 16, comprenant, après l'étape (a) et avant l'étape (b), l'étape supplémentaire consistant à :

(i) générer un code de temps et appliquer le code de temps aux données d'entrée,

et après l'étape (d) et avant l'étape (e) les étapes suivantes :
(ii) la réduction des données d'entrée avec le code de temps, reproduites dans l'étape (e) suivant un rapport prédéterminé, et
(iii) comparer le code de temps des données d'entrée avec le code de temps des données réduites dans l'étape (ii),

dans lequel ladite étape (e) consistant à fournir sélectivement en sortie au moins l'une des données d'entrée et des données réduites dans l'étape (ii) est fondée sur le résultat de la comparaison obtenu dans l'étape (iii).

26. Procédé selon la revendication 25, comprenant en

outre une étape consistant à compresser les données d'entrée avec le code de temps et une étape consistant à expanser les données avec le code de temps, qui ont été reproduites à l'étape (d).

27. Procédé selon la revendication 25, dans lequel l'étape (e) comprend une étape consistant à appliquer un ordre de priorité à chacune des données d'entrée avec le code de temps et aux données réduites avec le code de temps,

et dans lequel le procédé comprend en outre une étape consistant à afficher la sortie sélective dans l'étape (e) dans un mode prédéterminé, le mode prédéterminé étant modifié conformément à l'ordre de priorité.

28. Procédé selon la revendication 16, comprenant, après l'étape (a) et avant l'étape (b), les étapes supplémentaires consistant à :

(i) générer un code de temps et appliquer le code de temps aux données d'entrée,
(ii) réduire les données d'entrée avec le code de temps suivant un premier rapport,

et après l'étape d) et avant l'étape e), les étapes suivantes :
(iii) réduire les données avec le code de temps, reproduites dans l'étape (d) suivant un second rapport, et
(iiii) comparer le code de temps des données d'entrée au code de temps des données réduites dans l'étape (iii),

dans lequel ladite étape (e) consistant à fournir sélectivement en sortie au moins l'une des données d'entrée et des données réduites dans l'étape (iii) est fondée sur un résultat de comparaison obtenu dans l'étape (iiii).

29. Procédé selon la revendication 28, comprenant en outre une étape consistant à compresser les données d'entrée avec le code de temps, qui ont été réduites dans l'étape (ii) et une étape consistant à expanser les données avec le code de temps, qui ont été reproduites dans l'étape d).

30. Procédé selon la revendication 28, dans lequel l'étape e) comprend une étape consistant à appliquer un ordre de priorité à chacune des données d'entrée avec le code de temps et des données réduites avec le code de temps,

et dans lequel le procédé comprend en outre une étape consistant à afficher la sortie sélective dans l'étape (e) dans un mode prédéterminé, le mode prédéterminé étant modifié conformément à l'ordre de priorité.

FIG. 1

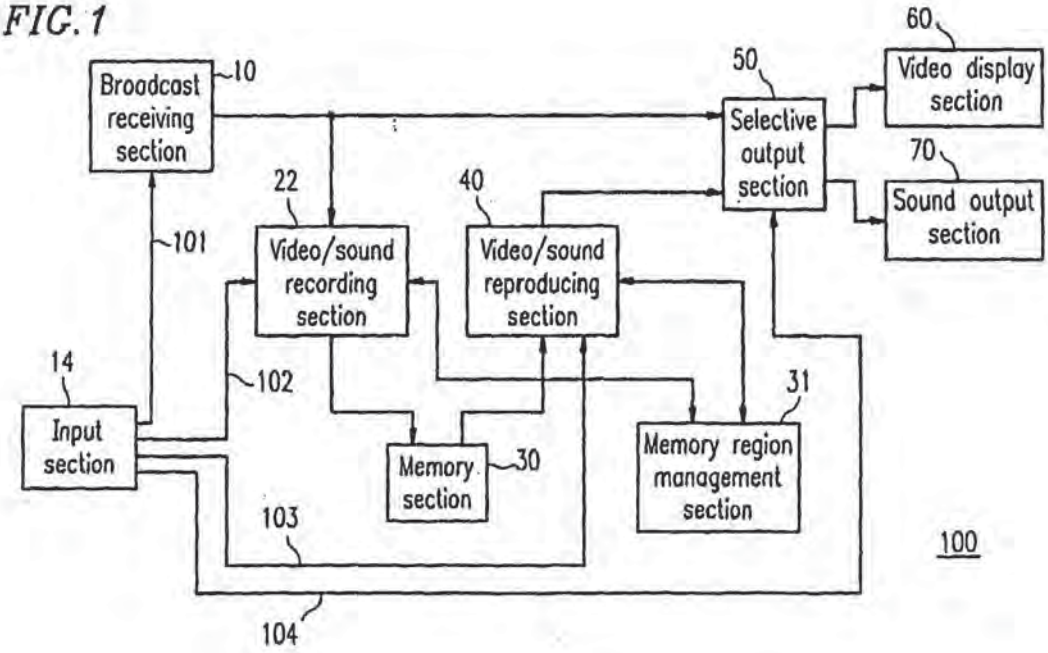

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FIG. 2

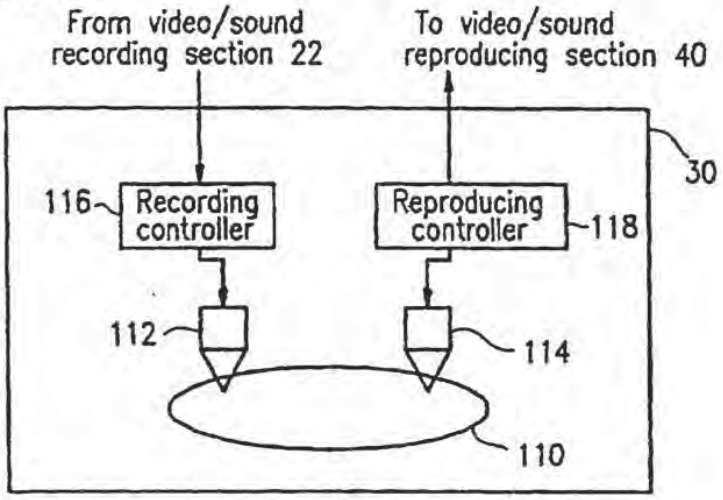
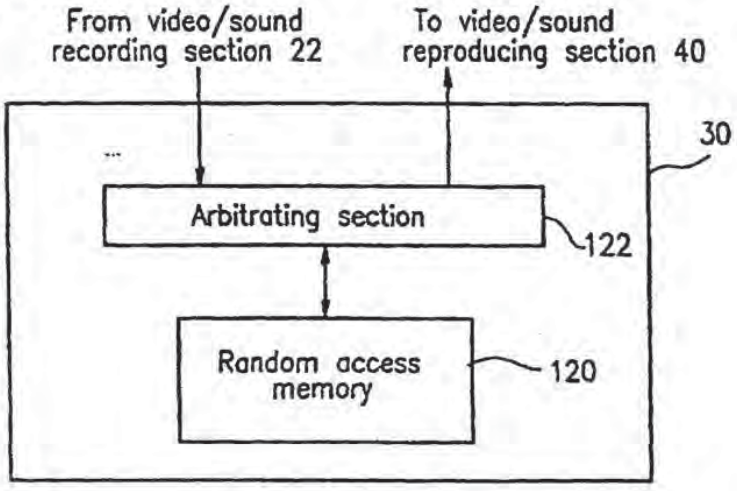

From video/sound recording section 22
To video/sound reproducing section 40
30
116
Recording controller
Reproducing controller
118
112
114
110

FIG. 3


From video/sound recording section 22
To video/sound reproducing section 40
30
Arbitrating section
122
Random access memory
120

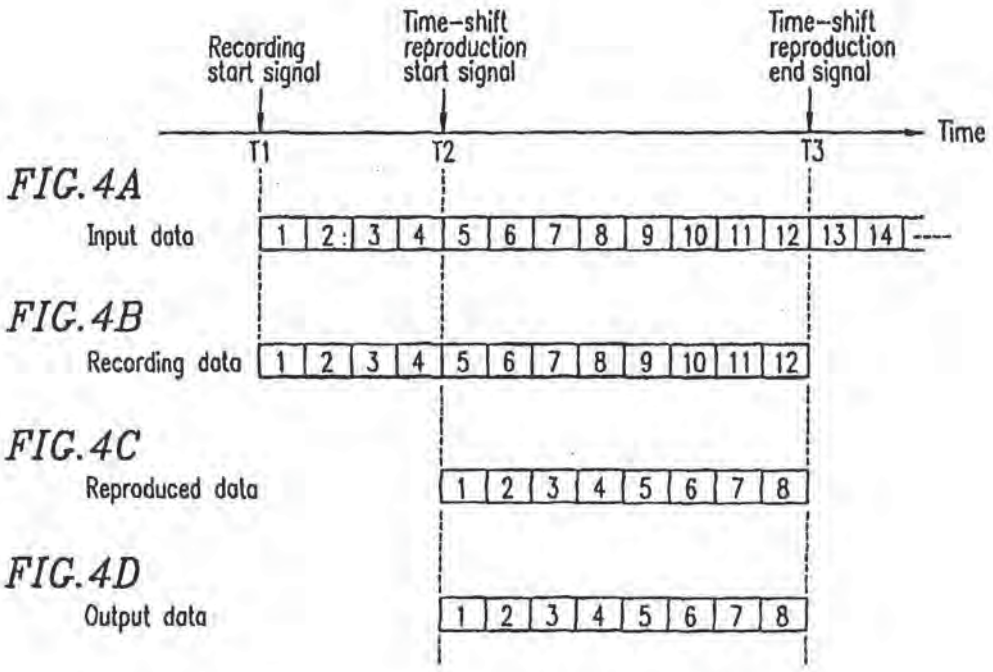
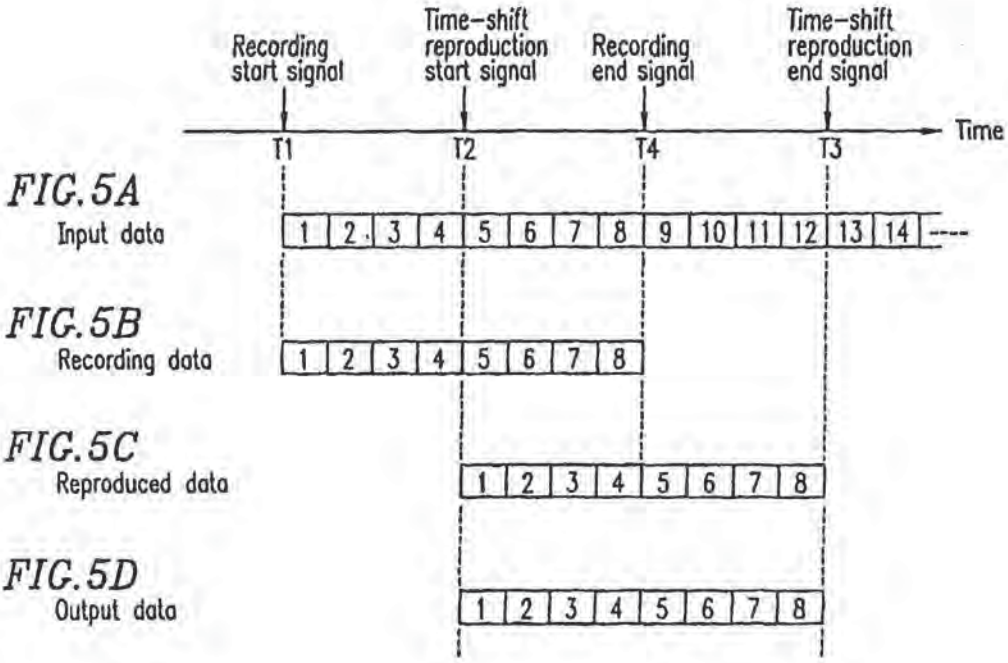


FIG. 4A

FIG. 4B

FIG. 4C

FIG. 4D



EP 0 726 574 B1

FIG. 6

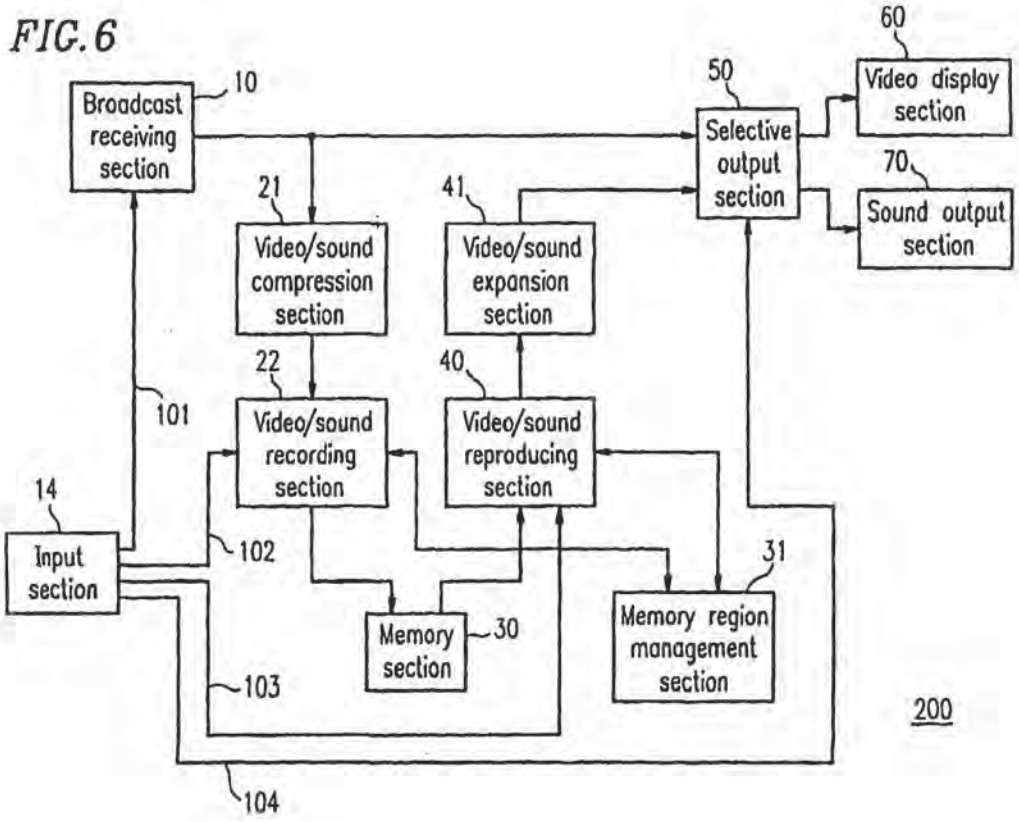

Broadcast receiving section
10
Selective output section
50
Video display section
60
Sound output section
70
Video/sound compression section
21
Video/sound expansion section
41
Video/sound recording section
22
Video/sound reproducing section
40
Input section
14
Memory section
30
Memory region management section
31
101
102
103
104
200

FIG. 7

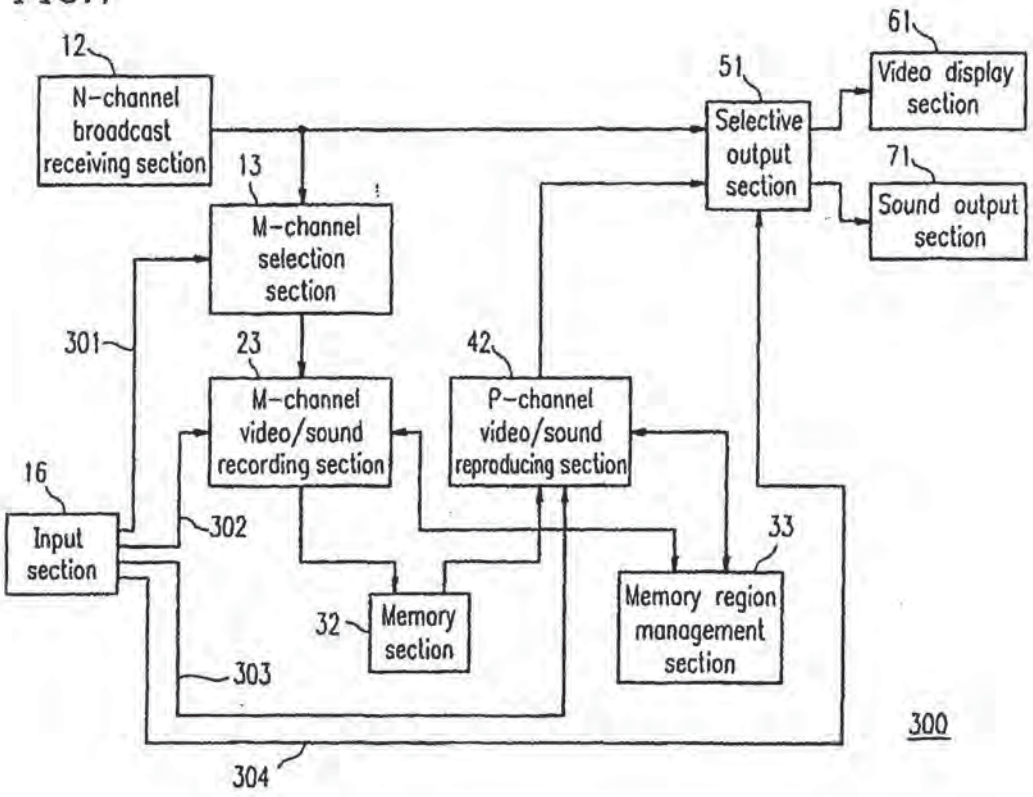


FIG. 8

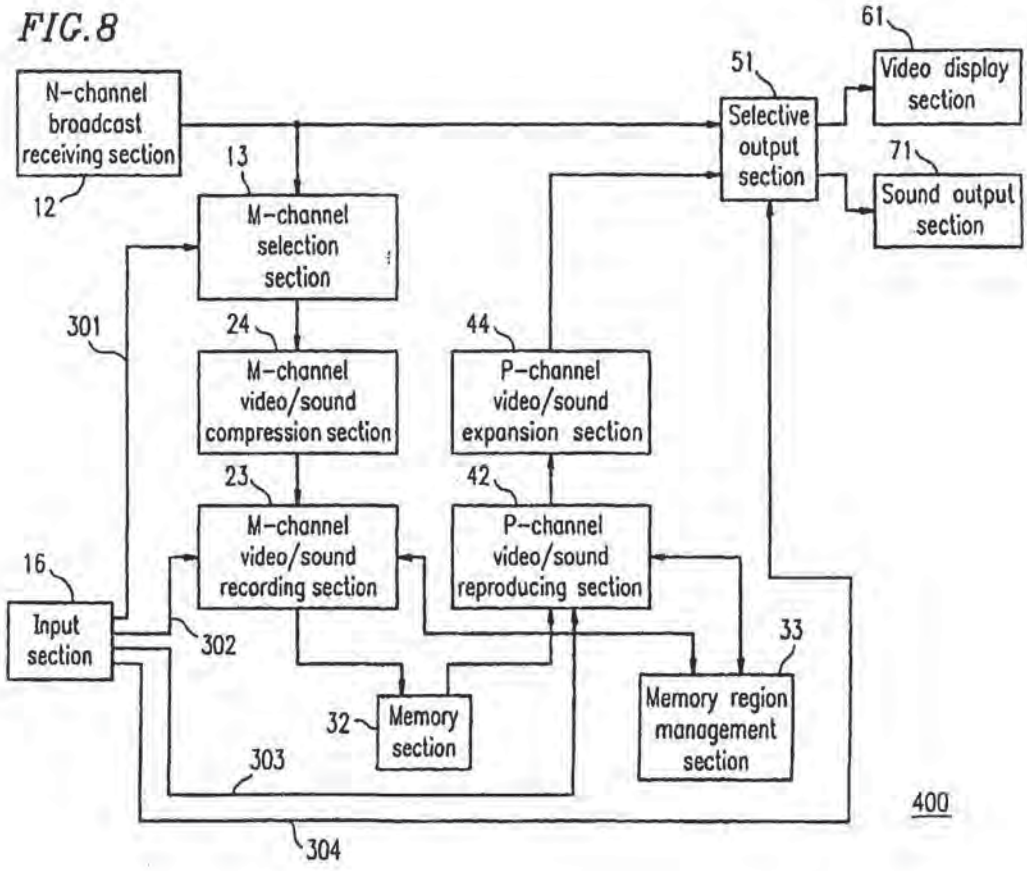


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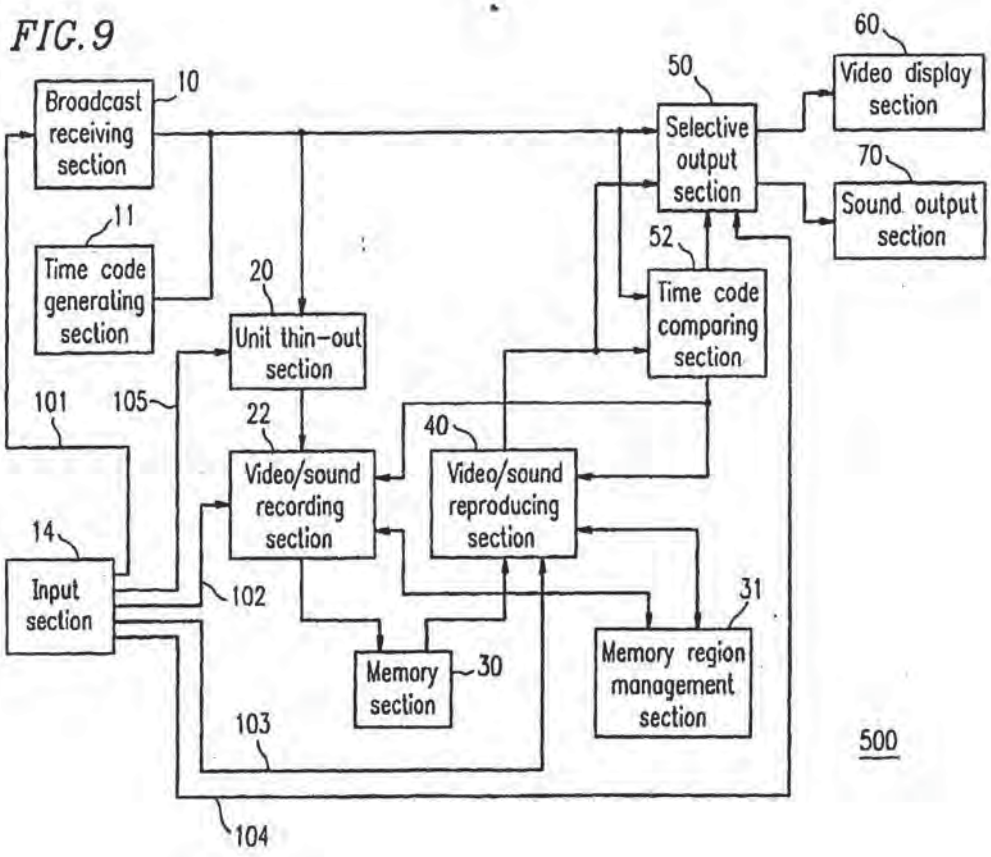
FIG. 9



EP 0 726 574 B1

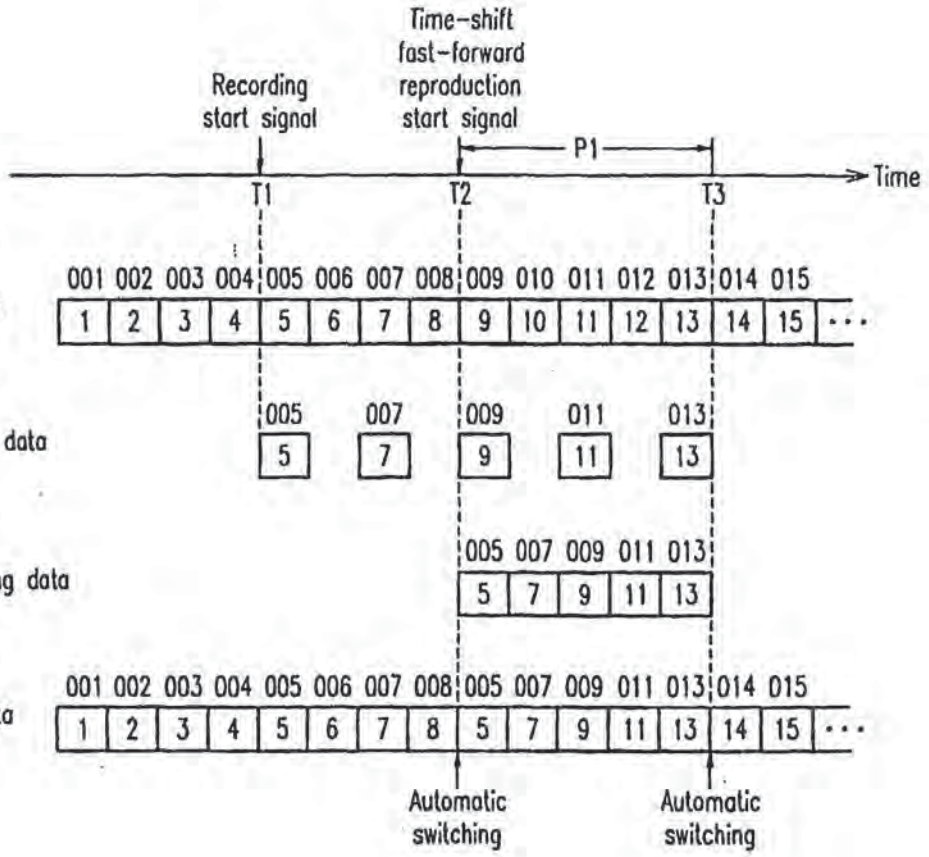


FIG. 10A

Input data

FIG. 10B

Recording data

FIG. 10C

Reproducing data

FIG. 10D

Output data

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FIG. 11

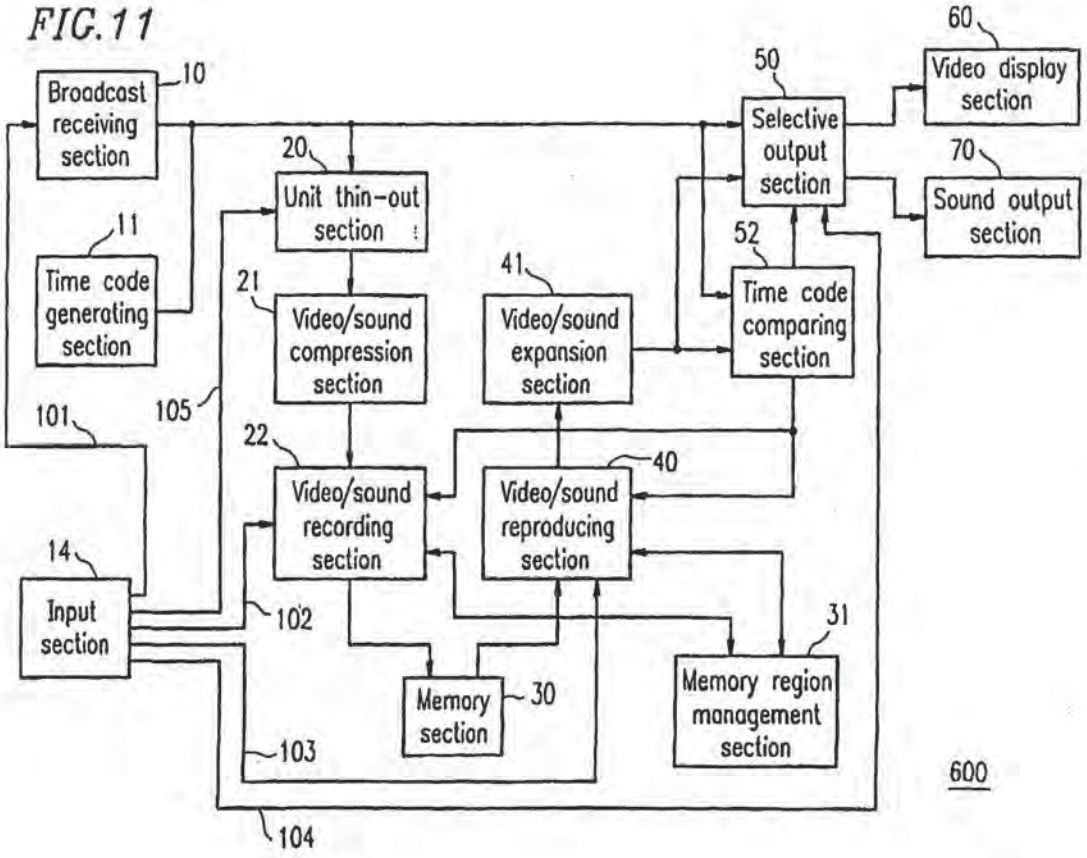

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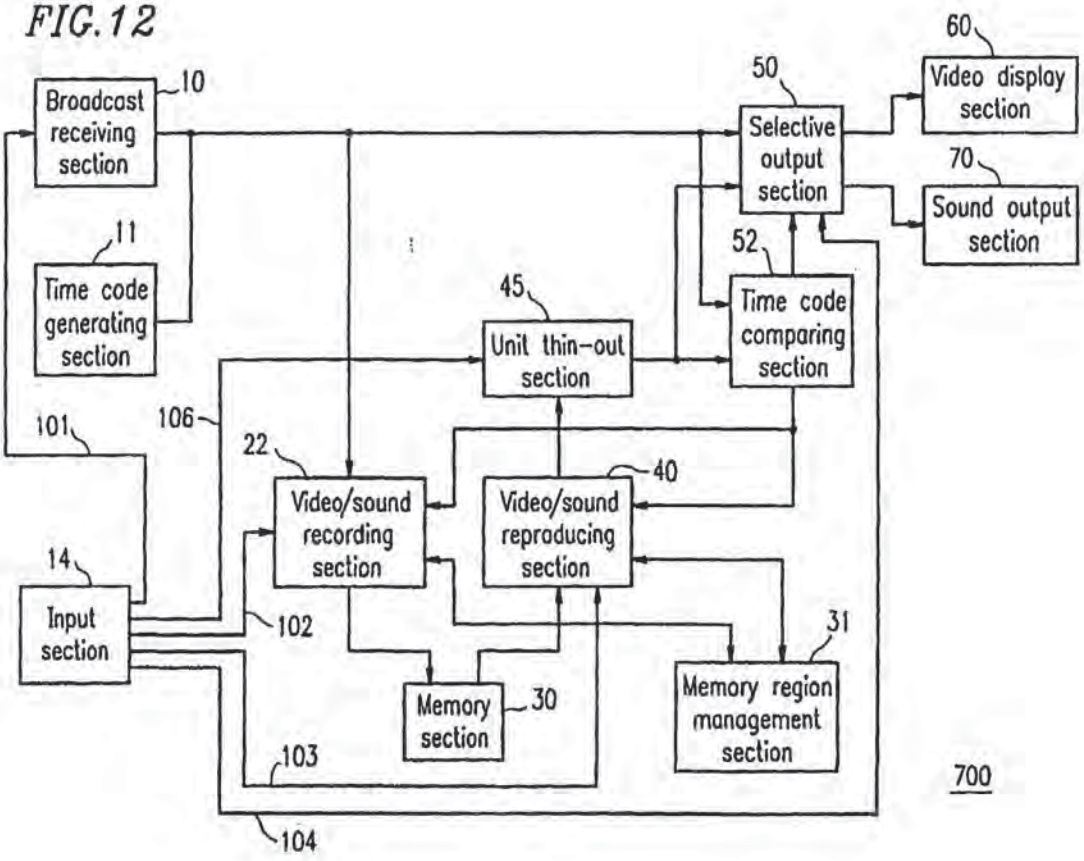
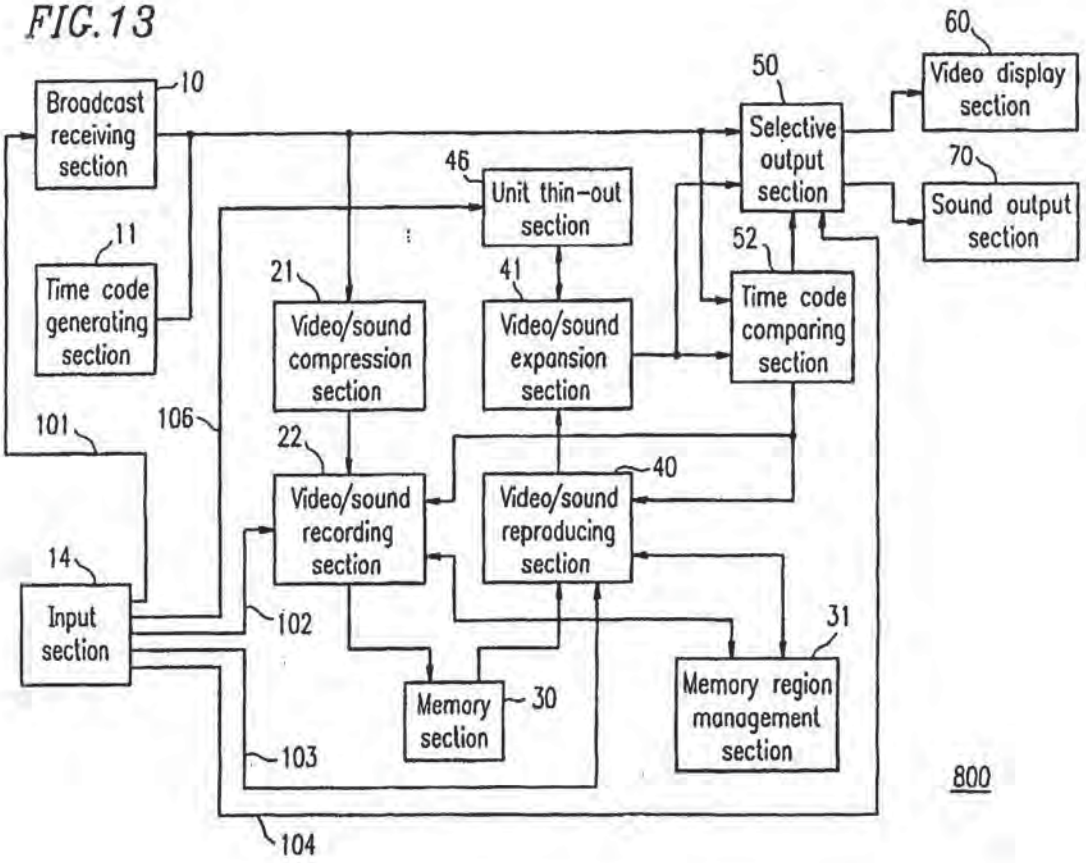
FIG. 12



EP 0 726 574 B1

FIG. 13



EP 0 726 574 B1

FIG. 14

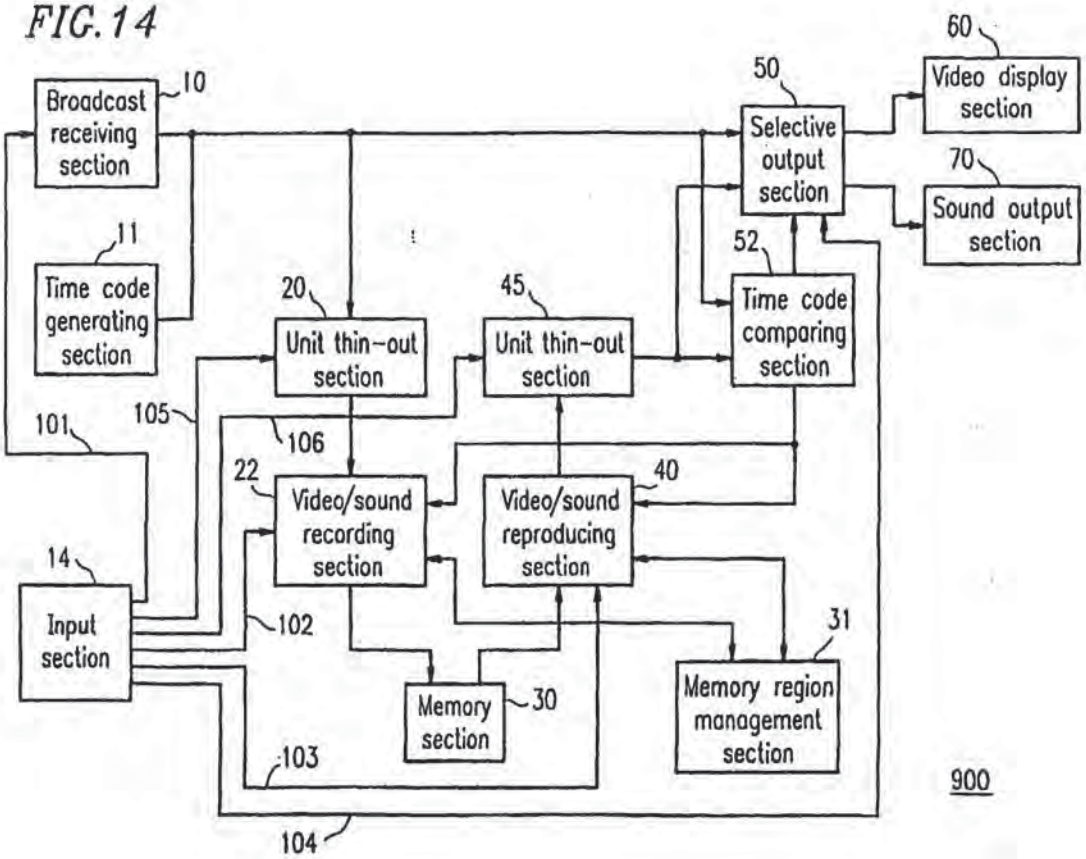


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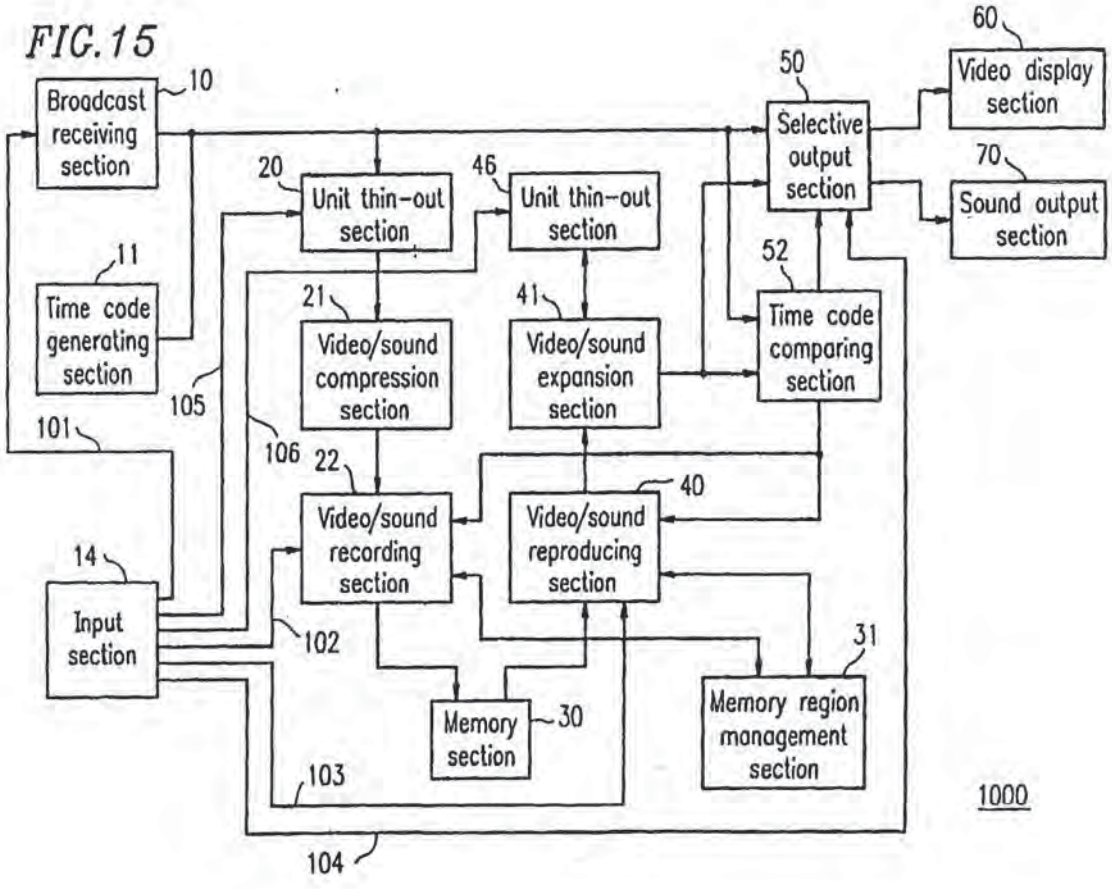
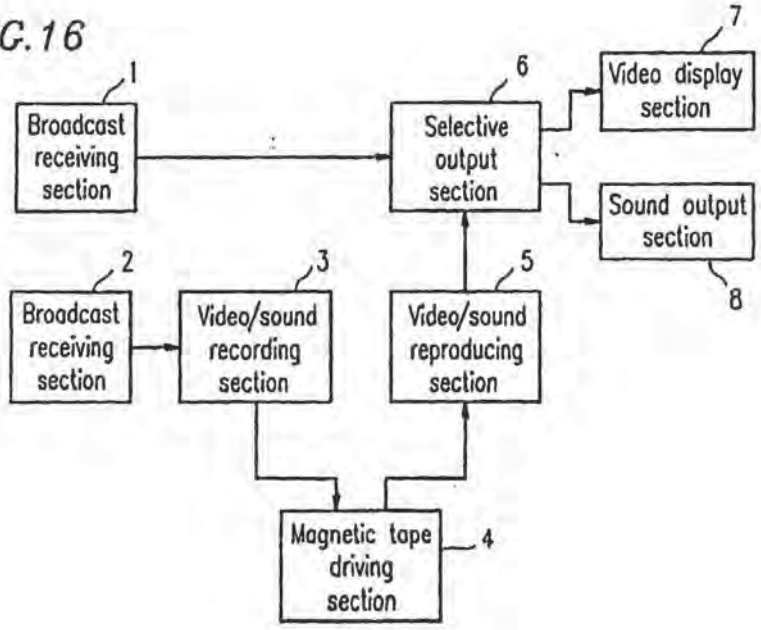
FIG. 15



EP 0 726 574 B1

FIG. 16



EP 0 726 574 B1

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OFFICIAL COMMUNICATION FOR ENTRY

HICKMAN PALERMO TRUONG & BECKER LLP
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TEL: (408) 414-1080
FAX: (408) 414-1076

FACSIMILE TRANSMITTAL SHEET

TO:	FROM:
Patricia Martin, Examiner	Kirk D. Wong
COMPANY:	DATE:
USPTO	MARCH 7, 2006
FAX NUMBER:	TOTAL NO. OF PAGES INCLUDING COVER:
(571) 273-9900	16
PHONE NUMBER:	SENDER'S REFERENCE NUMBER:
(571) 272-7716	60097-0357
RE:	U.S. SERIAL NUMBER:
Information Disclosure Statement	90/007,750

☑ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

NOTES/COMMENTS:

Dear Ms. Martin –

Pursuant to your request, attached please find the Corrected Information Disclosure Statement citing 37 C.F.R. §1.97(b) and Form 1449 as submitted on 2/15/06. Please proceed to acknowledge receipt.

Sincerely,
Kirk D. Wong

PAGE 1/16 * RCVD AT 3/7/2006 5:27:56 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-6/22 * DNIS:2739900 * CSID:4084141076 * DURATION (mm-ss):04-44

Attorney Docket No. 60097-0357

N/E (37 CFR 1.348)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reexamination of:

James M. Barton, et al.

Application No.: 90/007,750

Filing Date: October 17, 2005

Patent No.: 6,233,389

Issue Date: May 15, 2001

Confirmation No.: 4653

Examiner: NYA

Group Art Unit No.: NYA

For: MULTIMEDIA TIME WARPING SYSTEM

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Sir:

Enclosed is a copy of Information Disclosure Citation Form PTO-1449 together with copies of the documents cited on that form, if needed. Pursuant to 37 C.F.R. § 1.97, the submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made and is not to be construed as an admission that the information cited in this statement is material to patentability.

In accordance with the provisions of 37 C.F.R. 1.98, the attention of the Patent and Trademark Office is hereby directed to references listed on the attached form PTO-1449. The references were cited during the prosecution of parent application No. 09/126,071. Therefore, a copy of the references is not provided herewith.

Attorney Docket No. 60097-0357

Pursuant to 37 C.F.R. § 1.97, this Information Disclosure Statement is being submitted under one of the following (as indicated by an "X" to the left of the appropriate paragraph):

☒ 37 C.F.R. §1.97(b). It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(c). If so, then this Information Disclosure Statement includes one of the following:

☐ A statement pursuant to 37 C.F.R. §1.97(e)

☐ 1.97(e)(1) The undersigned hereby states that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement.

☐ 1.97(e)(2) The undersigned hereby states that no item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of this information disclosure statement.

☐ A check for $180.00 for the fee under 37 C.F.R. § 1.17(p).

It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

Attorney Docket No. 60097-0357

☐ 37 C.F.R. §1.97(d). If so, then this Information Disclosure Statement includes the following:

☐ A statement pursuant to 37 C.F.R. §1.97(e)

☐ 1.97(e)(1) The undersigned hereby states that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement; OR

☐ 1.97(e)(2) The undersigned hereby states that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of this information disclosure statement.

AND

☐ A check for $180.00 for the fee under 37 C.F.R. §1.17(i) for submission of the Information Disclosure Statement.

It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(i). Applicants are submitting references to satisfy Applicants' disclosure obligations in hopes that the references will be considered by the Examiner. Although the submission does not fully meet 37 C.F.R. §1.97, Applicant respectfully requests that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to Applicant(s). It is understood that if the Examiner does not consider the cited references, the cited documents will be placed in the file pursuant to 37 C.F.R. §1.97(i).

Accordingly, copies of the references as listed on the attached Form PTO 1449 are submitted herewith. No certification or fees are deemed necessary.

Attorney Docket No. 60097-0357

☒ The Examiner is hereby notified that the present application is related to the following related application(s):

DISCLOSURE OF RELATED APPLICATIONS

U.S. Application/ Pat. No.	File Date	Atty. Docket. No.
09/827,029	4/5/2001	60097-0026
09/935,426	8/22/2001	60097-0027
10/190,256	7/5/2002	60097-0028
10/081,776	2/20/2002	60097-0029
11/051,347	2/4/2005	60097-0297

The related application(s) may contain subject matter that is related to the subject matter of the present application. The related application(s) may contain one or more claims that may be substantially similar to one or more claims in the present application, and those claims may have been rejected in the related application(s). Therefore, the Examiner is encouraged to review the file history(ies) of the related application(s) as some of the information contained therein may be material to the examination of the present application.

☒ The Examiner is hereby notified that for the following related application(s) an Office Action has been received as indicated below:

DISCLOSURE OF OFFICE ACTIONS

U.S. Application/ Pat. No.	File Date	Office Action Mailing Date	Atty. Docket. No.
10/081,776	2/20/2002	5/20/05	60097-0029
10/081,776	2/20/2002	11/5/04	60097-0029
10/081,776	2/20/2002	6/29/04	60097-0029
10/081,776	2/20/2002	9/29/03	60097-0029
10/081,776	2/20/2002	4/4/03	60097-0029
10/081,776	2/20/2002	10/23/02	60097-0029
09/827,029	4/5/2001	11/17/03	60097-0026
09/827,029	4/5/2001	6/10/06	60097-0026

Attorney Docket No. 60097-0357

The related application(s) may contain one or more claims that may be substantially similar to one or more claims in the present application, and those claims may have been rejected in the related application(s). Therefore, the Examiner is encouraged to review the file history(ies) of the related application(s) as some of the information contained therein may be material to the examination of the present application.

Throughout the pendency of this application, please charge any additional fees, including any required extension of time fees, and credit all overpayments to deposit account 50-1302.

Respectfully submitted,

HICKMAN PALERMO TRUONG & BECKER LLP

Dated: February 15, 2006

Kirk D. Wong
Reg. No. 43, 284

2055 Gateway Place, Suite 550
San Jose, California 95110-1089
Telephone: (408) 414-1080 ext. 214
Facsimile: (408) 414-1076

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on February 15, 2006.
(Date of Deposit)

Annette Jacobs
(Typed or printed name of person mailing correspondence)

(Signature of person mailing correspondence)

INFORMATION DISCLOSURE CITATION IN AN APPLICATION (PTO-1449)	ATTY. DOCKET NO. 60097-0357	APPLICATION NO. 90/007,750
	APPLICANT: James M. Barton, et al.	
	FILING DATE: October 17, 2005	GROUP: NYA

U.S. PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		3,682,363		Hull	8/8/72	
		3,942,190		Detweiler	3/2/76	
		4,141,039		Yamamoto	2/20/79	
		4.224.481		Russell	9/23/80	
		4,258,418		Heath	3/24/81	
		4,313,135		Cooper	7/28/80	
		4,347,527		Lainez	8/31/82	
		4,388,659		Lemke	6/14/83	
		4,408,309		Kiesling et al.	10/4/83	
		4,423,480		Bauer et al.	12/27/83	
		4,439,785		Leonard	3/27/84	
		4,506,348		Miller et al.	3/19/85	
		4,506,358		Montgomery	3/19/85	
		4,602,297		Reese	7/22/86	
		4,633,331		McGrady et al.	12/30/86	
		4,665,431		Cooper	8/16/82	
		4,688,106		Keller et al.	8/18/87	
		4,689,022		Peers et al.	8/25/87	
		4,706,121		Young	11/10/87	
		4,752,834		Koombes	9/21/88	
		4,723,181		Hickok	2/2/88	
		4,755,889		Schwartz	7/5/88	
		4,760,442		O'Connell et al.	7/26/98	
		4,761,684		Clark et al.	8/2/98	
		4,789,961		Tindall	12/6/98	
		4,805,217		Morihiro et al.	2/14/89	
		4,816,905		Tweedy et al.	3/28/89	
		4,821,121		Beaulier	4/11/89	
		4,833,710		Hirashima	5/23/89	
		4,876,670		Nakabayashi et al.	10/24/89	
		4,891,715		Levy	1/2/90	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket N .: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

		4,897,867		Foster et al.	9/30/90	
		4,920,533		Dufresne et al.	4/24/90	
		4,924,387		Jeppesen	5/8/90	
		4,949,187		Cohen	8/14/90	
		4,963,866		Duncan	10/16/90	
		4,963,995		Lang	10/16/90	
		4,972,396		Rafner	11/20/90	
		4,979,050		Westland et al.	12/18/90	
		4,991,033		Takeshita	2/5/91	
		5,001,568		Efron et al.	3/19/91	
		5,014,125		Pocock et al.	5/7/91	
		5,018,186		Kimura et al.	5/21/91	
		5,019,900		Clark et al.	5/28/91	
		5,021,893		Scheffler	6/4/91	
		5,027,241		Hatch et al..	6/25/91	
		5,027,400		Baji et al.	6/25/92	
		5,047,857		Duffield et al.	9/10/91	
		5,057,932		Lang	10/15/91	
		5,063,453		Yoshimura et al.	11/5/91	
		5,089,885		Clark	2/18/92	
		5,093,718		Hoarty et al.	9/28/90	
		5,109,281		Koberi et al.	4/28/92	
		5,118,105		Brim et al.	6/2/92	
		5,126,852		Nishino et al.	6/30/92	
		5,126,982		Yifrach	6/30/92	
		5,130,792		Tindell et al.	7/14/92	
		5,132,992		Yurt	7/21/92	
		5,134,499		Sata et al.	7/28/92	
		5,142,532		Adams	8/25/92	
		5,153,726		Billing	10/6/92	
		5,168,353		Walker et al.	12/1/92	
		5,172,413		Bradley et al.	12/15/92	
		5,202,761		Cooper	5/28/91	
		5,208,665		McCalley et al.	5/4/93	
		5,214,768		Martin et al.	5/25/93	
		5,226,141		Esbensen	7/6/93	
		5,233,423		Jernigan et al.	8/3/93	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

		5,233,603		Tekeuchi	8/3/93	
		5,237,648		Mills et al.	8/17/93	
		5,241,428		Goldwasser et al.	8/31/93	
		5,245,430		Nishimura	9/14/93	
		5,247,347		Litteral et al.	9/21/93	
		5,251,009		Bruno	10/5/93	
		5,253,275		Yurt et al.	10/12/93	
		5,283,659		Akiyama et al.	2/1/94	
		5,285,272		Bradley et al.	2/8/94	
		5,287,182		Haskell et al.	2/15/94	
		5,311,423		Clark	5/10/94	
		5,317,603		Osterweil	5/31/94	
		5,317,604		Osterweil	5/31/94	
		5,329,320		Yifrach	7/12/94	
		5,361,261		Edem et al.	11/1/94	
		5,357,276		Banker et al.	10/18/94	
		5,371,551		Logan et al.	12/6/94	
		5,412,416		Nemirofsky	5/2/95	
		5,414,455		Hooper et al.	5/9/95	
		5,428,731		Powers	6/27/95	
		5,438,423		Lynch et al.	8/1/95	
		5,440,334		Walters et al.	8/8/95	
		5,442,390		Hooper et al.	8/15/95	
		5,477,263		O'Callaghan	12/19/95	
		5,481,542		Logston et al.	1/2/96	
		5,488,409		Yuen et al.	1/30/96	
		5,506,615		Awaji	4/9/96	
		5,508,940		Rossmere et al.	4/16/96	
		5,513,011		Matsumoto	4/30/96	
		5,513,306		Mills et al.	4/30/96	
		5,519,684		Iizuka et al.	5/21/96	
		5,528,281		Grady et al.	6/18/96	
		5,528,282		Voeten et al.	6/18/96	
		5,550,594		Cooper et al.	7/26/93	
		5,550,982		Long et al.	8/27/96	
		5,555,463		Staron	12/10/96	
		5,559,999		Maturi	9/24/96	
		5,572,261		Cooper	6/7/95	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Att rney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

U.S. PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5,581,479		McLaughlin et al.	12/3/96	
		5,583,561		Baker et al.	8/10/96	
		5,586,264		Belknap et al.	12/17/96	
		5,619,247		Russo	4/8/97	
		5,625,464		Compoint et al.	4/29/97	
		5,629,732		Moskowitz et al.	5/13/97	
		5,635,984		Lee	9/3/97	
		5,659,539		Porter	8/19/97	
		5,675,388		Cooper	12/28/93	
		5,696,866		Iggulden et al.	12/9/97	
		5,696,868		Kim et al.	8/19/96	
		5,701,383		Russo	12/23/97	
		5,706,388		Isaka	12/30/96	
		5,715,356		Hirayama et al.	2/3/98	
		5,721,815		Ottesen et al.	2/24/98	
		5,721,878		Ottensen et al.	2/24/98	
		5,724,474		Oguro et al.	3/3/98	
		5,751,282		Girard et al.	5/12/98	
		5,751,338		Ludwig et al.	5/12/98	
		5,751,371		Shintani	5/12/98	
		5,751,883		Ottensen et al.	5/12/98	
		5,754,254		Kobayashi et al.	5-1998	
		5,761,417		Henley et al.	6/2/98	
		5,771,334		Yamauchi et al.	6/23/98	
		5,774,170		Hite et al.	6/30/98	
		5,774,186		Brodsky et al.	6/30/98	
		5,778,137		Nielsen et al.	7/7/98	
		5,805,763		Lawler et al.	9/8/98	
		5,815,689		Shaw	9/29/98	
		5,822,493		Uehara et al.	10/13/98	
		5,852,705		Hanko et al.	12/22/98	

Examiner Signature		Date Considered	

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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number:
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

U.S. PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5,864,682		Porter et al.	5/21/97	
		5,870,553		Shaw et al.	7/6/99	
		5,892,884		Sugiyama et al.	4-1999	
		5,920,842		Cooper et al.	10/12/94	
		5,930,444		Camhi et al.	7/27/99	
		5,949,948		Krause et al.	9/7/99	
		5,991,496		Kojitma	11-1999	
		5,995,709		Tsuge	11/30/99	
		5,999,691		Takagi	12/7/99	
		6,002,832		Yoneda	12/14/99	
		6,005,562		Shiga et al.	12/21/99	
		6,005,564		Ahmad	12/21/99	
		6,018,612		Thomason et al.	1/25/00	
		6,028,599		Yuen et al.	2/22/00	
		6,112,226		Weaver et al.	10/22/97	
		6,138,147		Weaver et al.	10/22/97	
		6,141,385		Yamaji et al.	10/31/00	
		6,151,059		Schein et al.	11/21/00	
		6,154,771		Rangan et al.	11/28/00	
		6,163,644		Owashi et al.	12/19/00	
		6,167,083		Sporer	12/26/00	
		6,226,447		Sasaki	5/1/01	
		6,233,389		Barton et al.	5-2001	
		6,249,641		Yokota	6/19/01	
		6,253,375		Gordon et al.	6/25/01	
		6,256,704		Hlava et al.	7/3/01	
		6,272,672		Conway	8/7/01	
		6,278,837		Yasukohchi et al.	8-2001	
		6,285,824		Yanagihara et al.	9/4/01	
		6,292,618		Ohara et al.	9-2001	
		6,292,619		Fujita et al.	9-2001	
		6,301,711		Nusbickel	10/9/01	

Examiner Signature		Date Considered	

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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

		6,304,714		Krause et al.		
		6,330,675		Wiser et al.	12/11/01	
		6,341,195		Mankovitz et al.	1/22/02	
		6,424,791		Saib	7-2002	
		6,445,738		Zdepski	9/3/02	
		6,445,872		Sano et al.	9-2002	
		6,498,894		Ito et al.	12/24/02	
		6,504,990		Abecassis	1-2003	
		6,529,685		Ottesen et al.	3/4/02	
		6,553,178		Abecassis	4/22/03	
		6,788,882		Geer et al.	9/7/04	
		RE 36,801		Logan et al.	8/1/00	
		Re. 33,535		Cooper	10/23/89	
		2005/0025469		Geer et al.	2/3/05	
		2005/0132418		Barton et al.	6/16/05	

FOREIGN PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	Foreign Patent Document Office[3]	Number[4]	Kind Code[5] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		EP	0785675	A2	Toshiba	1/16/97		
		WO	2000/76130	A1	Thomason Multimedia	5/31/00		
		EP	0594241	A1	Philips Electronics N.V.	10/12/93		
		EP	0594241	B1	Koninklijke Philips Electronics N.V.	4/17/94		
		PCT	US92/04573		H. Lee Brown, et al.	6/22/92		
		UK	GB2222742	A	Hashimoto Corporation	8/24/89		
		EPO	0726574	B1	Matsushita Electric Industrial Co., Ltd	8/14/96		
		WO	91/03112	A1	Delta Beta Pty Ltd.	8/23/90		

Examiner Signature		Date Considered	

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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al	
	Filing Date: October 17, 2005	

OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	Translation[2]
		Inside MacIntosh "QuickTime", Apple Technology Library by Apple Computer, Inc., © 1993 (published by Addison-Wesley Publishing Company) 719 pgs.	
		Inside MacIntosh "Files", Apple Technology Library by Apple Computer, Inc., © 1992 (published by Addison-Wesley Publishing Company) 532 pgs.	
		Inside MacIntosh "Memory", Apple Technology Library by Apple Computer, Inc., © 1992 (published by Addison-Wesley Publishing Company) 303 pgs.	
		Inside MacIntosh "QuickTime Components", Apple Technology Library by Apple Computer, Inc., © 1993 (published by Addison-Wesley Publishing Company) 828 pgs.	
		Inside MacIntosh "Overview", Apple Technology Library by Apple Computer, Inc., © 1992 (published by Addison-Wesley Publishing Company) 251 pgs.	
		Quantum Q500 Series High Capacity 5 ¼" Fixed Disk Drive, Quantum Corporation, © 1983 (2 pgs)	
		Quantum 2000 Series Low-Cost 8' Fixed Disk Drives, "New DC Motor Option", Quantum Corporation (2 pgs)	
		Quantum Q2080 Low-Cost, 85 Megabyte Fixed Disk Drive, "85 Mb capacity/40ms average access time", Quantum Corporation, © 1982 (2 pgs)	
		OEM Interface Specifications for DSAA-3xxx, "3.5-Inch Hard Disk Drive with ATA Interface, IBM Corporation, © 1994 (65 pgs).	
		International Standard ISO/IEC 11172-2:1993(E), (Part 2: Video), Downloaded 6/15/05 (136 pgs).	
		International Standard ISO/IEC 11171-3:1993/Cor.1:1996(E), (Part 3: Audio), Downloaded 6/15/05 (159 pgs).	
		Hewlett Packard® MPEGscope User's Guide, Hewlett Packard Company © 1997-2000 (282 pgs).	
		DiviCom, MP100 User Guide, DiviCom, Inc., © 1996 (97 pgs).	

Examiner Signature		Date Considered	

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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al	
	Filing Date: October 17, 2005	

OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	Translation[2]
		Hewlett Packard® MPEGscope Startup Guide, Hewlett Packard Company © 1997-2000 (39 pgs).	
		MediaStream by Media4, "Desktop Satellite Multimedia", "The MediaStream Receiver Card", "MediaStream Uplink System", by Media4, Inc. (2 pgs).	
		Jim Stratigos et al., Media4 Press Release "Announces Reseller Agreement with AlphaStar Television Networks", Microsoft® and Windows® 95 (3 pgs).	
		Jim Stratigos et al., Media4 Press Release "Announces Multimedia Satellite Network for Personal Computers", Microsoft® and Windows® 95 (3 pgs).	
		Media Stream, "Satellite Receiver" Installation and Users Guide for Windows 95, Media4, Inc., © 1996 (33 pgs).	
		International Standard ISO/IEC 13818-1:2000(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Systems", © ISO/IEC 2000, Downloaded 6/30/05 (173 pgs).	
		International Standard ISO/IEC 13818-1:2000/Amd.2:2004(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Systems", Amendment 2: Support of IPMP on MPEG-2 Systems, © ISO/IEC 2004, Downloaded 6/30/05 (13 pgs).	
		International Standard ISO/IEC 13818-2:2000(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Video", © ISO/IEC 2000, Downloaded 6/30/05 (219 pgs).	
		International Standard ISO/IEC 13818-3:1998(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Audio", © ISO/IEC 1998 (125 pgs).	
		Guide to VAX/VMS File Applications,, Software Version VAX/VMS Version 4.0, September 1984 (19 pgs).	
		Harrick M. Vin, et al., *Designing A Multiuser HDTV Storage Server*, IEEE Journal, Vol. 11, No. 1, January 1993 (pps. 153-164).	
		Quantum Fireball 640/1280S Product Manual, Quantum®, Copyright © 1995 by Quantum Corporation (190 pgs).	

Examiner Signature		Date Considered	

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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al	
	Filing Date: October 17, 2005	

OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	Translation[2]
		Winston Hodge, et al., *"Chapter 7. True Video on Demand vs. Near Video on Demand"*, delivered at National Cable Television Conference, May 24, 1994 (pps. 103-120).	
		Cyril U. Orji, et al., *"Design and Configuration Rationales for Digital Video Storage and Delivery Systems"*, Multimedia Tools and Applications, 9, 275-302 (1992), © 1992 Kluwer Academic Publishers, Boston (pps. 275-302).	
		SCSI Specification, 0663 and 0663 Enhanced Disk Drive, Release 4.0, (247 pgs).	
		R. Johnston, et al., *"A Digital Television Sequence Store"*, IEEE, (pps. 594-600) © 1978.	
		M. Hausdorfer, *"Symposium Record Broadcast Sessions"*, HDTV Production: Today and Tomorrow, June 17, 1989, (7 pgs).	
		S. Berson, *"Computer Science Department Technical Report"*, Staggered Striping in Multimedia Information System, December 1993, April 29, 1994, (24 pgs).	
		S. Berson, et al., *"Design of a Scalable Multimedia Storage Manager"*, (pps. 1-30).	
		Conner Filepro Performance Series, CFP1060E/CFP1060S/CFP1060W, *"Intelligent Disk Drive Product Manual"*, Rev. A, May 1994, © 1994, Conner Peripherals, Inc., (79 pgs).	
		Hugh M. Sierra, *"An Introduction to Direct Access Storage Devices"*, © 1990 by Academic Press, Inc., (269 pgs).	
		I. Freeman, et al., *"Systems Aspects of COBE Science Data Compression"*, Cosmology Data Analysis Center, (pps. 85-97).	
		Douglas T. Anderson, *"The Hard Disk Technical Guide"*, Tenth Revision S-D., February 1994, © 1990, 1991, 1992, 1993, 1994 by Micro House International Inc., (70 pgs).	
		Official Action from EPO for foreign application no. 99 909 867.6-2002 dated 27 December 2005 (5 pgs) – attached.	

Examiner Signature		Date Considered	

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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al	
	Filing Date: October 17, 2005	

OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	Translation[2]
		Current Claims in EPO patent application no. 99 909 867.6-2002 (9 pgs) – attached.	
		ASTARTE DVDirector™, Beta Testing Program.	
		Official Action from CN for foreign patent application no. 02816471.1 dated 21 October 2005 (5 pgs) – attached.	
		Current Claims in CN patent application no. 02816471.7 (10 pgs) – attached.	
Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Unique citation designation number. [2]See attached Kinds of U.S. Patent Documents. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard S.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

OFFICIAL COMMUNICATION FOR ENTRY

HICKMAN PALERMO TRUONG & BECKER LLP
2055 GATEWAY PLACE, SUITE 550
SAN JOSE, CALIFORNIA 95110-1089
TEL: (408) 414-1080
FAX: (408) 414-1076

FACSIMILE TRANSMITTAL SHEET

TO:	FROM:
Patricia Martin, Examiner	Kirk D. Wong
COMPANY: USPTO	DATE: MARCH 10, 2006
FAX NUMBER: (571) 273-9900	TOTAL NO. OF PAGES INCLUDING COVER: 33
PHONE NUMBER: (571) 272-7716	SENDER'S REFERENCE NUMBER: 60097-0357
RE: Information Disclosure Statement	U.S. SERIAL NUMBER: 90/007,750

☑ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☐ PLEASE RECYCLE

NOTES/COMMENTS:

Dear Ms. Martin –

Pursuant to your instructions, we are have complied with 37 C.F.R. §1.248 and served counsel a copy of the Information Disclosures filed on 2/15/06 and the corrected version faxed to you on 3/8/06. Complete copies of these IDS Statements with the Proof of Service are attached. Please proceed to acknowledge receipt of the same.

Sincerely,
Kirk D. Wong

Attorney Docket No. 60097-0357

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reexamination of:

James M. Barton, et al.

Application No.: 90/007,750

Filing Date: October 17, 2005

Patent No.: 6,233,389

Issue Date: May 15, 2001

Confirmation No.: 4653

Examiner: NYA

Group Art Unit No.: NYA

For: MULTIMEDIA TIME WARPING SYSTEM

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Sir:

Enclosed is a copy of Information Disclosure Citation Form PTO-1449 together with copies of the documents cited on that form, if needed. Pursuant to 37 C.F.R. § 1.97, the submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made and is not to be construed as an admission that the information cited in this statement is material to patentability.

In accordance with the provisions of 37 C.F.R. 1.98, the attention of the Patent and Trademark Office is hereby directed to references listed on the attached form PTO-1449. The references were cited during the prosecution of parent application No. 09/126,071. Therefore, a copy of the references is not provided herewith.

Attorney Docket No. 60097-0357

Pursuant to 37 C.F.R. § 1.97, this Information Disclosure Statement is being submitted under one of the following (as indicated by an "X" to the left of the appropriate paragraph):

☒ 37 C.F.R. §1.97(b). It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(c). If so, then this Information Disclosure Statement includes one of the following:

☐ A statement pursuant to 37 C.F.R. §1.97(e)

☐ 1.97(e)(1) The undersigned hereby states that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement.

☐ 1.97(e)(2) The undersigned hereby states that no item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of this information disclosure statement.

☐ A check for $180.00 for the fee under 37 C.F.R. § 1.17(p).

It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

Attorney Docket No. 60097-0357

☐ 37 C.F.R. §1.97(d). If so, then this Information Disclosure Statement includes the following:

☐ A statement pursuant to 37 C.F.R. §1.97(e)

☐ 1.97(e)(1) The undersigned hereby states that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement; OR

☐ 1.97(e)(2) The undersigned hereby states that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of this information disclosure statement.

AND

☐ A check for $180.00 for the fee under 37 C.F.R. §1.17(i) for submission of the Information Disclosure Statement.

It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(i). Applicants are submitting references to satisfy Applicants' disclosure obligations in hopes that the references will be considered by the Examiner. Although the submission does not fully meet 37 C.F.R. §1.97, Applicant respectfully requests that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to Applicant(s). It is understood that if the Examiner does not consider the cited references, the cited documents will be placed in the file pursuant to 37 C.F.R. §1.97(i).

Accordingly, copies of the references as listed on the attached Form PTO 1449 are submitted herewith. No certification or fees are deemed necessary.

Attorney Docket No. 60097-0357

☒ The Examiner is hereby notified that the present application is related to the following related application(s):

DISCLOSURE OF RELATED APPLICATIONS

U.S. Application/ Pat. No.	File Date	Atty. Docket. No.
09/827,029	4/5/2001	60097-0026
09/935,426	8/22/2001	60097-0027
10/190,256	7/5/2002	60097-0028
10/081,776	2/20/2002	60097-0029
11/051,347	2/4/2005	60097-0297

The related application(s) may contain subject matter that is related to the subject matter of the present application. The related application(s) may contain one or more claims that may be substantially similar to one or more claims in the present application, and those claims may have been rejected in the related application(s). Therefore, the Examiner is encouraged to review the file history(ies) of the related application(s) as some of the information contained therein may be material to the examination of the present application.

☒ The Examiner is hereby notified that for the following related application(s) an Office Action has been received as indicated below:

DISCLOSURE OF OFFICE ACTIONS

U.S. Application/ Pat. No.	File Date	Office Action Mailing Date	Atty. Docket. No.
10/081,776	2/20/2002	5/20/05	60097-0029
10/081,776	2/20/2002	11/5/04	60097-0029
10/081,776	2/20/2002	6/29/04	60097-0029
10/081,776	2/20/2002	9/29/03	60097-0029
10/081,776	2/20/2002	4/4/03	60097-0029
10/081,776	2/20/2002	10/23/02	60097-0029
09/827,029	4/5/2001	11/17/03	60097-0026
09/827,029	4/5/2001	6/10/06	60097-0026

Attorney Docket No. 60097-0357

The related application(s) may contain one or more claims that may be substantially similar to one or more claims in the present application, and those claims may have been rejected in the related application(s). Therefore, the Examiner is encouraged to review the file history(ies) of the related application(s) as some of the information contained therein may be material to the examination of the present application.

Throughout the pendency of this application, please charge any additional fees, including any required extension of time fees, and credit all overpayments to deposit account 50-1302.

Respectfully submitted,

HICKMAN PALERMO TRUONG & BECKER LLP

Dated: February 15, 2006

Kirk D. Wong
Reg. No. 43, 284

2055 Gateway Place, Suite 550
San Jose, California 95110-1089
Telephone: (408) 414-1080 ext. 214
Facsimile: (408) 414-1076

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on February 15, 2006.
(Date of Deposit)

Annette Jacobs
(Typed or printed name of person mailing correspondence)

(Signature of person mailing correspondence)

Attorney Docket No. 60097-0357

PROOF OF SERVICE (37 C.F.R. §1.248)

I am a resident of the aforesaid county. I am over the age of eighteen years and not a party to the within action; my business address is 2055 Gateway Place, Suite 550, San Jose, CA 95110.

On March 10, 2006, I served the within Information Disclosure Statement and PTO Form 1449 on the interested parties in this action, by placing a true copy thereof enclosed in sealed envelopes addressed as follows: David L. Fehrman, Morrison & Foerster, LLP
555 W. Fifth Street, Suite 3500
Los Angeles, CA 90013

X (BY MAIL) The envelope was mailed with postage thereon fully prepaid. I am "readily" familiar with the firm's practice of collection and processing correspondence for mailing. It is deposited with U.S. Postal Service on that same day in the ordinary course of business. I am aware that on motion of a party served, service is presumed invalid if the postal cancellation date or postage meter date is more than one day after date of deposit for mailing an affidavit.

Executed on March 10, 2006, at San Jose, California.

X (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Annette Jacobs
[*Type or print name*]

[*Signature*]

INFORMATION DISCLOSURE CITATION IN AN APPLICATION (PTO-1449)	ATTY. DOCKET NO. 60097-0357	APPLICATION NO. 90/007,750
	APPLICANT: James M. Barton, et al.	
	FILING DATE: October 17, 2005	GROUP: NYA

U.S. PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		3,682,363		Hull	8/8/72	
		3,942,190		Detweiler	3/2/76	
		4,141,039		Yamamoto	2/20/79	
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		4,755,889		Schwartz	7/5/88	
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		4,821,121		Beaulier	4/11/89	
		4,833,710		Hirashima	5/23/89	
		4,876,670		Nakabayashi et al.	10/24/89	
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Examiner Signature		Date Considered	

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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

		4,897,867		Foster et al.	9/30/90	
		4,920,533		Dufresne et al.	4/24/90	
		4,924,387		Jeppesen	5/8/90	
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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Applicati n Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

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Exam. Initial*	Cite No.[1]	Foreign Patent Document: Office[3]	Number[4]	Kind Code[5] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T 6
		EP	0785675	A2	Toshiba	1/16/97		
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		EP	0594241	B1	Koninklijke Philips Electronics N.V.	4/17/94		
		PCT	US92/04573		H. Lee Brown, et al.	6/22/92		
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		WO	91/03112	A1	Delta Beta Pty Ltd.	8/23/90		

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OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	Translation[2]
		Inside MacIntosh "QuickTime", Apple Technology Library by Apple Computer, Inc., © 1993 (published by Addison-Wesley Publishing Company) 719 pgs.	
		Inside MacIntosh "Files", Apple Technology Library by Apple Computer, Inc., © 1992 (published by Addison-Wesley Publishing Company) 532 pgs.	
		Inside MacIntosh "Memory", Apple Technology Library by Apple Computer, Inc., © 1992 (published by Addison-Wesley Publishing Company) 303 pgs.	
		Inside MacIntosh "QuickTime Components", Apple Technology Library by Apple Computer, Inc., © 1993 (published by Addison-Wesley Publishing Company) 828 pgs.	
		Inside MacIntosh "Overview", Apple Technology Library by Apple Computer, Inc., © 1992 (published by Addison-Wesley Publishing Company) 251 pgs.	
		Quantum Q500 Series High Capacity 5 ¼" Fixed Disk Drive, Quantum Corporation, © 1983 (2 pgs)	
		Quantum 2000 Series Low-Cost 8' Fixed Disk Drives, "New DC Motor Option", Quantum Corporation (2 pgs)	
		Quantum Q2080 Low-Cost, 85 Megabyte Fixed Disk Drive, "85 Mb capacity/40ms average access time", Quantum Corporation, © 1982 (2 pgs)	
		OEM Interface Specifications for DSAA-3xxx, "3.5-Inch Hard Disk Drive with ATA Interface, IBM Corporation, © 1994 (65 pgs).	
		International Standard ISO/IEC 11172-2:1993(E), (Part 2: Video), Downloaded 6/15/05 (136 pgs).	
		International Standard ISO/IEC 11171-3:1993/Cor.1:1996(E), (Part 3: Audio), Downloaded 6/15/05 (159 pgs).	
		Hewlett Packard® MPEGscope User's Guide, Hewlett Packard Company © 1997-2000 (282 pgs).	
		DiviCom, MP100 User Guide, DiviCom, Inc., © 1996 (97 pgs).	

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		Hewlett Packard® MPEGscope Startup Guide, Hewlett Packard Company © 1997-2000 (39 pgs).	
		MediaStream by Media4, "Desktop Satellite Multimedia", "The MediaStream Receiver Card", "MediaStream Uplink System", by Media4, Inc. (2 pgs).	
		Jim Stratigos et al., Media4 Press Release "Announces Reseller Agreement with AlphaStar Television Networks", Microsoft® and Windows® 95 (3 pgs).	
		Jim Stratigos et al., Media4 Press Release "Announces Multimedia Satellite Network for Personal Computers", Microsoft® and Windows® 95 (3 pgs).	
		Media Stream, "Satellite Receiver" Installation and Users Guide for Windows 95, Media4, Inc., © 1996 (33 pgs).	
		International Standard ISO/IEC 13818-1:2000(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Systems", © ISO/IEC 2000, Downloaded 6/30/05 (173 pgs).	
		International Standard ISO/IEC 13818-1:2000/Amd.2:2004(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Systems", Amendment 2: Support of IPMP on MPEG-2 Systems, © ISO/IEC 2004, Downloaded 6/30/05 (13 pgs).	
		International Standard ISO/IEC 13818-2:2000(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Video", © ISO/IEC 2000, Downloaded 6/30/05 (219 pgs).	
		International Standard ISO/IEC 13818-3:1998(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Audio", © ISO/IEC 1998 (125 pgs).	
		Guide to VAX/VMS File Applications,, Software Version VAX/VMS Version 4.0, September 1984 (19 pgs).	
		Harrick M. Vin, et al., *Designing A Multiuser HDTV Storage Server*, IEEE Journal, Vol. 11, No. 1, January 1993 (pps. 153-164).	
		Quantum Fireball 640/1280S Product Manual, Quantum®, Copyright © 1995 by Quantum Corporation (190 pgs).	

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		Winston Hodge, et al., *"Chapter 7, True Video on Demand vs. Near Video on Demand"*, delivered at National Cable Television Conference, May 24, 1994 (pps. 103-120).	
		Cyril U. Orji, et al., *"Design and Configuration Rationales for Digital Video Storage and Delivery Systems"*, Multimedia Tools and Applications, 9, 275-302 (1992), © 1992 Kluwer Academic Publishers, Boston (pps. 275-302).	
		SCSI Specification, 0663 and 0663 Enhanced Disk Drive, Release 4.0, (247 pgs).	
		R. Johnston, et al., *"A Digital Television Sequence Store"*, IEEE, (pps. 594-600) © 1978.	
		M. Hausdorfer, *"Symposium Record Broadcast Sessions"*, HDTV Production: Today and Tomorrow, June 17, 1989, (7 pgs).	
		S. Berson, *"Computer Science Department Technical Report"*, Staggered Striping in Multimedia Information System, December 1993, April 29, 1994, (24 pgs).	
		S. Berson, et al., *"Design of a Scalable Multimedia Storage Manager"*, (pps. 1-30).	
		Conner Filepro Performance Series, CFP1060E/CFP1060S/CFP1060W, *"Intelligent Disk Drive Product Manual"*, Rev. A, May 1994, © 1994, Conner Peripherals, Inc., (79 pgs).	
		Hugh M. Sierra, *"An Introduction to Direct Access Storage Devices"*, © 1990 by Academic Press, Inc., (269 pgs).	
		I. Freeman, et al., *"Systems Aspects of COBE Science Data Compression"*, Cosmology Data Analysis Center, (pps. 85-97).	
		Douglas T. Anderson, *"The Hard Disk Technical Guide"*, Tenth Revision S-D., February 1994, © 1990, 1991, 1992, 1993, 1994 by Micro House International Inc., (70 pgs).	
		Official Action from EPO for foreign application no. 99 909 867.6-2002 dated 27 December 2005 (5 pgs) – attached.	

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OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	Translation[2]
		Current Claims in EPO patent application no. 99 909 867.6-2002 (9 pgs) – attached.	
		ASTARTE DVDirector™, Beta Testing Program.	
		Official Action from CN for foreign patent application no. 02816471.1 dated 21 October 2005 (5 pgs) – attached.	
		Current Claims in CN patent application no. 02816471.7 (10 pgs) – attached.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Unique citation designation number. [2]See attached Kinds of U.S. Patent Documents. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard S.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

Attorney Docket No. 60097-0357

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reexamination of:

James M. Barton, et al.

Application No.: 90/007,750

Filing Date: October 17, 2005

Patent No.: 6,233,389

Issue Date: May 15, 2001

Confirmation No.: 4653

Examiner: NYA

Group Art Unit No.: NYA

For: MULTIMEDIA TIME WARPING SYSTEM

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Sir:

Enclosed is a copy of Information Disclosure Citation Form PTO-1449 together with copies of the documents cited on that form, if needed. Pursuant to 37 C.F.R. § 1.97, the submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made and is not to be construed as an admission that the information cited in this statement is material to patentability.

In accordance with the provisions of 37 C.F.R. 1.98, the attention of the Patent and Trademark Office is hereby directed to references listed on the attached form PTO-1449. The references were cited during the prosecution of parent application No. 09/126,071. Therefore, a copy of the references is not provided herewith.

Attorney Docket No. 60097-0357

Pursuant to 37 C.F.R. § 1.97, this Information Disclosure Statement is being submitted under one of the following (as indicated by an "X" to the left of the appropriate paragraph):

☐ 37 C.F.R. §1.97(b). It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(c). If so, then this Information Disclosure Statement includes one of the following:

☐ A statement pursuant to 37 C.F.R. §1.97(e)

☐ 1.97(e)(1) The undersigned hereby states that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement.

☐ 1.97(e)(2) The undersigned hereby states that no item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of this information disclosure statement.

☐ A check for $180.00 for the fee under 37 C.F.R. § 1.17(p).

It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

Attorney Docket No. 60097-0357

☐ 37 C.F.R. §1.97(d). If so, then this Information Disclosure Statement includes the following:

☐ A statement pursuant to 37 C.F.R. §1.97(e)

☐ 1.97(e)(1) The undersigned hereby states that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement; OR

☐ 1.97(e)(2) The undersigned hereby states that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of this information disclosure statement.

AND

☐ A check for $180.00 for the fee under 37 C.F.R. §1.17(i) for submission of the Information Disclosure Statement.

It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(i). Applicants are submitting references to satisfy Applicants' disclosure obligations in hopes that the references will be considered by the Examiner. Although the submission does not fully meet 37 C.F.R. §1.97, Applicant respectfully requests that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to Applicant(s). It is understood that if the Examiner does not consider the cited references, the cited documents will be placed in the file pursuant to 37 C.F.R. §1.97(i).

Accordingly, copies of the references as listed on the attached Form PTO 1449 are submitted herewith. No certification or fees are deemed necessary.

Attorney Docket No. 60097-0357

☒ The Examiner is hereby notified that the present application is related to the following related application(s):

DISCLOSURE OF RELATED APPLICATIONS

U.S. Application/ Pat. No.	File Date	Atty. Docket. No.
09/827,029	4/5/2001	60097-0026
09/935,426	8/22/2001	60097-0027
10/190,256	7/5/2002	60097-0028
10/081,776	2/20/2002	60097-0029
11/051,347	2/4/2005	60097-0297

The related application(s) may contain subject matter that is related to the subject matter of the present application. The related application(s) may contain one or more claims that may be substantially similar to one or more claims in the present application, and those claims may have been rejected in the related application(s). Therefore, the Examiner is encouraged to review the file history(ies) of the related application(s) as some of the information contained therein may be material to the examination of the present application.

☒ The Examiner is hereby notified that for the following related application(s) an Office Action has been received as indicated below:

DISCLOSURE OF OFFICE ACTIONS

U.S. Application/ Pat. No.	File Date	Office Action Mailing Date	Atty. Docket. No.
10/081,776	2/20/2002	5/20/05	60097-0029
10/081,776	2/20/2002	11/5/04	60097-0029
10/081,776	2/20/2002	6/29/04	60097-0029
10/081,776	2/20/2002	9/29/03	60097-0029
10/081,776	2/20/2002	4/4/03	60097-0029
10/081,776	2/20/2002	10/23/02	60097-0029
09/827,029	4/5/2001	11/17/03	60097-0026
09/827,029	4/5/2001	6/10/06	60097-0026

Attorney Docket No. 60097-0357

The related application(s) may contain one or more claims that may be substantially similar to one or more claims in the present application, and those claims may have been rejected in the related application(s). Therefore, the Examiner is encouraged to review the file history(ies) of the related application(s) as some of the information contained therein may be material to the examination of the present application.

Throughout the pendency of this application, please charge any additional fees, including any required extension of time fees, and credit all overpayments to deposit account 50-1302.

Respectfully submitted,

HICKMAN PALERMO TRUONG & BECKER LLP

Dated: February 15, 2006

Kirk D. Wong
Reg. No. 43,284

2055 Gateway Place, Suite 550
San Jose, California 95110-1089
Telephone: (408) 414-1080 ext. 214
Facsimile: (408) 414-1076

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on February 15, 2006.
(Date of Deposit)

Annette Jacobs
(Typed or printed name of person mailing correspondence)

(Signature of person mailing correspondence)

Attorney Docket No. 60097-0357

PROOF OF SERVICE (37 C.F.R. §1.248)

I am a resident of the aforesaid county. I am over the age of eighteen years and not a party to the within action; my business address is 2055 Gateway Place, Suite 550, San Jose, CA 95110.

On March 10, 2006, I served the within Information Disclosure Statement and PTO Form 1449 on the interested parties in this action, by placing a true copy thereof enclosed in sealed envelopes addressed as follows: David L. Fehrman, Morrison & Foerster, LLP
555 W. Fifth Street, Suite 3500
Los Angeles, CA 90013

X (BY MAIL) The envelope was mailed with postage thereon fully prepaid. I am "readily" familiar with the firm's practice of collection and processing correspondence for mailing. It is deposited with U.S. Postal Service on that same day in the ordinary course of business. I am aware that on motion of a party served, service is presumed invalid if the postal cancellation date or postage meter date is more than one day after date of deposit for mailing an affidavit.

Executed on March 10, 2006, at San Jose, California.

X (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Annette Jacobs
[*Type or print name*]

[*Signature*]

INFORMATION DISCLOSURE CITATION IN AN APPLICATION (PTO-1449)	ATTY. DOCKET NO. 60097-0357	APPICATION NO. 90/007,750
	APPLICANT: James M. Barton, et al.	
	FILING DATE: October 17, 2005	GROUP: NYA

U.S. PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		3,682,363		Hull	8/8/72	
		3,942,190		Detweiler	3/2/76	
		4,141,039		Yamamoto	2/20/79	
		4.224.481		Russell	9/23/80	
		4,258,418		Heath	3/24/81	
		4,313,135		Cooper	7/28/80	
		4,347,527		Lainez	8/31/82	
		4,388,659		Lemke	6/14/83	
		4,408,309		Kiesling et al.	10/4/83	
		4,423,480		Bauer et al.	12/27/83	
		4,439,785		Leonard	3/27/84	
		4,506,348		Miller et al.	3/19/85	
		4,506,358		Montgomery	3/19/85	
		4,602,297		Reese	7/22/86	
		4,633,331		McGrady et al.	12/30/86	
		4,665,431		Cooper	8/16/82	
		4,688,106		Keller et al.	8/18/87	
		4,689,022		Peers et al.	8/25/87	
		4,706,121		Young	11/10/87	
		4,752,834		Koombes	9/21/88	
		4,723,181		Hickok	2/2/88	
		4,755,889		Schwartz	7/5/88	
		4,760,442		O'Connell et al.	7/26/98	
		4,761,684		Clark et al.	8/2/98	
		4,789,961		Tindall	12/6/98	
		4,805,217		Morihiro et al.	2/14/89	
		4,816,905		Tweedy et al.	3/28/89	
		4,821,121		Beaulier	4/11/89	
		4,833,710		Hirashima	5/23/89	
		4,876,670		Nakabayashi et al.	10/24/89	
		4,891,715		Levy	1/2/90	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

		4,897,867		Foster et al.	9/30/90	
		4,920,533		Dufresne et al.	4/24/90	
		4,924,387		Jeppesen	5/8/90	
		4,949,187		Cohen	8/14/90	
		4,963,866		Duncan	10/16/90	
		4,963,995		Lang	10/16/90	
		4,972,396		Rafner	11/20/90	
		4,979,050		Westland et al.	12/18/90	
		4,991,033		Takeshita	2/5/91	
		5,001,568		Efron et al.	3/19/91	
		5,014,125		Pocock et al.	5/7/91	
		5,018,186		Kimura et al.	5/21/91	
		5,019,900		Clark et al.	5/28/91	
		5,021,893		Scheffler	6/4/91	
		5,027,241		Hatch et al..	6/25/91	
		5,027,400		Baji et al.	6/25/92	
		5,047,857		Duffield et al.	9/10/91	
		5,057,932		Lang	10/15/91	
		5,063,453		Yoshimura et al.	11/5/91	
		5,089,885		Clark	2/18/92	
		5,093,718		Hoarty et al.	9/28/90	
		5,109,281		Koberi et al.	4/28/92	
		5,118,105		Brim et al.	6/2/92	
		5,126,852		Nishino et al.	6/30/92	
		5,126,982		Yifrach	6/30/92	
		5,130,792		Tindell et al.	7/14/92	
		5,132,992		Yurt	7/21/92	
		5,134,499		Sata et al.	7/28/92	
		5,142,532		Adams	8/25/92	
		5,153,726		Billing	10/6/92	
		5,168,353		Walker et al.	12/1/92	
		5,172,413		Bradley et al.	12/15/92	
		5,202,761		Cooper	5/28/91	
		5,208,665		McCalley et al.	5/4/93	
		5,214,768		Martin et al.	5/25/93	
		5,226,141		Esbensen	7/6/93	
		5,233,423		Jernigan et al.	8/3/93	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

		5,233,603		Tekeuchi	8/3/93	
		5,237,648		Mills et al.	8/17/93	
		5,241,428		Goldwasser et al.	8/31/93	
		5,245,430		Nishimura	9/14/93	
		5,247,347		Litteral et al.	9/21/93	
		5,251,009		Bruno	10/5/93	
		5,253,275		Yurt et al.	10/12/93	
		5,283,659		Akiyama et al.	2/1/94	
		5,285,272		Bradley et al.	2/8/94	
		5,287,182		Haskell et al.	2/15/94	
		5,311,423		Clark	5/10/94	
		5,317,603		Osterweil	5/31/94	
		5,317,604		Osterweil	5/31/94	
		5,329,320		Yifrach	7/12/94	
		5,361,261		Edem et al.	11/1/94	
		5,357,276		Banker et al.	10/18/94	
		5,371,551		Logan et al.	12/6/94	
		5,412,416		Nemirofsky	5/2/95	
		5,414,455		Hooper et al.	5/9/95	
		5,428,731		Powers	6/27/95	
		5,438,423		Lynch et al.	8/1/95	
		5,440,334		Walters et al.	8/8/95	
		5,442,390		Hooper et al.	8/15/95	
		5,477,263		O'Callaghan	12/19/95	
		5,481,542		Logston et al.	1/2/96	
		5,488,409		Yuen et al.	1/30/96	
		5,506,615		Awaji	4/9/96	
		5,508,940		Rossmere et al.	4/16/96	
		5,513,011		Matsumoto	4/30/96	
		5,513,306		Mills et al.	4/30/96	
		5,519,684		Iizuka et al.	5/21/96	
		5,528,281		Grady et al.	6/18/96	
		5,528,282		Voeten et al.	6/18/96	
		5,550,594		Cooper et al.	7/26/93	
		5,550,982		Long et al.	8/27/96	
		5,555,463		Staron	12/10/96	
		5,559,999		Maturi	9/24/96	
		5,572,261		Cooper	6/7/95	

Examiner Signature		Date Considered	

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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket N .: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

U.S. PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5,581,479		McLaughlin et al.	12/3/96	
		5,583,561		Baker et al.	8/10/96	
		5,586,264		Belknap et al.	12/17/96	
		5,619,247		Russo	4/8/97	
		5,625,464		Compoint et al.	4/29/97	
		5,629,732		Moskowitz et al.	5/13/97	
		5,635,984		Lee	9/3/97	
		5,659,539		Porter	8/19/97	
		5,675,388		Cooper	12/28/93	
		5,696,866		Iggulden et al.	12/9/97	
		5,696,868		Kim et al.	8/19/96	
		5,701,383		Russo	12/23/97	
		5,706,388		Isaka	12/30/96	
		5,715,356		Hirayama et al.	2/3/98	
		5,721,815		Ottesen et al.	2/24/98	
		5,721,878		Ottensen et al.	2/24/98	
		5,724,474		Oguro et al.	3/3/98	
		5,751,282		Girard et al.	5/12/98	
		5,751,338		Ludwig et al.	5/12/98	
		5,751,371		Shintani	5/12/98	
		5,751,883		Ottensen et al.	5/12/98	
		5,754,254		Kobayashi et al.	5-1998	
		5,761,417		Henley et al.	6/2/98	
		5,771,334		Yamauchi et al.	6/23/98	
		5,774,170		Hite et al.	6/30/98	
		5,774,186		Brodsky et al.	6/30/98	
		5,778,137		Nielsen et al.	7/7/98	
		5,805,763		Lawler et al.	9/8/98	
		5,815,689		Shaw	9/29/98	
		5,822,493		Uehara et al.	10/13/98	
		5,852,705		Hanko et al.	12/22/98	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number:
	First Named Invent r: James M. Barton, et al.	
	Filing Date: October 17, 2005	

U.S. PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	U.S. Patent Document Number	Kind Code[2] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5,864,682		Porter et al.	5/21/97	
		5,870,553		Shaw et al.	7/6/99	
		5,892,884		Sugiyama et al.	4-1999	
		5,920,842		Cooper et al.	10/12/94	
		5,930,444		Camhi et al.	7/27/99	
		5,949,948		Krause et al.	9/7/99	
		5,991,496		Kojitma	11-1999	
		5,995,709		Tsuge	11/30/99	
		5,999,691		Takagi	12/7/99	
		6,002,832		Yoneda	12/14/99	
		6,005,562		Shiga et al.	12/21/99	
		6,005,564		Ahmad	12/21/99	
		6,018,612		Thomason et al.	1/25/00	
		6,028,599		Yuen et al.	2/22/00	
		6,112,226		Weaver et al.	10/22/97	
		6,138,147		Weaver et al.	10/22/97	
		6,141,385		Yamaji et al.	10/31/00	
		6,151,059		Schein et al.	11/21/00	
		6,154,771		Rangan et al.	11/28/00	
		6,163,644		Owashi et al.	12/19/00	
		6,167,083		Sporer	12/26/00	
		6,226,447		Sasaki	5/1/01	
		6,233,389		Barton et al.	5-2001	
		6,249,641		Yokota	6/19/01	
		6,253,375		Gordon et al.	6/25/01	
		6,256,704		Hlava et al.	7/3/01	
		6,272,672		Conway	8/7/01	
		6,278,837		Yasukohchi et al.	8-2001	
		6,285,824		Yanagihara et al.	9/4/01	
		6,292,618		Ohara et al.	9-2001	
		6,292,619		Fujita et al.	9-2001	
		6,301,711		Nusbickel	10/9/01	

Examiner Signature		Date Considered	

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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney D cket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al.	
	Filing Date: October 17, 2005	

		6,304,714		Krause et al.		
		6,330,675		Wiser et al.	12/11/01	
		6,341,195		Mankovitz et al.	1/22/02	
		6,424,791		Saib	7-2002	
		6,445,738		Zdepski	9/3/02	
		6,445,872		Sano et al.	9-2002	
		6,498,894		Ito et al.	12/24/02	
		6,504,990		Abecassis	1-2003	
		6,529,685		Ottesen et al.	3/4/02	
		6,553,178		Abecassis	4/22/03	
		6,788,882		Geer et al.	9/7/04	
		RE 36,801		Logan et al.	8/1/00	
		Re. 33,535		Cooper	10/23/89	
		2005/0025469		Geer et al.	2/3/05	
		2005/0132418		Barton et al.	6/16/05	

FOREIGN PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	Foreign Patent Document Office[3]	Number[4]	Kind Code[5] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T 6
		EP	0785675	A2	Toshiba	1/16/97		
		WO	2000/76130	A1	Thomason Multimedia	5/31/00		
		EP	0594241	A1	Philips Electronics N.V.	10/12/93		
		EP	0594241	B1	Koninklijke Philips Electronics N.V.	4/17/94		
		PCT	US92/04573		H. Lee Brown, et al.	6/22/92		
		UK	GB2222742	A	Hashimoto Corporation	8/24/89		
		EPO	0726574	B1	Matsushita Electric Industrial Co., Ltd	8/14/96		
		WO	91/03112	A1	Delta Beta Pty Ltd.	8/23/90		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Application Number: 90/007,750
	First Named Inventor: James M. Barton, et al	
	Filing Date: October 17, 2005	

OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	Translation[2]
		Inside MacIntosh "QuickTime", Apple Technology Library by Apple Computer, Inc., © 1993 (published by Addison-Wesley Publishing Company) 719 pgs.	
		Inside MacIntosh "Files", Apple Technology Library by Apple Computer, Inc., © 1992 (published by Addison-Wesley Publishing Company) 532 pgs.	
		Inside MacIntosh "Memory", Apple Technology Library by Apple Computer, Inc., © 1992 (published by Addison-Wesley Publishing Company) 303 pgs.	
		Inside MacIntosh "QuickTime Components", Apple Technology Library by Apple Computer, Inc., © 1993 (published by Addison-Wesley Publishing Company) 828 pgs.	
		Inside MacIntosh "Overview", Apple Technology Library by Apple Computer, Inc., © 1992 (published by Addison-Wesley Publishing Company) 251 pgs.	
		Quantum Q500 Series High Capacity 5 ¼" Fixed Disk Drive, Quantum Corporation, © 1983 (2 pgs)	
		Quantum 2000 Series Low-Cost 8' Fixed Disk Drives, "New DC Motor Option", Quantum Corporation (2 pgs)	
		Quantum Q2080 Low-Cost, 85 Megabyte Fixed Disk Drive, "85 Mb capacity/40ms average access time", Quantum Corporation, © 1982 (2 pgs)	
		OEM Interface Specifications for DSAA-3xxx, "3.5-Inch Hard Disk Drive with ATA Interface, IBM Corporation, © 1994 (65 pgs).	
		International Standard ISO/IEC 11172-2:1993(E), (Part 2: Vidéo), Downloaded 6/15/05 (136 pgs).	
		International Standard ISO/IEC 11171-3:1993/Cor.1:1996(E), (Part 3: Audio), Downloaded 6/15/05 (159 pgs).	
		Hewlett Packard® MPEGscope User's Guide, Hewlett Packard Company © 1997-2000 (282 pgs).	
		DiviCom, MP100 User Guide, DiviCom, Inc., © 1996 (97 pgs).	

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		Hewlett Packard® MPEGscope Startup Guide, Hewlett Packard Company © 1997-2000 (39 pgs).	
		MediaStream by Media4, "Desktop Satellite Multimedia", "The MediaStream Receiver Card", "MediaStream Uplink System", by Media4, Inc. (2 pgs).	
		Jim Stratigos et al., Media4 Press Release "Announces Reseller Agreement with AlphaStar Television Networks", Microsoft® and Windows® 95 (3 pgs).	
		Jim Stratigos et al., Media4 Press Release "Announces Multimedia Satellite Network for Personal Computers", Microsoft® and Windows® 95 (3 pgs).	
		Media Stream, "Satellite Receiver" Installation and Users Guide for Windows 95, Media4, Inc., © 1996 (33 pgs).	
		International Standard ISO/IEC 13818-1:2000(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Systems", © ISO/IEC 2000, Downloaded 6/30/05 (173 pgs).	
		International Standard ISO/IEC 13818-1:2000/Amd.2:2004(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Systems", Amendment 2: Support of IPMP on MPEG-2 Systems, © ISO/IEC 2004, Downloaded 6/30/05 (13 pgs).	
		International Standard ISO/IEC 13818-2:2000(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Video", © ISO/IEC 2000, Downloaded 6/30/05 (219 pgs).	
		International Standard ISO/IEC 13818-3:1998(E) "Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Audio", © ISO/IEC 1998 (125 pgs).	
		Guide to VAX/VMS File Applications,, Software Version VAX/VMS Version 4.0, September 1984 (19 pgs).	
		Harrick M. Vin, et al., *Designing A Multiuser HDTV Storage Server*, IEEE Journal, Vol. 11, No. 1, January 1993 (pps. 153-164).	
		Quantum Fireball 640/1280S Product Manual, Quantum®, Copyright © 1995 by Quantum Corporation (190 pgs).	

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		Winston Hodge, et al., *"Chapter 7, True Video on Demand vs. Near Video on Demand"*, delivered at National Cable Television Conference, May 24, 1994 (pps. 103-120).	
		Cyril U. Orji, et al., *"Design and Configuration Rationales for Digital Video Storage and Delivery Systems"*, Multimedia Tools and Applications, 9, 275-302 (1992), © 1992 Kluwer Academic Publishers, Boston (pps. 275-302).	
		SCSI Specification, 0663 and 0663 Enhanced Disk Drive, Release 4.0, (247 pgs).	
		R. Johnston, et al., *"A Digital Television Sequence Store"*, IEEE, (pps. 594-600) © 1978.	
		M. Hausdorfer, *"Symposium Record Broadcast Sessions"*, HDTV Production: Today and Tomorrow, June 17, 1989, (7 pgs).	
		S. Berson, *"Computer Science Department Technical Report"*, Staggered Striping in Multimedia Information System, December 1993, April 29, 1994, (24 pgs).	
		S. Berson, et al., *"Design of a Scalable Multimedia Storage Manager"*, (pps. 1-30).	
		Conner Filepro Performance Series, CFP1060E/CFP1060S/CFP1060W, *"Intelligent Disk Drive Product Manual"*, Rev. A, May 1994, © 1994, Conner Peripherals, Inc., (79 pgs).	
		Hugh M. Sierra, *"An Introduction to Direct Access Storage Devices"*, © 1990 by Academic Press, Inc., (269 pgs).	
		I. Freeman, et al., *"Systems Aspects of COBE Science Data Compression"*, Cosmology Data Analysis Center, (pps. 85-97).	
		Douglas T. Anderson, *"The Hard Disk Technical Guide"*, Tenth Revision S-D., February 1994, © 1990, 1991, 1992, 1993, 1994 by Micro House International Inc., (70 pgs).	
		Official Action from EPO for foreign application no. 99 909 867.6-2002 dated 27 December 2005 (5 pgs) – attached.	

Examiner Signature		Date Considered	

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Substitute for Form 1449A/PTO (Modified) (use as many sheets as necessary)	Attorney Docket No.: 60097-0357	Applicati n Number: 90/007,750
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OTHER ART – NO PATENT LITERATURE DOCUMENTS

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		Current Claims in EPO patent application no. 99 909 867.6-2002 (9 pgs) – attached.	
		ASTARTE DVDirector™, Beta Testing Program.	
		Official Action from CN for foreign patent application no. 02816471.1 dated 21 October 2005 (5 pgs) – attached.	
		Current Claims in CN patent application no. 02816471.7 (10 pgs) – attached.	
Examiner Signature		Date Considered	

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[1]Unique citation designation number. [2]See attached Kinds of U.S. Patent Documents. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard S.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

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Attorney Docket No. 60097-0357

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reexamination of:

James M. Barton, et al.

Application No.: 90/007,750

Filing Date: October 17, 2005

Patent No.: 6,233,389

Issue Date: May 15, 2001

Confirmation No.: 4653

Examiner: NYA

Group Art Unit No.: NYA

For: MULTIMEDIA TIME WARPING SYSTEM

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Sir:

Enclosed is a copy of Information Disclosure Citation Form PTO-1449 together with copies of the documents cited on that form, if needed. Pursuant to 37 C.F.R. § 1.97, the submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made and is not to be construed as an admission that the information cited in this statement is material to patentability.

In accordance with the provisions of 37 C.F.R. 1.98, the attention of the Patent and Trademark Office is hereby directed to references listed on the attached form PTO-1449. The references were cited during the prosecution of parent application No. 09/126,071. Therefore, a copy of the references is not provided herewith.

Pursuant to 37 C.F.R. § 1.97, this Information Disclosure Statement is being submitted under one of the following (as indicated by an "X" to the left of the appropriate paragraph):

☒ 37 C.F.R. §1.97(b). It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(c). If so, then this Information Disclosure Statement includes one of the following:

☐ A statement pursuant to 37 C.F.R. §1.97(e)

☐ 1.97(e)(1) The undersigned hereby states that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement.

☐ 1.97(e)(2) The undersigned hereby states that no item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of this information disclosure statement.

☐ A check for $180.00 for the fee under 37 C.F.R. § 1.17(p).

It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(d). If so, then this Information Disclosure Statement includes the following:

☐ A statement pursuant to 37 C.F.R. §1.97(e)

☐ 1.97(e)(1) The undersigned hereby states that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement; OR

☐ 1.97(e)(2) The undersigned hereby states that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of this information disclosure statement.

AND

☐ A check for $180.00 for the fee under 37 C.F.R. §1.17(i) for submission of the Information Disclosure Statement.

It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(i). Applicants are submitting references to satisfy Applicants' disclosure obligations in hopes that the references will be considered by the Examiner. Although the submission does not fully meet 37 C.F.R. §1.97, Applicant respectfully requests that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to Applicant(s). It is understood that if the Examiner does not consider the cited references, the cited documents will be placed in the file pursuant to 37 C.F.R. §1.97(i).

Accordingly, copies of the references as listed on the attached Form PTO 1449 are submitted herewith. No certification or fees are deemed necessary.

Throughout the pendency of this application, please charge any additional fees, including any required extension of time fees, and credit all overpayments to deposit account 50-1302.

Respectfully submitted,

HICKMAN PALERMO TRUONG & BECKER LLP

Dated: March 23 2006

Kirk D. Wong
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San Jose, California 95110-1089
Telephone: (408) 414-1080 ext. 214
Facsimile: (408) 414-1076

PROOF OF SERVICE (37 C.F.R. §1.248)

I am a resident of the aforesaid county. I am over the age of eighteen years and not a party to the within action; my business address is 2055 Gateway Place, Suite 550, San Jose, CA 95110.

On March ____, 2006, I served the within Information Disclosure Statement and PTO Form 1449 on the interested parties in this action, by placing a true copy thereof enclosed in sealed envelopes addressed as follows: David L. Fehrman, Morrison & Foerster, LLP
555 W. Fifth Street, Suite 3500
Los Angeles, CA 90013

X (BY MAIL) The envelope was mailed with postage thereon fully prepaid. I am "readily" familiar with the firm's practice of collection and processing correspondence for mailing. It is deposited with U.S. Postal Service on that same day in the ordinary course of business. I am aware that on motion of a party served, service is presumed invalid if the postal cancellation date or postage meter date is more than one day after date of deposit for mailing an affidavit.

Executed on March 23, 2006, at San Jose, California.

X (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Annette Jacobs
[*Type or print name*]


[*Signature*]

A FAST ALGORITHM FOR VIDEO PARSING USING MPEG COMPRESSED SEQUENCES

Ke Shen and Edward J. Delp

Purdue University
School of Electrical Engineering
Computer Vision and Image Processing Laboratory
West Lafayette, Indiana 47907-1285

ABSTRACT

Video parsing is a fundamental operation used in many digital video applications such as digital libraries and video servers. The accuracy and execution speed of the parsing algorithm is critical if large amounts of video data are to be processed, particularly in real-time. In this paper, we present a new algorithm to reconstruct DC coefficient images of a DCT and motion compensation compressed video sequence, e.g. MPEG. The histograms of the DC coefficient images can be used to detect scene changes.

1. INTRODUCTION

Demand for digital video has been growing rapidly in the past few years [1]. Applications such as video-on-demand (VOD) and video databases (VDB) are turning into practical services. A VOD/VDB system that incorporates digital video, storage, database, and networking technologies is usually referred as a *video server* [2].

Digital video needs to be properly processed before it can be inserted into a video server. These tasks include compressing, parsing and indexing a video sequence. Video parsing is the process of detecting scene changes or the boundaries between camera shots in a video stream [3]. Usually a camera shot, which consists of several video frames recorded contiguously, represents continuous action in both time and space in a scene. An assumption that is often made is that certain features in a scene, such as the motion of objects, color distribution and lighting, should not change greatly from one frame to the next within one camera shot. Based on this assumption, several scene change detection algorithms have been described based on the use of the color distribution and motion. Color histograms have been widely used in video parsing algorithms [3, 4, 6, 8]. The motion of objects in the scene have also been used to detect scene changes [8].

Digital video sequences are usually stored in a compressed format such as motion JPEG or MPEG [7, 8]. The most computationally expensive part of the decoding algorithm is the inverse DCT (IDCT) operation. If a video sequence can be processed before the IDCT is performed, execution time can be reduced [9]. Various approaches have been proposed to parse a video sequence directly from the compressed data [10, 11, 12].

In this paper we present a fast algorithm to parse MPEG1, MPEG2 or motion JPEG compressed video sequences by approximating color histograms using DC coefficients and motion vectors.

2. PARSING OF MPEG CODED VIDEO SEQUENCE

The MPEG1 or MPEG2 video compression algorithms use the DCT and motion compensated prediction to reduce spatial and temporal redundancy. Only the DCT coefficients and the motion vectors are available in the compressed data stream. In this section, we describe an algorithm for estimating color histograms using the DCT coefficients and motion vectors. A simple scene change detection scheme using color histogram differences is also described.

2.1. Color histogram estimation

A set of colors can be represented in a three dimensional space, known as a color space. In color space ABC where A, B, and C represent the three dimensions of the color space, a color can be represented by a vector $\mathbf{x} = [\ a\ \ b\ \ c\ ]$, where a, b, and c are the three color components in A, B, and C, respectively. In a color image a pixel at spatial position (m,n) can be expressed as a vector

$$\mathbf{f}(m,n) = [\ f_A(m,n)\ \ f_B(m,n)\ \ f_C(m,n)\ ] = \mathbf{x}$$

in the color space, where f_A, f_B and f_C are the three color components of the pixel value in A, B, and C. A color image can also be viewed as three image planes, each of which is a grayscale image in A, B, or C with pixel values $f_A(m,n)$, $f_B(m,n)$, or $f_C(m,n)$, respectively. The histogram of an image, which represents the relative frequency of occurrence of the various colors in the image, can be obtained by

$$h[\mathbf{x}] = \frac{1}{MN}(\text{Number of pixels} \ni \mathbf{f} = \mathbf{x}; \mathbf{x} \in ABC),$$

where M and N are numbers of pixels in the image in horizontal direction and in vertical direction, respectively. A color histogram is a function defined in a three-dimensional space. It can be reduced to three one-dimensional grayscale

This work was supported by the Advanced Research Projects Agency under contract DABT63-93-C-0032. Address all correspondence to E. J. Delp, ace@ecn.purdue.edu or (317) 494-1740.

histograms, each of which is a projection of the color histogram onto one of the three dimensions of the color space ABC and can be obtained by

$$h_X[a] = \frac{1}{MN}(\text{Number of pixels } \ni f_X = x_i : a \in X),$$

where $X \in \{A, B, C\}$. These three one-dimensional histograms can be further combined into a single one-dimensional histogram. In an MPEG sequence, the native color space is YCrCb. In our algorithm we represent each pixel value by 1 byte (8 bits), with 4 bits for the Y component, 2 bits for the Cr component and 2 bits for the Cb component. Therefore, the color histogram obtained on the basis of such pixel values is one-dimensional and has 256 bins.

In an MPEG compressed sequence pixel values are not available directly. In an intracoded picture (I picture) the image is divided into 8x8 blocks and the DCT of each block is obtained. In order to compute the color histogram without taking the inverse DCTs, we need to use the DCT coefficients directly. The zero frequency term of the DCT, known as the DC term, is proportional to the average of the pixel values in the block. The histogram of the DC terms can be used as an approximation of the histogram of the original image.

The DC terms of I pictures can be obtained directly from the MPEG sequence and can be used to estimate the histogram for I pictures. However, the DC terms coded in P pictures, the predictive coded pictures, and B pictures, the bidirectionally-predictive coded pictures, are not the DC terms of the image itself because motion compensated prediction is used. In P pictures and B pictures, the motion vectors and the DCT coefficients of the difference image are encoded. In the decoder algorithm, the current P picture or B picture is constructed by taking the appropriate macroblock-sized pixel arrays from the reference frames, putting them at new positions according to the motion vectors and adding the difference image. The DCT is a linear transformation, i.e. if f_1 and f_2 are two images with the same size and F_1 and F_2 are their DCT, respectively, the DCT of the image $g = f_1 + f_2$ have the form

$$G = F_1 + F_2.$$

Hence, if a block b in a P or B picture is the sum of two blocks b_{ref1} and b_{ref} with DCTs B_{ref1} and B_{ref}, respectively, where b_{ref1} is the block in the difference image and b_{ref} is the block in the reference frame, the DCT of b can be obtained by

$$B = B_{ref1} + B_{ref}.$$

Thus the DC coefficients of the current frame can be obtained by adding the appropriate DC coefficients of the reference image to the DC coefficients of the difference image.

In the MPEG algorithm an image is divided into non-overlapping macroblocks and their DCTs are obtained. The locations of these macroblocks are fixed. However, a motion vector does not necessarily point to the beginning of a macroblock in the reference frame. Therefore the reference block b_{ref} can overlap with up to four neighboring blocks in a reference frame (Figure 1). In this case, the DCT of the block b_{ref} is not available directly in the MPEG sequence. The motion compensation in MPEG prohibits the generation of DC images directly from the DCT coefficients. In [9],

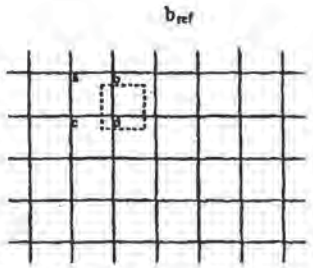

Figure 1: Part of a reference image which is divided into blocks. The pixel array b_{ref} overlaps the four blocks (a, b, c, and d).

an algorithm was proposed to reconstruct the DCT coefficients of a block using motion vectors. However this algorithm requires 8 matrix (8x8) multiplications and 4 matrix summations for each block to compute the DCT coefficients B_{ref}. In our algorithm, we approximate the DC coefficient of B_{ref} using the weighted average of the DC coefficients of the blocks pointed by the motion vector:

$$DC_{ref} = \frac{1}{64} \sum_{a \in \mathcal{S}} N_a DC_a,$$

where DC_a is the DC coefficient of block a, N_a is the number of pixels in block a that is overlapped by the reference block and $\mathcal{S}$ is the collection of the blocks that is overlapped by the reference block (Figure 1). The computation is reduced to at most 4 scalar multiplications and 3 scalar summations for each block.

In summary, the DC terms encoded in I pictures are used directly to construct the DC coefficient images for I pictures. For P pictures and B pictures, the encoded DC terms of the difference images are added to the DC terms of the predicted images, which are approximated using the DC terms in the reference frames according to motion vectors. Hence, the color histograms can be estimated without decompressing the sequence or, more specifically, without computing the IDCT, which is computationally expensive. Also, since only the DC coefficients are used, the computation of histograms is 64 times faster than that using the original pixel values.

2.2. Scene change detection

In general, there are two types of camera shot transitions—break and dissolve. A break transition is an abrupt transition between two camera shots that is completed within two consecutive frames. A dissolve is a transition between two camera shots that takes several frames. It can be a

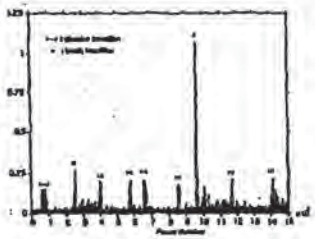

Figure 2: A histogram difference diagram.

fade-out, a fade-in, or a combination of both. The difference between the color histograms of a video sequence can be used to detect scene changes. Mathematically, the distance between the histograms of two images can be measured and a threshold can be used to determine whether they are from the same camera shot [4, 13]. We generate a histogram difference diagram by taking the distance between the histograms of two consecutive frames through out the video sequence and plotting them in order of the frame number as shown in Figure 2. In a histogram difference diagram a break transition is usually represented by a single high pulse and a dissolve transition is usually represented by a number of consecutive medium-heighted pulses. In our algorithm we used the absolute distance:

$$dist(n, n+1) = \sum_{i=1}^{N} |h^n[i] - h^{n+1}[i]|,$$

where N is the total number of bins in the histogram. For normalized histograms, the absolute distance has a range of 0 to 2.

In most cases a break transition can be detected using a threshold, usually in the range of 0.3 to 0.45. The histogram difference for a dissolve transition region has a much lower magnitude than that of a break transition. Hence it is more difficult to detect a dissolve transition. Several approaches have been proposed to detect dissolve scene changes, including the twin-comparison [4] and the use of the variance of pixel values [16]. In our algorithm we adopted a new method. The histogram difference of the current frame is compared with the average of the histogram differences of the frames within a window (15 to 60 frames in length) preceding the current frame. If the difference is several (2 or 3) times larger than the average value, a possible dissolve transition is detected. Then, for the following frames the same value (2 or 3 times the average) will be used as a soft threshold for this dissolve transition until the histogram difference is lower than the threshold. Since during a dissolve transition all of the histogram differences may not be higher than the soft threshold, we allow several frames to have lower differences as long as the majority of the frames in the transition period have higher magnitudes than the soft threshold.

Usually during a single camera shot, the histogram differences tend to have a small variance. Sometimes this condition is not true when there is rapid movement in a scene. In this case the histogram differences can be as high as those for a dissolve transition or even higher. Usually high magnitude pulses, due to reasons other than scene changes, have relatively lower frequency of occurrence than those in a dissolve transition region. In our algorithm, a local median filter (of size 3) is applied to smooth the histogram differences. The filtered histogram differences are used to detect dissolve transitions while the original histogram differences are used to detect break transitions.

In some very rare cases, the histogram differences can be as high as those of break transitions even though there is no scene changes. Usually in this case, in the neighborhood of the high pulses there are other comparable high pulses. Therefore, when we detect a break transition we require the difference at the break to be much higher than the average of the differences in the neighborhood.

3. EXPERIMENTAL RESULTS

We used MPEG1 compressed sequences with image size of 352x240. Each video sequence we digitized are approximately 1800 frames (60 seconds) in length. The video source included C-SPAN, CNN Headline News and college football games.

Since there is no IDCT in our algorithm, the execution time is very small. On a Sun SPARCstation 10 using the Berkeley Decoder an MPEG sequence can be decompressed at about 28 frames per second without dithering and display. Using our algorithm for the same video sequence, the entire process runs 27 frames per second, including DC image generation, color histogram estimation, computation of the histogram differences and the scene change detection.

Since a reconstructed DC coefficient image is an approximation of the original image, the performance of the scene change detection algorithm using color histograms can be affected by factors such as color shift, changes in lighting, and the loss of high frequency components in a scene. Usually there are more high magnitude pulses at regions other than scene transitions using the estimated DC coefficients than those using the original pixel values especially when a video sequence contains P and B pictures. This will increase the possibility of false detection (Figure 3). However our scene change detection algorithm can effectively avoid these types of false detection.

In our sequences, there are a total of 39 break transitions and 9 dissolve transitions. Our algorithm is able to detect all of the break transitions with no false alarms or misses. For the dissolve transitions, we have 2 misses and 1 false alarm.

A postscript version of this paper is available via anonymous ftp at skynet.ecn.purdue.edu in the directory /pub/dist/delp/icip95-parsing.

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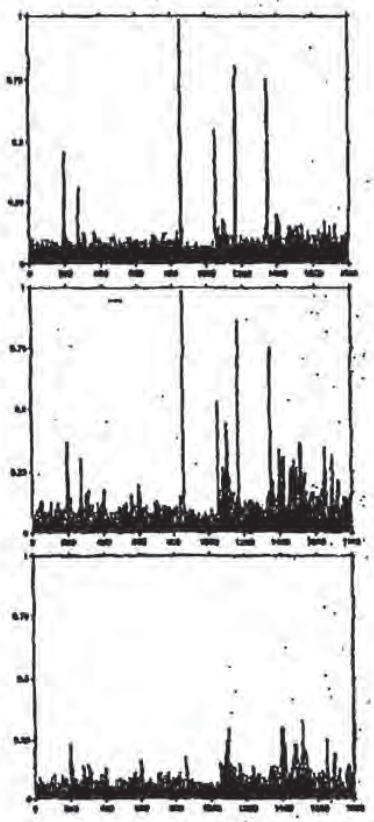

Figure 3: Histogram difference diagrams of the same video sequence. Top: Original pixel values are used. Clearly there are 8 break transitions; middle: Estimated histograms are used; bottom: A median filter of size 3 is applied to the middle diagram. The high pulses are suppressed to avoid being false detected as dissolve transitions.

Content-Based Video Indexing and Retrieval

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Current video management tools and techniques are based on pixels rather than perceived content. Thus, state-of-the-art video editing systems can easily manipulate such things as time codes and image frames, but they cannot "know," for example, what a basketball is. Our research addresses four areas of content-based video management.

Video has become an important element of multimedia computing and communication environments, with applications as varied as broadcasting, education, publishing, and military intelligence. However, video will only become an effective part of everyday computing environments when we can use it with the same facility that we currently use text. Computer literacy today entails the ability to set our ideas down spontaneously with a word processor, perhaps while examining other text documents to develop those ideas and even using editing operations to transfer some of that text into our own compositions. Similar composition using video remains far in the future, even though workstations now come equipped with built-in video cameras and microphones, not to mention ports for connecting our increasingly popular hand-held video cameras.

Why is this move to communication incorporating video still beyond our grasp? The problem is that video technology has developed from the start as a technology of images. Little has been done to help us use those images effectively. Thus, we can buy a camera that "knows" all about how to focus itself properly and even how to compensate for the fact that we can rarely hold it steady without a tripod. But no camera knows "where the action is" during a basketball game or a family reunion. A camera can give us a clear shot of the ball going through the basket, but only if we find the ball for it.

The point is that we do not use images just because they are steady or clearly focused. We use them for their content. If we wish to compose with images in the same way that we compose with words, we must focus our attention on content. Video composition should not entail thinking about image "bits" (pixels), any more than text composition requires thinking about ASCII character codes. Video content objects include basketballs, athletes, and hoops. Unfortunately, state-of-the-art software for manipulating video does not "know" about such objects. At best, it "knows" about time codes, individual frames, and clips of video and sound. To compose a video document—or even just incorporate video as part of a text document—we find ourselves thinking one way (with ideas) when we are working with text and another (with pixels) when we are working with video. The pieces do not fit together effectively, and video suffers for it.

Similarly, if we wish to incorporate other text material in a document, word processing offers a powerful repertoire of techniques for finding what we want. In video, about the only technique we have is our own memory coupled with some information about how to use fast forward and fast reverse buttons while viewing.

The moral of all this is that the effective use of video is still beyond our grasp because the effective use of its content is still beyond our grasp. How can we remedy this situation? At the Institute of Systems Science of the National University of Singapore, the Video Classification project addresses this question. We are currently tackling problems in four areas:

- Defining an architecture that characterizes the tasks of managing video content.
- Developing software tools and techniques that identify and represent video content.
- Applying knowledge representation techniques to the development of index construction and retrieval tools.
- Developing an environment for interacting with video objects.

In this article, we discuss each of these problem areas in detail, then briefly review a recent case study concerned with content analysis of news videos. We conclude with a discussion of our plans to extend our work into the audio domain.

Architecture for video management

Our architecture is based on the assumption that video information will be maintained in a

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database.[1] This assumption requires us to define tools for the construction of such databases and the insertion of new material into existing databases. We can characterize these tools in terms of a sequence of specific task requirements:

- *Parsing*, which segments the video stream into generic clips. These clips are the elemental index units in the database. Ideally, the system decomposes individual images into semantic primitives. On the basis of these primitives, a video clip can be indexed with a semantic description using existing knowledge-representation techniques.

- *Indexing*, which tags video clips when the system inserts them into the database. The tag includes information based on a knowledge model that guides the classification according to the semantic primitives of the images. Indexing is thus driven by the image itself and any semantic descriptors provided by the model.

- *Retrieval and browsing*, where users can access the database through queries based on text and/or visual examples or browse it though interaction with displays of meaningful icons. Users can also browse the results of a retrieval query. It is important that both retrieval and browsing appeal to the user's visual intuition.

Figure 1 summarizes this task analysis as an architectural diagram. The heart of the system is a database management system containing the video and audio data from video source material that has been compressed wherever possible. The DBMS defines attributes and relations among these entities in terms of a frame-based approach to knowledge representation (described further under the subhead "A frame-based knowledge base," p. 65). This representation approach, in turn, drives the indexing of entities as they are added to the database. Those entities are initially extracted by the tools that support the parsing task. In the opposite direction, the database contents are made available by tools that support the processing of both specific queries and the more general needs of casual browsing.

The next three sections discuss elements of this architecture in greater detail.

Video content parsing

Three tool sets address the parsing task. The first set segments the video source material into individual camera shots, which then serve as the basic units for indexing. The second set identifies different manifestations of camera technique in these clips. The third set applies content models to the identification of context-dependent semantic primitives.

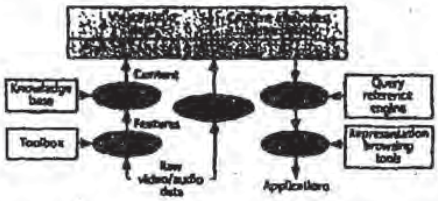

Figure 1. Diagram of video management architecture.

Locating camera shot boundaries

We decided that the most viable segmentation criteria for motion video are those that detect boundaries between camera shots. Then, the *camera shot*—consisting of one or more frames generated and recorded contiguously and representing a continuous action in time and space—becomes the smallest unit for indexing video. The simplest shot transition is a camera cut, where the boundary lies between two successive frames. More sophisticated transition techniques include dissolves, wipes, and fade-outs—all of which take place over a sequence of frames.

In any case, camera shots can always be distinguished by significant qualitative differences. If we can express those differences by a suitable quantitative measure, then we can declare a segment boundary whenever that measure exceeds a given threshold. The key issues in locating shot boundaries, therefore, are selecting suitable difference measures and thresholds, and applying them to the comparison of video frames. We now briefly review the segmentation techniques we currently employ. (For details, see Zhang et al.[2])

The most suitable measures rely on comparisons between the pixel-intensity histograms of two frames. The principle behind this metric is that two frames with little change in the background and object content will also differ little in their overall intensity distributions. Further strengthening this approach, it is easy to define a histogram that effectively accounts for color information.[3] We also developed an automatic approach to detect the segmentation threshold on

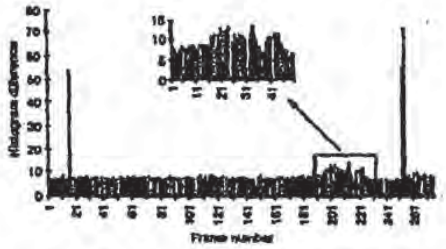

Figure 2. A sequence of frame-to-frame histogram differences obtained from a documentary video, where differences corresponding both to camera breaks and to transitions implemented by special effects can be observed.

the basis of statistics of frame difference values and a multipass technique that improves processing speed.[2]

Figure 2 illustrates a typical sequence of difference values. The graph exhibits two high pulses corresponding to two camera breaks. It also illustrates a gradual transition occurring over a sequence of frames. In this case, the task is to identify the sequence start and end points. As the inset in Figure 2 shows, the difference values during such a transition are far less than across a camera break. Thus, a single threshold lacks the power to detect gradual transitions.

A so-called *twin-comparison* approach solves this problem. The name refers to the use of two thresholds. First, a reduced threshold detects the potential starting frame of a transition sequence. Once that frame has been identified, it is compared against successive frames, thus measuring an accumulated difference instead of frame-to-frame differences. This accumulated difference must be monotonic. When it ceases to be monotonic, it is compared against a second, higher threshold. If this threshold is exceeded, we conclude that the monotonically increasing sequence of accumulated differences corresponds to a gradual transition. Experiments have shown this approach to be very effective.[2]

Shot classification

Before a system can parse content, it must first recognize and account for artifacts caused by camera movement. These movements include panning and tilting (horizontal or vertical rotation of the camera) and zooming (focal length change), in which the camera position does not change, and tracking and booming (horizontal and vertical transverse movement of the camera) and dollying (horizontal lateral movement of the camera), in which the camera position does change.[6] These operations may also occur in combinations. They are most readily detected through motion field analysis, since each operation has its own characteristic pattern of motion vectors. For example, a zoom causes most of the motion vectors to point either toward or away from a focus center, while movement of the camera itself shows up as a modal value across the entire motion field.

The motion vectors can be computed by the block-matching algorithms used in motion compensation for video compression. Thus, a system can often retrieve the vectors from files of video compressed according to standards such as MPEG and H.261. The system could also compute them in real time by using chips that perform such compression in hardware.

Content models

Content parsing is most effective with an a priori model of a video's structure.[1] Such a model can represent a strong spatial order within the individual frames of shots and/or a strong temporal order across a sequence of shots. News broadcasts usually provide simple examples of such models. For example, all shots of the anchorperson conform to a common spatial layout, and the temporal structure simply alternates between the anchorperson and more detailed footage (possibly including breaks for commercials).

Our approach to content parsing begins with identifying key features of the image data, which are then compared to domain models to identify objects believed to be part of the domain. We then identify domain events as segments that include specific domain objects. Our initial experiments involve models for cut boundaries, typed shots, and episodes. The cut boundary model drives the segmentation process that locates camera shot boundaries. Once a shot has been isolated through segmentation, it can be compared against type models based both on features to be detected and on measures that determine acceptable similarity. Sequences of typed shots can then be similarly compared against episode models. We discuss this in more detail later, under "Case study of video content analysis."

Index construction and retrieval tools

The fundamental task of any database system is to support retrieval, so we must consider how to build indexes that facilitate such retrieval services for video. We want to base the index on semantic

properties, rather than lower level features. A knowledge model can support such semantic properties. The model for our system is a frame-based knowledge base. In the following discussion, the word "frame" refers to such a knowledge base object rather than a video image frame.

A frame-based knowledge base

An index based on semantic properties requires an organization that explicitly represents the various subject matter categories of the material being indexed. Such a representation is often realized as a semantic network, but text indexes tend to be structured as trees (as revealed by the indented representations of most book indexes). We decided that the more restricted tree form also suited our purposes.

Figure 3 gives an example of such a tree. It represents a selection of topical categories taken from a documentary video about the Faculty of Engineering at the National University of Singapore. The tree structure represents relations of *specialization* and *generalization* among these categories. Note, in particular, that categories correspond both to content material about student activities (Activity) and to classifications of different approaches to producing the video (Video_Types).

Users tend to classify material on the basis of the information they hope to extract. This particular set of categories reflects interest both in the faculty and in documentary production. Thus, the purpose of this topical organization is not to classify every object in the video definitively. Rather, it helps users who approach this material with only a general set of questions, orienting them in how to formulate more specific questions and what sorts of answers to expect.

The frame-based knowledge base is the most appropriate technology for building such a structure.[3] The *frame* is a data object that plays a role similar to that of a record in a traditional database. However, frames are grouped into classes, each of which represents some topical category. As Figure 3 illustrates, these classes tend to be organized in a specialization hierarchy. Such a hierarchy allows the representation of content in terms of one or more systems of categories that can then be used to focus attention for a variety of tasks.

The simplest of these tasks is the casual browsing of collections of items. However, hierarchical organization also facilitates the retrieval of specific items that satisfy the sorts of constraints normally associated with a database query. Like the

Figure 3. A tree structure of topical categories for a documentary video about engineering at the National University of Singapore.

records of a database, frames are structured as a collection of fields (usually called slots in frame-based systems). These slots provide different elements of descriptive information, and the elements distinguish the topical characteristics for each object represented by a frame.

It is important to recognize that we use frames to represent both classes (the categories) and instances (the elements categorized). As an example of a class frame, consider the Laboratory category in Figure 3. We might define the frame for it as shown in Figure 4a. Alternatively, we can define an instance of one of its subclasses in a slightly similar manner as shown in Figure 4b.

Note that not all slots need to be filled in a class definition ("void" indicates an unfilled slot), while

```
Name: Laboratory
SuperClass: Academic
SubClasses: {table|Computer_Lab
     Electronic_Lab Mechanical_Lab
     Civil_Lab Chemical_Lab}
Instances: void
Description: void
Video: void
Course: void
Equipment: void

Name: Wave_Simulator
Class: Civil_Lab
Description: "Monitoring pressure
     variation in breaking waves."
Video: WaveBreaker_CoverFrame
Course: Civil_Eng
Equipment: {table|Computer
     Wave_Generator}
```

Figure 4. Examples of class frame Laboratory (top) and subclass instance Wave_Simulator (bottom).

they do all tend to be filled in instances. Also note that a slot can be filled by either a single value or a collection of values (indicated by the "#table (...)" construct).

For purposes of search, it is also important to note that some slots, such as Name, SuperClass, SubClasses, Instances, and Class, exist strictly for purposes of maintaining a system of frames. The remaining slots, such as Description, Video, Course, and Equipment, are responsible for the actual representation of content. These latter slots are thus the objective of all search tasks.

Most frame-based knowledge bases impose no restrictions on the contents of slots: Any slot can assume any value or set of values. However, the search objective can be facilitated by strongly typing all slots. The system could enforce such a constraint through an "if-added" demon that does not allow a value to be added to a slot unless it satisfies some data typing requirement. For example, if Shot is a class whose instances represent individual camera shots from a video source, then only values that are instances of the Shot class can be added to the Video slot in frames such as those in Figure 4.

Data typing can determine whether or not any potential slot value is a frame, and it might even be able to distinguish class frames from instance frames. However, we can make typing even more powerful if we extend it to deal with classes as if they were data types. In this case, type checking would verify not only that every potential Video slot value is an instance frame but, more specifically, that it is an instance of the Shot class. Furthermore, we could subject slot values for instances of more specific classes to even more restrictive constraints. Thus, we might constrain the Video slot of the Headings frame to check whether or not the content of a representative frame of the Shot instance being assigned consists only of characters. (We could further refine this test if we knew the fonts used to compose such headings.)

What is important for retrieval purposes is that we can translate knowledge of a slot's type into knowledge of how to search it. We can apply different techniques to inspecting the contents of different slots, and we can combine those techniques by means far more sophisticated than the sorts of combinations normally associated with database query operations.

Retrieval tools

Let us now consider more specifically how we can search frames given a priori knowledge of the typing of their slots. Because a database is only as good as the retrieval facilities it supports, it must have a variety of tools, based on both text and visual interfaces. Our system's current suite of tools includes a free-text query engine and interface, the tree display of the class hierarchy, image feature-based retrieval tools, and the Clipmap.

Every frame in the knowledge base includes a Description slot with a text string as its contents. Thus, the user can provide text descriptions for all video shots in the database. The free-text retrieval tool retrieves video shots on the basis of the Description slot contents. A concept-based retrieval engine analyzes the user's query.[3] Given a free-text query specified by the user, the system first extracts the relevant terms by removing the nonfunctional words and converting those remaining into stemmed forms. The system then checks the query against a domain-specific thesaurus, after which it uses similarity measures to compare the text descriptions with the query terms. Frames whose similarity measure exceeds a given threshold are identified and retrieved, linearly ordered by the strength of the similarity.

In addition to using free text, we can formulate queries directly on the basis of the category tree itself. This tree is particularly useful in identifying all shots that are instances of a common category at any level of generalization. We can then use the tree to browse instances of related categories. The class hierarchy also allows for slot-based retrieval. Free-text retrieval provides access to Description slots, but we can search on the basis of other slots as well. For example, we can retrieve slots whose contents are other frames through queries based on their situation in the class hierarchy. We can compare slots having numeric values against numeric intervals. Furthermore, if we want to restrict a search to the instances of a particular class, then the class hierarchy can tell us which slots can be searched and what types of data they contain.

Retrieval based on the contents of Video slots will require computation of characteristic visual features. As an example, a user examining a video of a dance performance should be able to retrieve all shots of a particular dancer on the basis of costume color. Retrieval would then require con-

structing a model for matching regions of the color with suitable spatial properties. The primitives from which such models are constructed then serve as the basis for the index structure. In such a database, each video clip would be represented by one or more frames, and all indexing and retrieval would be based on the image features of these frames.

Some image database systems, such as the Query By Image Content (QBIC) Project[3] have developed techniques that support this approach. These techniques include selection and computation of image features that provide useful query functionality, similarity-based retrieval methods, and interfaces that let users pose and refine queries visually and navigate their way through the database visually.

We chose color, texture, and shape as basic image features and developed a prototype system with fast image-indexing abilities. This system automatically computes numerical index keys based on color distribution, prominent color region segmentation, and color histograms (as texture models) for each image. Each image is indexed by the size, color, location, and shape of segmented regions and the color histograms of the entire image and nine subregions. To achieve fast retrieval, the system codes these image features into numerical index keys according to the significance of each feature in the query-matching process. This retrieval approach has proved fast and accurate.

Indexing representative images essentially ignores the temporal nature of a video. Retrieval should be based on events as well as features of static images. This will require a better understanding of which temporal visual features are both important for retrieval and feasible to compute. For instance, we can retrieve zooming sequences through a relatively straightforward examination of the motion vector field.[4] However, because such vector fields are often difficult to compute (and because the "motion vectors" provided by compressed video are not always a reliable representation of optical flow), a more viable alternative might be to perform feature analysis on the spatio-temporal images. We discuss this alternative below under the subsection "Micons: Icons for video content".

A Clipmap is simply a window containing a collection of icons, each of which represents a camera shot. We can use Clipmaps to provide an unstructured index for a collection of shots.[4] They can also be used to display the results of retrieval operations. For example, rather than simply listing the frames retrieved by a free-text query, the system can construct a Clipmap based on the contents of the Video slot of each frame. Such a display is especially useful when the query results in a long list of frames. For example, Figure 5 is a Clipmap constructed for a query requesting all instances of the Activity class. Even if the system orders retrieval results by degree of similarity (as they are in free-text search), it can still be difficult to identify the desired shots from text representations of those frames. The Clipmap provides visual recognition as an alternative to examining such text descriptions.

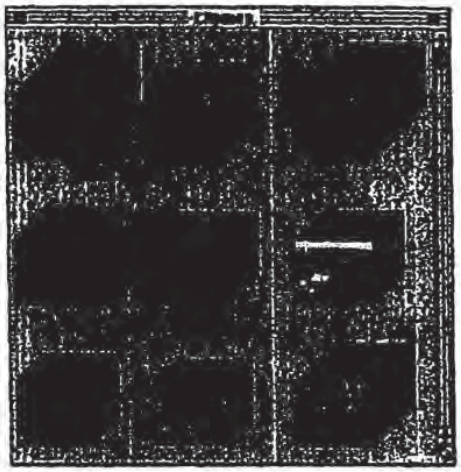

Figure 5. A typical Clipmap.

Interactive video objects

We turn now to the problem of interfaces. Video is "media rich," providing moving pictures, text, music, and sound. Thus, interfaces based on keywords or other types of text representation cannot provide users a suitable "window" on video content. Only visual representation can provide an intuitive cue to such content. Furthermore, we should not regard such cues as passive objects. A user should be able to interact with them, just as text indexes are more for interaction than for examination. In this section, we discuss three approaches to interactivity.

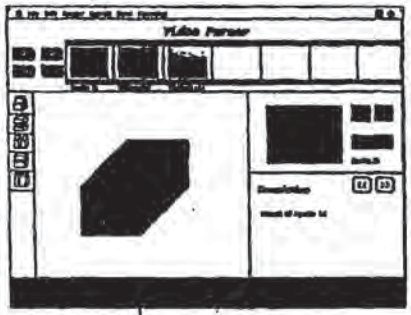

Figure 6. An environment for examining and manipulating micons.

Micons: Icons for video content

A commonly used visual representation of video shots or sequences in the video or movie icon, sometimes called a micon.[6] Figure 6 illustrates the environment we have designed for examining and manipulating micons. Every video clip has a representative frame that provides a visual cue to its content. This static image is displayed in the upper "index strip" of Figure 6. Selecting an image from the index strip causes the system to display the entire micon in the left-hand window. It also brings up a display of the contents of the Description slot and "loads" the clip into the "soft video player" shown on the right. The "depth" of the micon itself corresponds to the duration of the represented video sequence, and we can use this depth dimension as a "scroll bar." Thus, we can use any point along a "depth face" of the icon to cue the frame corresponding to that point in time for display on the front face. The top and side planes of the icon are the spatio-temporal pictures composed by the pixels along the horizontal and vertical edge of each frame in the video clip.[7]

Figure 7. A micon with a horizontal slice. Each colored line matches the color of a leotard on the lower leg. Horizontal movement of the line in the image exposed by the slice corresponds to horizontal movement of the leg (and usually the dancer). Dancers' movements can be traced by using this exposed spatio-temporal picture as a source of cues.

This presentation reveals that, at the bit level, a video clip is best thought of as a *volume of pixels*, different views of which can provide valuable content information. (For example, the accent of Apollo 11 represented in Figure 6 is captured by the upper face of the icon.) We can also incorporate the camera operation information into the video icon construction and build a VideoSpaceIcon.[8]

We can examine this volume further by taking horizontal and vertical slices, as indicated by the operator icons on the side of the display in Figure 6. For example, Figure 7 illustrates a horizontal slice through a micon corresponding to an excerpt from "Changing Steps," produced by Elliot Caplan and Merce Cunningham, a video interpretation of Cunningham's dance of the same name. (This micon actually does not correspond to a single camera shot. The clip was obtained from the Hierarchical Video Magnifier, discussed in the next subsection.) Note that the slice was taken just above the ankles, so it is possible to trace the movements of the dancers in time through the colored lines created as traces of their leotards.

Selecting a representative frame for each camera shot in the index strip is an important issue. Currently, we avoid tools that are too computationally intensive. Two approaches involve simple pixel-based properties. An "average frame" is defined in which each pixel has the average of values at the same grid point in all frames of the shot. Then, the system will select a frame that is most similar to this average frame as the representative frame.

Another approach involves averaging the histograms of all the frames in a clip and selecting the frame whose histogram is closest to the average histogram as the representative frame. However, neither of these approaches involves semantic properties (although the user can always override decisions made by these methods). We also plan to incorporate camera and object

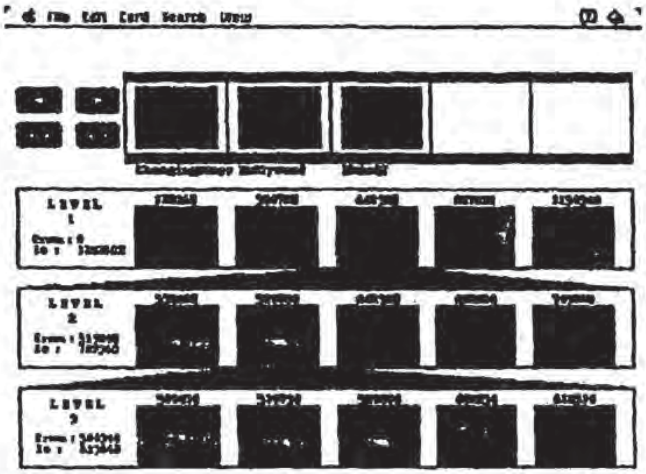

Figure 8. A hierarchical browser of a full-length video.

motion information either for selecting a representative frame or for constructing a "salient still"[8] instead of a representative frame.

Hierarchical video magnifier

Sometimes the ability to browse a video in its entirety is more important than examining individual camera shots in detail. We base our approach on the Hierarchical Video Magnifier.[11] It is illustrated in Figure 8, which presents an overview of the entire "Changing Steps" video. The original tape of this composition was converted to a QuickTime movie 1,282,602 units long. (There are 600 QuickTime units per second, so this corresponds to a little under 36 minutes.) As the figure shows, dimensions allow for the display of five frames side by side. Therefore, the whole movie is divided into five segments of equal length, each segment represented by the frame at its midpoint.

As an example from this particular video, the first segment occupies the first 256,520 units of the movie, and its representative frame is at index 128,260. Each segment can then be similarly expanded by dividing it into five portions of equal length, each represented by the midpoint frame. By the time we get to the third level, we are viewing five equally spaced frames from a segment of size 51,304 (approximately 85.5 seconds). Users can continue browsing to greater depth, after which the screen scrolls accordingly.

The user can also select any frame on the display for storage. The system will store the entire segment represented by the frame as a separate file, which the user can then examine with the micon viewer. (This is how we created the image in Figure 7.) This approach to browsing is particularly valuable for a source like "Changing Steps," which does not have a well-defined narrative structure. It can serve equally well for material where the narrative structure is not yet understood.

The Hierarchical Video Magnifier is an excellent example of "content-free content analysis." The technique requires no information regarding the content of the video other than its duration. We developed it to exploit the results of automatic segmentation. The segment boundaries determined by simple arithmetic division in the Hierarchical Video Magnifier are then "justified" by being shifted to the nearest camera shot boundary. Thus, at the top levels of the hierarchy, the segments actually correspond to sequences of camera shots, rather than an arbitrary interval of a fixed duration. These camera shot boundaries are honored in the subdivision of all segments that consist of more than a single such shot. When a

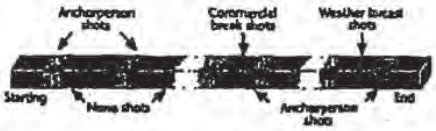

Figure 9. The temporal structure of a typical news program.

segment contains only one shot, the simple arithmetic division of the Hierarchical Video Magnifier is restored in constructing all subsequent levels of the hierarchy.

Clipmaps

In addition to providing a useful interface for the results of retrieval queries, Clipmaps can also serve as an interactive tool for index construction. In this capacity, the Clipmap plays a role in examining camera shots similar to that of a light table in examining photographic slides. Such a display is very useful in manually sorting the video segments into different categories. It works because the user can maintain several open Clipmap windows. It is thus possible to start with a Clipmap window that is a totally unstructured collection and group segments from a common category into a separate Clipmap. Thus, this feature can be used to form categories by the "divide and conquer" technique of breaking down a large pile of video icons into smaller piles.

Furthermore, the groups created by this process then define the topology of a class hierarchy, such as the one illustrated in Figure 3. While no system is yet sophisticated enough to generate labels or descriptions for these classes automatically, the user can be prompted for such information while seeing a display of the Clipmap corresponding to the class that needs labeling.

Case study of video content analysis

We took a case study approach to validating the tools and techniques discussed in this article. Many of our best results to date have come from analyses of television news programs. As pointed out earlier, content parsing is most feasible when we have an a priori model of a video's structure based on domain knowledge. Such model definition is comparatively easy for news broadcasts. For example, Figure 9 provides a straightforward representation of the temporal structure of a news video.[4,12] It shows a simple sequence of news items (possibly interleaved with commercials), each of which may include an anchorperson shot at its beginning and/or end.

As a rule, it is not easy to classify individual news shots by structural properties, with the possible exception of certain regular features, such as weather, sports, and business. On the other hand, frames of anchorperson shots have a well defined spatial structure, which can be distinguished from frames of other news shots (see Figure 10). Additionally, a news item in most news programs always starts with an anchorperson shot, followed by a sequence of shots illustrating the news story. Parsing thus relies on classifying each shot according to such temporal and spatial structures.

Our approach to news video content parsing begins with identifying key features of the shots, which are then compared to domain models to identify objects inferred to be part of the domain. Thus, we break news program parsing into three tasks. The first task defines an anchorperson shot model that incorporates both the temporal structure of the shot and the spatial structure of a representative frame. The second task develops similarity measures to be used in matching these models with a given shot as a means of deciding whether that shot is an anchorperson shot. The third task uses a temporal structure model of the entire news program to finalize the shot classification.

We developed a set of algorithms that locates anchorperson shots based on the spatial and temporal features of the shots. The system then compares sequences of typed shots to episode models. The algorithms have proved very effective and achieve high accuracy in news video parsing.[12]

We applied the two index schemes discussed earlier—text and visual—to the news programs. The text index uses the topical category tree and assigns news items to classes corresponding to different news topics. The free-text tool can retrieve these news items. However, although we can predefine the category tree structure, we have to insert each news item manually into the tree, which can be a time-consuming and tedious task.

The visual index is composed automatically from the parsing processes. We represent each news item visually by a sticon in a Clipmap. The cover frames are anchorperson frames containing a news icon, which provides a visual cue to the content of the news item. If there is no anchorperson frame containing a news icon, then the cover frame is the first frame of the first news shot following the anchorperson shot. All icons of the news items belonging to a news program are then presented in a common Clipmap.

Currently, we digitize, compress, and save the video data of each news item as a QuickTime file.

together with the soundtrack. A lower level of visual index is provided for each news item. That is, each shot of a news item, segmented during the video parsing process, can be represented as a micon, and we represent each news item in its own Clipmap. This allows direct access to each shot. A user can select the icon and activate a browsing tool to view the contents of a news item, the entire program, or a camera shot within a news item.

Figure 10. The spatial structure of a frame from an anchorperson shot.

Audio analysis: A new frontier

As any filmmaker knows, the audio track provides a very rich source of information to supplement our understanding of any video.[12] We can also use this information in video segmentation and indexing tasks. For instance, significant changes in spectral content can serve as segment boundary cues. Furthermore, we assume that we can decompose our auditory perceptions into objects, just as we can our visual perceptions. We currently know far less about just what such audio objects are than we do about corresponding visual objects.[13] However, if we can characterize them, we should be able to track them across an auditory stream. This technique should provide useful information for segmentation and indexing. Therefore, effective analysis of audio signals and their integration with information obtained from image analysis is an important part of our work.

We have begun to develop algorithms that detect content changes in an audio signal, but the task is challenging. We are investigating changes in both time and frequency domain representations as sources of criteria for segment boundaries. We also plan to develop models of audio events, similar to the models used in image-based content parsing.[14] For example, in a sports video, very loud shouting followed by a long whistle might indicate that someone has scored a goal, in which case the system should recognize an "event." We also anticipate incorporating spectral signatures into these models.

Voices of speakers are a key source of content information. Most important here is the problem of identifying different speakers from the audio signal. Although considerable research has addressed this problem, most results are inadequate in the presence of other nonspeech signals. Thus, further study is necessary. Once a speaker's voice has been detected and isolated, it should then also be possible to apply speech-to-text techniques for an additional source of content information. MM

Acknowledgments

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CVEPS - A Compressed Video Editing and Parsing System

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ABSTRACT

Processing digital video directly in the compressed domain has many advantages in terms of storage efficiency, speed, and video quality. We have developed a compressed video editing and parsing system (CVEPS) with advanced video indexing and manipulation functions. The video parsing tools support automatic extraction of key visual features, e.g., scene cuts, transitional effects, camera operations (zoom/pan), shape and trajectories of prominent moving objects. These visual features are used for efficient video indexing, retrieval and browsing. The editing tools allow users to perform useful video compositing functions and special visual effects typically seen in video production studios. We contrast our compressed-domain approach with traditional decode-process-recode approach with quantitative and/or qualitative performance comparison. We also present a client-server network based CVEPS implementation.

KEYWORDS

Compressed domain video manipulation, client-server network based video editing, video content analysis, video indexing.

1. INTRODUCTION

Digital video is an essential component of new media applications. It demands special technical support in processing, communication, and storage. This paper investigates innovative compressed-domain technologies for compressed video manipulation, indexing, and browsing, in order to support various multimedia applications such as real-time video production and video digital library.

We present a *Compressed Video Editing and Parsing System*, CVEPS, using a unique compressed-domain approach which offers many great benefits [6,7]. First, implementation of the same manipulation algorithms in the compressed domain will be much cheaper than that in the uncompressed domain because the data rate is highly reduced in the compressed domain (e.g., a typical 20:1 to 50:1 compression ratio for MPEG). Second, given most existing images and videos stored in the compressed form, the specific manipulation algorithms can be applied to the compressed streams without full decoding of the compressed images/videos. Lastly, because that full decoding and re-encoding of video are not necessary, we can avoid the extra quality degradation that usually occurs in the reencoding process. We have shown that for MPEG compressed video editing, the speed performance can be improved by more than 60 times and the video quality can be improved by about 3-4 dB if we use the compressed-domain approach rather than the traditional decode-edit-reencode approach [15].

In order to allow users to manipulate compressed video directly, two types of functionalities are required (1) key content browsing and search, (2) compressed video editing. The former allows users to efficiently browse through or search for key content of the video without decoding and viewing the entire video stream. The key content refers to the key frames in video sequences, prominent video objects and their associated visual features (motion, shape, color, and trajectory), or special reconstructed video models for representing video content in a video scene. The second type of functionalities, video editing, allow users to manipulate the object of interest in the video stream without full decoding. One example is to cut and paste any arbitrary segments from existing video streams and produce a new video stream which conforms to the valid compression format. Other examples include special visual effects typically used in video production studios.

This paper describes system components and specific proposed compressed-domain algorithms for achieving the above functionalities in CVEPS. The primary compression standard used is MPEG (MPEG1 and MPEG2). Most of our techniques are applicable to generally encoded MPEG streams with different parameter settings such as constant or variable bitrate, different frequency of I, P, B frames etc. Our scene change detection techniques assume the use of interframe coded frames (i.e. P or B). However, the underly-

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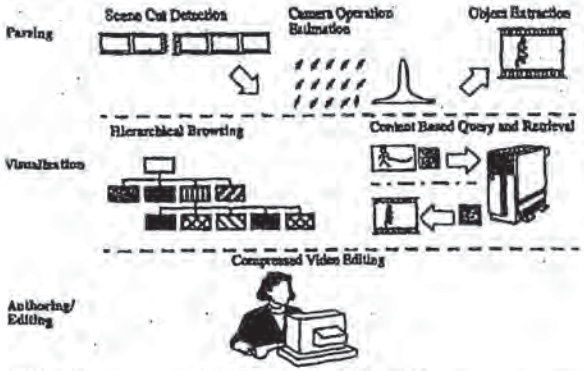


FIGURE 1. CVEPS System Overview

log approach and techniques are general enough to be applied to other video compression standards (e.g. those using transform coding and/or interframe motion compensation). This paper is organized as the following. Section 2 discusses related work. Section 3 provides system overview for CVEPS. Section 4 presents our compressed-domain techniques for parsing MPEG video to extract visual features. Section 5 describes algorithms for compressed video editing. Section 6 discusses system design issues, followed by conclusion at the end.

2. RELATED WORK

Video indexing and manipulation has emerged as an active research area. Much work has been reported by several research groups, some of which also explored the compressed-domain approach. But there are no existing systems that provide integrated solutions for both video manipulation and video indexing. To this end, our prior work has presented techniques for manipulation of both compressed image and video [7,8], compressed image feature extraction [6], and video scene analysis using MPEG streams [15].

For scene cut detection in the spatial domain, Smoliar and Zhang proposed color histogram comparison [22] and Shahraray used a block-based search and motion estimation algorithm [19]. In the compressed domain (Motion JPEG video), comparison of DCT coefficients of selected blocks from each JPEG frame was used to detect the scene cuts [4]. We detect scene cuts in motion compensated video sequences such as MPEG. Distribution of motion vectors is used for detecting direct scene cuts and the variance of DCT DC coefficients is used for detecting transitional scene cuts [14]. After the scene cuts are found, video shots can be browsed with the clustering algorithms proposed in [24].

Within each shot, camera operation and moving objects are important visual features. In spatial domain, finding parameters of an affine matrix and constructing a mosaic image from a sequence of video images was addressed by Szeliski *et al* [18]; searching for object appearance and using them in video indexing was proposed by Nagasaka *et al* [16]. In compressed domain, detecting camera operations (zoom, pan) using motion vectors had been discussed in [2,25]. Both [2,25] used a simple 3 parameter model with the assumption that the camera panning is very small and focal length is very long. The two restrictions make the algorithms not suitable for general video processing. Object motion tracking in MPEG video was also discussed by Dimitrova *et al* [9], however, camera operations were not taken into consideration for object motion recovery. We use a 6-parameter affine transform model and the least squares (LS) method to estimate camera operation parameters. With the estimated camera parameters we further recover the local object motion from the global motion.

Video indexing using finite state models for parsing and retrieval of specific domain video, such as news video, was discussed by Smoliar *et al* [22]. Hampapur *et al* [11] proposed feature based video indexing scheme, which uses low level machine derivable indices to map into the set of application specific video indices. Our goal is to extract a rich set of visual features associated with the scenes and individual objects from the compressed video to enable content based query, and allow for integration with domain knowledge for derivation of higher-level semantics.

To manipulate image and video sequences, a resolution independent video language (Rivl) was proposed by Swartz and Smith [23]. Although Rivl utilized group of pictures (GOPs) level direct copying whenever possible for "cut and

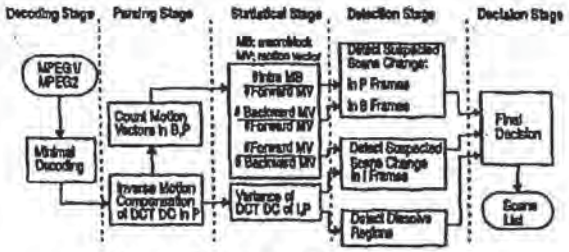


FIGURE 2. The Compressed Domain Scene Cut Detection Algorithm

paste" operations on MPEG video, RivI did not use compressed domain approach at the frame level and macroblock level for special effects editing (see Section 5.2). Most video effects in RivI were done by decoding each frame to pixel domain and applying image library routines. Also the rate control problems due to editing of constant bitrate video was not addressed by RivI.

3. SYSTEM OVERVIEW

The CVEPS system consists of three major modules: Parsing, Visualization and Authoring, see Figure 1. In the Parsing module, MPEG compressed video is first broken into shot segments. Within each shot, camera operation parameters are estimated. Then moving objects are detected and their shape and trajectory features are extracted. In the Visualization module, the scene cut output list and the camera zoom/pan information are used to extract key frames for representing each video shot. The key frames can be browsed with the hierarchical video scene browser [26]. Our content-based image query system, VisualSEEk [20] and WebSEEk [21], are used to index and retrieve key frames or video objects based on their visual features and spatial layout. In the Authoring module, we provide tools for cutting/pasting of arbitrary MPEG video segments and adding special effects such as dissolve, key, masking and motion effects (described in more details later).

4. PARSING OF MPEG VIDEO

4.1 Scene Cut Detection in Compressed Domain

Within a video shot, consecutive frames have high temporal correlation. In MPEG video, this correlation can be characterized by the ratio of the number of backward motion vectors (or intracoded macroblocks) versus the number of forward motion vectors in B (or P) frames. For example, when a direct scene cut occurs on a P-frame, most macroblocks will be intracoded (i.e., no interframe prediction). We calculate the motion vector ratios for every B/P frame and use local adaptive thresholds to detect the peak values.

To detect the transitional scene cut such as dissolve, we use the fact that the variance of the pixel intensity of each frame in the dissolve region shows an approximated parabolic curve [3]. For MPEG video, we use the DCT DC values to approximate the pixel intensity. We are able to successfully detect long dissolves in sequences without high motion. Short dissolves with high motion are trickier and often treated as direct scene cuts.

Figure 2 shows the block diagram of our scene cut detection algorithm. MPEG video is minimally decoded and parsed to get the motion vector counts and DCT DC coefficients. This involves simple parsing of the MPEG streams and does not need any intensive computation. In the Statistical Stage, three ratios are calculated for detecting direct scene cuts in P, B, and I frames, respectively; variance of DCT DC coefficients are calculated from I and P frames for detecting dissolve curves. The peaks of ratios and the dissolve curve are found in the Detection Stage. Finally, duplicated cuts are eliminated before returning a list of scenes.

We have tested our algorithms on several bitstreams from classic movies and CNN news. Table 1 shows the results of a 10 minutes CNN news (unconstrained content) with 19931 frames, Group of Pictures (GOP) size 15, one I or P frame for every two B frames, and frame size 352 pixels by 240 pixels. For the direct scene cuts, we detected 54 out of 59 correctly; the 7 false alarms were mainly caused by a shot including the strobe motion special effect (*refer to* Section 5.2.4); the 5 missed cuts were due to similar dark background of the two shots. For transitional effects, we detected 19 out 21 correctly; the false alarms and misses in the transitional scene cut detection were mainly due to our light-weight implementation which skipped B frames.

TABLE 1. Scene Cut Detection Results

	Direct Scene Cuts	Transitional Scene Cuts
Manual	59	21
Detected	54	19
Missed	5	2
False Alarm	7	8

4.2 Camera Operation Parameters Estimation

Within a shot, low level visual features such as camera zoom/pan and moving objects are useful information for video indexing. We estimate the camera zoom and pan with a 6-parameter affine transform model [5] using the motion vectors from the MPEG compressed stream.

The motion vectors in MPEG are usually generated by block matching: finding a block in the reference frame so that the mean square error is minimized. Although the motion vectors do not represent the true optical flow, it is still good in most cases to estimate the camera parameters in sequences that do not contain large dark or uniform regions.

When the distance between the object/background and the camera is large, it is usually sufficient to use a 6 parameter affine transform to describe the global motion of the current frame,

$$\begin{bmatrix} u \\ v \end{bmatrix} = \begin{bmatrix} 1 & x & y & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & x & y \end{bmatrix} \cdot \begin{bmatrix} a_1 & a_2 & a_3 & a_4 & a_5 & a_6 \end{bmatrix}^T \qquad (1)$$

where (x,y) is the coordinate of a macroblock in the current frame, $[u\ v]^T$ is the motion vector associated with that macroblock, $[a_1\ a_2\ a_3\ a_4\ a_5\ a_6]^T$ is the affine transform vector. We denote U for $[u\ v]^T$, X for $\begin{bmatrix} 1 & x & y & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & x & y \end{bmatrix}$, and $\hat{a}$ for $[a_1\ a_2\ a_3\ a_4\ a_5\ a_6]^T$.

Given the motion vector for each macroblock, we find the global parameter using the Least Squares (LS) estimation, that is to find a set of parameter $\hat{a}$ to minimize the error between the motion vectors estimated in (1) and the actual motion vectors obtained from the MPEG stream [25].

$$S(\hat{a}) = \sum_x \sum_y [(\theta_{xy} - u_{xy})^2 + (\vartheta_{xy} - v_{xy})^2] \qquad (2)$$

where $[\theta\ \vartheta]^T$ is the estimated motion vector. To solve for $\hat{a}$, set the first derivative of $S(\hat{a})$ to 0, then we get

$$\begin{bmatrix} N & A & B \\ A & C & E \\ B & E & D \end{bmatrix} \cdot \begin{bmatrix} a_1 \\ a_2 \\ a_3 \end{bmatrix} = \begin{bmatrix} U_1 \\ U_2 \\ U_3 \end{bmatrix} \text{ and } \begin{bmatrix} N & A & B \\ A & C & E \\ B & E & D \end{bmatrix} \cdot \begin{bmatrix} a_4 \\ a_5 \\ a_6 \end{bmatrix} = \begin{bmatrix} V_1 \\ V_2 \\ V_3 \end{bmatrix} \qquad (3)$$

where,

$$N = \sum_x \sum_y 1,\ A = \sum_x \sum_y x,\ B = \sum_x \sum_y y,$$
$$C = \sum_x \sum_y x^2,\ D = \sum_x \sum_y y^2,\ E = \sum_x \sum_y x \cdot y,$$
$$U_1 = \sum_x \sum_y u_{xy},\ U_2 = \sum_x \sum_y u_{xy} \cdot x,\ U_3 = \sum_x \sum_y u_{xy} \cdot y,$$
$$V_1 = \sum_x \sum_y v_{xy},\ V_2 = \sum_x \sum_y v_{xy} \cdot x,\ V_3 = \sum_x \sum_y v_{xy} \cdot y.$$

All summations are computed over all valid macroblocks whose motion vectors survive after the nonlinear noise reduction process. After the first LS estimation, motion vectors that have large distance from the estimated ones are filtered out before a second LS estimation. The estimation process is iterated several times to refine the accuracy.

4.3 Moving Object Detection and Tracking

After the global camera parameters $\hat{a}$ is found, we may recover the object motion by applying the global motion compensation. If an object located at (x,y) in the current frame has a local motion $M = [m_x\ m_y]^T$ from (x_0,y_0) to (x_1,y_1) in the reference frame with motion vector U, then $U + M = X \cdot \hat{a}$, see Figure 3. That means the local object motion can be recovered from motion vectors provided that $\hat{a}$ is known,

$$M = X \cdot \hat{a} - U \qquad (4)$$

This is the global motion compensation (GMC). For motion vectors of the background, GMC will give mostly 0. For motion vectors of the foreground moving objects, GMC will reveal the local motion of objects, see Figure 4(b).

Moving objects are detected by thresholding the magnitude of the local motion followed by simple morphological operations to delete small false objects and to fill noisy spots.

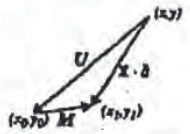


FIGURE 3. Relation among global motion $X \cdot \hat{a}$, local motion M and net displacement U

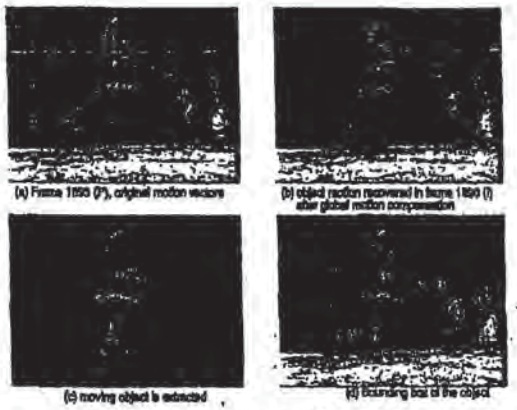


FIGURE 4. Camera Parameter and Moving Object Detection

See Figure 4(c) for extracted moving object. The DCT coefficients of the moving object are extracted for query purpose. The outermost points of the object are used to form a bounding box. The location and size of the bounding boxes are saved for later browsing and indexing, see Figure 4(d).

To track the moving objects throughout a video shot, we first select a reference frame where the moving object is initially detected. Secondly, we obtain the centroid of each moving object by taking the first moment of the object's shape. Thirdly, we map the centroid of each object onto the reference frame using the global camera parameters θ. When tracking multiple objects, color and texture of the object can be used to distinguishing them. The motion trajectory of each moving object is formed by repeatedly mapping the centroid until the object has stopped or moved out of the picture or the next scene comes. Finally, filters such as a median filter are used to smooth out the trajectories.

Visual features of the extracted objects, such as color, textures, and shape, can be used to provide content-based visual query of these and associated video scenes.

5. COMPRESSED VIDEO EDITING

Based on the source material, we classify video editing into two stages: the production stage and the post-production stage. The production stage editing are based on original analog or digital footages from cameras. At this level, sophisticated hardware is usually used to guarantee the ease of editing and the highest possible video quality. Commercially available digital video systems such as AVID, Media100 and D-Vision etc., currently use the Motion JPEG compression [17]. The compression ratio varies from 3:1 to about 10:1. With the latest technology, high bandwidth bus technology will make uncompressed video editing possible. The output video from the production stage will be eventually converted to more heavily compressed bitstreams (e.g. MPEG2) for broadcasting or storage.

At the post-production stage, the users will retrieve the MPEG bitstreams according to their needs and perform desired editing. Post-production video editing shall not be available only to users that have sophisticated video hardware. We develop the CVEPS using a pure software and compressed domain approach particularly for this purpose.

We will discuss technical issues of editing MPEG video such as frame type conversion, maintaining bitrate integrity and algorithms for creating common special effects in the compressed domain.

5.1 Basic Editing Functions: Cut and Paste MPEG Video

When cutting and pasting several MPEG video segments to create a new sequence, a straightforward way is to decode all the segments and re-encode. This method is computation intensive, and the output picture will suffer generation loss multiple times.

We apply the basic editing functions directly in the compressed domain. Figure 5 illustrates a scenario of cutting two arbitrary segments from the middle of two separate video streams and merging them to form a new compressed video stream.

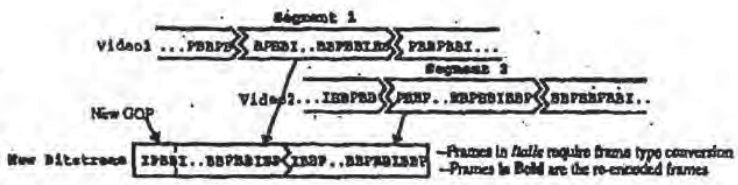


FIGURE 5. Cut and Paste MPEG bitstreams in the compressed domain.

5.1.1 Issue I — Frame Type Conversion

The MPEG video consists of GOP units. Each GOP starts with an I frame. We only need to re-encode few frames which are out of the GOP boundary at the beginning or ending part of the segments. The newly created GOP may have a different size, but it is still conformable to the MPEG format. Details of the frame type conversion may be found in [15]. After type conversion, each segment is independently decodable and can be pasted together back to back to form a new sequence. Figure 5 shows cutting out segment 1 and 2 at arbitrary location to form a new bitstream. The beginning few frames of a segment is re-encoded to form a shorter new GOP.

5.1.2 Issue II — Decoder Video Buffer Control

For constant bitrate MPEG video, the MPEG encoder solves the rate control problem with the "virtual buffer" [12,13], a simulation module of the decoder buffer. Before quantizing each macroblock, it sets the reference value of the quantization parameter based on the fullness of the "virtual buffer."

When cutting and pasting arbitrary segments from different compressed video streams of the same bitrate, the integrity of the original rate control mechanism is lost. For example, Figure 6 (a) shows the video buffer occupancy after connecting four segments. The video buffer size is 1 Mbits. Each segment consists of 49 frames, starts with an I frame and ends with an I frame. The video buffer decreases to a very low level after the first I frame of Seg3. When Seg4 is pasted, the buffer starts to have the underflow problem.

The overflow problem can be easily solved by stuffing zero bits at the end of a slice or a picture whenever the buffer reaches a very high level. The underflow problem can be solved by inserting a synthetic transitional GOP [15] which has a lower average bitrate than normal GOPs or by applying rate shaping algorithm [10] to reduce the bitrate of the boundary I/P frames.

5.2 Extended Editing Functions: Special Effects in the Compressed Domain

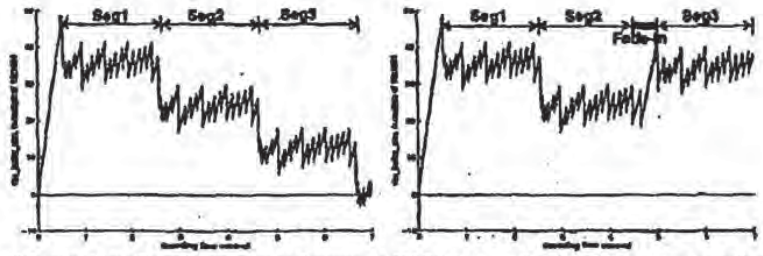
In addition to the basic editing function "cut and paste", several special visual effects can be created in the compressed domain. For I frames, the basic compression component is the Discrete Cosine Transform (DCT), which we denote as

$$F(u,v) = DCT(f(x,y)) \tag{5}$$

Basic linear operations like the intensity addition and scaling can done as follows [7],

$$DCT(f_1(x,y) + f_2(x,y)) = F_1(u,v) + F_2(u,v) \tag{6}$$

$$DCT(\alpha \cdot f(x,y)) = \alpha \cdot F(u,v) \tag{7}$$



(a) Decoder video buffer underflows when pasting segments together.

(b) With the proposed synthetic fade-in connecting Seg2 and Seg3, buffer remains normal.

FIGURE 6. Connecting MPEG video segments in the compressed domain.

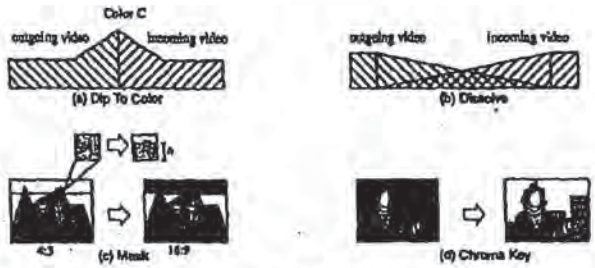


FIGURE 7. Some Special Visual Effects

Algorithms for other operations such as spatial scaling, translation, and filtering in DCT domain can be found in [7]. Usually, the DCT of the output video, Y, can be obtained by linear matrix operations of the input DCT, P_i, as follows

$$Y = \sum_i W_i \cdot P_i \cdot H_i \qquad (8)$$

where H_i and W_i are special filter coefficient matrices in the DCT domain. For motion compensated B and P frames, the compressed-domain manipulation functions can be implemented in two ways. First, in [7,8], we have proposed transform-domain techniques to convert B and P frames to intraframe DCT coefficients, on which the above techniques can be readily applied. An alternative is to keep the B/P structure (i.e., DCT of residual errors and motion vectors) and develop algorithms directly utilizing these data. The following are some examples of typically used editing functions such as *Blend*, *Film*, *Key*, *Motion*, and *Wipe* etc. [1], some of which are illustrated in Figure 7.

5.2.1 Blend Effects

Blend effects are generally two-channel effects: to create a transitional connection between two video segments. Two commonly used ones are: dip to color and dissolve.

Dip to color

Fades from the outgoing video to black, white, or any color and then fades to the incoming video. Since the outgoing and incoming video do not overlap, this effect is achieved by modifying the DCT coefficients in outgoing and incoming video frames. The normalized color level increment ΔI_k, is added to the DCT DC of each macroblock,

$$\Delta I_k = \frac{N \cdot C_k}{n} \qquad (9)$$

where $k=0,1,2$ standards for luminance and two chrominance channels, C_k is the dip-to color, n is the total number of frames in this effect, and the constant N is the DCT block size (default 8).

This operation is directly applied to the DCT coefficients in I frames or DCT coefficients of residual in B and P frames. For a typical MPEG., $I_0B_1B_2P_3B_4B_5 \ldots B_{n-1}B_n$, with I/P frequency $M=3$, the operation for each type is:

$$I\text{ frame:} \quad F'_k = F_k + i \cdot \Delta I_k \qquad (10)$$

$$P\text{ frame:} \quad F'_k = F_k + M \cdot \Delta I_k \qquad (11)$$

$$B\text{ frame:} \quad F'_k = F_k + mod(i, M-1) \cdot \Delta I_k \qquad (12)$$

where F_k, F'_k are the original and the modified DCT DC value, and $i=0,1,\ldots,n$ is the frame number.

Dissolve

The outgoing video fades out while the incoming video fades in. When there is no or low motion in the two videos, this effects can be approximated by the linear combination of the two video:

$$F(u,v,t) = \alpha(t) \cdot F_1(u,v,t_1) + (1-\alpha(t)) \cdot F_2(u,v,t_2) \qquad (13)$$

where $\alpha(t)$ is a weighing function changing from 100% to 0%, user may modify it with any rate; $F_1(u,v,t_1)$ is the last I frame of the outgoing video and $F_2(u,v,t_2)$ is the first I frame of the incoming video. The resulting effect is a dissolve transition from a frozen frame of video 1 to another frozen frame of video 2. However, when either of the video contains high motion, re-encoding of few frames in the transitional period will be required.

5.2.2 Film Effects

Film effects refers to masking video with 4:3 aspect ratio to different aspect ratios such as 1:1.66, 1:1.85, 1:2.35, and 16:9. For I frames, the DCT blocks outside of the desired region are set to 0, and the blocks that lie on the masking boundaries are recalculated using the simplified DCT translation algorithm described in [7].

$$DCT(B) = DCT(H) \cdot DCT(A), \text{ where } H = \begin{bmatrix} 0 & 0 \\ 0 & I_k \end{bmatrix} \quad (14)$$

where A is an original block located on the boundary, B is the new masked block, and I_k is the identity matrix with size $k \times k$, as shown in Figure 7(c).

For P and B frames, only macroblocks with motion vectors pointing outside of the masking region need to be re-encoded. Macroblocks with motion vectors pointing inside do not need any modification. Efficient algorithms for re-encoding macroblocks are described in [7,8].

5.2.3 Key Effects

Key effects are often used for compositing an anchorperson with a scene, such as a weatherman in front of a satellite weather map. In spatial domain, this is done by shooting the first video with a uniform background color (usually blue), then replace every blue color pixel with the second video. In compressed domain, we segment the first video into foreground and background regions by detecting the blue color. Then we replace the macroblocks with just blue background color with corresponding macroblocks from the second video. We need to re-encode the macroblocks lying on the region boundary and the macroblocks with motion vector pointing outside their regions. The percentage of macroblocks which need re-encoding depends on the video type and MPEG encoder design. Some simulation results were reported in [7]. The complexity of the re-encoding process can be reduced by using the pre-existing motion vectors to infer new motion estimation parameters.

5.2.4 Motion Effects

Motion effects include *Freeze Frame*, *Variable Speed* and *Strobe Motion*.

Freeze Frame

Since the freeze effect is usually longer than 1 second, simply inserting duplicated frames (e.g. zero-energy P frames) for a long period of time is not desirable for interactive playback (e.g. random search) due to the lack of frequent I frames. We need to place an I frame at regular short interval. Therefore, the frozen frame is converted to an I frame if it were B/P frame. And the rest of the GOP is filled with duplicated P frames. All the macroblocks in the duplicated P frames are set to Motion Compensation Not Coded (i.e., 0 motion vector, and the 0 residue error blocks are not coded).

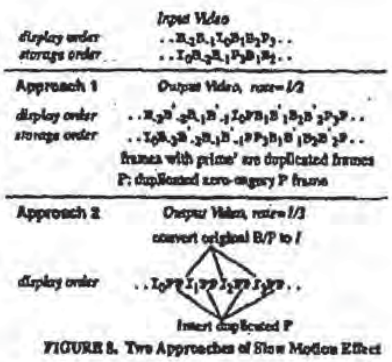


FIGURE 8. Two Approaches of Slow Motion Effect

Variable Speed

For fast motion, B, P, and I frames are subsequently dropped according to the variable speed.

For slow motion, depending on the slow motion rate, two approaches are used as shown in Figure 8. In approach 1, duplicated frames are inserted with no decoding involved. But the I/P frame delay is multiplied by the inverse of the motion rate. For example, I_3 of output video must be transmitted 4 frames earlier, rather than the original 2 frames. This approach is suitable for rate 1/2 and up.

In approach 2, original P/B frames are converted to I frames using our DCT domain techniques [7]. Then duplicated P frames will be inserted between I frames. This approach reduces the frame delay, however extra DCT domain manipulations are required.

Strobe Motion

Strobe motion is a combination of *Freeze Frame* and *Variable Speed*. It is done by dropping original B/P frame and inserting duplicated P frames.

As described in Section 5.1.2, to avoid decoder buffer to overflow (e.g., inserted frame is too small) in constant bitrate video, we may stuff redundant bits to the inserted P frames. To avoid any buffer underflow, we may apply rate adjustment techniques described in Section 5.1.2.

5.3 Advantages of Compressed Domain Approaches

For the basic editing function: cut and paste, the compressed domain approach runs at least 60 times[1] faster than the straightforward approach (decode-edit-encode). That is based on 12 second per cut on average, one P or I frame for

1. Based on analytical estimation of computation complexity as well as software simulation results.

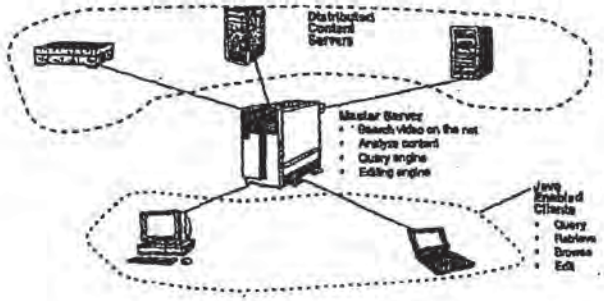


FIGURE 9. Client-Server Based CVEPS System

every two B frames, and cutting at arbitrary locations. The speedup can go over 500 times if we allow cuts only at P frames. The longer the segments are, the higher speedup we gain. The compressed domain approach also avoids quality degradation because the second quantization in the re-encoding process is avoided. For example, we observed an average 3.5 dB gain for a 60 frame segment (508x224, 4.0 Mbps). Only the re-encoded boundary GOP will suffer the 3 to 4 dB quality loss as in the straightforward approach.

6. SYSTEM DESIGN

The CVEPS uses a distributed client-server model as illustrated in Figure 9. The master server is linked with WebSEEk which searches for image and video files over the WWW. Once a video file is found on any other hosts or WWW distributed content servers, it will be downloaded and preprocessed by the master server to extract the key-frames and associated visual features such as camera motion, moving objects, color, texture, and temporal variance etc. The HTTP address of video and the extracted features will be stored on the master server. This client-server model gives the client much richer resources that are not constrained to the client's local environment.

The client is implemented with Java applets. The client may open any video at the server and browse the keyframes hierarchically using story structure or content clustering methods [26]. All the keyframes are hyperlinked to the WebSEEk's query engine so that the keyframes or objects may be used to form new visual queries for new videos or images over the entire master server.

To view the video, the user may simply drag the keyframe which represents for a video shot to the source monitor of the editing interface, see Figure 9. A low resolution copy of the video shot will be sent to the client by the server. The client can use the interactive MPEG2 viewer/decoder to do random access, step forward, fast forward/reverse and normal playback. The MPEG2 decoder is written in C and compiled as a run-time shared library to be called by the Java client.

The user may also turn on the *VideoMap* option of the MPEG2 player. This option will invoke the display of the bounding boxes of any moving objects detected (described in Section 4.3). By clicking the mouse inside the bounding box, the client will send a request to the server to get additional information of the object (e.g. a hyperlinked home page) or invoke content-browsed visual query using this object as a template.

To edit the video, the user may mark in/out any segment of the video shot in the source monitor to splice-in or overwrite to the new sequence in the record monitor. A separate timeline window will show the resulting video/audio tracks and the detailed information of each included video shot. The user may also insert special effects as described in Section 5.2.

During the editing, only the Edit Decision List (EDL) is created. The new sequence must be rendered before it can be displayed. There are three levels of rendering. At the first level, the client uses C routines from its shared libraries to render only the straight cuts at low resolution without showing the special effect. At the second level, the client may send the EDL to the server for generating the new low resolution video with desired special effects. Finally, when the client is done with the editing, the master server will generate a full resolution video with all the effects from the highest quality source video which is located at either the master server or the distributed remote content servers.

7. CONCLUSION

We presented a Compressed Video Editing and Parsing System with our proposed compressed-domain video manipulation and indexing techniques. The CVEPS processes the compressed video to automatically extract key visual features such as scene cut, camera operation parameters, moving objects, and then visual features (e.g., color, motion speed and trajectory). Content based queries are formed with the above visual features for retrieving raw video clips. The CVEPS also provides tools for editing compressed video and creating special effects. We have shown that the compressed domain approach can achieve significant system performance improvement in speed, quality, and storage. Software implementations of the proposed algorithms have been developed in C and Java employing a client-server model over the WWW. The client-server implementation is particularly useful for users with access to regular computers or even less powerful devices (such as light-weight mobile units).

8. ACKNOWLEDGMENT

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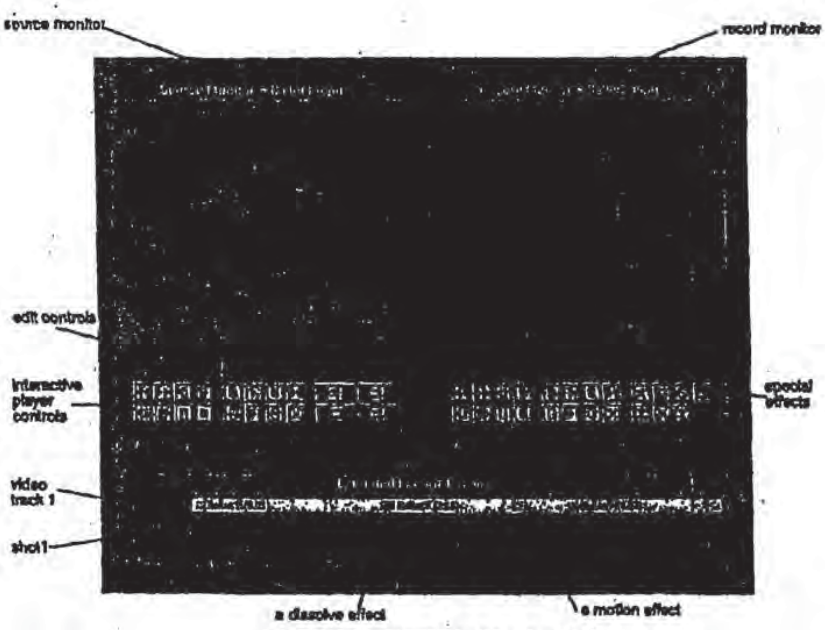

FIGURE 10. The CVEPS Video Editor Java Interface

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		Office Action from CN for foreign patent application no. 200410056388.3 dated 25 November 2005 (15 pgs) – attached.	
		Current Claims in CN patent application no. 200410056388.3 (9 pgs) – attached.	

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第一次审查意见通知书

1. ☑应申请人提出的实审请求，根据专利法第 35 条第 1 款的规定，国家知识产权局对上述发明专利申请进行实质审查。
   ☐根据专利法第 35 条第 2 款的规定，国家知识产权局决定自行对上述发明专利申请进行审查。
2. ☑申请人要求以其在：
   US 专利局的申请日 1998 年 07 月 30 日为优先权日，
   专利局的申请日 年 月 日为优先权日，
   专利局的申请日 年 月 日为优先权日，
   专利局的申请日 年 月 日为优先权日，
   专利局的申请日 年 月 日为优先权日。
   ☑申请人已经提交了经原申请国受理机关证明的第一次提出的在先申请文件的副本。
   ☐申请人尚未提交经原申请国受理机关证明的第一次提出的在先申请文件的副本，根据专利法第 30 条的规定视为未提出优先权要求。
3. ☐经审查，申请人于：
   年 月 日提交的 不符合实施细则第 51 条的规定；
   年 月 日提交的 不符合专利法第 33 条的规定；
   年 月 日提交的
4. 审查针对的申请文件：
   ☑原始申请文件。 ☐审查是针对下述申请文件的
   申请日提交的原始申请文件的权利要求第 项、说明书第 页、附图第 页；
   年 月 日提交的权利要求第 项、说明书第 页、附图第 页；
   年 月 日提交的权利要求第 项、说明书第 页、附图第 页；
   年 月 日提交的权利要求第 项、说明书第 页、附图第 页；
   年 月 日提交的说明书摘要， 年 月 日提交的摘要附图。
5. ☐本通知书是在未进行检索的情况下作出的。
   ☑本通知书是在进行了检索的情况下作出的。
   ☑本通知书引用下述对比文献（其编号在今后的审查过程中继续沿用）：

编号	文件号或名称	公开日期（或抵触申请的申请日）
1	CN1173095A	1998-2-11
2	CN1156942A	1997-8-13
3	CN1189045A	1998-7-29

6. 审查的结论性意见：
   ☑关于说明书：

回函请寄：100088 北京市海淀区蓟门桥西土城路 6 号 国家知识产权局专利局受理处收
（注：凡寄给审查员个人的信函不具有法律效力）

☐申请的内容属于专利法第 5 条规定的不授予专利权的范围。
☐说明书不符合专利法第 26 条第 3 款的规定。
☐说明书不符合专利法第 33 条的规定。
☑说明书的撰写不符合实施细则第 18 条的规定。
☑说明书中附图标记不符合实施细则第 19 条第 3 款的规定。
☑关于权利要求书：
☐权利要求_____不具备专利法第 22 条第 2 款规定的新颖性。
☑权利要求1, 12, 23, 35不具备专利法第 22 条第 3 款规定的创造性。
☐权利要求_____不具备专利法第 22 条第 4 款规定的实用性。
☐权利要求_____属于专利法第 25 条规定的不授予专利权的范围。
☑权利要求1, 3-9, 12, 14-21, 23, 35, 37-43不符合专利法第 26 条第 4 款的规定。
☐权利要求_____不符合专利法第 31 条第 1 款的规定。
☐权利要求_____不符合专利法第 33 条的规定。
☐权利要求_____不符合专利法实施细则第 2 条第 1 款关于发明的定义。
☐权利要求_____不符合专利法实施细则第 13 条第 1 款的规定。
☑权利要求1, 4, 8, 12, 15, 19, 23, 26, 30, 35, 38, 42, 46不符合专利法实施细则第 20 条的规定。
☐权利要求_____不符合专利法实施细则第 21 条的规定。
☐权利要求_____不符合专利法实施细则第 22 条的规定。
☐权利要求_____不符合专利法实施细则第 23 条的规定。
☐_____

上述结论性意见的具体分析见本通知书的正文部分。

7. 基于上述结论性意见，审查员认为：
☐申请人应按照通知书正文部分提出的要求，对申请文件进行修改。
☑申请人应在意见陈述书中论述其专利申请可以被授予专利权的理由，并对通知书正文部分中指出的不符合规定之处进行修改，否则将不能授予专利权。
☐专利申请中没有可以被授予专利权的实质性内容，如果申请人没有陈述理由或者陈述理由不充分，其申请将被驳回。
☐_____

8. 申请人应注意下述事项：
(1) 根据专利法第 37 条的规定，申请人应在收到本通知书之日起的肆个月内陈述意见，如果申请人无正当理由逾期不答复，其申请将被视为撤回。
(2) 申请人对其申请的修改应符合专利法第 33 条的规定，修改文本应一式两份，其格式应符合审查指南的有关规定。
(3) 申请人的意见陈述书和/或修改文本应邮寄或递交国家知识产权局专利局受理处，凡未邮寄或递交给受理处的文件不具备法律效力。
(4) 未经预约，申请人和/或代理人不得前来国家知识产权局专利局与审查员举行会晤。

9. 本通知书正文部分共有 6 页，并附有下述附件：
☑引用的对比文件的复印件共 3 份 99 页。☐_____

审查员：[illegible](9509)
2005 年 11 月 7 日

审查部门 审查协作中心

回函请寄：100088 北京市海淀区蓟门桥西土城路 6 号 国家知识产权局专利局受理处收
（注：凡寄给审查员个人的信函不具有法律效力）

中华人民共和国国家知识产权局

邮政编码：200233 上海桂平路 435 号 上海专利商标事务所有限公司 钱慰民	发文日期
申请号：2004100563883	
申请人：提维股份有限公司	
发明创造名称：多媒体时间偏移系统	

第一次审查意见通知书

1. ☑应申请人提出的实审请求，根据专利法第 35 条第 1 款的规定，国家知识产权局对上述发明专利申请进行实质审查。
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   专利局的申请日 年 月 日为优先权日，
   专利局的申请日 年 月 日为优先权日，
   专利局的申请日 年 月 日为优先权日，
   专利局的申请日 年 月 日为优先权日。
   ☑申请人已经提交了经原申请国受理机关证明的第一次提出的在先申请文件的副本。
   ☐申请人尚未提交经原申请国受理机关证明的第一次提出的在先申请文件的副本，根据专利法第 30 条的规定视为未提出优先权要求。
3. ☐经审查，申请人于：
   年 月 日提交的 不符合实施细则第 51 条的规定；
   年 月 日提交的 不符合专利法第 33 条的规定；
   年 月 日提交的
4. 审查针对的申请文件：
   ☑原始申请文件。 ☐审查是针对下述申请文件的
   申请日提交的原始申请文件的权利要求第 项、说明书第 页、附图第 页；
   年 月 日提交的权利要求第 项、说明书第 页、附图第 页；
   年 月 日提交的权利要求第 项、说明书第 页、附图第 页；
   年 月 日提交的权利要求第 项、说明书第 页、附图第 页；
   年 月 日提交的说明书摘要， 年 月 日提交的摘要附图。
5. ☐本通知书是在未进行检索的情况下作出的。
   ☑本通知书是在进行了检索的情况下作出的。
   ☑本通知书引用下述对比文献（其编号在今后的审查过程中继续沿用）：

编号	文件号或名称	公开日期（或抵触申请的申请日）
1	CN1173095A	1998-2-11
2	CN1156942A	1997-8-13
3	CN1189045A	1998-7-29

6. 审查的结论性意见：
   ☑关于说明书：

第一次审查意见通知书正文

申请号：2004100563883

本发明专利申请涉及电视播送信号的时移，尤其涉及电视播送信号的即时记录、储存及播放。经审查，现提供如下的审查意见：

1. 权利要求1要求保护一种用于在计算机环境中同时储存及回放多媒体数据的方法。对比文件1（CN1173095A）公开了一种具有处理文本数据功能的电视设备，其中（说明书第3页第3行至第9页第16行，图1-7）具体公开了以下技术特征：提供多个输入信号的调谐器（11，17）；其中所述调谐器接收模拟和/或数字电视播送信号；其中每个所述调谐器各自调谐到一特定的播送信号；视频处理电路（12，18）将模拟电视播送信号转换成数字信号；提供输出装置（15）；视频处理电路（12，18）将特定的数字信号解码成电视输出信号；将电视输出信号发送到电视监视器（16）；其中输出装置（15）允许在电视监视器上显示图像。权利要求1所要求保护的技术方案与对比文件1所公开的技术方案相比其区别特征在于：在存储装置中储存所述数字信号和数字电视播送信号；提供多个输出装置；其中每个所述输出装置从所述储存装置中提取特定的数字信号。上述区别特征所要解决的技术问题是使用者能储存所选定的电视节目，而且使用者能够同时观看或回顾另一节目。对比文件2（CN1156942A）公开了一种录制和再生数据的装置和方法，其中（说明书第10页第15行至第33页第8行，图1-16）具体公开了以下技术特征：在存储装置（30，32）中储存所述数字信号和数字电视播送信号；其中输出装置（60，70，61，71）从所述储存装置中提取特定的数字信号。权利要求1中提供多个输出装置为本领域普通技术人员的常用技术手段。对比文件2和常用技术手段公开的技术特征所解决的技术问题是使用者能储存所选定的电视节目，而且使用者能够同时观看或回顾另一节目，其所解决的技术问题和上述区别特征所要解决的技术问题相同，并且相应技术特征在对比文件2中和权利要求1中所起作用相同。由此可见，所属技术领域普通技术人员在对比文件1的基础上，会从对比文件2和常用技术手段获得将上述技术特征应用到对比文件1中而得到权利要求1所要求保护技术方案的启示，也就是说这样的结合对所属技术领域的技术人员来说是显而易见的，而且它们的结合没有产生预料不到的技术效果，因此权利要求1所要求保护的技术方案不具备突出的实质性特点和显著的进步，不符合专利法第二十二条

第三款有关创造性的规定。

2. 权利要求12要求保护的是实施相对于权利要求1的方法的装置，虽然权利要求12与权利要求1所要求保护的客体不同，但是由于它们所要求保护的技术方案中的技术特征是一一对应的，其所要求保护的技术方案实质上相同。鉴于权利要求1的方法不具备创造性，以与评述权利要求1不具备创造性相同的理由，权利要求12所要求保护的技术方案不具备突出的实质性特点和显著的进步，不符合专利法第二十二条第三款有关创造性的规定。

3. 权利要求23要求保护一种用于在计算机环境中同时储存及回放多媒体数据的方法。对比文件1（CN1173095A）公开了一种具有处理文本数据功能的电视设备，其中（说明书第3页第3行至第9页第16行，图1-7）具体公开了以下技术特征：提供多个输入信号的调谐器（11，17）；其中所述调谐器接收模拟和/或数字电视播送信号；其中每个所述调谐器各自调谐到一特定的播送信号；视频处理电路（12，18）将模拟电视播送信号转换成数字信号；提供输出装置（15）；视频处理电路（12，18）将特定的数字信号解码成电视输出信号；将电视输出信号发送到电视监视器（16）；其中输出装置（15）允许在电视监视器上显示图像。权利要求23所要求保护的技术方案与对比文件1所公开的技术方案相比其区别特征在于：将数字信号或数字电视播送信号分离成其视频和音频分量；在存储装置中储存所述数字信号和数字电视播送信号；提供多个输出装置；其中每个所述输出装置从所述储存装置中提取特定的数字信号。上述区别特征所要解决的技术问题是使用者能储存所选定的电视节目，而且使用者能够同时观看或回顾另一节目。对比文件2（CN1156942A）公开了一种录制和再生数据的装置和方法，其中（说明书第10页第15行至第33页第8行，图1-16）具体公开了以下技术特征：在存储装置（30，32）中储存所述数字信号和数字电视播送信号；其中输出装置（60，70，61，71）从所述储存装置中提取特定的数字信号。权利要求23中提供多个输出装置和将数字信号或数字电视播送信号分离成其视频和音频分量分别进行处理为本领域普通技术人员的常用技术手段。对比文件2和常用技术手段公开的技术特征所解决的技术问题是使用者能储存所选定的电视节目，而且使用者能够同时观看或回顾另一节目，其所解决的技术问题和上述区别特征所要解决的技术问题相同，

第一次审查意见通知书正文

申请号：2004100563883

本发明专利申请涉及电视播送信号的时移，尤其涉及电视播送信号的即时记录、储存及播放。经审查，现提供如下的审查意见：

1. 权利要求1要求保护一种用于在计算机环境中同时储存及回放多媒体数据的方法。对比文件1（CN1173095A）公开了一种具有处理文本数据功能的电视设备，其中（说明书第3页第3行至第9页第16行，图1-7）具体公开了以下技术特征：提供多个输入信号的调谐器（11，17）；其中所述调谐器接收模拟和/或数字电视播送信号；其中每个所述调谐器各自调谐到一特定的播送信号；视频处理电路（12，18）将模拟电视播送信号转换成数字信号；提供输出装置（15）；视频处理电路（12，18）将特定的数字信号解码成电视输出信号；将电视输出信号发送到电视监视器（16）；其中输出装置（15）允许在电视监视器上显示图像。权利要求1所要求保护的技术方案与对比文件1所公开的技术方案相比其区别特征在于：在存储装置中储存所述数字信号和数字电视播送信号；提供多个输出装置；其中每个所述输出装置从所述储存装置中提取特定的数字信号。上述区别特征所要解决的技术问题是使用者能储存所选定的电视节目，而且使用者能够同时观看或回顾另一节目。对比文件2（CN1156942A）公开了一种录制和再生数据的装置和方法，其中（说明书第10页第15行至第33页第8行，图1-16）具体公开了以下技术特征：在存储装置（30，32）中储存所述数字信号和数字电视播送信号；其中输出装置（60，70，61，71）从所述储存装置中提取特定的数字信号。权利要求1中提供多个输出装置为本领域普通技术人员的常用技术手段。对比文件2和常用技术手段公开的技术特征所解决的技术问题是使用者能储存所选定的电视节目，而且使用者能够同时观看或回顾另一节目，其所解决的技术问题和上述区别特征所要解决的技术问题相同，并且相应技术特征在对比文件2中和权利要求1中所起作用相同。由此可见，所属技术领域普通技术人员在对比文件1的基础上，会从对比文件2和常用技术手段获得将上述技术特征应用到对比文件1中而得到权利要求1所要求保护技术方案的启示，也就是说这样的结合对所属技术领域的技术人员来说是显而易见的，而且它们的结合没有产生预料不到的技术效果，因此权利要求1所要求保护的技术方案不具备突出的实质性特点和显著的进步，不符合专利法第二十二条

第三款有关创造性的规定。

2. 权利要求12要求保护的是实施相对于权利要求1的方法的装置，虽然权利要求12与权利要求1所要求保护的客体不同，但是由于它们所要求保护的技术方案中的技术特征是一一对应的，其所要求保护的技术方案实质上相同。鉴于权利要求1的方法不具备创造性，以与评述权利要求1不具备创造性相同的理由，权利要求12所要求保护的技术方案不具备突出的实质性特点和显著的进步，不符合专利法第二十二条第三款有关创造性的规定。

3. 权利要求23要求保护一种用于在计算机环境中同时储存及回放多媒体数据的方法。对比文件1（CN1173095A）公开了一种具有处理文本数据功能的电视设备，其中（说明书第3页第3行至第9页第16行，图1-7）具体公开了以下技术特征：提供多个输入信号的调谐器（11，17）；其中所述调谐器接收模拟和/或数字电视播送信号；其中每个所述调谐器各自调谐到一特定的播送信号；视频处理电路（12，18）将模拟电视播送信号转换成数字信号；提供输出装置（15）；视频处理电路（12，18）将特定的数字信号解码成电视输出信号；将电视输出信号发送到电视监视器（16）；其中输出装置（15）允许在电视监视器上显示图像。权利要求23所要求保护的技术方案与对比文件1所公开的技术方案相比其区别特征在于：将数字信号或数字电视播送信号分离成其视频和音频分量；在存储装置中储存所述数字信号和数字电视播送信号；提供多个输出装置；其中每个所述输出装置从所述储存装置中提取特定的数字信号。上述区别特征所要解决的技术问题是使用者能储存所选定的电视节目，而且使用者能够同时观看或回顾另一节目。对比文件2（CN1156942A）公开了一种录制和再生数据的装置和方法，其中（说明书第10页第15行至第33页第8行，图1-16）具体公开了以下技术特征：在存储装置（30，32）中储存所述数字信号和数字电视播送信号；其中输出装置（60，70，61，71）从所述储存装置中提取特定的数字信号。权利要求23中提供多个输出装置和将数字信号或数字电视播送信号分离成其视频和音频分量分别进行处理为本领域普通技术人员的常用技术手段。对比文件2和常用技术手段公开的技术特征所解决的技术问题是使用者能储存所选定的电视节目，而且使用者能够同时观看或回顾另一节目，其所解决的技术问题和上述区别特征所要解决的技术问题相同，

并且相应技术特征在对比文件2中和权利要求23中所起作用相同。由此可见，所属技术领域普通技术人员在对比文件1的基础上，会从对比文件2和常用技术手段获得将上述技术特征应用到对比文件1中而得到权利要求23所要求保护技术方案的启示，也就是说这样的结合对所属技术领域的技术人员来说是显而易见的，而且它们的结合没有产生预料不到的技术效果，因此权利要求23所要求保护的技术方案不具备突出的实质性特点和显著的进步，不符合专利法第二十二条第三款有关创造性的规定。

4. 权利要求35要求保护的是实施相对于权利要求23的方法的装置，虽然权利要求35与权利要求23所要求保护的客体不同，但是由于它们所要求保护的技术方案中的技术特征是一一对应的，其所要求保护的技术方案实质上相同。鉴于权利要求23的方法不具备创造性，以与评述权利要求23不具备创造性相同的理由，权利要求35所要求保护的技术方案不具备突出的实质性特点和显著的进步，不符合专利法第二十二条第三款有关创造性的规定。

5. 同时，对比文件3（CN1189045A）和对比文件2结合也影响权利要求1、12、23和35的创造性，相对于对比文件3和对比文件2公开的内容，权利要求1、12、23和35所要求保护的技术方案不具备突出的实质性特点和显著的进步，不符合专利法第二十二条第三款有关创造性的规定。

6. 权利要求1中记载的"所述多个输出装置允许所述电视监视器上图像显示中的图像"（第1页第12行）语句不通顺，依审查员理解应为"所述多个输出装置允许在电视监视器上图像显示中显示图像"，上述不清楚之处导致了该权利要求的保护范围不清楚，不符合专利法实施细则第二十条第一款的规定。类似地，权利要求12、23和35中的类似描述也不符合专利法实施细则第二十条第一款的规定。申请人应当修改上述描述，如改用其它表达方式，申请人应当注意该表达方式在原申请文件中要有所记载。

7. 权利要求3-9的附加技术特征在说明书中没有记载，实质上得不到说明书的支持，因此权利要求3-9没有以说明书为依据，不符合专利法第二十六条第四款的规定。类似地，权利要求14-21、25-31、37-43也不符合专利法第二十六条第四款的规定。申请人应当将上述权利要求删除。

8. 权利要求4中记载的"选择所述输出装置中的哪一个显示在图像显示中的所述图像中"含义不清楚，该描述没有说明是"选择所述（多个）输出装置中的哪一个""输出装置""显示在图像显示中的所述图像"，还是"选择所述（多个）输出装置中的哪一个""图像"显示在图像显示中"？而且，"所述输出装置"中的"输出装置"含义也不清楚，该描述没有说明是前述的"多个输出装置"之一呢，还是其全部呢？依审查员理解应为"所述多个输出装置"。上述不清楚之处导致了该权利要求的保护范围不清楚，不符合专利法实施细则第二十条第一款的规定。类似地，权利要求15、26和38中的类似描述也不符合专利法实施细则第二十条第一款的规定。申请人应当修改上述描述，如改用其它表达方式，申请人应当注意该表达方式在原申请文件中要有所记载。

9. 权利要求8中记载的"反绕，帧步进，暂停"（第1页第26-27行）中的逗号"，"使其描述语句不通顺，依审查员理解应为"反绕、帧步进、暂停"，上述不清楚之处导致了该权利要求的保护范围不清楚，不符合专利法实施细则第二十条第一款的规定。类似地，权利要求19、30和42中的类似描述也不符合专利法实施细则第二十条第一款的规定。申请人应当对上述描述中的标点符号进行修改。

10. 权利要求19中记载的"所述解码步骤"（第2页第29-30行）含义不清楚，因为所引用的权利要求13中为装置权利要求，其中进行解码的为"模块"，而非"步骤"，而且，"解码模块"在所引用的权利要求13中也没有记载，"所述"缺乏引用基础，上述不清楚之处导致了该权利要求的保护范围不清楚，不符合专利法实施细则第二十条第一款的规定。申请人要么将上述描述修改为"所述解码的模块"，要么将权利要求13修改为"解码成电视输出信号的解码模块"。类似地，权利要求42中的"所述解码步骤"（第5页第10-11行）和权利要求46中的"所述储存模块"（第5页第21行）也不符合专利法实施细则第二十条第一款的规定。

11. 独立权利要求1、12、23和35中记载的技术方案在说明书的发明内容部分中的技术方案中没有记载，因此权利要求1、12、23和35在形式上得不到说明书的支持，不符合专利法第二十六条第四款的规定。申请人在针对本意见通知书对权利要求书进行修改以后，应当对说明书做出适应性修改。至少独立权利要求中记载的技术方案在说明书的发明内容部分中的技术方案中要有所记载，以在形式上得到说明

书的支持。

12. 说明书中存在前后描述不一致之处，如"输入区"、"输出区"（第4页第5-6行等多处）与附图1和13中的"输入模块"、"输出模块"；"偏移量"（第6页第15行等多处）与附图5中的"地址"；"MPEG声音704"（第7页第23行）与"MPEG声音（音频）编码器704"（第7页第24行、第27行等多处）、附图7中的"声频"；"VBI数据702"（第7页第23行，附图7）与"VBI解码器702"（第7页第25行等多处）；"标签707"（第8页第2-3行等多处）与附图7中的"标记"；"控制目标917（1114）"（第11页第7行，第12页第2行等多处）与附图9和11中的"控制器"。上述说明书中使用的技术术语与符号前后不一致之处，不符合专利法实施细则第十八条第三款的规定。申请人应当对说明书进行修改，克服上述缺陷，同时注意修改不得超出原说明书记载的范围。

13. 说明书中使用了非本领域的科技术语，如"垂直空白间隙"（第4页第18行等多处）应为"垂直消隐间隙"。上述说明书中使用的非本领域的科技术语，不符合专利法实施细则第十八条第三款的规定。

14. 说明书文字部分提及的附图标记"21"（第4页第22行）在附图中没有出现，不符合专利法实施细则第十九条第三款的规定。

15. 说明书摘要文字部分超过了300字，不符合专利法实施细则第二十四条第二款的规定。申请人应当对说明书摘要文字部分进行修改，克服上述缺陷。

16. 本申请说明书中的小标题不准确，不符合专利法实施细则第十八条第一款的规定。五部分小标题分别为"技术领域"、"背景技术"、"发明内容"、"附图说明"和"具体实施方式"。申请人应当对说明书进行修改，以符合上述规定。

17. 说明书中存在打印错误："208"（第5页第12行）应为"308"；"模拟模拟"（第5页第13行）应为"模拟"；"二制"（第5页第24行）应为"二进制"。

基于上述理由，本专利申请按照目前的文本不能被授予专利权。该申请存在实质性缺陷，属于专利法实施细则第五十三条驳回的情形，如果申请人不能在指定期限内陈述具有专利性的理由或者做出符合专利法第三十三条规定的修改，本申请将依据专利法第三十八条予以驳回。

审查员：陈荣华

THE PATENT OFFICE OF THE STATE INTELLECTUAL PROPERTY OFFICE OF THE PEOPLE'S REPUBLIC OF CHINA

Address:No.6 Xi Tucheng Lu, Jimeng Qiao Haidian District, Beijing Post code: 100088 P.O.BOX:Beijing 8020

Shanghai Patent & Trademark Law Office	Date of Dispatch November 25, 2005

Application No.: 200410056388.3	Applicant:TIVO, INC.
Application Date: March 4, 1999	Agent:
Title: MULTIMEDIA TIME WARPING SYSTEM	

NOTICE ON OFFICE ACTION

1. ☒ According to the Request for Substantive Examination raised by the applicant and based on the provision of Item 1, Article 35 of the Patent Law, the Examiner has proceeded with the Examination as to Substance on the above mentioned application for patent for invention.
   ☐ According to Item 2, Article 35 of the Chinese Patent Law, the Patent Office has decided to examine the above application for patent for invention.

2. ☒ The applicant has requested that the filling date of
   July 30, 1998 at the US Patent Office as the priority date,
   _____ at the _____ Patent Office as the priority date,
   _____ at the _____ Patent Office as the priority date,
   _____ at the _____ Patent Office as the priority date,
   ☒ The applicant has already submitted the copy of the first filed prior application document certified by the receiving office of the country where the application was originally filed.
   ☐ The applicant has not submitted the copy of the first filed prior application document certified by the receiving office of the country where the application was originally filed. It is deemed not having claimed priority according to the provision stipulated in Article 30 of the Patent Law.
   ☐ This application is a PCT application.

3. ☐ The applicant submitted on _____ and _____ the amendment documents.
   On examination , among them,
   the _____ submitted on _____ can not be accepted.
   the _____ submitted on _____ can not be accepted.
   Because the above amendment
   ☐ does not conform with the provisions of Article 33 of the Chinese Patent Law,
   ☐ does not conform with the provisions of Rule 51 of the Implementing Regulations of the Chinese Patent Law,
   Refer to the text of the Notice for the specific reasons why the amendment cannot be accepted

4. ☒ The examination has been proceeded on the original application documents.
☐ The examination is directed at the following application documents:
Claim _____, page _____ of the specification, page _____ of the drawing of the original application documents submitted on the date of filing.
Claim _____, page _____ of the specification, page _____ of the drawing submitted on _____.
Claim _____, page _____ of the specification, page _____ of the drawing submitted on _____.
Claim _____, page _____ of the specification, page _____ of the drawing submitted on _____.
Abstract of the specification submitted on _____, the drawing of the Abstract submitted on _____.

5. ☐ This Notice is made under the condition of no search having been conducted.
☒ This Notice is made under the condition of search having been conducted.
☒ This Notice has cited the below comparison documents (the number of which shall continue to be used in the subsequent examination procedures):

No.	Title of Document	Date of Publication (or the filing date of the conflicting Application)
1	CN 1173095A	1998-02-11
2	CN 1156942A	1997-08-13
3	CN 1189045A	1998-07-29
4		

6. The conclusive opinion drawn from the examination:
☒ **As regards the Specification:**
☐ The contents of the application fall under the scope stipulated by Article 5 of the Patent Law for which no patent right shall be granted.
☐ The specification does not conform with the provision of Item 3, Article 26 of the Patent Law.
☒ The drafting of the specification does not conform with the provision of Rule 18 of the Implementing Regulations.
☒ The drafting of the specification does not conform with the provision of Item 3, Rule 19 of the Implementing Regulations.
☒ **As regards the Claims:**
☐ Claim _____ does not possess the novelty as stipulated in Item 2, Article 22 of the Patent Law.
☒ Claim 1,12,23,35 does not possess the inventiveness as stipulated in Item 3, Article 22 of the Patent Law.
☐ Claim _____ does not possess the practical applicability as stipulated in Item 4, Article 22 of the Patent Law.
☐ Claim _____ falls under the scope of Article 25 of the Patent Law where no patent right is to be granted.
☒ Claim 1,3-9,12,14-21,23,35,37-43 does not conform with the provision of Item 4, Article 26 of the Patent Law.
☐ Claim _____ does not conform with the provision of Item 1, Article 31 of the Patent Law.
☐ Claim _____ does not conform with the definition of invention as stipulated in Item 1, Article 2 of the Implementing Regulations of the Patent Law.
☐ Claim _____ does not conform with the provision of Item 1, Rule 13 of the Implementing Regulations of the Patent Law.
☒ Claim 1,4,8,12,15,19,23,26,30,35,38,42,46 does not conform with the provisions of Rules 20 of

the Implementing Regulations of the Patent Law.

☐ Claim _____ does not conform with the provisions of Rules 21 of the Implementing Regulations of the Patent Law.

☐ Claim _____ does not conform with the provisions of Rules 22 of the Implementing Regulations of the Patent Law.

Refer to the text of this Notice for the specific analyses of the conclusive opinion.

7. Based on the above conclusive opinion, the Examiner deems that:

☐ The applicant shall amend the application documents in accordance with the requirements raised in the text of the Notice.

☒ The applicant shall discuss in his observations reasons why this application for patent can be granted a patent right, and amend the portions indicated in the text of the Notice which have been deemed as not conforming with the provisions, or no patent right shall be granted.

☐ There are no substantive contents in the application for patent that can be granted a patent right. If the applicant does not present reasons or the reasons presented are not sufficient, the application shall be rejected.

8. The applicant is asked to note the following items:

(1) According to the provision of Article 37 of the Patent Law, the applicant shall submit his observations within **four months** from the receipt of this Notice. Where, without justified reasons, the applicant does not respond at the expiration of said date, the application shall be deemed to have been withdrawn

(2) The applicant shall amend his application according to Article 33 of the Patent Law. The amended documents shall be in duplicate, and the form, in conformity with the relevant provisions in the Examination Guide.

(3) The applicant and/or his agent can not, without first making an appointment, go to the Patent Office to have an interview with the Examiner.

(4) The observations and/or the amended documents shall be mailed or delivered to Department of Receipt, the Patent Office of the State Intellectual Property Office. No documents shall possess legal effects if not mailed or delivered to Department of Receipt.

9. The text portion of this Notice totals 6 page(s), and includes the following attachment(s):

☒ duplicate copy(ies) of cited comparison document(s), altogether 3 copy(ies) 99 pages.

☐

Examination Department: _____ Examiner(Seal): _____

2201 2001.7

P1718

TEXT OF THE FIRST OFFICE ACTION

Application number: 2004100563883

The application relates to the time offset of television signals, and more particularly to the simultaneous recording, storage, and playback of television signals. After examination, the office action is as follows:

1. Claim 1 asks to protect a method for simultaneous storage and playback of multimedia data in a computer environment; while Reference 1 (CN 1173095A) discloses a television device having the function of text data processing, and specifically discloses (Page 3, Line 3 to Page 9, Line 16; and Figs. 1-7): "a tuner (11, 17) for providing a plurality of input signals, wherein said tuner receiving analog and/or digital television signals, each turner respectively tunes to a particular output signal; a video processing circuit (12, 18) for converting the analog television signals to digital signals; output apparatus (15); the video processing circuit (12, 18) decoding the particular digital signal into a television output signal; transmitting the television output signal to television monitor (16); the output apparatus (15) allows for a picture displaying on the television monitor". The differences between the technical solution of Claim 1 and that of Reference 1 lie in: "storing digital signals and digital television signals in the storage apparatus; providing a plurality of output apparatuses; each of the apparatus extracts a particular digital signal from said storage apparatuses". The technical problem to be solved by the above distinguishing features is allowing the user to store selected television program, and to concurrently watch or playback another program. Reference 2 (CN 1156942A) discloses an apparatus and method for recording and reproducing data, and specifically discloses (Page 10, Line 15 to Page 33, Line 8; and Figs. 1-16): "storing the digital signals and television signals in the storage apparatus (30, 32); the output apparatus (60, 70, 61, 71) extracting a particular digital signal from said storage apparatus". Providing a plurality of output apparatuses is a technical measure commonly used in the art. The technical problem to be

solved by the combination of Reference 2 and common technical measure is allowing the user to store selected television program and to concurrently watch or playback another program, which is the same as the above technical problem solved by the above distinguishing technical features. Therefore, the usage of corresponding technical features of Reference 2 and common technical measure in Reference 2 is the same as in Claim 1. Therefore, the technical solution of Claim 1 can be derived by those skilled in the art from the combination of References 1 and 2 and common technical measures in the art. Therefore, this combination has no unexpected technical effect and can be easily contemplated by those skilled in the art. Therefore, the technical solution of Claim 1 neither has prominent substantial features nor has notable progress, not complying with the provision prescribed in Item 3, Article 22 of the Patent Law.

2. The apparatus asked to protect in Claim 12 corresponds to the method of Claim 1. Though the objects for protection of claims 12 and 1 are different, the technical solutions of claims 1 and 12 are substantially the same since they have corresponding technical features. Since the method of Claim 1 lacks an inventive step, for the same reason as above, Claim 12 neither has prominent substantial features nor has notable progress, not complying with the provision prescribed in Item 3, Article 22 of the Patent Law.

3. Claim 23 asks to protect a method for simultaneous storage and playback of multimedia data in a computer environment; while Reference 1 (CN 1173095A) discloses a television device having the function of text data processing, and specifically discloses (Page 3, Line 3 to Page 9, Line 16; and Figs. 1-7): "a tuner (11, 17) for providing a plurality of input signals, wherein said tuner receiving analog and/or digital television signals, each turner respectively tunes to a particular output signal; a video processing circuit (12, 18) for decoding the particular digital signal into a television output signal; transmitting the television output signal to television monitor (16); the output apparatus (15) allows for a picture displaying on the television monitor". The differences between the technical solution of Claim 23 and that of Reference 1

lie in: "separating the digital signals or digital television signals into video components and audio components; storing digital signals and digital television signals in the storage apparatus; providing a plurality of output apparatuses; each of the apparatus extracts a particular digital signal from said storage apparatuses". The technical problem to be solved by the above distinguishing features is allowing the user to store selected television program, and to concurrently watch or playback another program. Reference 2 (CN 1156942A) discloses an apparatus and method for recording and reproducing data, and specifically discloses (Page 10, Line 15 to Page 33, Line 8; and Figs. 1-16): "storing the digital signals and television signals in the storage apparatus (30, 32); the output apparatus (60, 70, 61, 71) extracting a particular digital signal from said storage apparatus". Providing a plurality of output apparatuses and separating digital signals and digital television signals into video components and audio components are technical measures commonly used in the art. The technical problem to be solved by the combination of Reference 2 and common technical measures is allowing the user to store selected television program and to concurrently watch or playback another program, which is the same as the above technical problem solved by the above distinguishing technical features. Therefore, the usage of corresponding technical features of Reference 2 and common technical measure in Reference 2 is the same as in Claim 23. Therefore, the technical solution of Claim 23 can be derived by those skilled in the art from the combination of References 1 and 2 and common technical measures in the art. Therefore, this combination has no unexpected technical effect and can be easily contemplated by those skilled in the art. Therefore, the technical solution of Claim 23 neither has prominent substantial features nor has notable progress, not complying with the provision prescribed in Item 3, Article 22 of the Patent Law.

4. The apparatus asked to protect in Claim 35 corresponds to the method of Claim 23. Though the objects for protection of claims 23 and 35 are different, the technical solutions of claims 23 and 35 are substantially the same since they

have corresponding technical features. Since the method of Claim 23 lacks an inventive step, for the same reason as above, Claim 35 neither has prominent substantial features nor has notable progress, not complying with the provision prescribed in Item 3, Article 22 of the Patent Law.

5. The combination of Reference 3 (CN1189045A) and Reference 2 would also affect the inventiveness of claims 1, 12, 23, and 35. Therefore, the technical solutions of claims 1, 12, 23, and 35 neither have prominent substantial features nor have notable progress with respect to the combination of References 2 and 3, not complying with the provision prescribed in Item 3, Article 22 of the Patent Law.

6. (This deficiency would be overcome by us.)

7. The additional technical features of claims 3-9 are not recited in and supported by the Specification, not complying with the provision of Item 4, Article 26 of the Patent Law. Similarly, claims 14-21, 25-31, and 37-43 do not comply with the provision of Item 4, Article 26 of the Patent Law, either. The applicant should delete the above claims.

8. The additional technical features of Claim 4, "the user selects which of said output devices displays in said picture in a picture display", is unclear. Further, the "output devices" in Claim 4 is unclear too. According to the Examiner's understanding, "said output devices" in Claim 4 should be "said plurality of output devices" in order to be consistent with the recitations in the cited claim. The above unclearness cause the scope of protection of Claim 4 unclear, not complying with the provision prescribed in Item 1, Rule 20 of the Implementing Regulations. Claims 15, 26, and 38 also have the above problems. If the applicant changes the claims 4, 15, 26, and 38 into other formulations, such formulations should be recited in the Specification already.

9. (This deficiency would be overcome by us.)

10. The "decoding module" in Claim 19 does not exist in the cited Claim 13; therefore, it's inappropriate to use the word "said" before "decoding module". The applicant can either change "said decoding module" to "said

module for decoding", or change the additional technical feature of Claim 13 to "a decoding module for accepting control commands from a user". Claim 42 has similar problem too. Similarly, the "said storage module" of Claim 46 has the same problem too. Therefore, claims 19, 42, and 46 do not comply with the provision prescribed in Item 1, Rule 20 of the Implementing Regulations.

11. The technical solution of independent claims 1, 12, 23, and 36 do not appear in the Summary of Invention section in the Specification, causing that claims 1, 12, 23, and 36 are not supported by the Specification in terms of form, not complying with the provision prescribed in Item 4, Article 26 of the Patent Law. After amending the independent claims, the applicant should amend the Summary of Invention section correspondingly.

12. (This deficiency would be overcome by us.)

13. (This deficiency would be overcome by us.)

14. The reference sign of figure "21" on Page 5, Line 24 (WO00/07368: "user of line 21") of the Specification does not appear in corresponding Fig. 1, not complying with the provision prescribed in Item 3, Rule 19 of the Implementing Regulations.

15. The Abstract contains more than 300 Chinese words, not complying with the provision prescribed in Item 2, Rule 24 of the Implementing Regulations. The applicant should amend the Abstract to overcome this deficiency.

16. The subtitles in the Specification are not precise, not complying with the provision prescribed in Item 1, Rule 18 of the Implementing Regulations. The Specification should be drafted in five sections: 1) Technical Field; 2) Background Art; 3) Summary of invention; 4) Description of Figures; and 5) Detailed Embodiments.

Summing up the above, this application cannot be granted a patent right based on the present application documents. If the applicant amends the application documents according to the Office Action to overcome the

objections, the application will be granted a patent right; otherwise the application will be rejected. Please note that the amendments to the application documents shall conform with Article 33 of the Chinese Patent Law, i.e., the amendments cannot go beyond the scope of disclosure contained in the initial Description and Claims.

1. A process for simultaneous storage and playback of multimedia data in a computer environment, comprising the steps of:

providing a plurality of input signal tuners;

wherein said tuners accept analog and/or digital television broadcast signals;

wherein each of said tuners is individually tuned to a specific broadcast signal;

converting analog television broadcast signals into a digital signal;

storing said digital signals and digital television broadcast signals on a storage device;

providing a plurality of output devices;

wherein each of said output devices extracts a specific digital signal from said storage device;

decoding said specific digital signals into a television output signal;

sending said television output signal to a television monitor; and

wherein said plurality of output devices allows for a picture in a picture display on said television monitor.

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

accepting control commands from a user.

3. The process of claim 2, wherein the user selects the picture in a picture option to be displayed on said television monitor.

4. The process of claim 2, wherein the user selects which of said output devices displays in said picture in a picture display.

5. The process of claim 2, wherein the user selects the display position of each picture in the picture in a picture display.

6. The process of claim 2, wherein the user selects an individual tuner and the specific broadcast signal for said individual tuner.

7. The process of claim 2, wherein the user selects a specific digital signal to be extracted from said storage device and decoded.

8. The process of claim 2, wherein the user controls the decoding rate and direction of said decoding step to perform variable rate fast forward and rewind, frame step, pause, and play functions on said television output signal.

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

inserting on screen displays into said television output signal.

10. The process of claim 1, wherein the specific broadcast signal for an individual tuner is selected automatically based on the current date and time.

11. The process of claim 1, wherein the specific broadcast signal for an individual tuner is selected automatically based on a particular word or phrase in said broadcast signal.

12. An apparatus for simultaneous storage and playback of multimedia data in a computer environment, comprising:

a plurality of input signal tuners;

wherein said tuners accept analog and/or digital television broadcast signals;

wherein each of said tuners is individually tuned to a specific broadcast signal;

a module for converting analog television broadcast signals into a digital signal;

a module for storing said digital signals and digital television broadcast signals on a storage device;

a plurality of output devices;

wherein each of said output devices extracts a specific digital signal from said storage device;

a module for decoding said specific digital signals into a television output signal;

a module for sending said television output signal to a television monitor; and

wherein said plurality of output devices allows for a picture in a picture display on said television monitor.

13. The apparatus of claim 12, further comprising:

a module for accepting control commands from a user.

14. The apparatus of claim 13, wherein the user selects the picture in a picture option to be displayed on said television monitor.

15. The apparatus of claim 13, wherein the user selects which of said output devices displays in said picture in a picture display.

16. The apparatus of claim 13, wherein the user selects the display position of each picture in the picture in a picture display.

17. The apparatus of claim 13, wherein the user selects an individual tuner and the specific broadcast signal for said individual tuner.

18. The apparatus of claim 13, wherein the user selects a specific digital signal to be extracted from said storage device and decoded.

19. The apparatus of claim 13, wherein the user controls the decoding rate and direction of said decoding module to perform variable rate fast forward and rewind, frame step, pause, and play functions on said television output signal.

20. The apparatus of claim 12, further comprising:

a module for inserting on screen displays into said television output signal.

21. The apparatus of claim 12, wherein the specific broadcast signal for an individual tuner is selected automatically based on the current date and time.

22. The apparatus of claim 12, wherein the specific broadcast signal for an individual tuner is selected automatically based on a particular word or phrase in said broadcast signal.

23. A process for simultaneous storage and playback of multimedia data in a computer environment, comprising the steps of:

providing a plurality of input signal tuners;

wherein said tuners accept analog and/or digital television broadcast signals;

wherein each of said tuners is individually tuned to a specific broadcast signal;

converting analog television broadcast signals into a digital signal;

separating a digital signal or digital television broadcast signal into its video and audio components;

storing said video and audio components on a storage device;

providing a plurality of output devices;

wherein each of said output devices extracts a specific video and audio component from said storage device;

decoding said specific video and audio components into a television output signal;

sending said television output signal to a television monitor; and

wherein said plurality of output devices allows for a picture in a picture display on said television monitor.

24. The process of claim 23, further comprising the step of:

accepting control commands from a user.

25. The process of claim 24, wherein the user selects the picture in a picture option to be displayed on said television monitor.

26. The process of claim 24, wherein the user selects which of said output devices displays in said picture in a picture display.

27. The process of claim 24, wherein the user selects the display position of each picture in the picture in a picture display.

28. The process of claim 24, wherein the user selects an individual tuner and the specific broadcast signal for said individual tuner.

29. The process of claim 24, wherein the user selects a specific video and audio component to be extracted from said storage device and decoded.

30. The process of claim 24, wherein the user controls the decoding rate and direction of said decoding step to perform variable rate fast forward and rewind, frame step, pause, and play functions on said television output signal.

31. The process of claim 23, further comprising the step of:

inserting on screen displays into said television output signal.

32. The process of claim 23, wherein the specific broadcast signal for an individual tuner is selected automatically based on the current date and time.

33. The process of claim 23, wherein the specific broadcast signal for an individual tuner is selected automatically based on a particular word or phrase in said broadcast signal.

34. The process of claim 23, further comprising the steps of:

extracting other signal components from said digital signal or said digital television broadcast signal;

wherein said storage step stores said other signal components on said storage device;

wherein each of said output devices extracts the associated signal components of said specific video and audio components from said storage device; and

reproducing said associated signal components into their proper location in said television output signal.

35. An apparatus for simultaneous storage and playback of multimedia data in a computer environment, comprising:

a plurality of input signal tuners;

wherein said tuners accept analog and/or digital television broadcast signals;

wherein each of said tuners is individually tuned to a specific broadcast signal;

a module for converting analog television broadcast signals into a digital signal;

a module for separating a digital signal or digital television broadcast signal into its video and audio components;

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

a plurality of output devices;

wherein each of said output devices extracts a specific video and audio component from said storage device;

a module for decoding said specific video and audio components into a television output signal;

a module for sending said television output signal to a television monitor; and

wherein said plurality of output devices allows for a picture in a picture display on said television monitor.

36. The apparatus of claim 35, further comprising:

a module for accepting control commands from a user.

37. The apparatus of claim 36, wherein the user selects the picture in a picture option to be displayed on said television monitor.

38. The apparatus of claim 36, wherein the user selects which of said output devices displays in said picture in a picture display.

39. The apparatus of claim 36, wherein the user selects the display position of each picture in the picture in a picture display.

40. The apparatus of claim 36, wherein the user selects an individual tuner and the specific broadcast signal for said individual tuner.

41. The apparatus of claim 36, wherein the user selects a specific video and audio component to be extracted from said storage device and decoded.

42. The apparatus of claim 36, wherein the user controls the decoding rate and direction of said decoding module to perform variable rate fast forward and rewind, frame step, pause, and play functions on said television output signal.

43. The apparatus of claim 35, further comprising:

a module for inserting on screen displays into said television output signal.

44. The apparatus of claim 35, wherein the specific broadcast signal for an individual tuner is selected automatically based on the current date and time.

45. The apparatus of claim 35, wherein the specific broadcast signal for an individual tuner is selected automatically based on a particular word or phrase in said broadcast signal.

46. The apparatus of claim 35, further comprising:

a module for extracting other signal components from said digital signal or said digital television broadcast signal;

wherein said storage module stores said other signal components on said storage device;

wherein each of said output devices extracts the associated signal components of said specific video and audio components from said storage device; and

a module for reproducing said associated signal components into their proper location in said television output signal.

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(54) Television device having text data processing function

(57) This invention provides a television device in which text data can be continuously and stably obtained even when the switching of reception is made between a plurality of tuners. Outputs of first and second signals (11, 17) are input to and demodulated by video processing circuits (12, 18). One of outputs of the video processing circuits (12, 18) is selected by a selector (24) and input to a text decoder (20). In a case where the reception channel of the first tuner is switched to a channel received by the second tuner under a condition that the selector (24) selects the output of the video processing circuit (18), the selector (24) is switched to select the output of the video processing circuit (12) after the reception state of the first tuner becomes stable.

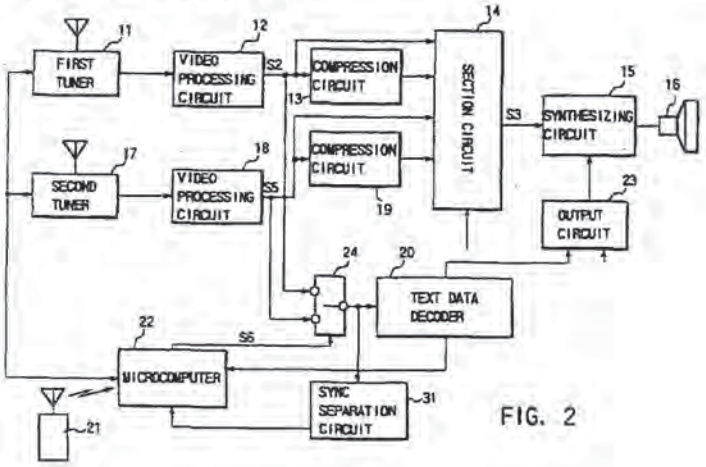

FIG. 2

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Description

This invention relates to a television device which has a text data processing function and a multiscreen display function and which can receive and display text data in addition to a television signal.

Recently, wide-screen television devices using a picture tube of oblong (wide) screen with the aspect ratio of 16 : 9 are widely used. There is provided a multiscreen system which permits a plurality of images with the aspect ratio of 4 : 3 to be displayed on the wide screen, for example, by making use of the merits of the wide screen. The television device of the multiscreen system can display a first image which is compressed in the horizontal direction as a parent screen on one side of the wide screen and display another compressed image as a child screen on a space area on the other side of the wide screen. The display mode is known as PIP (Picture In Picture). Further, in a television device of double-screen system (or double-window system), the wide screen can be divided into right and left areas of the same size and images of different broadcasting programs can be simultaneously displayed on the right and left shared screens.

To serve the above purpose, the television device of double-screen system has two different tuners.

Further, as one type of recent broadcasting, there is provided a data broadcasting program for transmitting text data multiplexed on the television signal. The text data is multiplexed in the vertical blanking period of the television signal.

In one application form of the television device of double-screen system, a normal television broadcasting program and a data broadcasting program are received, an image of the normal television broadcasting program is displayed on one of the shared screens, and an image of the text data of the data broadcasting program is displayed on the other shared screen.

As described above, the double-screen system can be utilized in various configurations of display types. That is, there are provided a one-screen display mode in which a normal television broadcasting program is received by use of only the first tuner and the image is displayed on the entire area of the wide screen, a double-screen display mode in which normal television broadcasting programs are received by use of the first and second tuners and respective images are displayed on the left and right screens, and a double-screen display mode in which text data is displayed on one of the screens.

However, in a case where the position of the user who utilizes the double-screen system is taken into consideration, a problem may occur particularly when a data broadcast is received. The user does not always fully understand the broadcasting system of text data and the broadcasting system of television program.

Assume now that a normal television broadcast is received by the first tuner of the television receiver of double-screen system, the program is displayed on the screen which is one of the double screens, a data broadcast is received by the second tuner, and the text data is displayed on the other screen of the double screens. Further, assume that, in this situation, the user watching and listening to the broadcast takes an interest in the text data, sets the one-screen display mode and sets the state in which the data broadcast is received by the first tuner.

In the above case, data of the data broadcast supplied to a decoder for the text data cannot be obtained until the operation of the first tuner becomes stabilized. As a result, it is sometimes impossible to see important text data.

Accordingly, an object of this invention is to provide a television device having a text data processing function capable of stably receiving text data even when one of a plurality of tuners is selectively switched to receive a data broadcast.

In order to attain the above object, there is provided a television device comprising a first tuner, a second tuner, a selector for selectively supplying a reception output of one of the first and second tuners to a text decoder, and control means for controlling the operation of the television device, wherein the control means keeps the channel selecting states of the first and second tuners in an overlapped state for a preset period of time when the first tuner is selected to receive a channel which is the same as a channel which gives a data broadcast received by the second tuner under a condition that the control means controls the selector to cause a reception output of the second tuner to be supplied to the text decoder, and controls the selector to supply a reception output of the first tuner to the text decoder when the reception state of the first tuner becomes stable.

By use of the above control means, the text decoder can stably acquire continuous text data.

This invention can be more fully understood form the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a diagram for illustrating text data;

FIG. 2 is a block diagram showing the construction of a television device having a text data processing function according to one embodiment of this invention;

FIG. 3A is a diagram showing the double-screen display state in the above embodiment;

FIG. 3B is a diagram showing the one-screen display state in the above embodiment;

FIG. 4A is a diagram showing the state of the display screen when the display state is switched from the double-screen display state to the one-screen display state;

FIGS. 4B and 4C are diagrams for illustrating a problem occurring when the display state is switched from the double-screen display state to

the one-screen display state;

FIGS. 5A to 5E are timing charts for illustrating the operation inherent to the device of this invention;

FIG. 6 is a diagram showing another embodiment of this invention; and

FIG. 7 is a block diagram showing an example of the concrete construction of a text data decoder.

There will now be described an embodiment of this invention with reference to the accompanying drawings.

FIG. 1 shows the positional relation of data items having text signals inserted into a television signal of normal NTSC system. That is, text signals D1 to D4 are transmitted in the respective vertical blanking periods. The text signal is inserted into the tenth horizontal period (10H) to the thirteenth horizontal period (13H) of the vertical blanking period in the same manner as in the multiplexed text system. The multiplexed text signal is repeatedly broadcasted, but the text signal is broadcasted as real-time information synchronized with the corresponding main program. Of course, the text signal may be broadcasted repeatedly in the same manner as the multiplexed text signal.

FIG. 2 shows a television device having a function of processing the above text data.

The television device has two systems each including a receiving system such as a tuner for receiving ground waves in order to make full use of the double-screen function. A television signal S1 output from a first tuner 11 is supplied to a video processing circuit 12. A video signal S2 which is an output signal of the video processing circuit 12 is supplied to a compression circuit 13 and selection circuit 14.

A memory (not shown) is connected to the compression circuit 13 so that a compressed still picture can be stored and pictures of the respective channels can be sequentially stored and read out in the channel search mode.

A video signal output from the compression circuit 13 is supplied to the selection circuit 14. A video signal S3 selected by the selection circuit 14 is converted into an analog signal in a synthesizer circuit 15 and then supplied to a color cathode ray tube 16 for image display.

On the other hand, a television signal S4 output from a second tuner 17 is supplied to a video processing circuit 18. A video signal S5 which is an output signal of the video processing circuit 18 is supplied to a compression circuit 19 and selection circuit 14. A video signal S3 selected by the selection circuit 14 is supplied to the color cathode ray tube 16 via the synthesizing circuit 15 and a corresponding image is displayed.

Further, the output video signal S2 of the video processing circuit 12 is supplied to one of two terminals of a selector 24. The output video signal S5 of the video processing circuit 18 is supplied to the other terminal of the selector 24. A signal selected by the selector 24 is input to a text data decoder 20. If the text data decoder 20 is switched into a text processing mode via a microcomputer 22 by the operation of a remote controller 21, a text data processing operation is effected. An output signal obtained by the text processing operation is supplied to the synthesizing circuit 15 via an output circuit 23 in which the output timing is controlled. As a result, the text image is superposed on the image output from the selection circuit 14 and displayed.

The above television device is normally constructed such that the video processing circuit 12 has a higher performance and provides an image of higher image quality in comparison with the video processing circuit 18.

Further, in the above television device, an output signal of the selector 24 is supplied to a sync separation circuit 31. A synchronizing signal separated in the sync separation circuit 31 is supplied to the microcomputer 22. Further, the selector 24 is controlled by a switching control signal S6 from the microcomputer 22.

The microcomputer 22 is designed to control the switching position of the selector 24 in a period other than the period of the synchronizing signal supplied from the sync separation circuit 31 when controlling the selector 24.

With the above device, various display methods can be attained.

First, the channel of the system including the video processing circuit 12 is selected to perform the normal image display. At this time, the one-screen display mode is specified and the output video signal S2 from the video processing circuit 12 is selected by the selection circuit 14, supplied to the color cathode ray tube 16 via the synthesizing circuit 15 and displayed on the color cathode ray tube.

Next, when the double-screen display mode is specified, the video signal S2 of the video processing circuit 12 is compressed to 1/2 in the horizontal direction by the compression circuit 13 and the video signal S5 of the video processing circuit 18 is compressed by half in the horizontal direction by the compression circuit 19. The selection circuit 14 alternately selects the outputs of the compression circuits 13 and 19 for every 1/2 horizontal period and supplies the selected output to the synthesizing circuit 15. As a result, a video image of a channel selected by the first tuner 11 is displayed on the left side of the display screen and a video image of a channel selected by the second tuner 17 is displayed on the right side of the display screen.

The output video signals of the video processing circuits 12 and 18 are supplied to and synchronized by a synchronization processing circuit (not shown) and then output.

In the double-screen display mode, the television signal S1 received by the first tuner 11 is displayed as a parent picture on a left screen 411 of a wide screen 41 as shown in FIG. 3A. The television signal S4 received by the second tuner 17 is displayed as a child picture on a right screen 412 of the wide screen 41 as shown in

FIG. 3A. In the one-screen display mode, the parent picture is displayed on the entire area of the wide screen 41 as shown in FIG. 3B.

In this example, a case wherein text data is first displayed on the screen 412 and then the text data display state is switched to the display state in the wide screen as shown in FIG. 3B is explained.

Assume now that, for example, a double-screen display state in which a video image of a first channel by the first tuner is displayed on the left screen and text data and a video image of a fourth channel by the second tuner 17 are displayed on the right screen (the text data decoder 20 selects the second tuner 17 side) is set as shown in FIG. 4A. Further, assume that the display state is switched from the present state to a state in which the video image of the fourth channel and text data are displayed on the entire area of the wide screen.

When the display state is switched from the double-screen display state to the one-screen display state, the operation state of the first tuner 11 is switched from a state in which the first channel is received to a state in which the fourth channel is received and an unstable state occurs until the channel selection is completed (refer to FIG. 4B).

The unstable state occurs because it takes a long time to correctly perform the AGC (Automatic Gain Control) and the conversion of PLL (Phase Locked Loop) data of the selection circuit at the time of channel switching. Therefore, in a preset period of time after the screen switching operation has been effected, the reception signal in the system of the first tuner becomes unstable and text data cannot be correctly reproduced (refer to FIG. 4C).

At this time, if the selector 24 is immediately switched to select an output of the first video processing circuit 12, a problem occurs. That is, part of text data is lost in the unstable period as shown in FIG. 4C and part of the text data transmitted on the real-time basis is missed. For example, information such as an address and telephone number transmitted as text data is sometimes lost.

In the field of application of the text data broadcasting, teleshopping is provided. That is, goods or articles are introduced in a television program, and information such as the article codes of the respective articles and the dealing shops thereof is transmitted as text data. If the channel switching operation described above is effected in such a television program, a telephone number for doing the teleshopping is sometimes lost.

In order to solve the above problem, in the device of this invention, the screen switching operation is effected as follows so as to prevent occurrence of omission of data.

FIGS. 5A to 5E show the states of outputs and data obtained when the switching position of the selector 24 is controlled in a case where text data is input to the parent screen or child screen. That is, when the display mode is switched from the double-screen display mode to the one-screen display mode by operating the remote controller 21, first, the reception channel of the first tuner 11 is switched to a channel which is the same as the reception channel of the second tuner 17 by a selection control signal from the microcomputer 22. At this time, the selection circuit 14 selects the output signal of the video processing circuit 18 and an image of the television signal S4 (FIG. 5A) output from the second tuner 17 is displayed on the display screen 41. The selector 24 keeps the state in which the video processing circuit 18 is selected. As a result, text data items D1, D2 are not omitted and can be received into the text data decoder 20. The second tuner 17 continues to receive the program until the first tuner 11 is set to select a channel for a desired program and the image mute thereof is released.

At this time, in the first tuner 11, the reception channel is switched to the same channel as the reception channel of the second tuner 17. Therefore, the television signal S1 is changed to the channel of the television signal S4 received by the second tuner 17 after a channel selection stable time t1 has passed as shown in FIG. 5B. At the same time, it is subjected to the IF AGC control.

FIG. 5C shows a synchronizing signal output from the sync separation circuit 31 and FIG. 5D shows an output of the selector 24. The selector 24 may effect the switching operation when the synchronizing signal output from the sync separation circuit 31 is at the low level, that is, in a period other than the vertical blanking period. The synchronizing signal output from the sync separation circuit 31 shown in FIG. 5C is input to the microcomputer 22. The microcomputer 22 sets the channel selection stable time t1 from the operation time of the screen switching key and then changes the switching position of the selector 24 from the second tuner 17 side to the first tuner 11 side in a period of time t2 other than the vertical blanking period. That is, it controls the selector 24 to select the output of the video processing circuit 12. Since the stable time t3 of the selector 24 at the time of switching thereof is extremely short time and the switching operation is effected in a period other than the vertical blanking period, the text data decoder 20 can receive text data items D3, D4, D5 shown in FIG. 5E derived from the first tuner 11 side. As a result, text data items D1 to D5 are not lost and can be decoded in the text data decoder 20. After input of the text data is switched to the first tuner 11, the second tuner 17 is set to receive another channel or set into the OFF state. Even if the time t2 is set as predetermined fixed time, the object of this invention can be attained. Further, it is possible to provide means for positively monitoring and determining whether or not the reception state of the tuner 11 becomes stable in order to determine the switching timing of the selector 24 and use an output of the monitoring means so as to switch the switching position of the selector 24.

Switching of the display images on the wide screen

is effected by use of the selection circuit 14. The switching can be effected in the horizontal synchronizing signal period or vertical synchronizing signal period, for example.

In the above example, the display mode is switched from the double-screen display mode to the one-screen display mode and the test data reception state of the second tuner side is switched to the text data reception state of the first tuner. However, the concept of this invention is not limited to the above mode switching operation. For example, this invention can be applied in a case wherein the switching operation is effected between the reception channel of the first tuner and the reception channel of the second tuner while the state of the double-screen display mode is maintained. More specifically, the reception channels of one of the tuners which now receives text data and the other tuner which is to receive the text data are controlled to overlap in a preset period of time so as to prevent the text data from being lost. After the overlapping period of time has passed, an output of the other (latter) tuner which now receives the text data is supplied to the text data decoder and then the reception state of the former tuner is controlled. During the overlapping period, the text data decoder selects the output of the former tuner.

FIG. 6 shows another embodiment of this invention.

In this embodiment, portions which are the same as those in the former embodiment are denoted by the same reference numerals. This embodiment is different from the former embodiment of FIG. 2 in that an output video signal S2 of the video processing circuit 12 and an output video signal S5 of the video processing circuit 18 are supplied to a switching section 51, one of the two output signals of the switching section 51 is supplied to a V/C/D processing circuit 52, and the other output signal thereof is supplied to the compression circuit 19 and selection circuit 14. The V/C/D processing circuit 52 is a video/chroma/deflection processing circuit, and can adjust the image quality by controlling the luminance signal and can adjust the hue and color balance by controlling the chroma signal. Further, it processes the synchronizing signal for deflection process.

The V/C/D processing circuit 52 processes the output video signal selected and derived by a switch 511 of the switching section 51 and supplies the processed output video signal to the selection circuit 14 and compression circuit 13. Further, the V/C/D processing circuit 52 separates the synchronizing signal from the output video signal selected and derived by the switch 511 of the switching section 51 and supplies the synchronizing signal to the microcomputer 22.

In the switching section 51, the switch 511 normally selects a signal on the first tuner 11 side and a switch 512 selects a signal on the second tuner 17 side.

The switching section 51 is used to replace the right and left images in the double-screen display mode. That is, if the switch 511 is set to select the output on the tuner 17 side and the switch 512 is set to select the output on the tuner 11 side, the images of the right and left positions can be replaced with each other.

Assume now that the display state is switched from the double-screen display state to the one-screen display state as shown in FIG. 4A like the case of the former embodiment. In this case, the switch 511 is switched to the second tuner 17 side based on a switching control signal from the microcomputer 22. Therefore, the V/C/D processing circuit 52 processes the output video signal of the same program as that of the output video signal selected and derived by the switch 512. The selection circuit 14 selects the output signal of the V/C/D processing circuit 52 and outputs the same as a signal for the wide display screen. Further, the reception state of the first tuner 11 is set to the reception state of a channel which is the same as the reception channel of the second tuner 17 in which the text broadcasting is performed.

As a result, at this time, an image of the channel received by the second tuner 17 and text data are displayed on the wide display screen.

The reception state of the first tuner 11 becomes stable when a preset period of time has passed. Then, the microcomputer 22 controls the switch 511 to select the video signal on the first tuner 11 side. Further, when the switching position of the selector 24 is switched, the microcomputer 22 monitors the synchronizing signal from the V/C/D processing circuit 52 and controls the selector 24 to select the signal on the first tuner 11 side in a period other than the period of the vertical synchronizing signal.

According to the above embodiment, an example in which the double-screen display mode is used is explained, but it is of course possible to apply this invention to the multiscreen display and PIP process. Further, as data dealt in the text data decoder 20, various data items such as an script used in another data broadcasting and inter text data can be used.

As described above, according to this invention, text data can be continuously received even when the switching operation of reception between a plurality of tuners is effected and the text data process of high reliability can be attained.

FIG. 7 shows an example of the concrete construction of the text data decoder.

A video signal is input to a sync separation section 122 and A/D converter 123 via an input terminal 121. Digital data explained with reference to FIG. 1 is superposed on the vertical blanking period of the video signal. Data converted into the digital form in the A/D converter 123 is subjected to the waveform equalization process in a waveform equalizing section 124 and supplied to a data fetching/error correcting section 125.

The data fetching/error correcting section 125 fetches a text signal based on the timing signal from the sync separation section 122 and performs the error correction process. A CPU 127 is operated based on a fixed program stored in a program ROM 128. In a char-

acter font ROM 129, character fonts for displaying characters are stored and character data can be read out by causing the CPU 127 to address a desired character in the character font ROM 129.

A display synchronizing signal which is synchronized with the operation of the television device is supplied to an input terminal 130. The synchronizing signal is supplied to a display control section 131. The display control section 131 effects the process for reading out data of a display memory 132 in synchronism with reproduction of a television image and writing display data into the display memory 132 in response to a write instruction from the CPU 127.

Data read out from the display memory 132 is supplied to a color map memory 133. The color map memory 133 receives display data as an address input and outputs level data of primary color signals R, G, B corresponding to the address. The level data is converted to analog R, G, B signals by a D/A converter 134 and they are derived from an output terminal as a display signal.

The display signal is synthesized with the television signal by synthesizing means (not shown) and displayed on the display. Further, the D/A converter 134 can be omitted and the R, G, B signals output from the color map memory 133 can be used as they are depending on the type of an interface on the display side.

An operation signal generated from the operating section of the remote controller operated by the viewer is input via an input terminal 136. The operation signal is fetched by the CPU 127 via an operation input interface (I/F) 137 and then analyzed.

A modem 138 contains a modulator and demodulator to construct a communication control section and is connected to a telephone line 140 via a line connecting section 139. The line connecting section 139 controls connection/disconnection to or from the telephone line 140 and is controlled by the CPU 127.

The CPU 127 is connected to function blocks, that is, the data fetching/error correcting section 125, program ROM 128, character font ROM 129, operation input interface 137, work RAM 141, program RAM 142 and nonvolatile memory 143 via the bus line.

The program RAM 142 is a memory for storing a script (computer program) transmitted from the broadcasting station, the content of the script is interpreted according to an interpreter in the fixed program stored in the ROM 128 by the operation of the viewer and a preset process can be executed according to the procedure.

A fixed identification number (ID) of the reception terminal is stored in the nonvolatile memory 143 and when order data is transmitted to the data collecting station in the teleshopping, for example, the identification number is used. In the data collecting station, the orderer is determined by recognizing the identification number.

The above circuit construction is used when the multiplexed text broadcasting program is processed. That is, if reception of the multiplexed text broadcasting program is specified by the operation of the remote controller, the CPU 127 is switched to be put under control of the multiplexed text broadcast processing program stored in the program ROM 128. Then, transmitted character data is converted to display data in the character font ROM 129 and stored into the display memory 132 via the display control section 131.

Claims

1. A television device having a text data processing function characterized by comprising:

   a first tuner (11);
   a first signal processing system (12) for processing an output signal of said first tuner;
   a second tuner (12);
   a second signal processing system (18) for processing an output signal of said second tuner;
   a selector (24) for selectively supplying an output signal of one of said first and second signal processing systems to a text decoder (20); and
   control means for controlling the operation of the television device;
   wherein said control means (22) keeps the channel selecting states of said first and second tuners in an overlapped state for a preset period of time when said first tuner is selected to receive a channel which is the same as a channel received by said second tuner under a condition that said control means controls said selector (24) to cause an output signal of said second signal processing system to be supplied to said text decoder, and controls said selector to supply a reception output of said first tuner to said text decoder when the reception state of said first tuner becomes stable.

2. A television device having a text data processing function according to claim 1, characterized in that said control means controls the switching operation of said selector in a period other than the vertical blanking period of an output signal of said first tuner.

3. A television device having a text data processing function according to claim 1, characterized in that the text data is inter text data.

4. A television device having a text data processing function comprising:

   reception means (11, 12, 17, 18) having at least first and second tuners and capable of

receiving and demodulating television broadcasting signals of two channels;

video signal processing means (13, 14, 19) for independently displaying a video signal which is a reception signal of said first tuner or compressing at least one of video signals which are reception signals of said first and second tuners to simultaneously display the video signals on a display device;

selector means (24) for selectively deriving the television broadcasting signals received by said first and second tuners;

text receiving/demodulating means (20) for receiving an output of said selector means and receiving and demodulating transmitted text data superposed on a data channel contained in the television broadcasting signal and independent from the video/audio signal thereof;

text synthesizing means (15, 23) for synthesizing the text data demodulated by said text receiving/demodulating means (20) with an output of said video signal processing means;

synchronization separation means (31) for separating a synchronizing signal from an output of said selector means; and

switching control means (22) for controlling the switching operation of said selector means in a period other than the vertical blanking period based on the synchronizing signal from said synchronization separation means after the channel selection becomes stable in a case where a selected channel of said first tuner is switched to a channel selected by said second tuner.

5. A television device having a text data processing function according to claim 4, characterized by further comprising channel selection control means for controlling said first and second tuners to temporarily receive the same channel program in a case where a reception channel of said first tuner is switched to a channel received by said second tuner; and means for setting said second tuner to another channel or setting said second tuner into an OFF state after the selection channel of said first tuner is switched.

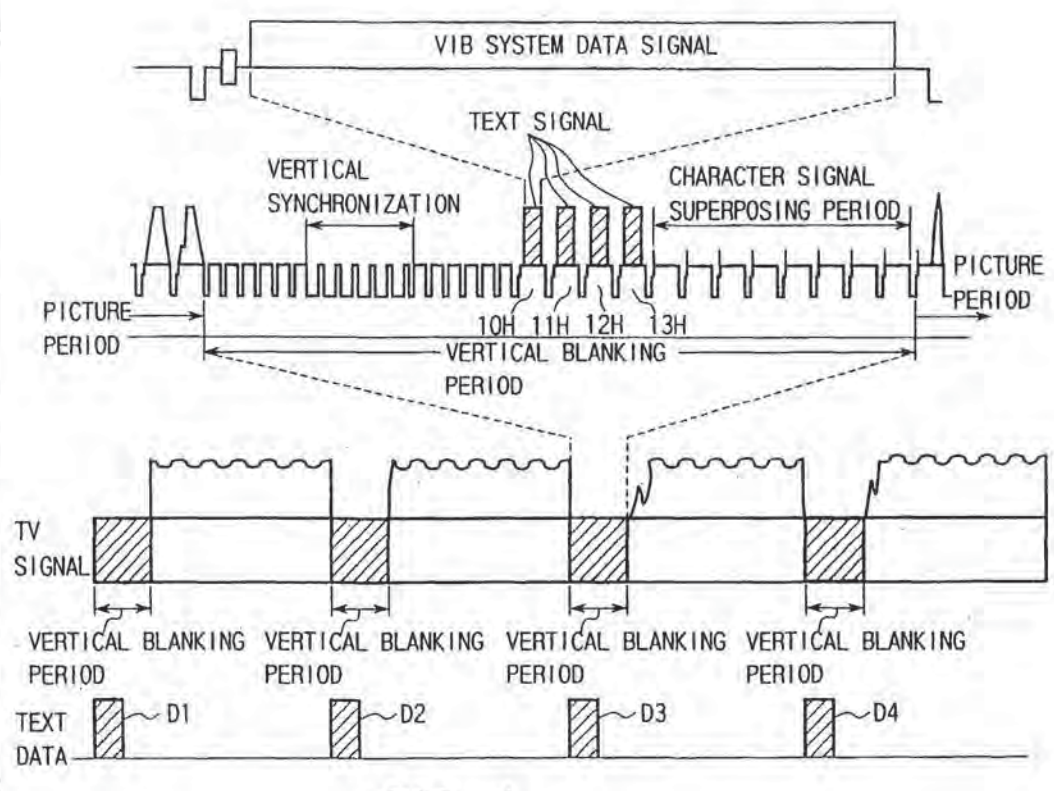
VIB SYSTEM DATA SIGNAL
TEXT SIGNAL
VERTICAL SYNCHRONIZATION
CHARACTER SIGNAL SUPERPOSING PERIOD
PICTURE PERIOD
PICTURE PERIOD
10H 11H 12H 13H
VERTICAL BLANKING PERIOD
TV SIGNAL
VERTICAL BLANKING PERIOD
VERTICAL BLANKING PERIOD
VERTICAL BLANKING PERIOD
VERTICAL BLANKING PERIOD
TEXT DATA
D1
D2
D3
D4

FIG. 1

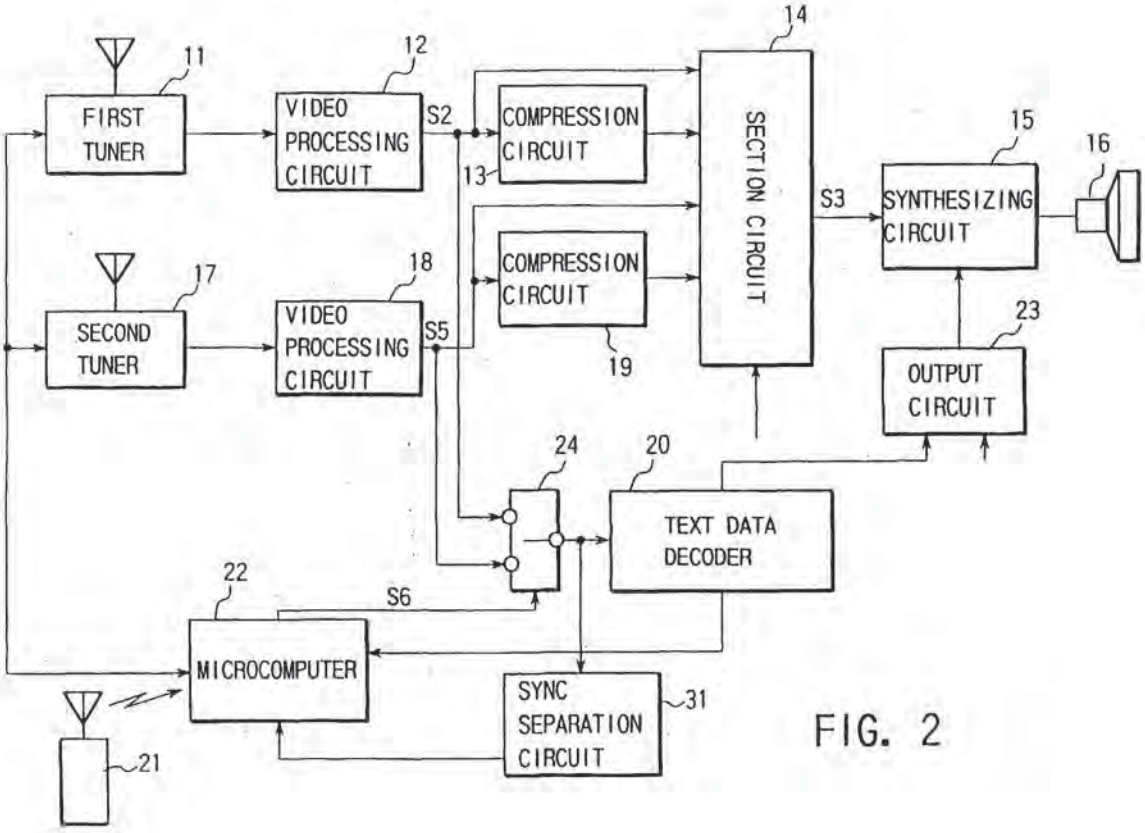

FIG. 2

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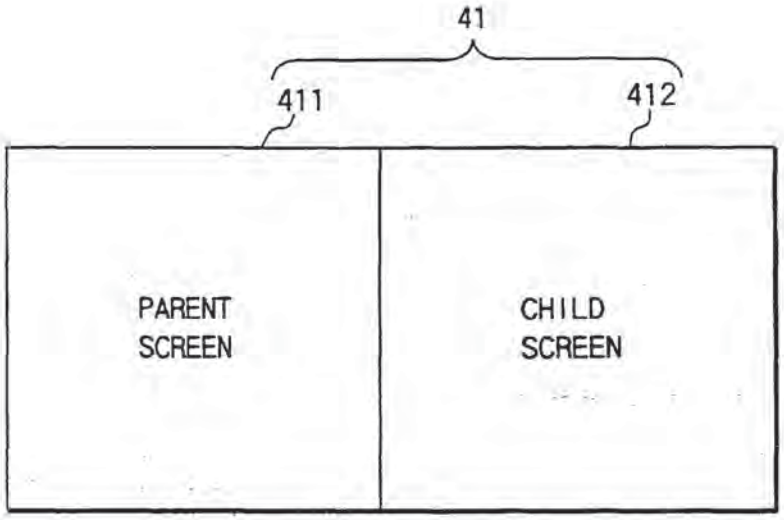

FIG. 3A

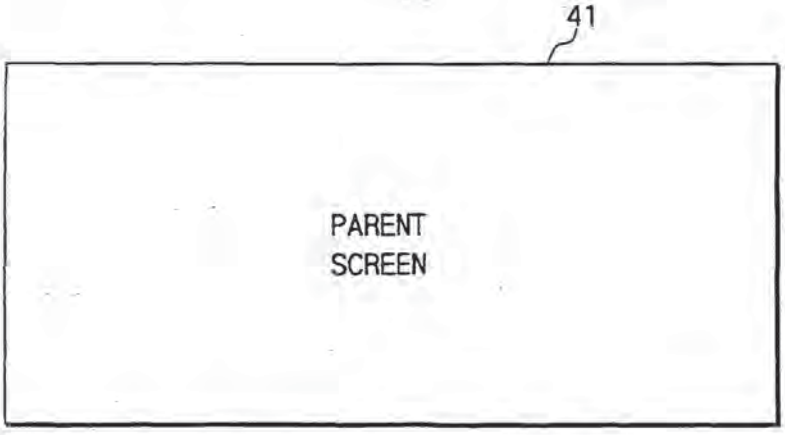

FIG. 3B

FIG. 4A

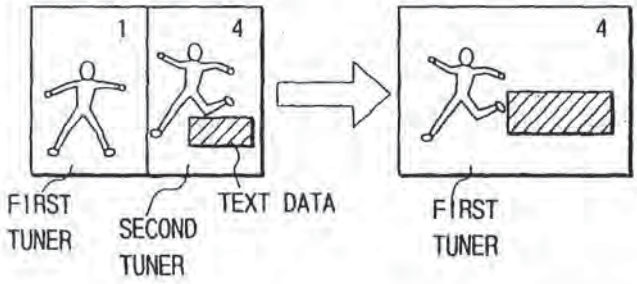

FIG. 4B

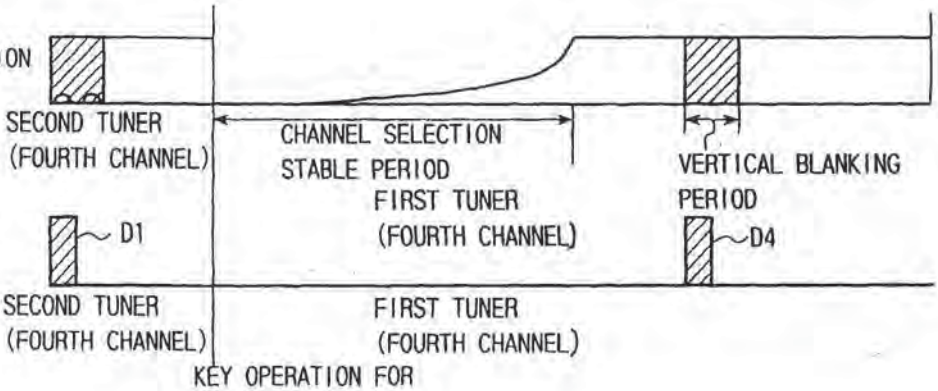

FIG. 4C

KEY OPERATION FOR SWITCHING OF DISPLAY SCREEN

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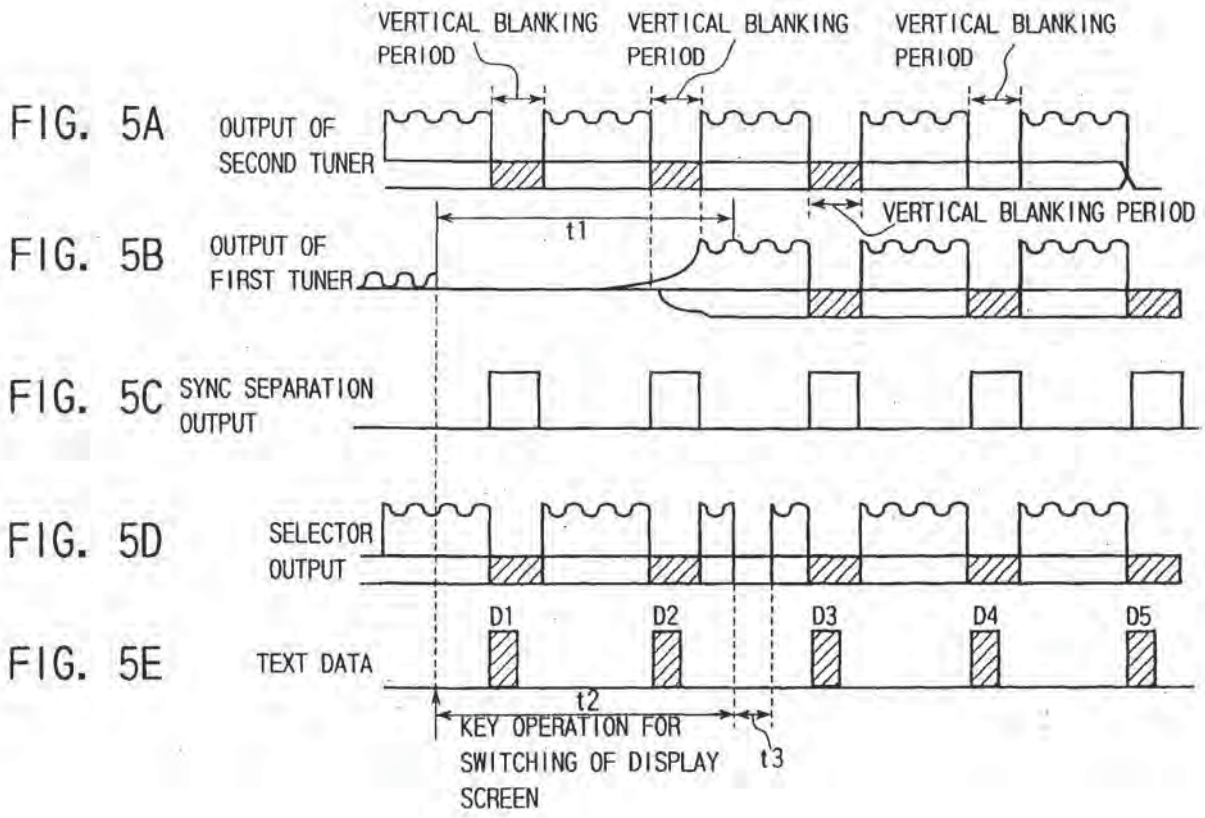

FIG. 5A

FIG. 5B

FIG. 5C

FIG. 5D

FIG. 5E

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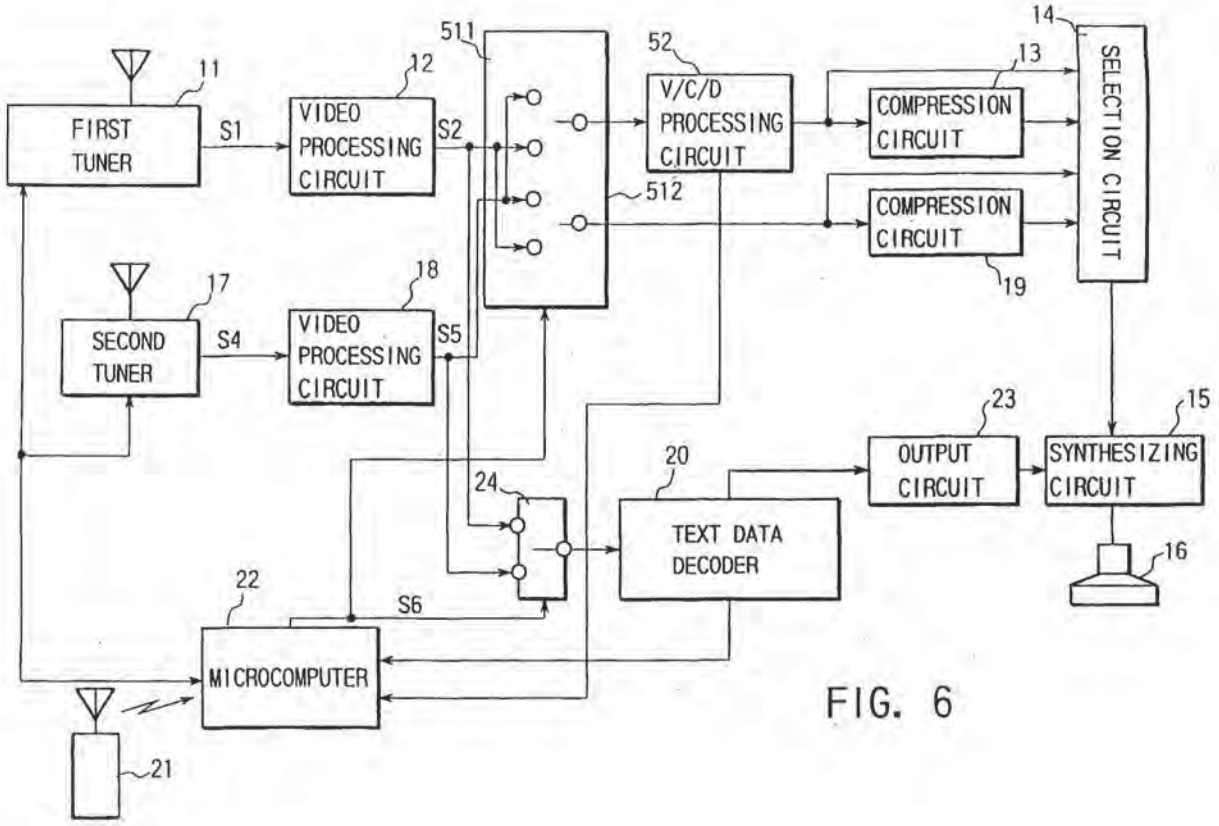

FIG. 6

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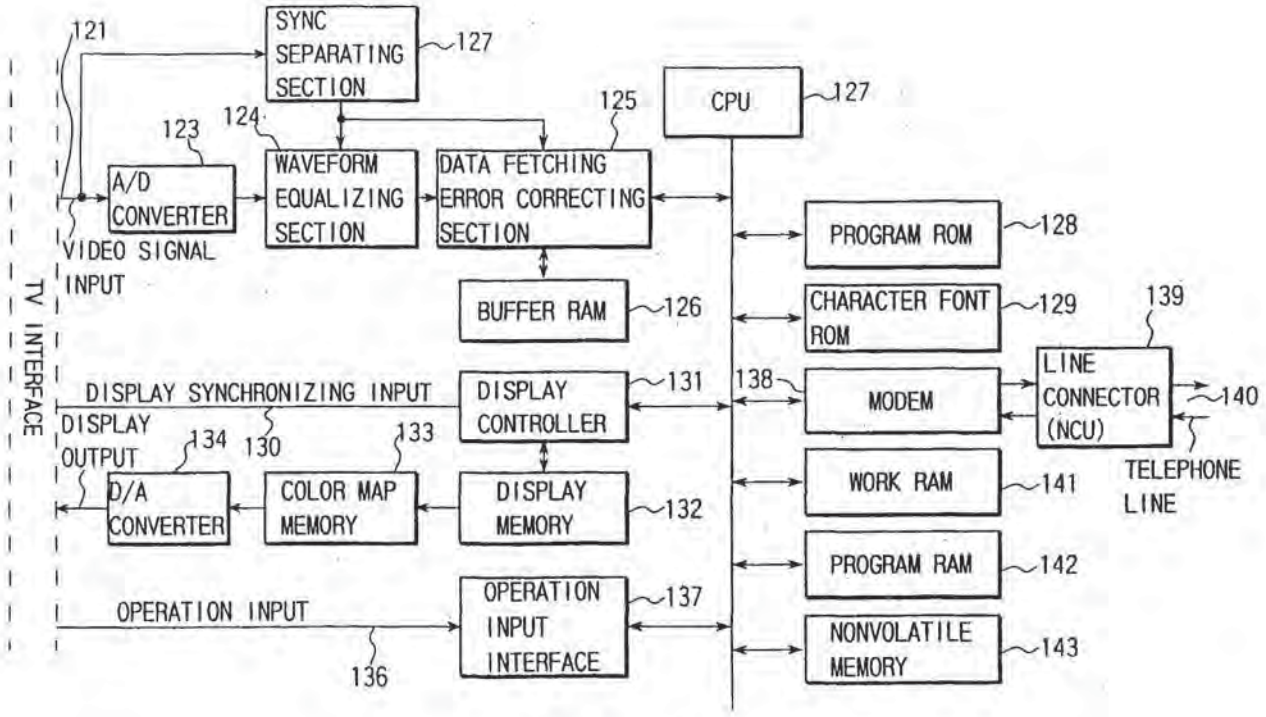

FIG. 7

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(54) Apparatus and method for recording and reproducing data

(57) The apparatus for recording and reproducing data includes: a receiving section for receiving input data; a recording section for recording the input data on a recording medium; a managing section for managing information indicating a position of the input data recorded on the recording medium; a reproducing section for reproducing the data recorded on the recording medium based on the information managed by the managing means during recording of the input data on the recording medium; and a selective output section for selectively outputting at least one of the input data and the data reproduced by the reproducing section.

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention:

The present invention relates to an apparatus and a method for recording and reproducing video and sound for providing a "time-shift reproduction" function and a "time-shift fast-forward reproduction" function.

2. Description of the Related Art:

In recent years, the popularization of satellite broadcasting, CATVs and the like has caused a considerable increase in the number of broadcasting channels. As a result, very frequently TV audiences want to watch several TV programs broadcasted in the same time period. Moreover, home-use video apparatuses have also been popularized. Therefore, it is desirable to develop a method for utilizing such apparatuses more efficiently.

Figure 16 shows an exemplary conventional apparatus for recording and reproducing video and sound, in which a TV set is connected with a video cassette recorder (VCR).

Hereinafter, the respective components shown in Figure 16 will be described.

Broadcast receiving sections 1 and 2 receive a broadcast. Typically, the broadcast receiving section 1 is a tuner incorporated into a TV set, and the broadcast receiving section 2 is a tuner incorporated into a VCR.

A video/sound recording section 3 converts the video and the sound output from the broadcast receiving section 2 into a recording signal so as to record the recording signal on a magnetic tape. The magnetic tape is driven by a magnetic tape driving section 4.

A video/sound reproducing section 5 converts the recording signal recorded on the magnetic tape, thereby reproducing the video and the sound. The video and the sound reproduced by the video/sound reproducing section 5 are supplied to a selective output section 6.

The selective output section 6 selectively outputs one of the output from the broadcast receiving section 1 and the output from the video/sound reproducing section 5. The selection in the selective output section 6 is manually determined by a user.

A video display section 7 displays the video selected by the selective output section 6. A sound output section 8 outputs the sound selected by the selective output section 6.

However, in order to reproduce a program now being recorded, a conventional apparatus having the above-described configuration is required to suspend the recording operation once, rewind the magnetic tape and then start the reproducing operation. Therefore, such an apparatus has the following problems.

(1) During recording of a program which is now being broadcasted, it is impossible to reproduce the program from the beginning while continuing recording of the program.

(2) In the case where watching and listening of a program now being broadcasted must be suspended, it is impossible to reproduce the program from the point at which watching and listening of the program was suspended while continuing recording of the program.

(3) In the case where watching and listening of a program now being broadcasted must be suspended, it is impossible to fast-forward reproduce the program from the point at which watching and listening of the program was suspended while continuing recording of the program.

In addition, it is impossible for a conventional apparatus to simultaneously record a plurality of programs on one and the same magnetic tape. Therefore, in order to simultaneously record a plurality of programs, it has been necessary to provide the same number of recording and reproducing apparatuses as the number of programs.

SUMMARY OF THE INVENTION

According to one aspect of the present invention, an apparatus for recording and reproducing data is provided. The apparatus includes: receiving means for receiving input data; recording means for recording the input data on a recording medium; managing means for managing information indicating a position of the input data recorded on the recording medium; reproducing means for reproducing the data recorded on the recording medium, based on the information managed by the managing means during recording of the input data on the recording medium; and selective output means for selectively outputting at least one of the input data and the data reproduced by the reproducing means.

According to another aspect of the present invention, an apparatus for recording and reproducing data of a plurality of channels is provided. The apparatus includes: receiving means for receiving input data of a N number of channels; first selection means for selecting a M number of channels among the N number of channels; recording means for recording on a recording medium the input data of the M number of channels selected by the first selection means; managing means for managing information indicating a position of the input data of the M number of channels recorded on the recording medium; second selection means for selecting a P number of channels among a plurality of channels recorded on the recording medium; reproducing means for reproducing the data of the P number of channels selected by the second selection means among the plurality of channels recorded on the record-

ing medium, based on the information managed by the managing means, during recording of the input data of the M number of channels on the recording medium; and selective output means for selectively outputting at least one of the input data of the N number of channels and the data of the P number of channels reproduced by the reproducing means, where N, M and P are positive integers and N ≥ M.

In one embodiment, the apparatus further includes compression means for compressing the input data and expansion means for expanding the data reproduced by the reproducing means.

In another embodiment, the selective output means includes means for applying a priority order to each of the input data and the reproduced data, and the apparatus further includes display means for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

According to still another aspect of the present invention, an apparatus for recording and reproducing data is provided. The apparatus includes: receiving means for receiving input data; time code generating means for generating a time code and applying the time code to the input data; thin-out means for thinning out the input data with the time code at a predetermined ratio; recording means for recording on a recording medium the input data with the time code which have been thinned out by the thin-out means; managing means for managing information indicating a position of the input data with the time code recorded on the recording medium; reproducing means for reproducing the data with the time code recorded on the recording medium, based on the information managed by the managing means, during recording of the input data with the time code on the recording medium; comparing means for comparing the time code of the input data with the time code of the data reproduced by the reproducing means; and selective output means for selectively outputting at least one of the input data and the data reproduced by the reproducing means based on a comparison result obtained by the comparing means.

In one embodiment, the apparatus further includes compression means for compressing the input data with the time code which have been thinned out by the thin-out means and expansion means for expanding the data with the time code which have been reproduced by the reproducing means.

In another embodiment, the selective output means includes means for applying a priority order to each of the input data with the time code and the reproduced data with the time code, and the apparatus further includes display means for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

According to still another aspect of the present invention, an apparatus for recording and reproducing data is provided. The apparatus includes: receiving means for receiving input data; time code generating means for generating a time code and applying the time code to the input data; recording means for recording on a recording medium the input data with the time code; managing means for managing information indicating a position of the input data with the time code recorded on the recording medium; reproducing means for reproducing the data with the time code recorded on the recording medium, based on the information managed by the managing means, during recording of the input data with the time code on the recording medium; thin-out means for thinning out the data with the time code reproduced by the reproducing means at a predetermined ratio; comparing means for comparing the time code of the input data with the time code of the data thinned out by the thin-out means; and selective output means for selectively outputting at least one of the input data and the data thinned out by the thin-out means based on a comparison result obtained by the comparing means.

In one embodiment, the apparatus further includes compression means for compressing the input data with the time code and expansion means for expanding the data with the time code which have been reproduced by the reproducing means.

According to still another aspect of the present invention, an apparatus for recording and reproducing data is provided. The apparatus includes: receiving means for receiving input data; time code generating means for generating a time code and applying the time code to the input data; first thin-out means for thinning out the input data with the time code at a first ratio; recording means for recording on a recording medium the input data with the time code which have been thinned out by the first thin-out means; managing means for managing information indicating a position of the input data with the time code recorded on the recording medium; reproducing means for reproducing the data with the time code recorded on the recording medium, based on the information managed by the managing means, during recording of the input data with the time code on the recording medium; second thin-out means for thinning out the data with the time code reproduced by the reproducing means at a second ratio; comparing means for comparing the time code of the input data with the time code of the data thinned out by the second thin-out means; and selective output means for selectively outputting at least one of the input data and the data thinned out by the second thin-out means based on a comparison result obtained by the comparing means.

In one embodiment, the apparatus further includes compression means for compressing the input data with the time code which have been thinned out by the first thin-out means and expansion means for expanding the data with the time code which have been reproduced by the reproducing means.

In another embodiment, the selective output means includes means for applying a priority order to each of

the input data with the time code and the thinned out data with the time code, and the apparatus further includes display means for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

According to still another aspect of the present invention, a method for recording and reproducing data is provided. The method includes the steps of: (a) receiving input data; (b) recording the input data on a recording medium; (c) managing information indicating a position of the input data recorded on the recording medium; (d) reproducing the data recorded on the recording medium, based on the information managed in the step (c), during recording of the input data on the recording medium; and (e) selectively outputting at least one of the input data and the data reproduced in the step (d).

In one embodiment, the step (e) includes a step of applying a priority order to each of the input data and the reproduced data, and the method further includes a step of displaying the selective output in the step (e) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

According to still another aspect of the present invention, a method for recording and reproducing data of a plurality of channels is provided. The method includes the steps of: (a) receiving input data of a N number of channels; (b) selecting a M number of channels among the N number of channels; (c) recording on a recording medium the input data of the M number of channels selected in the step (b); (d) managing information indicating a position of the input data of the M number of channels recorded on the recording medium; (e) selecting a P number of channels among a plurality of channels recorded on the recording medium; (f) reproducing the data of the P number of channels selected in the step (e) among the plurality of channels recorded on the recording medium, based on the information managed in the step (d), during recording of the input data of the M number of channels on the recording medium; and (g) selectively outputting at least one of the input data of the N number of channels and the reproduced data of the P number of channels, where N, M and P are positive integers and $N \geq M$.

In one embodiment, the method further includes a step of compressing the input data and a step of expanding the reproduced data.

In another embodiment, the step (g) includes a step of applying a priority order to each of the input data and the reproduced data, and the method further includes a step of displaying the selective output in the step (g) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

According to still another aspect of the present invention, a method for recording and reproducing data is provided. The method includes the steps of: (a) receiving input data; (b) generating a time code and applying the time code to the input data; (c) thinning out the input data with the time code at a predetermined ratio; (d) recording on a recording medium the input data with the time code which have been thinned out in the step (c); (e) managing information indicating a position of the input data with the time code recorded on the recording medium; (f) reproducing the data with the time code recorded on the recording medium, based on the information managed in the step (e), during recording of the input data with the time code on the recording medium; (g) comparing the time code of the input data with the time code of the data reproduced in the step (f); and (h) selectively outputting at least one of the input data and the reproduced data based on a comparison result obtained in the step (g).

In one embodiment, the method further includes a step of compressing the input data with the time code which have been thinned out in the step (c) and a step of expanding the data with the time code which have been reproduced in the step (f).

In another embodiment, the step (h) includes a step of applying a priority order to each of the input data with the time code and the reproduced data with the time code, and the method further includes a step of displaying the selective output in the step (h) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

According to still another aspect of the present invention, a method for recording and reproducing data is provided. The method includes the steps of: (a) receiving input data; (b) generating a time code and applying the time code to the input data; (c) recording on a recording medium the input data with the time code; (d) managing information indicating a position of the input data with the time code recorded on the recording medium; (e) reproducing the data with the time code recorded on the recording medium, based on the information managed in the step (d), during recording of the input data with the time code on the recording medium; (f) thinning out the data with the time code reproduced in the step (e) at a predetermined ratio; (g) comparing the time code of the input data with the time code of the data thinned out in the step (f); and (h) selectively outputting at least one of the input data and the data thinned out in the step (f) based on a comparison result obtained in the step (g).

In one embodiment, the method further includes a step of compressing the input data with the time code and a step of expanding the data with the time code which have been reproduced in the step (e).

In another embodiment, the step (h) includes a step of applying a priority order to each of the input data with the time code and the thinned out data with the time code, and the method further includes a step of displaying the selective output in the step (h) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

According to still another aspect of the present invention, a method for recording and reproducing data is provided. The method includes the steps of: (a)

receiving input data; (b) generating a time code and applying the time code to the input data; (c) thinning out the input data with the time code at a first ratio; (d) recording on a recording medium the input data with the time code which have been thinned out in the step (c); (e) managing information indicating a position of the input data with the time code recorded on the recording medium; (f) reproducing the data with the time code recorded on the recording medium, based on the information managed in the step (e), during recording of the input data with the time code on the recording medium; (g) thinning out the data with the time code reproduced in the step (f) at a second ratio; (h) comparing the time code of the input data with the time code of the data thinned out in the step (g); and (i) selectively outputting at least one of the input data and the data thinned out in the step (g) based on a comparison result obtained in the step (h).

In one embodiment, the method further includes a step of compressing the input data with the time code which have been thinned out in the step (c) and a step of expanding the data with the time code which have been reproduced in the step (f).

In another embodiment, the step (i) includes a step of applying a priority order to each of the input data with the time code and the thinned out data with the time code, and the method further includes a step of displaying the selective output in the step (i) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

Thus, the invention described herein makes possible the advantages of (a) providing a recording/reproducing apparatus and method which provides a "time-shift reproduction" function for solving the above-mentioned problems (1) and (2) and a "time-shift fast-forward reproduction" function for solving the above-mentioned problem (3); and (b) providing a recording/reproducing apparatus and method capable of simultaneously recording and reproducing data from a plurality of channels.

These and other advantages of the present invention will become apparent to those skilled in the art upon reading and understanding the following detailed description with reference to the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure **1** is a block diagram showing a configuration for an apparatus **100** for recording and reproducing video and sound according to a first example of the present invention.

Figure **2** is a diagram showing a specific configuration for the memory section **30** in the apparatus **100**.

Figure **3** is a diagram showing another specific configuration for the memory section **30** in the apparatus **100**.

Figures **4A** to **4D** are time charts showing an operation of the apparatus **100** in association with the "time-shift reproduction" function.

Figures **5A** to **5D** are time charts showing another operation of the apparatus **100** in association with the "time-shift reproduction" function.

Figure **6** is a block diagram showing a configuration for an apparatus **200** for recording and reproducing video and sound according to a second example of the present invention.

Figure **7** is a block diagram showing a configuration for an apparatus **300** for recording and reproducing video and sound according to a third example of the present invention.

Figure **8** is a block diagram showing a configuration for an apparatus **400** for recording and reproducing video and sound according to a fourth example of the present invention.

Figure **9** is a block diagram showing a configuration for an apparatus **500** for recording and reproducing video and sound according to a fifth example of the present invention.

Figures **10A** to **10D** are time charts showing another operation of the apparatus **500** in association with the "time-shift fast-forward reproduction" function.

Figure **11** is a block diagram showing a configuration for an apparatus **600** for recording and reproducing video and sound according to a sixth example of the present invention.

Figure **12** is a block diagram showing a configuration for an apparatus **700** for recording and reproducing video and sound according to a seventh example of the present invention.

Figure **13** is a block diagram showing a configuration for an apparatus **800** for recording and reproducing video and sound according to an eighth example of the present invention.

Figure **14** is a block diagram showing a configuration for an apparatus **900** for recording and reproducing video and sound according to a ninth example of the present invention.

Figure **15** is a block diagram showing a configuration for an apparatus **1000** for recording and reproducing video and sound according to a tenth example of the present invention.

Figure **16** is a block diagram showing a configuration for a conventional apparatus for recording and reproducing video and sound.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereinafter, the present invention will be described by way of illustrative examples with reference to the accompanying drawings.

Example 1

Figure **1** shows a configuration for an apparatus **100** for recording and reproducing video and sound according to a first example of the present invention. The apparatus **100** has a "time-shift reproduction" func-

tion. The "time-shift reproduction" function is herein defined as a function of, during recording of a program which is now being broadcasted, reproducing the program from the beginning while continuing recording of the program.

For example, the "time-shift reproduction" function is effectively applicable to a case where a first half of a program is desired to be watched again while continuing recording of the second half of the program. A user can reproduce the first half of the program from the beginning without waiting for the completion of recording of the second half of the program.

In addition, the "time-shift reproduction" function is also effectively applicable to a case where a program is to be recorded from nine p.m. to eleven p.m. using a preset timer during the user's absence (such a recording will be referred to as an "absence recording"); the user comes home at a time during the absence recording (for example, at nine-thirty); and the user wants to start to reproduce the absence-recorded program before eleven o'clock. The user can reproduce the absence-recorded program from the beginning without waiting for the completion of recording of the program.

Moreover, the "time-shift reproduction" function is also effectively applicable to a case where watching and listening of a program now being broadcasted must be suspended and a user later wants to restart watching and listening to the program from the point at which watching and listening of the program was suspended. The user can reproduce the program from the point at which watching and listening of the program was suspended without waiting for the completion of recording of the program.

Hereinafter, the respective components of the apparatus **100** will be described with reference to Figure **1**.

A broadcast receiving section **10** receives a broadcast of video and sound. In general, the broadcast receiving section **10** is configured so as to receive broadcasts of a plurality of channels. The broadcast receiving section **10** selects one channel from a plurality of channels in response to a channel selection signal supplied from an input section **14**, so as to output video and sound corresponding to the selected channel to a video/sound recording section **22** and a selective output section **50**. The channel selection signal is input from the input section **14** to the broadcast receiving section **10** via a line **101**.

The video/sound recording section **22** inquires of a memory region management section **31** where the video and the sound supplied from the broadcast receiving section **10** are to be recorded in a memory section **30**, and obtains information indicating a position at which the video and the sound are to be recorded as a reply to the inquiry. The video/sound recording section **22** records the video and the sound at the position indicated by the information in the memory section **30**. This positional information is determined by the memory region management section **31**, and is referred to when a time-shift reproduction is made by a video/sound reproducing section **40**, as will be described later. This positional information is, for example, an address on a recording medium.

A recording start signal, a recording end signal and a time-shift reproduction end signal are input from the input section **14** to the video/sound recording section **22** via a line **102**. The video/sound recording section **22** starts a recording operation in response to the recording start signal, and ends the recording operation in response to the recording end signal or the time-shift reproduction end signal.

The memory section **30** has a function of performing the reproduction operation of the video and the sound recorded in the memory section **30** in parallel with performing the recording operation of video and sound in the memory section **30**. For example, the memory section **30** may be an optical disk driving apparatus having a recording head and a reproducing head which can be driven independently from each other, or a hard disk driving apparatus including a plurality of such heads.

Figure **2** shows a specific configuration for the memory section **30**. The memory section **30** includes: a recording head **112** for recording data on a recording medium **110**; a reproducing head **114** for reproducing the data recorded on the recording medium **110**; a recording controller **116** for controlling the recording head **112**; and a reproducing controller **118** for controlling the reproducing head **114**.

The recording controller **116** receives data to be written on the recording medium **110** and the information, e.g., an address on the recording medium **110**, indicating a position at which the data is to be written, from the video/sound recording section **22**. The recording controller **116** controls the position of the recording head **112** based on the positional information and writes the data into the recording medium **110** via the recording head **112**.

The reproducing controller **118** receives information, e.g., an address on the recording medium **110**, indicating a position of the recording medium **110** from which the data is to be read out, from the video/sound reproducing section **40**. The reproducing controller **118** controls the position of the reproducing head **114** based on the positional information and reads out the data corresponding to the positional information from the recording medium **110** via the reproducing head **114**.

Thus, the recording controller **116** and the reproducing controller **118** can be controlled independent of each other. As a result, the recording head **112** and the reproducing head **114** can also be controlled independent of each other. Therefore, it becomes possible to perform the reproduction operation of the video and the sound recorded on the recording medium **110** in parallel with the recording operation of the video and the sound on the recording medium **110**.

Figure **3** shows another specific configuration for the memory section **30**. The memory section **30**

includes an arbitrating section **122** and a random access memory **120**.

The arbitrating section **122** receives a write command from the video/sound recording section **22** and a read command from the video/sound reproducing section **40**. The arbitrating section **122** arbitrates between the write command and the read command, thereby sequentially outputting the write command and the read command to the random access memory **120**. As a result, a simultaneous access to the random access memory **120** is prevented. By setting the cycle of the write command and the read command to be given to the random access memory **120** to be sufficiently small, it is possible to consider that the operation of writing the data onto the random access memory **120** can be performed substantially in parallel with the operation of reading out the data from the random access memory **120**. Therefore, under such a configuration, it is also possible to perform the operation of reproducing the video and the sound recorded in the memory section **30** in parallel with the operation of recording the video and the sound in the memory section **30**.

Referring back to Figure **1**, the video/sound reproducing section **40** reproduces the video and the sound supplied from the memory section **30**. A reproduction start signal, a reproduction end signal, a time-shift reproduction start signal and a time-shift reproduction end signal are input from the input section **14** to the video/sound reproducing section **40** via a line **103**.

The video/sound reproducing section **40** starts and ends a normal reproduction operation in response to the reproduction start signal and the reproduction end signal, respectively. In response to the time-shift reproduction start signal, the video/sound reproducing section **40** receives positional information on the video and the sound recorded in the memory section **30** from the memory region management section **31** and then starts to reproduce the video and the sound based on the positional information. In response to the time-shift reproduction end signal, the video/sound reproducing section **40** ends the reproduction operation.

The memory region management section **31** manages the memory region of the video and the sound recorded in the memory section **30**, and determines a memory region where a video and a sound is newly recorded. More specifically, the memory region management section **31** has a region **R** for storing therein the information, e.g., an address on the recording medium, indicating a position in the memory section **30** at which the video and the sound are recorded.

When the recording start signal is input to the video/sound recording section **22**, the video/sound recording section **22** starts the recording operation. The video/sound recording section **22** inquires of the memory region management section **31** where the video and the sound supplied from the broadcast receiving section **10** are to be recorded in the memory section **30**, and obtains information indicating a position at which the video and the sound are to be recorded as a reply to the inquiry. The memory region management section **31** determines a position at which the video and the sound are to be recorded, and stores information indicating the position in the region **R**.

In the situation where the recording start signal is input to the video/sound recording section **22** again after the recording operation is once ended, new positional information is overwritten in the region **R** in the memory region management section **31**. Thus, the memory region management section **31** holds only the latest positional information.

When the time-shift reproduction start signal is input to the video/sound reproducing section **40**, the video/sound reproducing section **40** reads out positional information by reference to the region **R** in the memory region management section **31**, thereby starting to reproduce the video and the sound from the position indicated by the positional information.

The selective output section **50** selectively outputs at least one of the video and the sound output from the broadcast receiving section **10** and the video and the sound output from the video/sound reproducing section **40**. The selective output section **50** may selectively output either one of the output from the broadcast receiving section **10** and the output from the video/sound reproducing section **40**, or may output both the output from the broadcast receiving section **10** and the output from the video/sound reproducing section **40** by applying priority orders to the two outputs.

The priority order is used to determine a mode for displaying a video in a video display section **60** or a mode for outputting a sound in a sound output section **70**. For example, it is assumed that the selective output section **50** applies a priority order "1" to the output from the broadcast receiving section **10** and a priority order "2" to the output from the video/sound reproducing section **40**. In this case, the video display section **60** displays the video output from the broadcast receiving section **10** on a main screen and the video output from the video/sound reproducing section **40** on a subscreen, for example. In a similar manner, the video display section **60** can employ an arbitrary display mode in accordance with the priority order. The sound output section **70** outputs the sound output from the broadcast receiving section **10** at a higher loudness level and the sound output from the video/sound reproducing section **40** at a lower loudness level, for example. In a similar manner, the sound output section **70** can employ an arbitrary output mode in accordance with the priority order.

The selection in the selective output section **50** is made in response to a video/sound selection signal input from the input section **14** via a line **104**. The video/sound selection signal is used by a user for manually switching the output from the broadcast receiving section **10** and the output from the video/sound reproducing section **40**. The selection in the selective output section **50** is also made in response to the time-shift reproduction start signal and the time-shift reproduction

end signal input from the input section **14** via the line **104**.

Next, referring to Figures **4A** to **4D**, the operation of the apparatus **100** will be described in association with the "time-shift reproduction" function.

Figures **4A** to **4D** show a temporal relationship among the output from the broadcast receiving section **10** (input data); the input to the memory section **30** (recording data); the output from the memory section **30** (reproduced data); and the output from the selective output section **50** (output data).

In Figures **4A** to **4D**, each of the numbered squares indicates one unit for recording and reproduction. For example, this square may represent one frame or one field. In addition, this square may represent analog data or digital data.

When a recording start signal is input from the input section **14** at a time **T1**, the recording start signal is supplied to the video/sound recording section **22** via a line **102**. As a result, the video/sound recording section **22** starts the recording operation. Consequently, the input data (data 1, 2, 3, 4, ...) are sequentially recorded in the memory section **30** (Figures **4A** and **4B**).

When a time-shift reproduction start signal is input from the input section **14** at a time **T2**, the time-shift reproduction start signal is supplied to the video/sound reproducing section **40** via a line **103** and to the selective output section **50** via a line **104**. As a result, the video/sound reproducing section **40** starts the reproduction operation from the head of the recorded data. Consequently, the recorded data (data 1, 2, 3, 4, ...) are sequentially reproduced as reproduced data from the time **T2** (Figure **4C**). In addition, the selective output section **50** automatically changes the output thereof so that at least the reproduced data is selectively output. As a result, at least the reproduced data is output from the selective output section **50** as the output data (Figure **4D**).

When a time-shift reproduction end signal is input from the input section **14** at a time **T3**, the time-shift reproduction end signal is supplied to the video/sound recording section **22** via the line **102**, to the video/sound reproducing section **40** via the line **103**, and to the selective output section **50** via the line **104**. As a result, the video/sound recording section **22** ends the recording operation; the video/sound reproducing section **40** ends the reproduction operation; and the selective output section **50** automatically changes the output thereof so that at least the output immediately before the time-shift reproduction start sinal is input is selectively output.

Thus, the reproduction operation of the video and the sound recorded in the memory section **30** can be performed in parallel with the recording operation of the video and the sound in the memory section **30** from the time **T2** to the time **T3**.

In the operation exemplified in Figures **4A** to **4D**, the data 9 to 12 are recorded in the memory section **30**. However, the data 9 to 12 are not reproduced by the video/sound reproducing section **40**. Accordingly, as shown in Figures **5A** to **5D**, even if the video/sound recording section **22** is made to end the recording operation at a time **T4** by inputting the recording end signal from the input section **14** at the time **T4**, the same operation as that shown in Figures **4A** to **4D** can be performed.

Thus, by inputting the recording end signal at the time **T4**, it is possible to prevent redundant data from being recorded in the memory section **30**. For example, in the case where the length of a program to be recorded is known beforehand, it is possible to input such a recording end signal in good time.

It is noted that the recording start signal and the recording end signal may be manually input by a user, or may be automatically input at a preset time by utilizing a known function of absence recording.

In the first example described above, a time-shift reproduction start signal and a time-shift reproduction end signal are provided separately from a reproduction start signal and a reproduction end signal which have conventionally been used. A method for realizing the generation of such signals most easily, is a method in which the input section **14** generates the reproduction start signal and the reproduction end signal in the case where the user inputs a reproduction start command and a reproduction end command to the input section **14**, respectively, and the input section **14** generates the time-shift reproduction start signal and the time-shift reproduction end signal in the case where the user inputs a time-shift reproduction start command and a time-shift reproduction end command to the input section **14**, respectively. However, it may be too complex for the user to distinguish the reproduction start command from the time-shift reproduction start command and distinguish the reproduction end command from the time-shift reproduction end command, and to input these commands to the input section **14**.

By additionally providing a state judging section **15** (not shown) for judging whether or not the apparatus **100** is in the recording state, it becomes possible to eliminate the necessity of distinction between the reproduction start command and the time-shift reproduction start command and the distinction between the reproduction end command and the time-shift reproduction end command.

The state judging section **15** judges whether or not the apparatus **100** is in the recording state. Such a judgement is accomplished, for example, by monitoring the recording start signal and the recording end signal input from the input section **14** to the video/sound recording section **22**. When the reproduction start command is input by the user to the input section **14**, the input section **14** inquires whether or not the apparatus **100** is in the recording state of the state judging section **15**. In response to the inquiry, the state judging section **15** answers a judgement result to the input section **14**. In the case where the judgement result indicates that the apparatus **100** is not in the recording state, the input

section **14** generates a reproduction start signal. The reproduction start signal is supplied to the video/sound reproducing section **40**. On the other hand, in the case where the judgement result indicates that the apparatus **100** is in the recording state, the input section **14** generates a time-shift reproduction start signal. The time-shift reproduction start signal is supplied to the video/sound reproducing section **40** and the selective output section **50**.

Also, the state judging section **15** judges which of the reproduction start signal and the time-shift reproduction start signal was generated more recently. Such a judgement is accomplished, for example, by monitoring the reproduction start signal and the time-shift reproduction start signal generated by the input section **14**. When a reproduction end command is input by the user to the input section **14**, the input section **14** inquires which of the reproduction start signal and the time-shift reproduction start signal was generated more recently of the state judging section **15**. In response to the inquiry, the state judging section **15** answers a judgement result to the input section **14**. In the case where the judgement result indicates that it was the reproduction start signal, the input section **14** generates a reproduction end signal. The reproduction end signal is supplied to the video/sound reproducing section **40**. On the other hand, in the case where the judgement result indicates that it was the time-shift reproduction signal, the input section **14** generates a time-shift reproduction end signal. The time-shift reproduction end signal is supplied to the video/sound recording section **22**, the video/sound reproducing section **40** and the selective output section **50**.

In this way, the same operation as those shown in Figures **4A** to **4D** and Figures **5A** to **5D** can be performed without using the time-shift reproduction start command and the time-shift reproduction end command. The state judging section **15** may be incorporated in the input section **14**.

Example 2

Figure **6** shows a configuration for an apparatus **200** for recording and reproducing video and sound according to a second example of the present invention. The configuration of the apparatus **200** is the same as that of the apparatus **100** shown in Figure **1** except that a video/sound compression section **21** and a video/sound expansion section **41** are additionally provided for the apparatus **200**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

The video/sound compression section **21** compresses the video and the sound output from the broadcast receiving section **10** by a predetermined method. The video/sound expansion section **41** expands the video and the sound output from the video/sound reproducing section **40** by a predetermined method. An arbitrary method can be employed as the compression method or as the expansion method. For example, a compression method or an expansion method in compliance with a standard MPEG1 or MPEG2 can be employed.

In the second example, not only the effects of the first example can be attained but also the amount of data to be recorded in the memory section **30** can be reduced by compressing the output from the broadcast receiving section **10**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the first example as the memory section **30**. In the case of using the same memory section **30** as that of the first example in this second example, it is possible to considerably increase the recordable time of the memory section **30**.

Example 3

Figure **7** shows a configuration for an apparatus **300** for recording and reproducing video and sound according to a third example of the present invention. The apparatus **300** has a "time-shift reproduction" function corresponding to multiple channels. The "time-shift reproduction" function corresponding to multiple channels is herein defined as a function of, during recording of programs of a plurality of channels which are now being broadcasted, reproducing a plurality of recorded programs from the beginning while continuing recording the plurality of programs.

Hereinafter, the respective components of the apparatus **300** will be described with reference to Figure **7**.

An N-channel broadcast receiving section **12** receives video and sound of a N number of channels now being broadcasted, where N is a positive integer.

An M-channel selection section **13** selects a M number of channels from the N number of channels in response to a channel selection signal supplied from an input section **16**, thereby outputting the video and the sound corresponding to the selected M number of channels to an M-channel video/sound recording section **23**. The channel selection signal is input from the input section **16** to the M-channel selection section **13** via a line **301**, where M is a positive integer and $N \geq M$.

The M-channel video/sound recording section **23** inquires of a memory region management section **33** where the video and the sound corresponding to the M number of channels selected by the M-channel selection section **13** are to be recorded in a memory section **32**, and obtains information indicating a position at which the video and the sound are to be recorded as a reply to the inquiry. The M-channel video/sound recording section **23** records the video and the sound at the position indicated by the information in the memory section **32**. This positional information is determined by the memory region management section **33**, and is referred to when a time-shift reproduction is made by a P-chan-

nel video/sound reproducing section **42** as will be described later. This positional information is, for example, an address on a recording medium.

A recording start signal, a recording end signal and a time-shift reproduction end signal are input from the input section **16** to the M-channel video/sound recording section **23** via a line **302**. The M-channel video/sound recording section **23** starts a recording operation in response to the recording start signal, and ends the recording operation in response to the recording end signal or the time-shift reproduction end signal.

The memory section **32** has a function of performing the reproduction operation of the video and the sound recorded in the memory section **32** in parallel with performing the recording operation of video and sound in the memory section **32**. For example, the memory section **32** may be an optical disk driving apparatus having a M number of recording heads and a P number of reproducing heads which can be driven independently from each other, or a hard disk driving apparatus including a plurality of such heads. Alternatively, the memory section **32** may be a random accessible semiconductor memory. The memory section **32** can be configured in the same way as the memory section **30** described with reference to Figures **2** and **3**.

The P-channel video/sound reproducing section **42** selects a P number of channels among a plurality of channels recorded in the memory section **32** in response to the channel selection signal supplied from the input section **16**, thereby reproducing the video and the sound corresponding to the selected P number of channels. The P number of channels may be selected among the M number of channels which are being recorded in the memory section **32** and/or a plurality of channels which were previously recorded in the memory section **32**. The channel selection signal is input from the input section **16** to the P-channel video/sound reproducing section **42** via a line **303**, where P is a positive integer.

A reproduction start signal, a reproduction end signal, a time-shift reproduction start signal and a time-shift reproduction end signal are input from the input section **16** to the P-channel video/sound reproducing section **42** via a line **303**.

The P-channel video/sound reproducing section **42** starts and ends a reproduction operation of the P number of channels in response to the reproduction start signal and the reproduction end signal, respectively. In response to the time-shift reproduction start signal, the P-channel video/sound reproducing section **42** receives positional information on the video and the sound recorded in the memory section **32** from the memory region management section **33** and then starts to reproduce the video and the sound of the number P of channels based on the positional information. In response to the time-shift reproduction end signal, the P-channel video/sound reproducing section **42** ends the reproduction operation of the P number of channels.

The memory region management section **33** manages the memory regions of the video and the sound corresponding to a plurality of channels recorded in the memory section **32**, and determines a memory region where a video and a sound are newly recorded. More specifically, the memory region management section **33** has a plurality of regions R_1 to R_{M+K} for storing therein the information, e.g., an address on the recording medium, indicating the position in the memory section **32** at which the video and the sound corresponding to a plurality of channels are recorded.

When the recording start signal is input to the M-channel video/sound recording section **23**, the M-channel video/sound recording section **23** starts the recording operation of the M number of channels. The M-channel video/sound recording section **23** inquires of the memory region management section **33** where the video and the sound supplied from the M-channel selection section **13** are to be recorded in the memory section **32**, and obtain information indicating positions at which the video and the sound are to be recorded as a reply to the inquiry. The memory region management section **33** determines positions at which the video and the sound are to be recorded, and stores information indicating the positions in the regions R_1 to R_{M+K}.

In the case where the recording start signal is input to the M-channel video/sound recording section **23** again after the recording operation was once ended, new positional information is overwritten in the regions R_1 to R_{M+K} in the memory region management section **33**. In this way, the memory region management section **33** holds only the latest positional information.

When the time-shift reproduction start signal is input to the P-channel video/sound reproducing section **42**, the P-channel video/sound reproducing section **42** reads out the positional information by reference to a P number of regions of the regions R_1 to R_{M+K} in the memory region management section **33**, thereby starting to reproduce the video and the sound corresponding to the P number of channels from the position indicated by the positional information.

The selective output section **51** selectively outputs at least the video corresponding to a Q number of channels and the sound corresponding to one channel among the video and the sound corresponding to the N number of channels output from the N-channel broadcast receiving section **12** and the video and the sound corresponding to the P number of channels output from the P-channel video/sound reproducing section **42**, where Q is a positive integer and $N + P \geq Q$. Alternatively, the selective output section **51** can selectively output only the video corresponding to the number Q of channels and the sound corresponding to one channel among the output from the N-channel broadcast receiving section **12** and the output from the P-channel video/sound reproducing section **42**, or may output both the output from the N-channel broadcast receiving section **12** and the output from the P-channel video/sound

reproducing section **42** by applying priority orders to the respective outputs.

The priority orders are used to determine a mode for displaying a video in a video display section **61** or a mode for outputting a sound in a sound output section **71**. For example, it is assumed that the selective output section **51** applies priority orders "P_1 to P_N" to the outputs from the N-channel broadcast receiving section **12** and priority orders "P_{N+1} to P_{N+P}" to the outputs from the P-channel video/sound reproducing section **42**. In this case, the video display section **61** displays a video having a priority order "P_i" on a screen having an area proportional to the priority order "P_i". In the same way, the video display section **61** can employ an arbitrary display mode in accordance with the priority orders. The sound output section **71** outputs a sound having a priority order "P_i" at a loudness level proportional to the priority order "P_i". Herein, i=1, 2, 3..., N+P. In a similar manner, the sound output section **71** can employ an arbitrary output mode in accordance with the priority orders. However, it is preferable for the sound output section **71** to set the loudness level of the sounds other than one selected sound to be zero in order to prevent the confusion of a plurality of sounds.

The selection in the selective output section **51** is made in response to a video/sound selection signal input from the input section **16** via a line **304**. The video/sound selection signal is used by a user for manually switching the output from the N-channel broadcast receiving section **12** and the output from the P-channel video/sound reproducing section **42**. The selection in the selective output section **51** is also made in response to the time-shift reproduction start signal and the time-shift reproduction end signal input from the input section **16** via the line **304**.

Example 4

Figure 8 shows a configuration for an apparatus **400** for recording and reproducing video and sound according to a fourth example of the present invention. The configuration of the apparatus **400** is the same as that of the apparatus **300** shown in Figure **7** except that an M-channel video/sound compression section **24** and a P-channel video/sound expansion section **44** are additionally provided for the apparatus **400**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

The M-channel video/sound compression section **24** compresses the video and the sound of a M number of channels output from the M-channel selection section **13** by a predetermined method. The P-channel video/sound expansion section **44** expands the video and the sound of a P number of channels output from the P-channel video/sound reproducing section **42** by a predetermined method. An arbitrary method can be employed as the compression method or as the expansion method. For example, a compression method or an expansion method in compliance with a standard MPEG1 or MPEG2 can be employed.

In the fourth example, not only the effects of the third example can be attained but also the amount of data to be recorded in the memory section **32** can be reduced by compressing the output from the M-channel selection section **13**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the third example as the memory section **32**. In the case of using the same memory section **32** as that of the third example in this fourth example, it is possible to considerably increase the recordable time of the memory section **32**.

Example 5

Figure **9** shows a configuration for an apparatus **500** for recording and reproducing video and sound according to a fifth example of the present invention.

The apparatus **500** has a "time-shift fast-forward reproduction" function. The "time-shift fast-forward reproduction" function is herein defined as a function of starting to record a program now being broadcasted at a point where watching and listening of the program was suspended; fast-forward reproducing later the video and the sound which have been recorded from the point where watching and listening of the program was suspended; automatically stopping the fast-forward reproduction at a point where the video and the sound fast-forward reproduced catch up with the video and the sound now being broadcasted; and then automatically switching the former into the latter.

The "time-shift fast-forward reproduction" function is effectively applicable, for example, to a case where watching and listening of a program now being broadcasted must be suspended and a user later wants to restart to watch and listen to the program from the point where watching and listening of the program was suspended.

The configuration of the apparatus **500** is the same as that of the apparatus **100** shown in Figure **1** except that a time code generating section **11**, a unit thin-out section **20** and a time code comparing section **52** are additionally provided for the apparatus **500**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

The time code generating section **11** generates a time code and then applies the time code to one unit of the video and the sound output from the broadcast receiving section **10**. When the video and the sound are digital data, the application of the time code is accomplished by adding a plurality of bits representing the time code to the digital data. When the video and the sound are analog data, the application of the time code is accomplished by inserting an analog signal representing the time code during an inter-frame vertical retrace line period, for example. The "time code" herein

refers to information for identifying a time. The "one unit" of the video and the sound herein refers to one unit for recording and reproduction. For example, one unit for recording and reproduction may be either one frame or one field. Note that, in this example, an expression "video and sound" means video and sound with a time code applied but for some special limitation.

The unit thin-out section **20** thins out (or decimates) video and sound with a time code applied at a predetermined ratio. The predetermined ratio is input from the input section **14** to the unit thin-out section **20** via a line **105**. For example, in the case where the predetermined ratio is 50%, the unit thin-out section **20** thins out one of two units of the video and the sound output from the broadcast receiving section **10**. Such a thin-out unit may be either one frame or one field. In this way, the video and the sound thinned out by the unit thin-out section **20** are supplied to the video/sound recording section **22**. As a result, the video/sound recording section **22** records the thinned out video and sound in the memory section **30**.

The video/sound reproducing section **40** reproduces the video and the sound recorded in the memory section **30**. As described above, the video and the sound recorded in the memory section **30** have been thinned out by the unit thin-out section **20**. The video/sound reproducing section **40** performs a signal processing for the thinned out sound so that the thinned out sound is recognizable as a normal sound by a human being. Any known processing can be employed as the signal processing, e.g., shortening a shadow zone, smoothly connecting the reproduced sounds, or the like.

A time code comparing section **52** compares a time code **TC1** of the video and the sound output from the broadcast receiving section **10** with the time code **TC2** of the video and the sound output from the video/sound reproducing section **40**. In the case where the time indicated by the time code **TC2** is equal to or later than the time indicated by the time code **TC1**, the time code comparing section **52** stops the reproduction operation of the video/sound reproducing section **40** and the recording operation of the video/sound recording section **22**, and changes the selection in the selective output section **50**.

The selective output section **50** selectively outputs at least one of the video and the sound output from the broadcast receiving section **10** and the video and the sound output from the video/sound reproducing section **40**. The selection in the selective output section **50** is made in response to a video/sound selection signal input from the time code comparing section **52**. In the case where the video and the sound which have been fast-forward reproduced have caught up with the video and the sound now being broadcasted, the video/sound selection signal is used to switch the video and the sound output from the video/sound reproducing section **40** into the video and the sound output from the broadcast receiving section **10**. The selection in the selective output section **50** is also made in response to a time-shift fast-forward reproduction start signal input from the input section **14** via a line **104**.

Next, referring to Figures **10A** to **10D**, the operation of the apparatus **500** will be described in association with the "time-shift fast-forward reproduction" function.

Figures **10A** to **10D** show a temporal relationship among the output from the broadcast receiving section **10** (input data); the input to the memory section **30** (recording data); the output from the memory section **30** (reproduced data); and the output from the selective output section **50** (output data).

In Figures **10A** to **10D**, each of the numbered squares indicates one unit for recording and reproduction. For example, this square may represent one frame or one field. In addition, this square may represent analog data or digital data. Above each numbered square, a time code which is added to the data indicated by the square is shown.

When a recording start signal is input from the input section **14** at a time **T1**, the recording start signal is supplied to the video/sound recording section **22** via a line **102**. As a result, the video/sound recording section **22** starts the recording operation. Input data (data 5, 7, 9, 11, ...) thinned out by the unit thin-out section **20** are supplied to the video/sound recording section **22**. Consequently, the input data thinned out by the unit thin-out section **20** are sequentially recorded in the memory section **30** (Figures **10A** and **10B**).

When a time-shift fast-forward reproduction start signal is input from the input section **14** at a time **T2**, the time-shift fast-forward reproduction start signal is supplied to the video/sound reproducing section **40** via a line **103** and to the selective output section **50** via a line **104**. As a result, the video/sound reproducing section **40** starts the reproduction operation from the head of the recorded data. Consequently, the recorded data (data 5, 7, 9, 11, ...) are sequentially reproduced as reproduced data from the time **T2** (Figure **10C**). In parallel with this reproduction operation, the video/sound recording section **22** continues the recording operation. In addition, in response to the time-shift fast-forward reproduction start signal, the selective output section **50** automatically switches the priority order corresponding to the input data into the priority order corresponding to the reproduced data so that the display of the reproduced data is given a priority. As a result, the reproduced data is output from the selective output section **50** as the output data in a higher priority than the input data (Figure **10D**).

During a period **P1**, the time indicated by the time code **TC2** of the video and the sound output from the video/sound reproducing section **40** is earlier than the time indicated by the time code **TC1** of the video and the sound output from the broadcast receiving section **10**. As a result, the video/sound recording section **22** continues the recording operation and the video/sound reproducing section **40** continues the reproduction operation.

The video and the sound which have been fast-forward reproduced catch up with the video and the sound now being broadcasted at a time **T3**. In the example shown in Figures **10B** and **10C**, the time (013) indicated by the time code **TC1** accords with the time (013) indicated by the time code **TC2** at the time **T3**. In such a case, the time code comparing section **52** supplies a recording end signal to the video/sound recording section **22**, a reproduction end signal to the video/sound reproducing section **40** and a video/sound selection signal to the selective output section **50**. As a result, the video/sound recording section **22** ends the recording operation in response to the recording end signal; the video/sound reproducing section **40** ends the reproduction operation in response to the reproduction end signal; and the selective output section **50** automatically switches the priority order corresponding to the reproduced data into the priority order corresponding to the input data in response to the video/sound selection signal so that the display of the input data is given a priority. As a result, the input data is output from the selective output section **50** as the output data in a higher priority than the reproduced data (Figure **10D**).

In this way, the reproduction operation of the video and the sound recorded in the memory section **30** can be performed in parallel with the recording operation of the video and the sound in the memory section **30** from the time **T2** to the time **T3**.

Example 6

Figure **11** shows a configuration for an apparatus **600** for recording and reproducing video and sound according to a sixth example of the present invention. The configuration of the apparatus **600** is the same as that of the apparatus **500** shown in Figure **9** except that a video/sound compression section **21** and a video/sound expansion section **41** are additionally provided for the apparatus **600**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

The video/sound compression section **21** compresses the video and the sound thinned out by the unit thin-out section **20** by a predetermined method. The video/sound expansion section **41** expands the video and the sound output from the video/sound reproducing section **40** by a predetermined method. An arbitrary method can be employed as the compression method or as the expansion method. For example, a compression method or an expansion method in compliance with a standard MPEG1 or MPEG2 can be employed.

In the sixth example, not only the effects of the fifth example can be attained but also the amount of data to be recorded in the memory section **30** can be reduced by compressing the output from the unit thin-out section **20**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the fifth example as the memory section **30**. In the case of using the same memory section **30** as that of the fifth example in this sixth example, it is possible to considerably increase the recordable time of the memory section **30**.

Example 7

Figure **12** shows a configuration for an apparatus **700** for recording and reproducing video and sound according to a seventh example of the present invention. The configuration of the apparatus **700** is the same as that of the apparatus **500** shown in Figure **9** except that the unit thin-out section **20** prior to the video/sound recording section **22** is omitted but a unit thin-out section **45** is additionally provided posterior to the video/sound reproducing section **40** for the apparatus **700**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

The apparatus **700** does not perform thin-out processing during the recording operation. As a result, the output from the broadcast receiving section **10** is recorded in the memory section **30** without being thinned out at all. On the other hand, the unit thin-out section **45** thins out the video and the sound reproduced by the video/sound reproducing section **40** at a predetermined ratio during the reproduction operation. The predetermined ratio is input from the input section **14** to the unit thin-out section **45** via a line **106**. For example, in the case where the predetermined ratio is 50%, the unit thin-out section **45** thins out one of two units of the video and the sound output from the video/sound reproducing section **40**. Such a thin-out unit may be either one frame or one field. In this way, the video and the sound thinned out by the unit thin-out section **45** are supplied to the time code comparing section **52**.

In the seventh example, not only the effects of the fifth example can be attained, but also it is possible to freely set or change the reproduction speed by performing the thin-out processing for the video and the sound during the reproduction operation. As a result, a reproduction satisfying the users' needs can be performed easily.

Example 8

Figure **13** shows a configuration for an apparatus **800** for recording and reproducing video and sound according to an eighth example of the present invention. The configuration of the apparatus **800** is the same as that of the apparatus **700** shown in Figure **12** except that a video/sound compression section **21** is additionally provided and the unit thin-out section **45** is replaced by a pair of sections consisting of a video/sound expansion section **41** and a unit thin-out section **46**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

The video/sound compression section **21** compresses the video and the sound output from the broadcast receiving section **10** by a predetermined method. The video/sound expansion section **41** expands the video and the sound output from the video/sound reproducing section **40** by a predetermined method. The unit thin-out section **46** performs a thin-out processing in collaboration with the video/sound expansion section **41**. For example, in the case where a compression method for performing an interframe or an inter-field coding such as MPEG1 or MPEG2 is employed, the function of the unit thin-out section **46** and the function of the video/sound expansion section **41** are accomplished only by expanding a number I of frames, because the expansion and the unit thin-out can be simultaneously performed by expanding only the I frames and outputting. As a result, it is possible to efficiently perform the unit thin-out.

In the eighth example, not only the effects of the seventh example can be attained, but also the amount of data to be recorded in the memory section **30** can be reduced by compressing the output from the broadcast receiving section **10**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the seventh example as the memory section **30**. In the case of using the same memory section **30** as that of the seventh example in this eighth example, it is possible to considerably increase the recordable time of the memory section **30**.

Example 9

Figure **14** shows a configuration for an apparatus **900** for recording and reproducing video and sound according to a ninth example of the present invention. The configuration of the apparatus **900** is the same as that of the apparatus **700** shown in Figure **12** except that a unit thin-out section **20** is additionally provided prior to the video/sound recording section **22** for the apparatus **900**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

The apparatus **900** performs thin-out processing during both the recording operation and the reproduction operation.

The unit thin-out section **20** thins out the video and the sound output from the broadcast receiving section **10** at a predetermined ratio during the recording operation. The predetermined ratio is input from the input section **14** to the unit thin-out section **20** via a line **105**. The video and sound thinned out by the unit thin-out section **20** are recorded in the memory section **30**.

The unit thin-out section **45** thins out the video and the sound reproduced by the video/sound reproducing section **40** at a predetermined ratio during the reproduction operation. The predetermined ratio is input from the input section **14** to the unit thin-out section **45** via a line **106**. The video and sound thinned out by the unit thin-out section **45** are supplied to the time code comparing section **52**. The thin-out ratio in the unit thin-out section **20** and the thin-out ratio in the unit thin-out section **45** can be adjusted independently.

In the ninth example, not only the effects of the seventh example can be attained, but also the amount of data to be recorded in the memory section **30** can be reduced by recording the thinned out video and sound in the memory section **30**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the seventh example as the memory section **30**. In the case of using the same memory section **30** as that of the seventh example in this ninth example, it is possible to considerably increase the recordable time of the memory section **30**.

Example 10

Figure **15** shows a configuration for an apparatus **1000** for recording and reproducing video and sound according to a tenth example of the present invention. The configuration of the apparatus **1000** is the same as that of the apparatus **900** shown in Figure **14** except that a video/sound compression section **21** is additionally provided and the unit thin-out section **45** is replaced by a pair of sections consisting of a video/sound expansion section **41** and a unit thin-out section **46**. Therefore, the same components will be identified by the same reference numerals and the description thereof will be omitted herein.

The video/sound compression section **21** compresses the video and the sound output from the broadcast receiving section **10** by a predetermined method. The video/sound expansion section **41** expands the video and the sound output from the video/sound reproducing section **40** by a predetermined method. The unit thin-out section **46** performs thin-out processing in collaboration with the video/sound expansion section **41**. For example, in the case where a compression method for performing an interframe or an inter-field coding such as MPEG1 or MPEG2 is employed, the function of the unit thin-out section **46** and the function of the video/sound expansion section **41** are accomplished only by expanding a number I of frames, because the expansion and the unit thin-out can be simultaneously performed by expanding only the I frames and outputting. As a result, it is possible to efficiently perform unit thin-out.

In the tenth example, not only the effects of the ninth example can be attained, but also the amount of data to be recorded in the memory section **30** can be reduced by compressing the output from the broadcast receiving section **10**. As a result, it is possible to use a less expensive memory device having a lower data transmission rate and a smaller memory capacity than that of the ninth example as the memory section **30**. In the case of using the same memory section **30** as that of the ninth example in this tenth example, it is possible

to considerably increase the recordable time of the memory section 30.

In all the foregoing Examples 1 to 10, all of the components can be embodied in physical devices. Alternatively, it is also possible to realize the functions of these components by using software controllable by a CPU. Those skilled in the art should readily understand that the functions other than that of the broadcast receiving section 10 and that of the memory section 30, in particular, can be easily realized by software.

According to the present invention, it is possible to realize a "time-shift reproduction" function, during recording a program now being broadcasted, of reproducing the program from the beginning while continuing recording the program. As a result, in the case where watching and listening of a program now being broadcasted must be suspended, it is possible to restart to watch and listen to the program later from the point where watching and listening of the program was suspended. In addition, such a "time-shift reproduction" function corresponding to multiple channels is also realizable.

Moreover, according to the present invention, it is also possible to realize a "time-shift fast-forward reproduction" function. As a result, in the case where watching and listening of a program now being broadcasted must be suspended, it is possible to restart to watch and listen to the program later from the point where watching and listening of the program was suspended. By thinning out data during the recording operation, the amount of data to be recorded in the memory section 30 can be reduced. In addition, by thinning out data during the reproduction operation, it is possible to freely set or change the reproduction speed during the reproduction operation. As a result, it is possible to easily perform a reproduction operation satisfying the users' needs.

Furthermore, by compressing data during the recording operation and by expanding data during the reproduction operation, the amount of data to be recorded in the memory section 30 can be reduced.

Various other modifications will be apparent to and can be readily made by those skilled in the art without departing from the scope and spirit of this invention. Accordingly, it is not intended that the scope of the claims appended hereto be limited to the description as set forth herein, but rather that the claims be broadly construed.

Claims

1. An apparatus for recording and reproducing data, comprising:

receiving means for receiving input data;

recording means for recording the input data on a recording medium;

managing means for managing information indicating a position of the input data recorded on the recording medium;

reproducing means for reproducing the data recorded on the recording medium, based on the information managed by the managing means during recording of the input data on the recording medium; and

selective output means for selectively outputting at least one of the input data and the data reproduced by the reproducing means.

2. An apparatus according to claim 1, further comprising compression means for compressing the input data and expansion means for expanding the data reproduced by the reproducing means.

3. An apparatus according to claim 1, wherein the selective output means comprises means for applying a priority order to each of the input data and the reproduced data,

and wherein the apparatus further comprises display means for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

4. An apparatus for recording and reproducing data of a plurality of channels, comprising:

receiving means for receiving input data of a N number of channels;

first selection means for selecting a M number of channels among the N number of channels;

recording means for recording on a recording medium the input data of the M number of channels selected by the first selection means;

managing means for managing information indicating a position of the input data of the M number of channels recorded on the recording medium;

second selection means for selecting a P number of channels among a plurality of channels recorded on the recording medium;

reproducing means for reproducing the data of the P number of channels selected by the second selection means among the plurality of channels recorded on the recording medium, based on the information managed by the managing means, during recording of the input data of the M number of channels on the recording medium; and

selective output means for selectively outputting at least one of the input data of the N number of channels and the data of the P number of channels reproduced by the reproducing means,

wherein N, M and P are positive integers and wherein $N \geq M$.

5. An apparatus according to claim 4, further comprising compression means for compressing the input data and expansion means for expanding the data reproduced by the reproducing means.

6. An apparatus according to claim 4, wherein the selective output means comprises means for applying a priority order to each of the input data and the reproduced data,

and wherein the apparatus further comprises display means for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

7. An apparatus for recording and reproducing data, comprising:

receiving means for receiving input data;

time code generating means for generating a time code and applying the time code to the input data;

thin-out means for thinning out the input data with the time code at a predetermined ratio;

recording means for recording on a recording medium the input data with the time code which have been thinned out by the thin-out means;

managing means for managing information indicating a position of the input data with the time code recorded on the recording medium;

reproducing means for reproducing the data with the time code recorded on the recording medium, based on the information managed by the managing means, during recording of the input data with the time code on the recording medium;

comparing means for comparing the time code of the input data with the time code of the data reproduced by the reproducing means; and

selective output means for selectively outputting at least one of the input data and the data reproduced by the reproducing means based on a comparison result obtained by the comparing means.

8. An apparatus according to claim 7, further comprising compression means for compressing the input data with the time code which have been thinned out by the thin-out means and expansion means for expanding the data with the time code which have been reproduced by the reproducing means.

9. An apparatus according to claim 7, wherein the selective output means comprises means for applying a priority order to each of the input data with the time code and the reproduced data with the time code,

and wherein the apparatus further comprises display means for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

10. An apparatus for recording and reproducing data, comprising:

receiving means for receiving input data;

time code generating means for generating a time code and applying the time code to the input data;

recording means for recording on a recording medium the input data with the time code;

managing means for managing information indicating a position of the input data with the time code recorded on the recording medium;

reproducing means for reproducing the data with the time code recorded on the recording medium, based on the information managed by the managing means, during recording of the input data with the time code on the recording medium;

thin-out means for thinning out the data with the time code reproduced by the reproducing means at a predetermined ratio;

comparing means for comparing the time code of the input data with the time code of the data thinned out by the thin-out means; and

selective output means for selectively outputting at least one of the input data and the data thinned out by the thin-out means based on a comparison result obtained by the comparing means.

11. An apparatus according to claim 10, further comprising compression means for compressing the input data with the time code and expansion means for expanding the data with the time code which have been reproduced by the reproducing means.

12. An apparatus according to claim 10, wherein the selective output means comprises means for applying a priority order to each of the input data with the time code and the thinned out data with the time code,

and wherein the apparatus further comprises display means for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

13. An apparatus for recording and reproducing data, comprising:

receiving means for receiving input data;

time code generating means for generating a time code and applying the time code to the input data;

first thin-out means for thinning out the input data with the time code at a first ratio;

recording means for recording on a recording medium the input data with the time code which have been thinned out by the first thin-out means;

managing means for managing information indicating a position of the input data with the time code recorded on the recording medium;

reproducing means for reproducing the data with the time code recorded on the recording medium, based on the information managed by the managing means, during recording of the input data

with the time code on the recording medium;

second thin-out means for thinning out the data with the time code reproduced by the reproducing means at a second ratio;

comparing means for comparing the time code of the input data with the time code of the data thinned out by the second thin-out means; and

selective output means for selectively outputting at least one of the input data and the data thinned out by the second thin-out means based on a comparison result obtained by the comparing means.

14. An apparatus according to claim 13, further comprising compression means for compressing the input data with the time code which have been thinned out by the first thin-out means and expansion means for expanding the data with the time code which have been reproduced by the reproducing means.

15. An apparatus according to claim 13, wherein the selective output means comprises means for applying a priority order to each of the input data with the time code and the thinned out data with the time code,

and wherein the apparatus further comprises display means for displaying an output from the selective output means in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

16. A method for recording and reproducing data, comprising the steps of:

(a) receiving input data;
(b) recording the input data on a recording medium;
(c) managing information indicating a position of the input data recorded on the recording medium;
(d) reproducing the data recorded on the recording medium, based on the information managed in the step (c), during recording of the input data on the recording medium; and
(e) selectively outputting at least one of the input data and the data reproduced in the step (d).

17. A method according to claim 16, further comprising a step of compressing the input data and a step of expanding the reproduced data.

18. A method according to claim 16, wherein the step (e) comprises a step of applying a priority order to each of the input data and the reproduced data,

and wherein the method further comprises a step of displaying the selective output in the step (e) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

19. A method for recording and reproducing data of a plurality of channels, comprising the steps of:

(a) receiving input data of a N number of channels;
(b) selecting a M number of channels among the N number of channels;
(c) recording on a recording medium the input data of the M number of channels selected in the step (b);
(d) managing information indicating a position of the input data of the M number of channels recorded on the recording medium;
(e) selecting a P number of channels among a plurality of channels recorded on the recording medium;
(f) reproducing the data of the P number of channels selected in the step (e) among the plurality of channels recorded on the recording medium, based on the information managed in the step (d), during recording of the input data of the M number of channels on the recording medium; and
(g) selectively outputting at least one of the input data of the N number of channels and the reproduced data of the P number of channels,

wherein N, M and P are positive integers and wherein $N \geq M$.

20. A method according to claim 19, further comprising a step of compressing the input data and a step of expanding the reproduced data.

21. A method according to claim 19, wherein the step (g) comprises a step of applying a priority order to each of the input data and the reproduced data,

and wherein the method further comprises a step of displaying the selective output in the step (g) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

22. A method for recording and reproducing data, comprising the steps of:

(a) receiving input data;
(b) generating a time code and applying the time code to the input data;
(c) thinning out the input data with the time code at a predetermined ratio;
(d) recording on a recording medium the input data with the time code which have been thinned out in the step (c);

(e) managing information indicating a position of the input data with the time code recorded on the recording medium;

(f) reproducing the data with the time code recorded on the recording medium, based on the information managed in the step (e), during recording of the input data with the time code on the recording medium;

(g) comparing the time code of the input data with the time code of the data reproduced in the step (f); and

(h) selectively outputting at least one of the input data and the reproduced data based on a comparison result obtained in the step (g).

23. A method according to claim 22, further comprising a step of compressing the input data with the time code which have been thinned out in the step (c) and a step of expanding the data with the time code which have been reproduced in the step (f).

24. A method according to claim 22, wherein the step (h) comprises a step of applying a priority order to each of the input data with the time code and the reproduced data with the time code,

and wherein the method further comprises a step of displaying the selective output in the step (h) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

25. A method for recording and reproducing data, comprising the steps of:

(a) receiving input data;

(b) generating a time code and applying the time code to the input data;

(c) recording on a recording medium the input data with the time code;

(d) managing information indicating a position of the input data with the time code recorded on the recording medium;

(e) reproducing the data with the time code recorded on the recording medium, based on the information managed in the step (d), during recording of the input data with the time code on the recording medium;

(f) thinning out the data with the time code reproduced in the step (e) at a predetermined ratio;

(g) comparing the time code of the input data with the time code of the data thinned out in the step (f); and

(h) selectively outputting at least one of the input data and the data thinned out in the step (f) based on a comparison result obtained in the step (g).

26. A method according to claim 25, further comprising a step of compressing the input data with the time code and a step of expanding the data with the time code which have been reproduced in the step (e).

27. A method according to claim 25, wherein the step (h) comprises a step of applying a priority order to each of the input data with the time code and the thinned out data with the time code,

and wherein the method further comprises a step of displaying the selective output in the step (h) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

28. A method for recording and reproducing data, comprising the steps of:

(a) receiving input data;

(b) generating a time code and applying the time code to the input data;

(c) thinning out the input data with the time code at a first ratio;

(d) recording on a recording medium the input data with the time code which have been thinned out in the step (c);

(e) managing information indicating a position of the input data with the time code recorded on the recording medium;

(f) reproducing the data with the time code recorded on the recording medium, based on the information managed in the step (e), during recording of the input data with the time code on the recording medium;

(g) thinning out the data with the time code reproduced in the step (f) at a second ratio;

(h) comparing the time code of the input data with the time code of the data thinned out in the step (g); and

(i) selectively outputting at least one of the input data and the data thinned out in the step (g) based on a comparison result obtained in the step (h).

29. A method according to claim 28, further comprising a step of compressing the input data with the time code which have been thinned out in the step (c) and a step of expanding the data with the time code which have been reproduced in the step (f).

30. A method according to claim 28, wherein the step (i) comprises a step of applying a priority order to each of the input data with the time code and the thinned out data with the time code,

and wherein the method further comprises a step of displaying the selective output in the step (i) in a predetermined mode, the predetermined mode being changed in accordance with the priority order.

FIG. 1

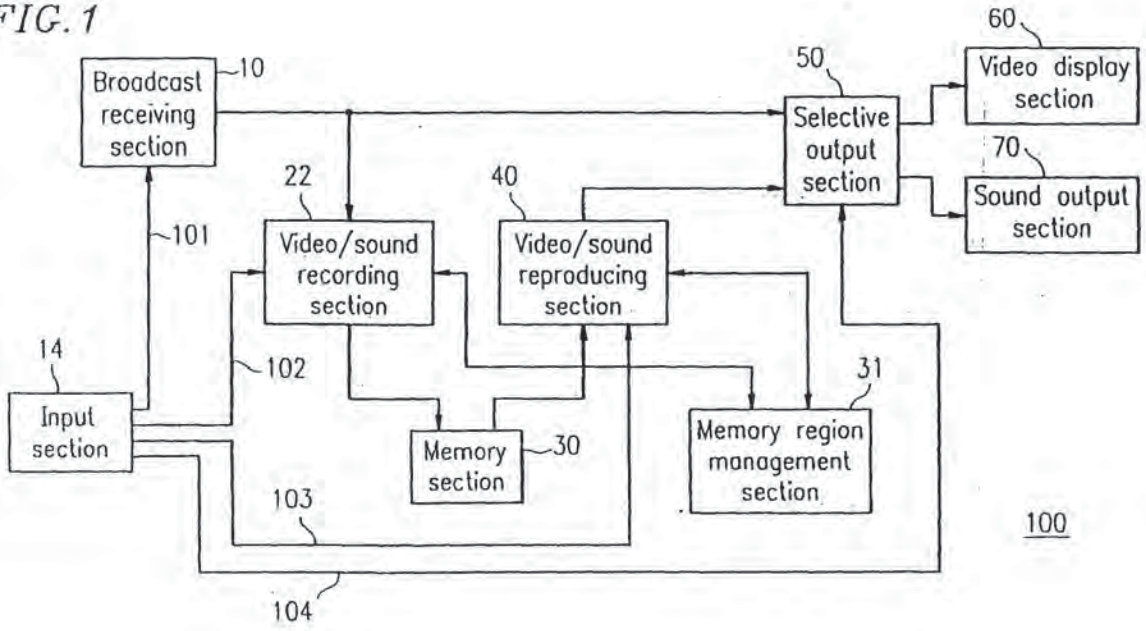

Broadcast receiving section
10
Selective output section
50
Video display section
60
Sound output section
70
Video/sound recording section
22
Video/sound reproducing section
40
101
102
103
104
Input section
14
Memory section
30
Memory region management section
31
100

FIG. 2

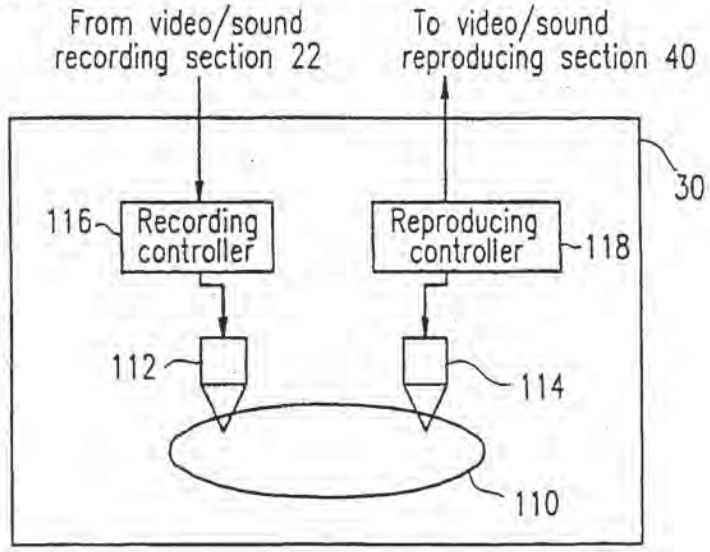
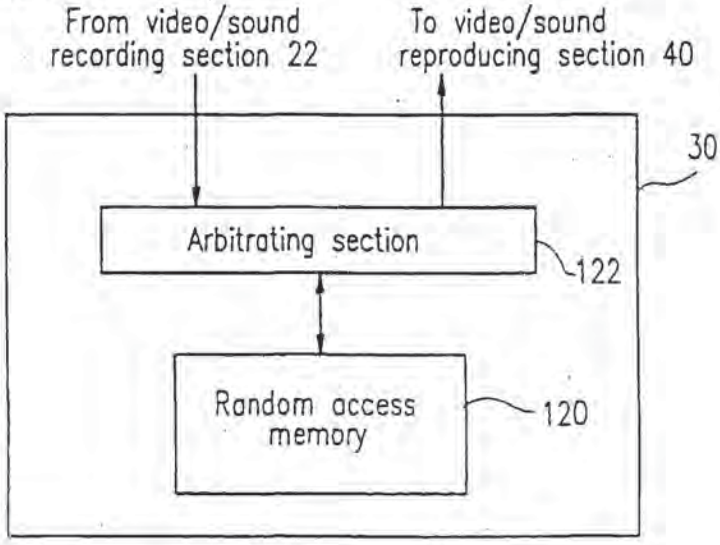

From video/sound recording section 22
To video/sound reproducing section 40
30
116
Recording controller
Reproducing controller
118
112
114
110

FIG. 3


From video/sound recording section 22
To video/sound reproducing section 40
30
Arbitrating section
122
Random access memory
120

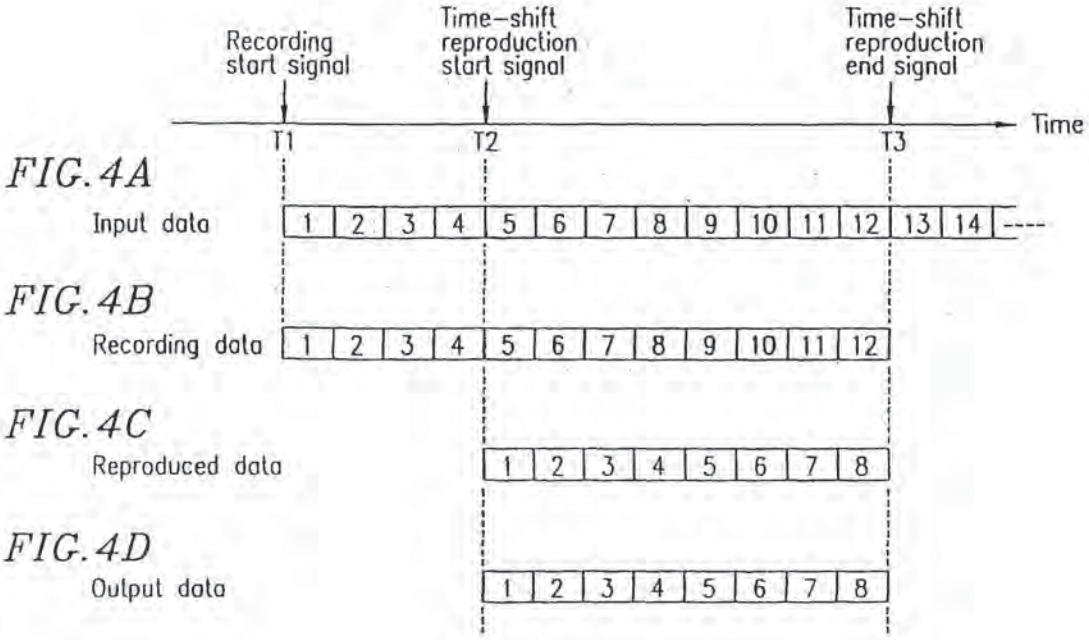


FIG. 4A

FIG. 4B

FIG. 4C

FIG. 4D

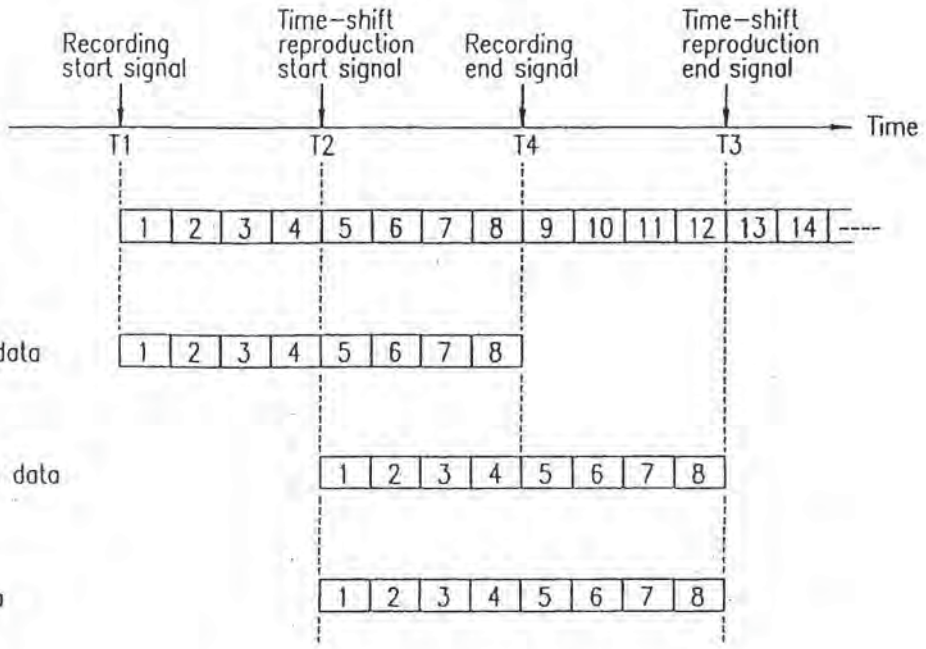


FIG. 5A
Input data

FIG. 5B
Recording data

FIG. 5C
Reproduced data

FIG. 5D
Output data

FIG. 6

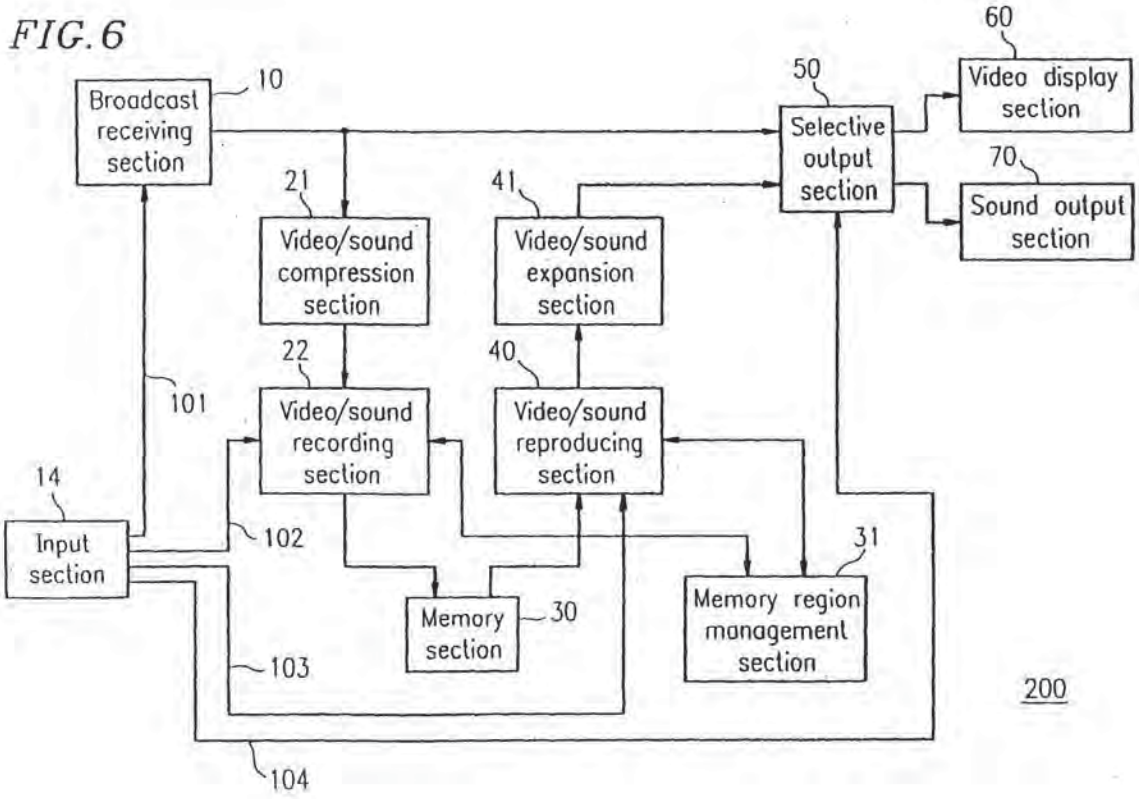


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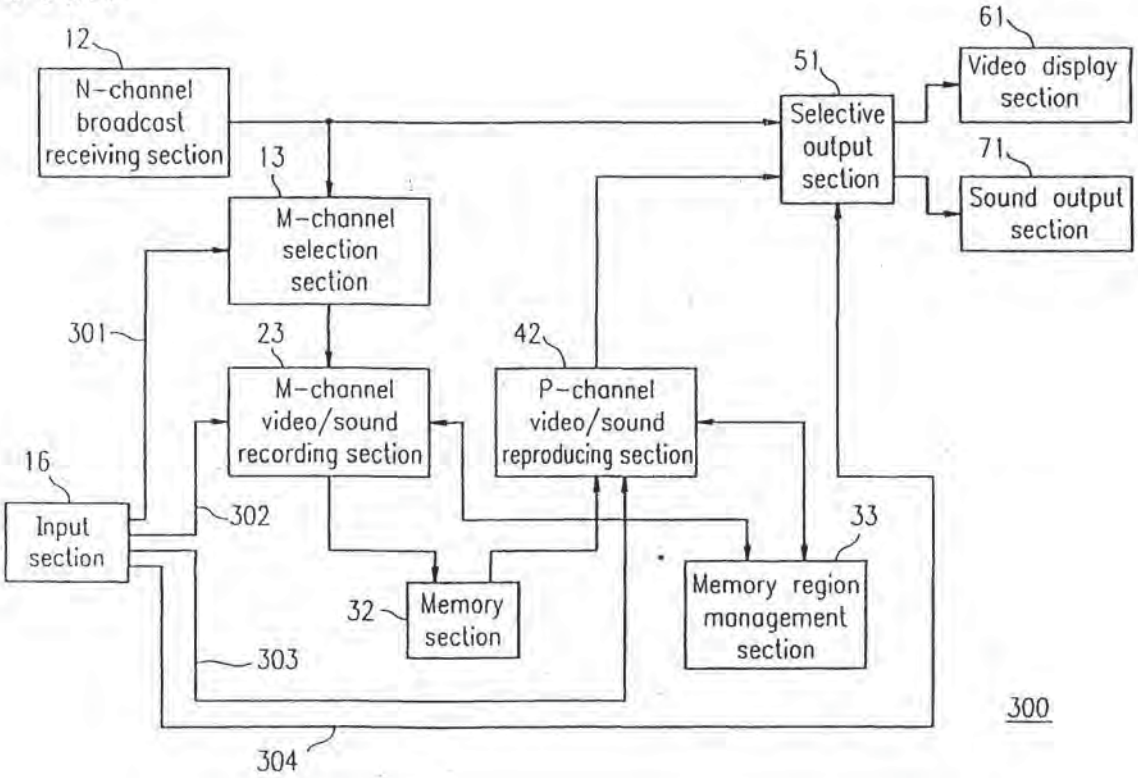
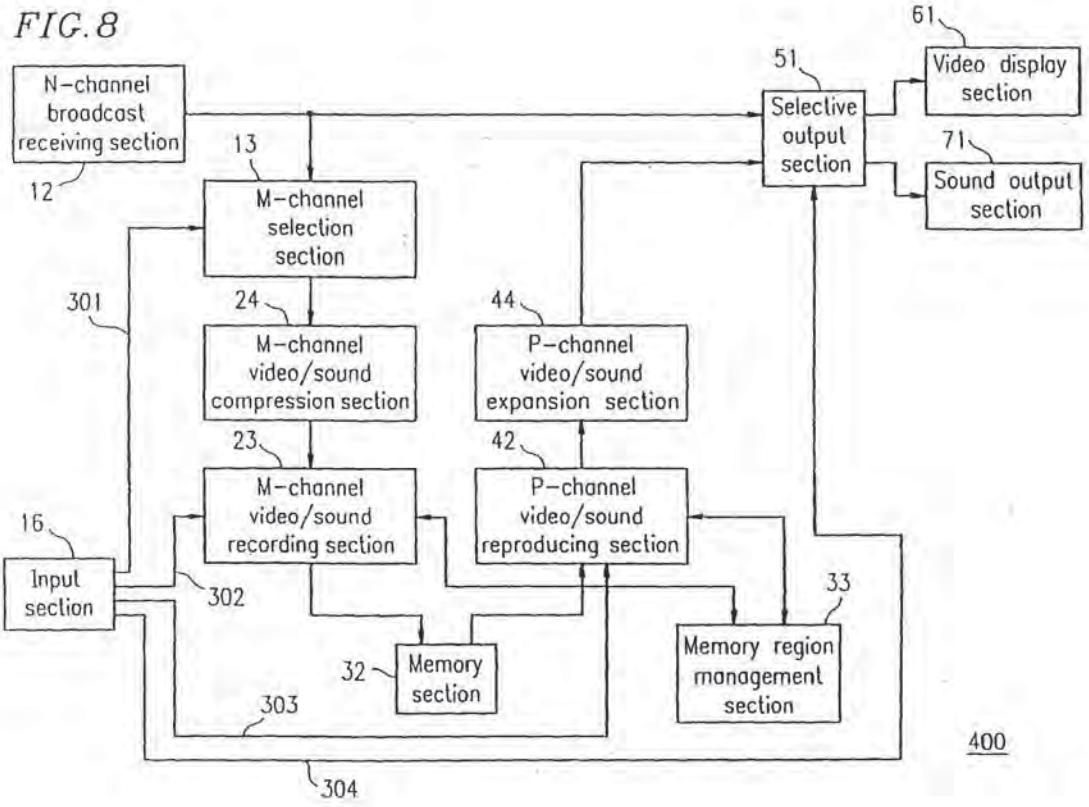
FIG. 7



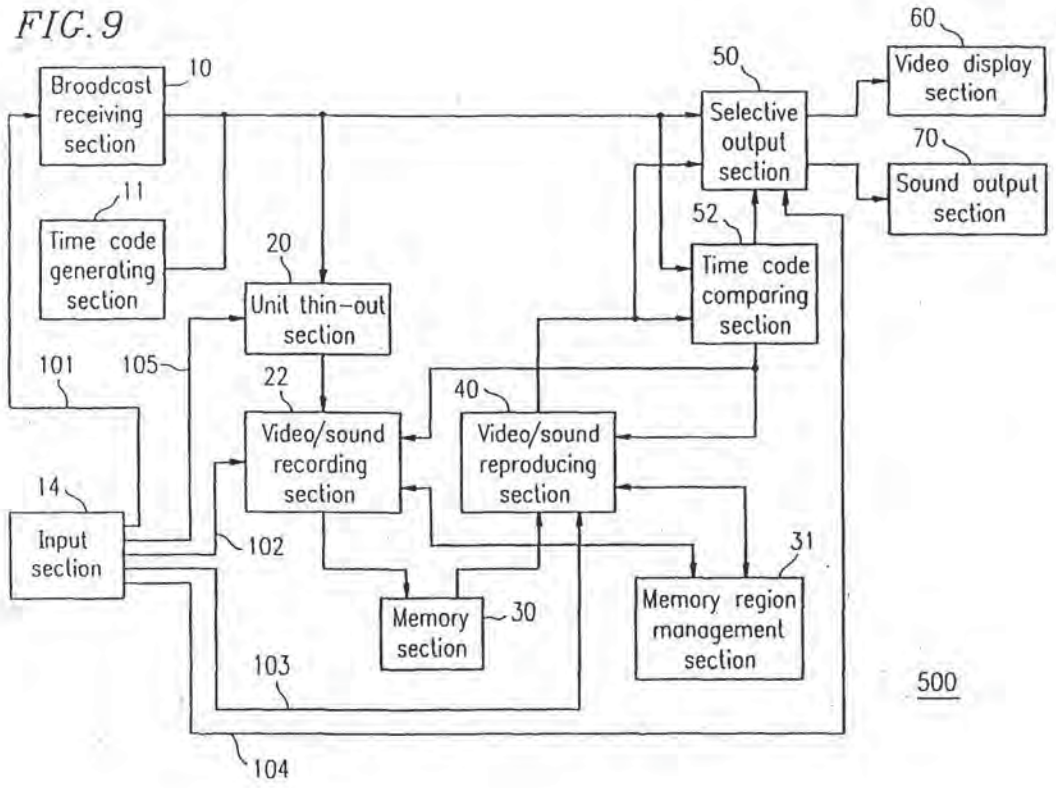
EP 0 726 574 A2

FIG. 8



EP 0 726 574 A2

FIG. 9



EP 0 726 574 A2

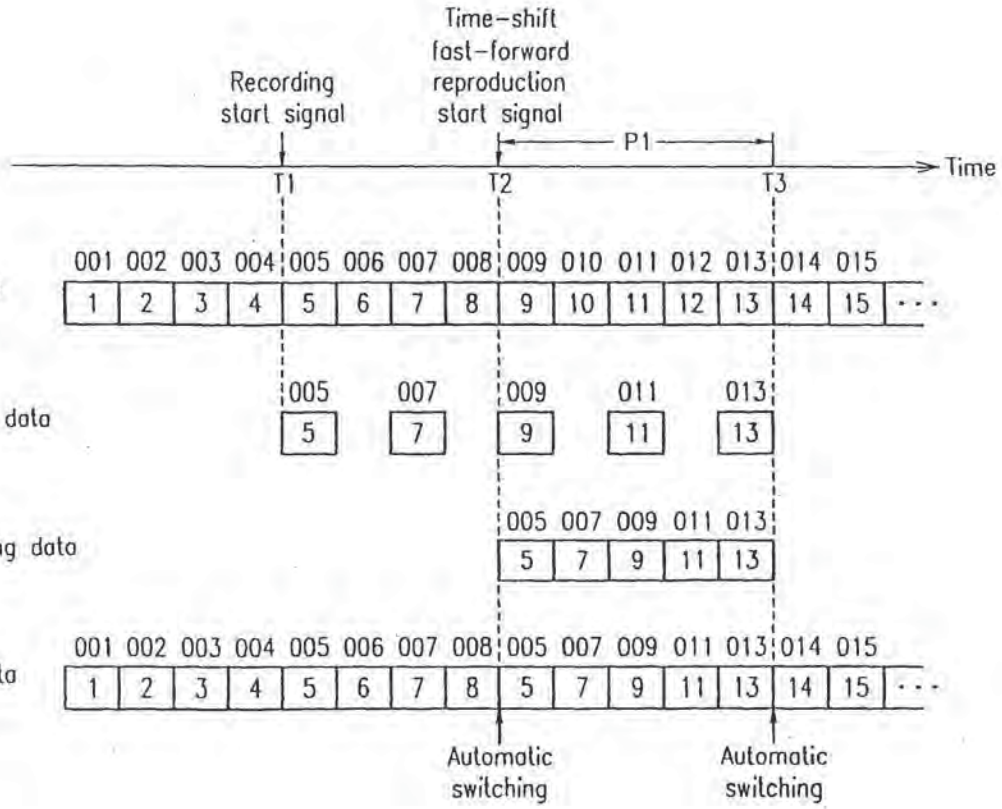


FIG. 10A

Input data

FIG. 10B

Recording data

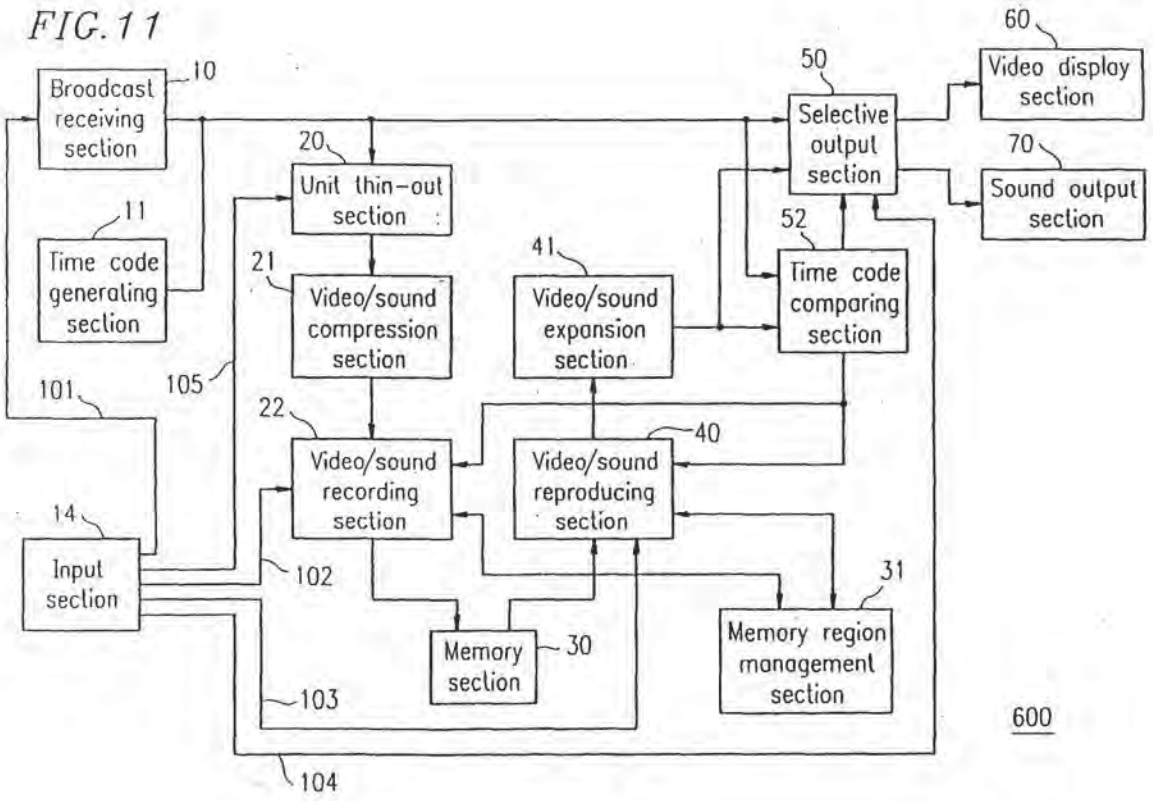
FIG. 10C

Reproducing data

FIG. 10D

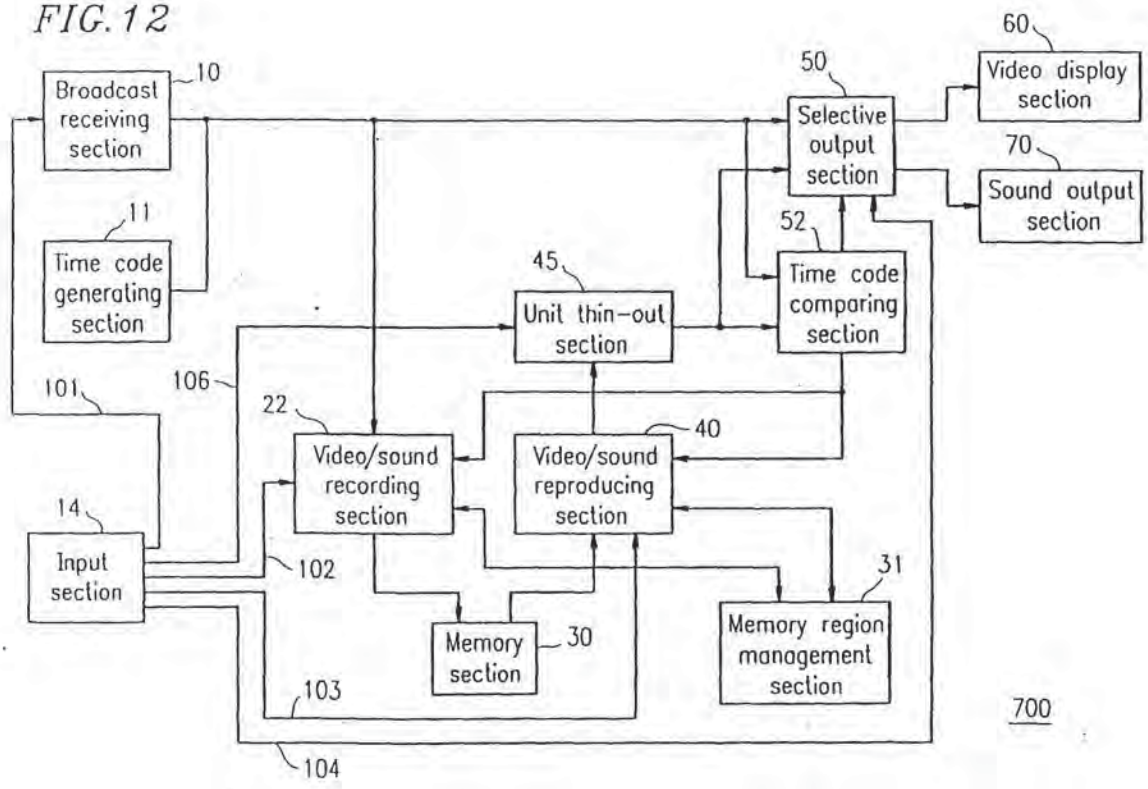
Output data

FIG. 11



EP 0 726 574 A2

FIG. 12



EP 0 726 574 A2

FIG. 13

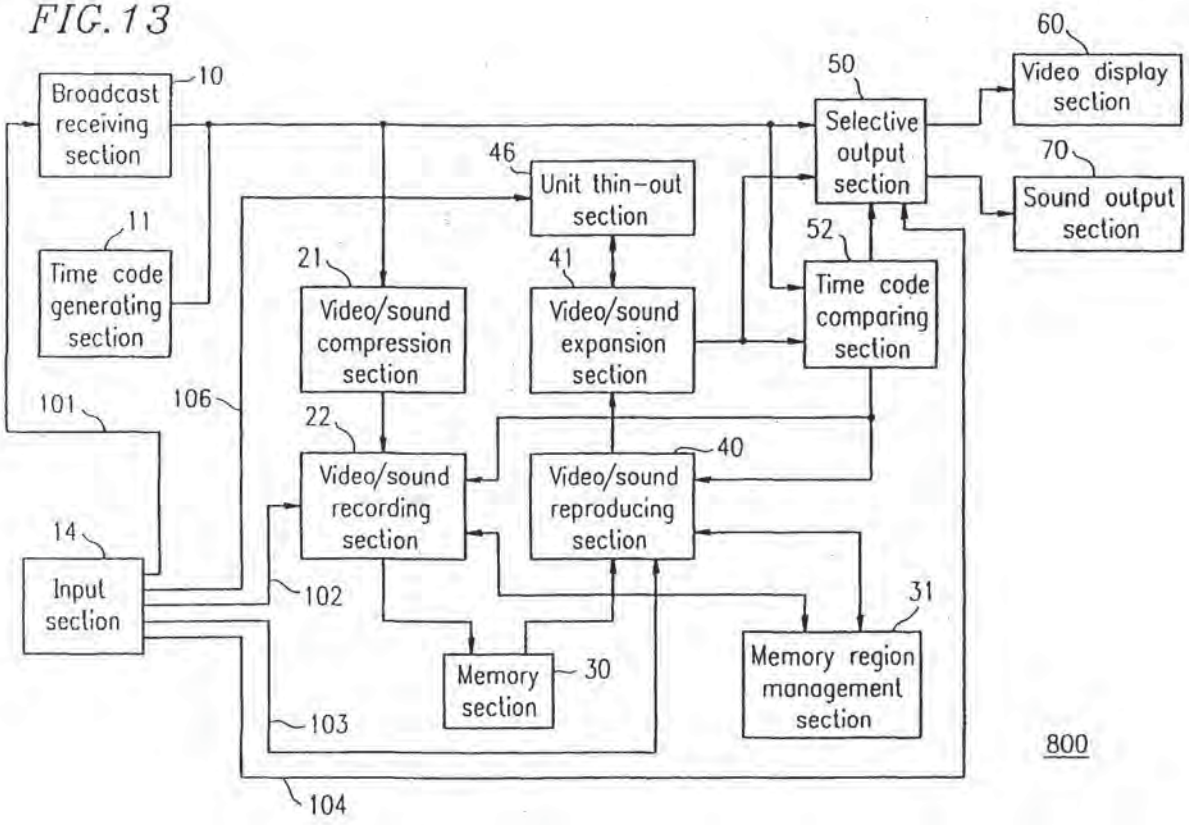


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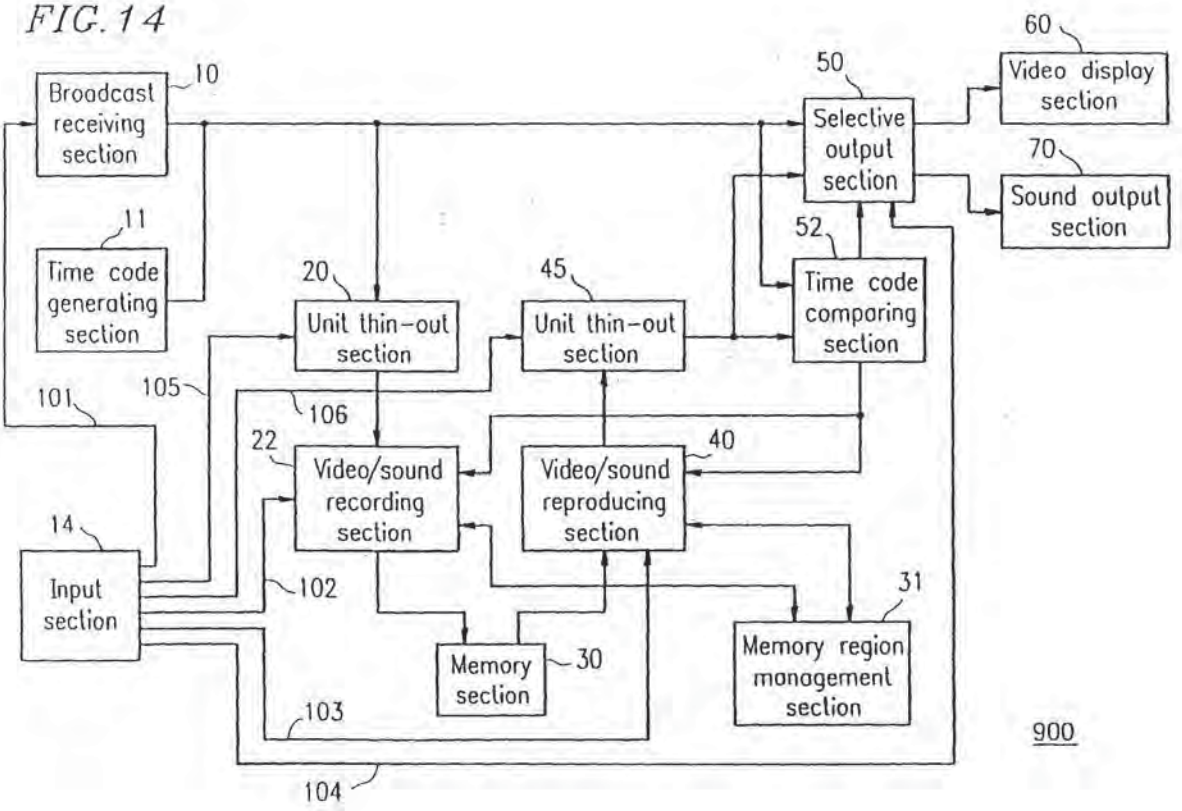
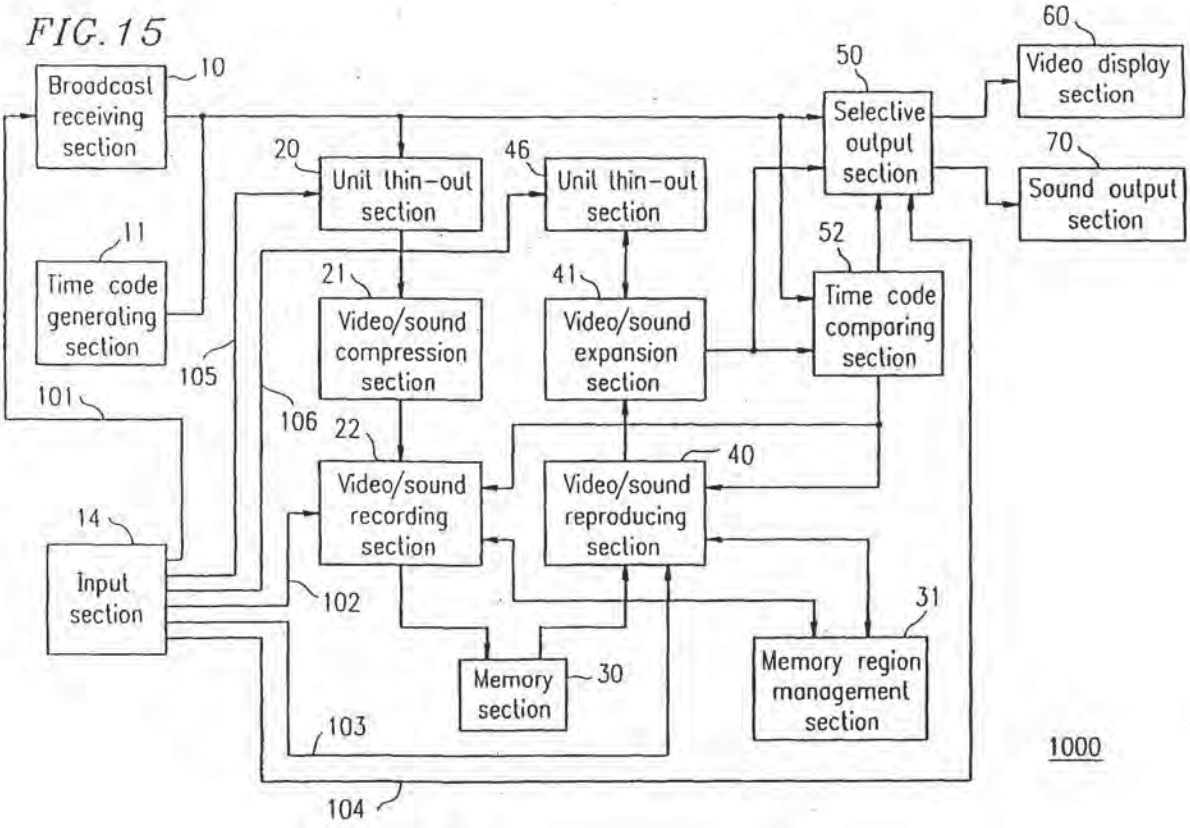
FIG. 14



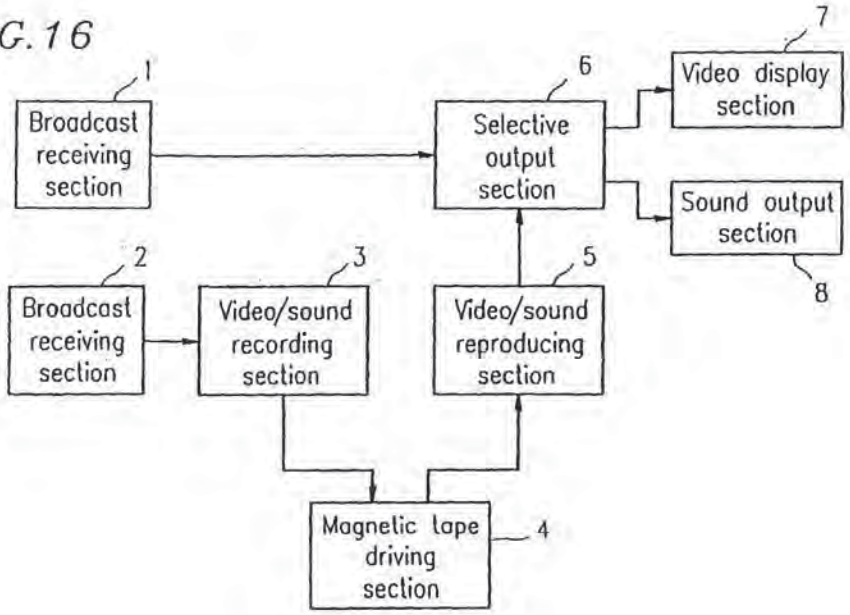
EP 0 726 574 A2

FIG. 15



EP 0 726 574 A2

FIG. 16



EP 0 726 574 A2

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1428	MPEG and (audio same video) and record$.ti.	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/21 10:57
L2	288	l1	EPO; JPO; DERWENT	OR	OFF	2006/04/21 10:49
L3	2	"6671290".pn. or "5398150".pn.	USPAT	OR	OFF	2006/04/21 11:48
L4	10	("5899578" | "5909257" | "5959659" | "6137486" | "6253019" | "6285824" | "6445872" | "6467093" | "6477317" | "6496896").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/21 10:50
L5	1140	l1 not l2	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/21 10:57
L6	468	l5 and @AY<"1999"	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/21 11:41
L7	0	standard and demultpleX$ and audio and video and mpeg	EPO; JPO; DERWENT	OR	OFF	2006/04/21 11:43
L8	17	standard and demultiple$ and audio and video and mpeg	EPO; JPO; DERWENT	OR	OFF	2006/04/21 11:43
L9	1	"6704493".pn.	USPAT	OR	OFF	2006/04/21 11:48
L10	6	("5394249" | "5610661" | "5864649" | "6049694" | "6233389" | "6504996"). PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/21 11:49
L11	101	tuner and mpeg$ and record$	EPO; JPO; DERWENT	OR	OFF	2006/04/21 11:56
L12	13	(hwon and lee).in.	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/21 11:57
L13	1440	(hwan and lee).in.	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/21 11:58
L14	279	(hwan and lee and jong).in.	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/21 11:58

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	4	"2294173"	EPO; DERWENT	OR	OFF	2006/04/21 13:54
S2	4	"2293516"	EPO; DERWENT	OR	OFF	2006/04/21 13:57
S3	10	"0782332"	EPO; DERWENT	OR	OFF	2006/04/21 13:58
S4	6	"782332"	EPO; DERWENT	OR	OFF	2006/04/21 13:59
S5	77	h04n007/13$.ipc. and mpeg$	EPO; DERWENT	OR	OFF	2006/04/21 14:04
S6	453	h04n007/13$.ipc. and record$.ti.	EPO; DERWENT	OR	OFF	2006/04/21 14:28
S7	1128	(digital near broadcast$) and record$.ti.	EPO; JPO; DERWENT	OR	OFF	2006/04/21 14:28
S8	696	h04n007/13$.ipc. and record$.ti.	EPO; JPO; DERWENT	OR	OFF	2006/04/21 14:29
S9	243	S8 not S6	EPO; JPO; DERWENT	OR	OFF	2006/04/21 14:29
S10	1371	S7 or S9	EPO; JPO; DERWENT	OR	OFF	2006/04/21 14:29
S11	150	S10 and tuner	EPO; JPO; DERWENT	OR	OFF	2006/04/21 14:33
S12	54442	h04n005/4$.ipc.	EPO; JPO; DERWENT	OR	OFF	2006/04/21 14:35
S13	759	S12 and mpeg$	EPO; JPO; DERWENT	OR	OFF	2006/04/21 14:58
S14	20	mpeg$ and dvr	EPO; JPO; DERWENT	OR	OFF	2006/04/21 15:04
S15	16	standard and dvr	EPO; JPO; DERWENT	OR	ON	2006/04/21 15:06
S16	1	"6963612".pn.	USPAT	OR	ON	2006/04/21 15:07
S17	1	("5726989").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/21 15:10
S18	85415	h04n005/7$.ipc.	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/21 15:11
S19	3198	S18 and digital and analog	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/21 15:11
S20	246	S19 and tuner	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/21 15:11

EAST Search History

S21	12	("4626926" | "4635132" | "5111285" | "5636315" | "6298405" | "6366359" | "6456714" | "6457079" | "6480630" | "6481010" | "6493874" | "6529522"). PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/21 15:13
S22	3	("20030040917" | "5787445" | "5831943").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/22 06:35
S23	17	(barry and schwab).in.	USPAT	OR	OFF	2006/04/22 06:41
S24	11	(kinya and washino).in.	USPAT	OR	OFF	2006/04/22 06:45
S25	439	(program near stream)	EPO; JPO; DERWENT	OR	OFF	2006/04/22 06:45
S26	121	(program near stream) same record$	EPO; JPO; DERWENT	OR	OFF	2006/04/22 06:59
S27	1	"6697432".pn.	USPAT	OR	OFF	2006/04/22 07:00
S28	16	("20010041056" | "5285497" | "5287182" | "5319707" | "5565924" | "5619337" | "5635989" | "5703877" | "5801781" | "5838873" | "5844636" | "5847771" | "5899578" | "5940148" | "6115074" | "6332057").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/22 07:15
S29	1321	mpeg$ same program same transport	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/22 07:16
S30	833	S29 and record$	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/22 07:16
S31	11	("5481543" | "5521927" | "5534944" | "5621840" | "5650825" | "5663962" | "5668601" | "5668841" | "5677980" | "5684804" | "5838874").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/22 08:51
S32	1174	MPEG$ and (record$ and reproduc$). ti.	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/22 08:52
S33	609	MPEG$ and (record$ and reproduc$). ti.	EPO; JPO; DERWENT	OR	OFF	2006/04/22 08:53
S34	150	S33 and @py<"1999"	EPO; JPO; DERWENT	OR	OFF	2006/04/22 09:13
S35	485	(multi near standard) and television	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/22 09:14
S36	67	S35 and recorder	USPAT; EPO; JPO; DERWENT	OR	OFF	2006/04/22 09:15
S37	6	("5394249" | "5610661" | "5864649" | "6049694" | "6233389" | "6504996"). PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/22 09:25

EAST Search History

S38	1246	mpeg$ and (record$ or reproduc$ or play$) and (dvr or disk or disc)	EPO; JPO; DERWENT	OR	OFF	2006/04/22 09:34
S39	268	S38 and @py<"1999"	EPO; JPO; DERWENT	OR	OFF	2006/04/22 09:30
S40	20	S39 and (program or tuner)	EPO; JPO; DERWENT	OR	OFF	2006/04/22 09:30
S41	7926	mpeg$ and (record$ or reproduc$ or play$) and (dvr or disk or disc)	USPAT	OR	OFF	2006/04/22 09:35
S42	3609	S41 and @AY<"1999"	USPAT	OR	OFF	2006/04/22 09:36
S43	282	S42 and ((simultan$ same record$ same (reproduc$ or play$)))	USPAT	OR	OFF	2006/04/22 09:38
S44	2	("5134499" | "5479302").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/22 09:47
S45	37	("5134499").URPN.	USPAT	OR	OFF	2006/04/22 09:48
S46	11	("5134499" | "5293282" | "5355486" | "5371551" | "5396375" | "5701383" | "5889920" | "5920340" | "6018612" | "6233389" | "6304714").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/22 09:50
S47	10	("4488179" | "4626847" | "4706121" | "4856081" | "4908713" | "5134499" | "5170388" | "5172111" | "5181114" | "5257142").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2006/04/22 10:04
S48	1	("5604838").URPN.	USPAT	OR	OFF	2006/04/22 10:08

Attorney Docket No. 60097-0357 ReExam

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reexamination of:

James M. Barton, et al.

Application No.: 90/007,750

Filing Date: October 17, 2005

Patent No.: 6,233,389

Issue Date: May 15, 2001

Confirmation No.: 4653

Examiner: NYA

Group Art Unit No.: NYA

For: MULTIMEDIA TIME WARPING SYSTEM

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Sir:

Enclosed is a copy of Information Disclosure Citation Form PTO-1449 together with copies of the documents cited on that form, if needed. Pursuant to 37 C.F.R. § 1.97, the submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made and is not to be construed as an admission that the information cited in this statement is material to patentability.

Pursuant to 37 C.F.R. § 1.97, this Information Disclosure Statement is being submitted under one of the following (as indicated by an "X" to the left of the appropriate paragraph):

☒ 37 C.F.R. §1.97(b). It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(c). If so, then this Information Disclosure Statement includes one of the following:

☐ A statement pursuant to 37 C.F.R. §1.97(e)

☐ 1.97(e)(1) The undersigned hereby states that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement.

☐ 1.97(e)(2) The undersigned hereby states that no item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in this information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of this information disclosure statement.

☐ A check for $180.00 for the fee under 37 C.F.R. § 1.17(p).

It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(d). If so, then this Information Disclosure Statement includes the following:

☐ A statement pursuant to 37 C.F.R. §1.97(e)

☐ 1.97(e)(1) The undersigned hereby states that each item of information contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this information disclosure statement; OR

☐ 1.97(e)(2) The undersigned hereby states that no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in §1.56(c)

more than three months prior to the filing of this information disclosure statement.

AND

☐ A check for $180.00 for the fee under 37 C.F.R. §1.17(i) for submission of the Information Disclosure Statement.

It is respectfully requested that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

☐ 37 C.F.R. §1.97(i). Applicants are submitting references to satisfy Applicants' disclosure obligations in hopes that the references will be considered by the Examiner. Although the submission does not fully meet 37 C.F.R. §1.97, Applicant respectfully requests that the cited documents be considered and that the enclosed Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to Applicant(s). It is understood that if the Examiner does not consider the cited references, the cited documents will be placed in the file pursuant to 37 C.F.R. §1.97(i).

Accordingly, copies of the references as listed on the attached Form PTO 1449 are submitted herewith. No certification or fees are deemed necessary.

Throughout the pendency of this application, please charge any additional fees, including any required extension of time fees, and credit all overpayments to deposit account 50-1302.

Respectfully submitted,

HICKMAN PALERMO TRUONG & BECKER LLP

Dated: April 20 2006

Kirk D. Wong
Reg. No. 43,284

2055 Gateway Place, Suite 550
San Jose, California 95110-1089
Telephone: (408) 414-1080 ext. 214
Facsimile: (408) 414-1076

INFORMATION DISCLOSURE CITATION IN AN APPLICATION (PTO-1449)

ATTY. DOCKET NO.	APPLICATION NO.
60097-0357	90/007,750
APPLICANT: James M. Barton, et al.	
FILING DATE: October 17, 2005	**GROUP:** NYA

U.S. PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	U.S. Patent Document Number	U.S. Patent Document Kind Code[2] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Exam. Initial*	Cite No.[1]	Foreign Patent Document Office[3]	Number[4]	Kind Code[5] (If known)	Name of Patentee or Applicant of Cited Document	Date of Publication of Cited Document MM-DD-YYYY	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

OTHER ART – NO PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published	Translation[2]
		TiVo Inc. vs. Echostar Communications Corp, et al., Case No. 2:04-CV-1-DF, "Verdict Form", filed April 13, 2006 in U.S. District Court, Eastern District of Texas, Marshall Division (8 pgs).	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Unique citation designation number. [2]See attached Kinds of U.S. Patent Documents. [3]Enter Office that issued the document, by the two-letter code (WIPO Standard S.3). [4]For Japanese patent documents, the indication of the year of reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6]Applicant is to place a check mark here if English language Translation is attached.

Burden Hour Statement: This form is estimated to take 2.0 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

Attorney Docket No. 60097-0357

PROOF OF SERVICE (37 C.F.R. §1.248)

I am a resident of the aforesaid county. I am over the age of eighteen years and not a party to the within action; my business address is 2055 Gateway Place, Suite 550, San Jose, California 95110.

On April 20, 2006, I served the within Information Disclosure Statement and PTO Form 1449 on the interested parties in this action, by placing a true copy thereof enclosed in sealed envelopes addressed as follows: David L. Fehrman, Morrison & Foerster, LLP
555 W. Fifth Street, Suite 3500
Los Angeles, CA 90013

X (BY MAIL) The envelope was mailed with postage thereon fully prepaid. I am "readily" familiar with the firm's practice of collection and processing correspondence for mailing. It is deposited with U.S. Postal Service on that same day in the ordinary course of business. I am aware that on motion of a party served, service is presumed invalid if the postal cancellation date or postage meter date is more than one day after date of deposit for mailing an affidavit.

Executed on April 20, 2006, at San Jose, California.

X (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Annette Jacobs
[*Type or print name*]

[*Signature*]

Litigation Search Report CRU 3999

Reexam Control No. 90/007,750

TO: Harvey, David **Location: CRU** **Art Unit: 3992** **Date: 04/26/06** **Case Serial Number: 90/007,750**	**From: Michelle R. Eason** **Location: CRU 3999** **MDW 7C76** **Phone: (571) 272-6277** **Michelle.eason@uspto.gov**

Search Notes

U.S. Patent No- 6,233,389

1) I performed a KeyCite Search in Westlaw, which retrieves all history on the patent including any litigation.

2) I performed a search on the patent in Lexis CourtLink for any open dockets or closed cases.

3) I performed a search in Lexis in the Federal Courts and Administrative Materials databases for any cases found.

4) I performed a search in Lexis in the IP Journal and Periodicals database for any articles on the patent.

5) I performed a search in Lexis in the news databases for any articles about the patent or any articles about litigation on this patent.

Litigation was found.

Westlaw.

Date of Printing: APR 26,2006

KEYCITE

CUS PAT 6233389 MULTIMEDIA TIME WARPING SYSTEM, Assignee: TiVo, Inc. (May 15, 2001)

History

=> 1 **MULTIMEDIA TIME WARPING SYSTEM,** US PAT 6233389, 2001 WL 510913 (U.S. PTO Utility May 15, 2001) (NO. 09/126071)

Assignments

2 Assignee(s): TIVO, INC. SUITE 100 894 ROSS DRIVE SUNNYVALE, CALIFORNIA 94089, DATE RECORDED: Jul 30, 1998

Patent Status Files

. Request for Re-Examination, (OG date: Jan 31, 2006)

. ,

. Patent Suit(See LitAlert Entries),

Litigation Alert

6 LitAlert P2004-08-19, (Jan 15, 2004) Action Taken: A complaint was filed.

7 LitAlert P2002-10-46, (Jan 23, 2002) Action Taken: A complaint was filed.

Prior Art

C 8 US PAT 4665431 APPARATUS AND METHOD FOR RECEIVING AUDIO SIGNALS TRANSMITTED AS PART OF A TELEVISION VIDEO SIGNAL, (U.S. PTO Utility 1987)

C 9 US PAT 5696868 APPARATUS AND METHOD FOR RECORDING/PLAYING BACK BROADCASTING SIGNAL, Assignee: Goldstar Co., Ltd., (U.S. PTO Utility 1997)

C 10 US PAT 5550594 APPARATUS AND METHOD FOR SYNCHRONIZING ASYNCHRONOUS SIGNALS, Assignee: Pixel Instruments Corp., (U.S. PTO Utility 1996)

C 11 US PAT 5675388 APPARATUS AND METHOD FOR TRANSMITTING AUDIO SIGNALS AS PART OF A TELEVISION VIDEO SIGNAL, (U.S. PTO Utility 1997)

C 12 US PAT 5202761 AUDIO SYNCHRONIZATION APPARATUS, (U.S. PTO Utility 1993)

C 13 US PAT RE33535 AUDIO TO VIDEO TIMING EQUALIZER METHOD AND APPARATUS, (U.S. PTO Reissue 1991)

C 14 US PAT 5572261 AUTOMATIC AUDIO TO VIDEO TIMING MEASUREMENT DEVICE AND METHOD, (U.S. PTO Utility 1996)

C 15 US PAT 4313135 METHOD AND APPARATUS FOR PRESERVING OR RESTORING AUDIO TO VIDEO SYNCHRONIZATION, (U.S. PTO Utility 1982)

C 16 US PAT 5937138 : METHOD AND AN APPARATUS FOR SYSTEM ENCODING BITSTREAMS FOR SEAMLESS CONNECTION, Assignee: Matsushita Electric Industrial Co., Ltd., (U.S. PTO Utility 1999)

C 17 US PAT 5787225 OPTICAL DISK APPARATUS FOR THE REPRODUCTION OF COMPRESSED DATA, Assignee: Matsushita Electric Industrial Co., Ltd., (U.S. PTO Utility 1998)

C 18 US PAT 5706388 RECORDING SYSTEM RECORDING RECEIVED INFORMATION ON A RECORDING MEDIUM WHILE REPRODUCING RECEIVED INFORMATION PREVIOUSLY RECORDED ON THE RECORDING MEDIUM, Assignee: Ricoh Company, Ltd., (U.S. PTO Utility 1998)

C 19 US PAT 5920842 : SIGNAL SYNCHRONIZATION, Assignee: Pixel Instruments, (U.S. PTO Utility 1999)
C 20 US PAT 5371551 TIME DELAYED DIGITAL VIDEO SYSTEM USING CONCURRENT RECORDING AND PLAYBACK, (U.S. PTO Utility 1994)
C 21 US PAT 5438423 TIME WARPING FOR VIDEO VIEWING, Assignee: Tektronix, Inc., (U.S. PTO Utility 1995)

US District Court Civil Docket

U.S. District - Georgia Northern
(Atlanta)

1:05cv2799

Tivo, Inc v. Echostar Communications Corporation et al

This case was retrieved from the court on Tuesday, March 28, 2006

Date Filed: 10/28/2005
Assigned To: Judge William S Duffey, Jr
Referred To:
Nature of suit: Patent (830)
Cause: FRCP 45(b) Motion to quash or modify subpoena
Lead Docket: None
Other Docket: USDC ED TX, 2-04cv01 DF
Jurisdiction: Federal Question

Class Code: APPEAL, CLOSED, SEAL_Material
Closed: yes
Statute:
Jury Demand: None
Demand Amount: $0
NOS Description: Patent

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Date	#	Proceeding Text
07/07/2005	1	MOTION to Quash subpoenas with Brief In Support by Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation. (Attachments: # 1 Exhibit 1# 2 Exhibit 1-A# 3 Exhibit 1-B# 4 Exhibit 1-C# 5 Exhibit 1-D# 6 Exhibit 1-E# 7 Exhibit 1-F# 8 Exhibit 1-G# 9 Exhibit 1-H# 10 Exhibit 1-I# 11 Exhibit 2# 12 Exhibit 2-A# 13 Exhibit 2-B# 14 Exhibit 2-C# 15 Exhibit 2-D# 16 Exhibit 2-E# 17 Exhibit 2-F)(fmm) (Entered: 07/15/2005)
07/26/2005	2	PROPOSED CONSENT ORDER For Extension of Time re: 1 MOTION to Quash subpoenas. (Buhay, William) (Entered: 07/26/2005)
07/27/2005	6	APPLICATION for Admission of Harold J. McElhinny Pro Hac Viceby Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation.Filing Fee received $150.00, Receipt #539834. (fmm) (Entered: 07/29/2005)
07/27/2005	7	APPLICATION for Admission of Peter P. Meringolo Pro Hac Viceby Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation.Filing Fee received $150.00, Receipt #539834. (fmm)

		(Entered: 07/29/2005)
07/27/2005	8	APPLICATION for Admission of Marc J. Pernick Pro Hac Viceby Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation.Filing Fee received $150.00, Receipt #539835. (fmm) (Entered: 07/29/2005)
07/28/2005	3	NOTICE of Appearance by William Charles Buhay on behalf of TiVo, Inc. (Buhay, William) (Entered: 07/28/2005)
07/28/2005	4	Second MOTION for Extension of Time Reply to Motion for Protective Order and to Quash re: 1 MOTION to Quash subpoenas, 2 Proposed Consent Order with Brief In Support by TiVo, Inc.. (Buhay, William) (Entered: 07/28/2005)
07/28/2005	5	PROPOSED ORDER Unopposed Motion to Extend Time to Reply to Motion for Protective Order and to Quash re: 4 Second MOTION for Extension of Time Reply to Motion for Protective Order and to Quash re: 1 MOTION to Quash subpoenas, 2 Proposed Consent Order. (Buhay, William) (Entered: 07/28/2005)
07/28/2005	9	ORDER GRANTING 4 Motion for Extension of Time. IT IS HEREBY ORDERED that Plaintiff shall have (3) three additional days in which to file its response to the Joint Motion . Signed by Judge William S. Duffey Jr. on 7/26/05. (kt) (Entered: 07/29/2005)
08/01/2005	10	ORDER GRANTING 5 Unopposed Motion to Extend time until 8/4/05 for TiVo to reply to EchoStar and Non-Party Homer Knearl's Joint Motion for a Protective Order and to Quash Rule 45 Subpoenas. Signed by Judge William S. Duffey Jr. on 8/1/05. (kt) (Entered: 08/02/2005)
08/02/2005	--	ORDER (by docket entry only) granting 6 Application for Admission Pro Hac Vice of Harold McElhinny, granting 7 Application for Admission Pro Hac Vice of Peter Meringolo, granting 8 Application for Admission Pro Hac Vice of Marc Pernick . Ordered by Judge William S. Duffey Jr. on 8/2/05. (jdb) (Entered: 08/02/2005)
08/03/2005	13	ORDER APPROVING 11 Third MOTION for Extension of Time to Reply to EchoStar and Non-Party Homer Knearl's Joint Motion for Protective Order and 1 Motion to Quash Rule 45 Subpoenas until 8/10/05. Signed by Judge William S. Duffey Jr. on 8/5/05. (kt) (Entered: 08/05/2005)
08/04/2005	11	Third MOTION for Extension of Time File Response re: 1 MOTION to Quash subpoenas with Brief In Support by TiVo, Inc.. (Buhay, William) (Entered: 08/04/2005)
08/04/2005	12	PROPOSED ORDER Granting Six (6) Day Extension re: 11 Third MOTION for Extension of Time File Response re: 1 MOTION to Quash subpoenas. (Buhay, William) (Entered: 08/04/2005)
08/05/2005	15	APPLICATION for Admission of Christine W.S. Byrd Pro Hac Viceby TiVo, Inc..Filing Fee received $150.00, Receipt #540264. (fmm) (Entered: 08/11/2005)
08/05/2005	16	APPLICATION for Admission of Perry M. Goldberg Pro Hac Viceby TiVo, Inc..Filing Fee received $150.00, Receipt #540264. (fmm) (Entered: 08/11/2005)
08/10/2005	14	Fourth MOTION for Extension of Time File Response re: 1 MOTION to Quash subpoenas with Brief In Support by TiVo, Inc.. (Attachments: # 1)(Buhay, William) (Entered: 08/10/2005)
08/12/2005	--	ORDER (by docket entry only) granting 15 Application for Admission Pro Hac Vice of Christine W.S. Byrd, granting 16 Application for Admission Pro Hac Vice of Perry M. Goldberg. Ordered by Judge William S. Duffey Jr. on 8/12/05. (jdb) (Entered: 08/12/2005)
08/12/2005	17	ORDER GRANTING 14 Unopposed Motion for Extension of Time to Reply to the Joint Motion until 8/31/05. Signed by Judge William S. Duffey Jr. on 8/11/05. (kt) (Entered: 08/12/2005)
08/31/2005	18	Fifth MOTION for Extension of Time re: 1 MOTION to Quash subpoenas with Brief In Support by TiVo, Inc.. (Attachments: # 1 Exhibit A # 2 Proposed Order)(Buhay, William) Modified on 9/1/2005 to describe attachments (fmm). (Entered: 08/31/2005)
09/01/2005	19	ORDER GRANTING 18 Motion for Extension of Time until 9/14/05 for TiVo Inc. to reply to the Joint Motion for Protective Order and to Quash Rule 45 Subpoenas. Signed by Judge William S. Duffey Jr. on 8/31/05. (kt) (Entered: 09/01/2005)
09/14/2005	20	Sixth MOTION for Extension of Time to Reply to Joint Motion for Protective Order and Quash Rule 45 Subpoenas re: 1 MOTION to Quash subpoenas with Brief In Support by TiVo, Inc.. (Attachments: # 1 Proposed Order)(Buhay, William) Modified on 9/15/2005 to describe attachments (fmm). (Entered: 09/14/2005)
09/15/2005	21	ORDER GRANTING 20 Unopposed Motion for Extension of Time to Reply to the Joint Motion until 10/06/05. Signed by Judge William S. Duffey Jr. on 9/15/05. (kt) (Entered: 09/16/2005)
10/06/2005	22	Seventh MOTION to Continue by TiVo, Inc.. (Attachments: # 1 Exhibit Texas Court's September 26th Order# 2 Text of Proposed Order Oder Granting Continuance)(Buhay, William) (Entered: 10/06/2005)

10/07/2005	23	ORDER GRANTING 22 Seventh Unopposed Motion to Extend Time to Reply to EchoStar and Non-Party Homer Knearl's Joint Motion for a Protective Order and to Quash Rule 45 Subponeas until 10/13/05. Signed by Judge William S. Duffey Jr. on 10/07/05. (kt) (Entered: 10/07/2005)
10/07/2005	24	RESPONSE re 22 Seventh MOTION to Continue filed by Echostar Technologies Corporation, Echosphere Limited Liability Company, Echostar Communications Corporation, EchoStar DBS Corporation. (Schlossberg, Ellen) (Entered: 10/07/2005)
10/13/2005	25	DOCUMENT FILED IN ERROR Eighth MOTION for Extension of Time to Reply to Echostar and Non-Party Homer Knearl's Joint Motionf or a Protective Order and to Quash Rule 45 Subpoenas; Motion to Dismiss Joint Motion as Moot with Brief In Support by TiVo, Inc.. (Attachments: # 1 Exhibit A to 8th Motion# 2 Exhibit Exhibit B to 8th motion# 3 Text of Proposed Order)(Buhay, William) Modified on 10/14/2005 (fmm). (Entered: 10/13/2005)
10/13/2005	26	REDOCKETED #25 MOTION AS Eighth MOTION for Extension of Time by 2 weeks to file response re: 1 MOTION for protective order and to Quash subpoenas or MOTION to Dismiss without prejudice the 1 MOTION for protective order and to Quash subpoenas by TiVo, Inc. (Attachments: # 1 Exhibit A# 2 Exhibit B# 3 Proposed Order)(fmm) (Entered: 10/14/2005)
10/14/2005	27	RESPONSE in Opposition re 26 MOTION to Dismiss MOTION for Extension of Time to file response to re: 1 MOTION to Quash subpoenas MOTION for Extension of Time to file response to re: 1 MOTION to Quash subpoenas filed by Homer Knearl. (Schlossberg, Ellen) (Entered: 10/14/2005)
10/28/2005	28	RESPONSE in Opposition re 1 MOTION to Quash subpoenas and Reply Brief to the 26 Motion to Dismiss filed by TiVo, Inc.. (Attachments: # 1 Text of Proposed Order Proposed Order denying Defendants' Motion for Protective Order and to Quash Subpoena and Granting Plaintiff's Motion to Dismiss Defendants' Motion as Moot)(Buhay, William) Modified on 10/31/2005 to add document link (fmm). (Entered: 10/28/2005)
10/28/2005	29	AFFIDAVIT in Opposition re 1 MOTION to Quash subpoenas and related Exhbits supporting TiVo's Response to the Motion to Quash and TiVo's Motion to Dismiss filed by TiVo, Inc.. (Attachments: # 1 Exhibit Exhibit A# 2 Exhibit Exhibit B# 3 Exhibit Exhibit C# 4 Exhibit Exhibit D# 5 Exhibit Exhibit E# 6 Exhibit Part 1 of Exhibit F# 7 Exhibit Part 2 of Exhibit F# 8 Exhibit Part 3 of Exhibit F)(Buhay, William) (Entered: 10/28/2005)
10/28/2005	30	AFFIDAVIT in Opposition re 1 MOTION to Quash subpoenas The Affidavit is actually a Declaration which attaches the Exhibits relied upon by TiVo filed by TiVo, Inc.. (Attachments: # 1 Exhibit Exhibit A - Filed Under Seal# 2 Exhibit Exhibit B# 3 Exhibit Exhibit C# 4 Exhibit Exhibit D# 5 Exhibit Exhibit E# 6 Exhibit Part 1 of Exhibit F# 7 Exhibit Part 2 of Exhibit F# 8 Exhibit Part 3 of Exhibit F)(Buhay, William) (Entered: 10/28/2005)
10/28/2005	31	MOTION to File Exhibit A to 29 Affidavit and 30 Affidavit Under Seal by TiVo, Inc. (Attachments: # 1 Proposed Order)(fmm) (Entered: 10/31/2005)
10/28/2005	32	Exhibit A to 29 Affidavit and 30 Affidavit by TiVo, Inc. (-- FILED UNDER SEAL --) (fmm) Modified on 2/13/2006 (kt). (Entered: 10/31/2005)
10/28/2005	--	Case reported statistically. Matter transferred from 1:05-mi-190. (kt) (Entered: 10/31/2005)
10/31/2005	33	MOTION to Supplement 28 Response in Opposition re 1 MOTION to Quash subpoenas and Reply Brief to the 26 Motion to Dismiss by TiVo, Inc. (Attachments: # 1 Exhibit G-1# 2 Exhibit G-2# 3 Exhibit G-3# 4 Exhibit H-1# 5 Exhibit H-2# 6 Proposed Order)(fmm) (Entered: 11/01/2005)
11/01/2005	--	Submission of 1 MOTION to Quash subpoenas, 26 MOTION to Dismiss MOTION for Extension of Time to file response to re: 1 MOTION to Quash subpoenas MOTION for Extension of Time to file response to re: 1 MOTION to Quash subpoenas, 11 Third MOTION for Extension of Time File Response re: 1 MOTION to Quash subpoenas, submitted to District Judge William S. Duffey. (fmm) (Entered: 11/01/2005)
11/14/2005	34	REPLY in support of 1 MOTION to Quash subpoenas, 33 MOTION to Supplement 28 Response in Opposition to Motion, filed by Homer Knearl. (Attachments: # 1 Exhibit A # 2 Exhibit B) (Murphy, Charles) Modified on 11/16/2005 to correct docket text to reflect e-filed document. (kt). (Entered: 11/14/2005)
11/15/2005	--	Submission of 31 MOTION to Seal Document 29 Affidavit in Opposition to Motion, 30 Affidavit in Opposition to Motion, 33 MOTION to Supplement 28 Response in Opposition to Motion, to District Judge William S. Duffey. (kt) (Entered: 11/15/2005)
11/16/2005	--	Notification of Docket Correction re 34 Reply to Response to Motion. Wrong event used and double wording in attachments. (kt) (Entered: 11/16/2005)
11/17/2005	35	RESPONSE re 31 MOTION to Seal Document 29 Affidavit in Opposition to Motion,, 30 Affidavit in Opposition to Motion, filed by Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation.

		(Murphy, Charles) (Entered: 11/17/2005)
11/17/2005	36	RESPONSE re 33 MOTION to Supplement 28 Response in Opposition to Motion, filed by Homer Knearl. (Murphy, Charles) (Entered: 11/17/2005)
02/06/2006	37	NOTICE Of Filing order in related case by TiVo, Inc. (Attachments: # 1 Order in Colorado Case) (fmm) (Entered: 02/07/2006)
02/07/2006	--	Notification of Docket Correction re 37 Notice of Filing. Pleading incorrectly e-filed in closed miscellaneous case and moved to correct pending civil action. (fmm) (Entered: 02/07/2006)
02/10/2006	38	Minute Entry for proceedings held before Judge William S. Duffey Jr.: Telephone Conference held on 2/10/2006. (Court Reporter Nick Marrone.)(jdb) (Entered: 02/13/2006)
02/13/2006	39	ORDER granting in part and denying in part 1 Motion to Quash (See order for details.) IT IS FURTHER ORDERED that the documents required by this Order to be produced in response to the subpoena which are not subject to in camera review shall be produced by Mr. Knearl on or before February 20, 2006. IT IS FURTHER ORDERED that Mr. Knearl's deposition shall be arranged to be conducted on or before February 28, 2006. IT IS FURTHER ORDERED that the motion is DENIED with respect to the grounds the Mr. Knearl was not provided with resaonable notice, with resaonable time for compliance or that the information otherwise has been requested to be produced by other lawyers at Merchant & Gould. IT IS FURTHER ORDERED that if the Court in the Eastern District of Texas determines that the Subpoena response is outside the period allowed for discovery, compliance with this order shall not be required. IT IS FURTHER ORDERED that Plaintiff's Unopposed Motion for Extension of Time to Reply to Joint Motion for a Protective Order and to Quash Subpoenas 11, Plaintiff's Motion to Extend Time to Reply 26, Plaintiff's Motion to File Documents Under Seal 31, and Plaintiff's Motion for Leave to File a Supplement to its Response in Opposition 33 are GRANTED. Signed by Judge William S. Duffey Jr. on 2/13/06. (kt) (Entered: 02/13/2006)
02/14/2006	41	TRANSCRIPT of Proceedings held on February 10, 2006 before Judge William S. Duffey. Court Reporter: Nicholas A. Marrone. (kt) (Entered: 02/15/2006)
02/15/2006	40	APPLICATION for Admission of Alison M. Tucher Pro Hac Vice by Echostar Technologies Corporation, Echosphere Limited Liability Company, Echostar Communications Corporation, and EchoStar DBS Corporation.Filing Fee received $150.00, Receipt #547386. (to WSD) (kt) (Entered: 02/15/2006)
02/17/2006	--	ORDER (by docket entry only) granting 40 Application for Admission Pro Hac Vice of Alison M. Tucher. Ordered by Judge William S. Duffey Jr. on 2/17/06. (jdb) (Entered: 02/17/2006)
02/28/2006	42	ORDER DIRECTING that Mr. Knearl is ORDERED to produce the documents enclosed in the packet transmitted today by Federal Express to counsel for Mr. Knearl. These documents shall be made available for inspection by Mr. Perry Goldbert, TiVo's outside counsel. The Produced Documents shall be produced for Mr. Goldberg's inspection on or before March 8, 2006. Mr. Goldberg will request Judge Folsom to determine if the Identified Documents are admissible in the litigation pending in Texas. Judge Folsome shall determine what, if any, restrictions will be placed on disclosre of any of the Identified Documents he will allow to be introduced at trial. Identified documents which are not admitted shall promptly be returned to counsel for Mr. Knearl. Signed by Judge William S. Duffey Jr. on 2/28/06. (kt) (Entered: 02/28/2006)
03/02/2006	43	Joint MOTION to Stay the Court's Order of February 28, 2006 with Brief In Support by Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation. (Attachments: # 1 Brief In Support of Joint Motion for a Stay of the Court's Order of February 28, 2006# 2 Text of Proposed Order) (Tucher, Alison) (Entered: 03/02/2006)
03/02/2006	44	Emergency MOTION 43 Joint MOTION to Stay the Court's Order of February 28, 2006 to Waive the Time Requirements of Rule 7.1 with Brief In Support by Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation. (Attachments: # 1 Text of Proposed Order)(Tucher, Alison) (Entered: 03/02/2006)
03/03/2006	45	ORDER DENYING 43 Motion to Stay the Court's Order of February 28, 2006, granting 44 Motion for Miscellaneous Relief. IT IS FURTHER ORDERED that because the Court has resolved the motion to quash at issue in this proceeding, the Clerk of Cour tis DIRECTED to close this case. Signed by Judge William S. Duffey Jr. on 3/3/06. (kt) (Entered: 03/03/2006)
03/03/2006	--	Civil Case Terminated. (kt) (Entered: 03/03/2006)
03/03/2006	46	NOTICE OF APPEAL as to 42 Order, by Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation. Filing fee $ 255, receipt no. 548185Transcript Order Form due on 3/17/2006. (fem) (Entered: 03/06/2006)

03/06/2006	47	DOCUMENT ERROR Transmission of Certified Copy of Notice of Appeal, Judgment, Order and Docket Sheet to US Court of Appeals re 46 Notice of Appeal, (fem) Modified on 3/8/2006 (fem). (Entered: 03/06/2006)
03/08/2006	48	Transmission of Certified Copy of Notice of Appeal, Judgment, Order and Docket Sheet to US Court of Appeals, Washington, D.C re 46 Notice of Appeal, (fem) (Entered: 03/08/2006)
03/08/2006	--	Notification of Docket Correction to indicate transmission incorrectly forwarded to the Eleventh Circuit and should have been transmitted to the Federal Circuit re 47 Transmission of Notice of Appeal and Docket Sheet to USCA. (fem) (Entered: 03/08/2006)
03/09/2006	49	ORDER of USCA - Federal Circuit temporarily staying 42 district court's Order re: 46 Notice of Appeal. USCA - Federal Circuit Miscellaneous Docket Case No. 816. (kac) (Entered: 03/10/2006)
03/13/2006	50	TRANSCRIPT ORDER FORM re: 46 Notice of Appeal. USCA - Federal Circuit Miscellaneous Number 816. Certificate of Readiness due on 3/27/2006 (All necessary transcript(s) on file.) (kac) (Entered: 03/13/2006)

US District Court Civil Docket

U.S. District - Georgia Northern
(Atlanta)

1:05mi208

Tivo, Inc v. Echostar Communications Corporation et al

This case was retrieved from the court on Wednesday, September 14, 2005

Date Filed: 07/21/2005
Assigned To: Judge William S Duffey, Jr
Referred To:
Nature of suit: Patent (830)
Cause: FRCP 37(a) Motion to compel deposition testimony
Lead Docket: None
Other Docket: USDC ED TX, 04cv01 DF
Jurisdiction: Federal Question

Class Code: CLOSED
Closed: yes
Statute:
Jury Demand: None
Demand Amount: $0
NOS Description: Patent

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Date	#	Proceeding Text
07/21/2005	1	MOTION to Compel production of a document from third party Scientific Atlanta with Brief In Support by Echostar Technologies Corporation, Echosphere Limited Liability Company, Echostar Communications Corporation, EchoStar DBS Corporation. (Attachments: # 1 Exhibit 1# 2 Exhibit A# 3 Exhibit B# 4 Exhibit C# 5 Exhibit D# 6 Exhibit E# 7 Exhibit F# 8 Exhibit G)(fmm) (Entered: 07/22/2005)
07/28/2005	2	Withdrawal of Motion 1 MOTION to Compel production of a document from third party Scientific Atlanta filed by Echostar Communications Corporation,, Echostar Technologies Corporation,, EchoStar DBS Corporation,, Echosphere Limited Liability Company,. (Murphy, Charles) (Entered: 07/28/2005)

07/28/2005 -- Miscellaneous Case Terminated. (fmm) (Entered: 07/29/2005)

US District Court Civil Docket

U.S. District - Georgia Northern
(Atlanta)

1:05mi190

Tivo, Inc v. Echostar Communications Corporation et al

This case was retrieved from the court on Thursday, October 20, 2005

Date Filed: 07/07/2005
Assigned To: Judge William S Duffey, Jr
Referred To:
Nature of suit: Patent (830)
Cause: FRCP 45(b) Motion to quash or modify subpoena
Lead Docket: None
Other Docket: USDC ED TX, 2-04cv01 DF
Jurisdiction: Federal Question

Class Code:
Closed: no
Statute:
Jury Demand: None
Demand Amount: $0
NOS Description: Patent

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Date	#	Proceeding Text
07/07/2005	1	MOTION to Quash subpoenas with Brief In Support by Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation. (Attachments: # 1 Exhibit 1# 2 Exhibit 1-A# 3 Exhibit 1-B# 4 Exhibit 1-C# 5 Exhibit 1-D# 6 Exhibit 1-E# 7 Exhibit 1-F# 8 Exhibit 1-G# 9 Exhibit 1-H# 10 Exhibit 1-I# 11 Exhibit 2# 12 Exhibit 2-A# 13 Exhibit 2-B# 14 Exhibit 2-C# 15 Exhibit 2-D# 16 Exhibit 2-E# 17 Exhibit 2-F)(fmm) (Entered: 07/15/2005)
07/26/2005	2	PROPOSED CONSENT ORDER For Extension of Time re: 1 MOTION to Quash subpoenas. (Buhay, William) (Entered: 07/26/2005)
07/27/2005	6	APPLICATION for Admission of Harold J. McElhinny Pro Hac Viceby Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation.Filing Fee received $150.00, Receipt #539834. (fmm) (Entered: 07/29/2005)
07/27/2005	7	APPLICATION for Admission of Peter P. Meringolo Pro Hac Viceby Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation.Filing Fee received $150.00, Receipt #539834. (fmm) (Entered: 07/29/2005)
07/27/2005	8	APPLICATION for Admission of Marc J. Pernick Pro Hac Viceby Echostar Technologies Corporation, Echosphere Limited Liability Company, Homer Knearl, Echostar Communications Corporation, EchoStar DBS Corporation.Filing Fee received $150.00, Receipt #539835. (fmm) (Entered: 07/29/2005)
07/28/2005	3	NOTICE of Appearance by William Charles Buhay on behalf of TiVo, Inc. (Buhay, William) (Entered: 07/28/2005)
07/28/2005	4	Second MOTION for Extension of Time Reply to Motion for Protective Order and to Quash re: 1 MOTION to Quash subpoenas, 2 Proposed Consent Order with Brief In Support by TiVo, Inc.. (Buhay, William) (Entered: 07/28/2005)
07/28/2005	5	PROPOSED ORDER Unopposed Motion to Extend Time to Reply to Motion for Protective Order and to Quash re: 4 Second MOTION for Extension of Time Reply to Motion for Protective Order and to Quash re: 1 MOTION to Quash subpoenas, 2 Proposed Consent Order. (Buhay, William) (Entered: 07/28/2005)
07/28/2005	9	ORDER GRANTING 4 Motion for Extension of Time. IT IS HEREBY ORDERED that Plaintiff shall have (3) three additional days in which to file its response to the Joint Motion . Signed by Judge William S. Duffey Jr. on 7/26/05. (kt) (Entered: 07/29/2005)
08/01/2005	10	ORDER GRANTING 5 Unopposed Motion to Extend time until 8/4/05 for TiVo to reply to EchoStar and Non-Party Homer Knearl's Joint Motion for a Protective Order and to Quash Rule 45 Subpoenas. Signed by Judge William S. Duffey Jr. on 8/1/05. (kt) (Entered: 08/02/2005)
08/02/2005	--	ORDER (by docket entry only) granting 6 Application for Admission Pro Hac Vice of Harold McElhinny, granting 7 Application for Admission Pro Hac Vice of Peter Meringolo, granting 8 Application for Admission Pro Hac Vice of Marc Pernick . Ordered by Judge William S. Duffey Jr. on 8/2/05. (jdb) (Entered: 08/02/2005)
08/03/2005	13	ORDER APPROVING 11 Third MOTION for Extension of Time to Reply to EchoStar and Non-Party Homer Knearl's Joint Motion for Protective Order and 1 Motion to Quash Rule 45 Subpoenas until 8/10/05. Signed by Judge William S. Duffey Jr. on 8/5/05. (kt) (Entered: 08/05/2005)
08/04/2005	11	Third MOTION for Extension of Time File Response re: 1 MOTION to Quash subpoenas with Brief In Support by TiVo, Inc.. (Buhay, William) (Entered: 08/04/2005)
08/04/2005	12	PROPOSED ORDER Granting Six (6) Day Extension re: 11 Third MOTION for Extension of Time File Response re: 1 MOTION to Quash subpoenas. (Buhay, William) (Entered: 08/04/2005)
08/05/2005	15	APPLICATION for Admission of Christine W.S. Byrd Pro Hac Viceby TiVo, Inc..Filing Fee received $150.00, Receipt #540264. (fmm) (Entered: 08/11/2005)
08/05/2005	16	APPLICATION for Admission of Perry M. Goldberg Pro Hac Viceby TiVo, Inc..Filing Fee received $150.00, Receipt #540264. (fmm) (Entered: 08/11/2005)
08/10/2005	14	Fourth MOTION for Extension of Time File Response re: 1 MOTION to Quash subpoenas with Brief In Support by TiVo, Inc.. (Attachments: # 1)(Buhay, William) (Entered: 08/10/2005)
08/12/2005	--	ORDER (by docket entry only) granting 15 Application for Admission Pro Hac Vice of Christine W.S. Byrd, granting 16 Application for Admission Pro Hac Vice of Perry M. Goldberg. Ordered by

		Judge William S. Duffey Jr. on 8/12/05. (jdb) (Entered: 08/12/2005)
08/12/2005	17	ORDER GRANTING 14 Unopposed Motion for Extension of Time to Reply to the Joint Motion until 8/31/05. Signed by Judge William S. Duffey Jr. on 8/11/05. (kt) (Entered: 08/12/2005)
08/31/2005	18	Fifth MOTION for Extension of Time re: 1 MOTION to Quash subpoenas with Brief In Support by TiVo, Inc.. (Attachments: # 1 Exhibit A # 2 Proposed Order)(Buhay, William) Modified on 9/1/2005 to describe attachments (fmm). (Entered: 08/31/2005)
09/01/2005	19	ORDER GRANTING 18 Motion for Extension of Time until 9/14/05 for TiVo Inc. to reply to the Joint Motion for Protective Order and to Quash Rule 45 Subpoenas. Signed by Judge William S. Duffey Jr. on 8/31/05. (kt) (Entered: 09/01/2005)
09/14/2005	20	Sixth MOTION for Extension of Time to Reply to Joint Motion for Protective Order and Quash Rule 45 Subpoenas re: 1 MOTION to Quash subpoenas with Brief In Support by TiVo, Inc.. (Attachments: # 1 Proposed Order)(Buhay, William) Modified on 9/15/2005 to describe attachments (fmm). (Entered: 09/14/2005)
09/15/2005	21	ORDER GRANTING 20 Unopposed Motion for Extension of Time to Reply to the Joint Motion until 10/06/05. Signed by Judge William S. Duffey Jr. on 9/15/05. (kt) (Entered: 09/16/2005)
10/06/2005	22	Seventh MOTION to Continue by TiVo, Inc.. (Attachments: # 1 Exhibit Texas Court's September 26th Order# 2 Text of Proposed Order Oder Granting Continuance)(Buhay, William) (Entered: 10/06/2005)
10/07/2005	23	ORDER GRANTING 22 Seventh Unopposed Motion to Extend Time to Reply to EchoStar and Non-Party Homer Knearl's Joint Motion for a Protective Order and to Quash Rule 45 Subponeas until 10/13/05. Signed by Judge William S. Duffey Jr. on 10/07/05. (kt) (Entered: 10/07/2005)
10/07/2005	24	RESPONSE re 22 Seventh MOTION to Continue filed by Echostar Technologies Corporation, Echosphere Limited Liability Company, Echostar Communications Corporation, EchoStar DBS Corporation. (Schlossberg, Ellen) (Entered: 10/07/2005)
10/13/2005	25	DOCUMENT FILED IN ERROR Eighth MOTION for Extension of Time to Reply to Echostar and Non-Party Homer Knearl's Joint Motionf or a Protective Order and to Quash Rule 45 Subpoenas; Motion to Dismiss Joint Motion as Moot with Brief In Support by TiVo, Inc.. (Attachments: # 1 Exhibit A to 8th Motion# 2 Exhibit Exhibit B to 8th motion# 3 Text of Proposed Order)(Buhay, William) Modified on 10/14/2005 (fmm). (Entered: 10/13/2005)
10/13/2005	26	REDOCKETED #25 MOTION AS Eighth MOTION for Extension of Time by 2 weeks to file response re: 1 MOTION for protective order and to Quash subpoenas or MOTION to Dismiss without prejudice the 1 MOTION for protective order and to Quash subpoenas by TiVo, Inc. (Attachments: # 1 Exhibit A# 2 Exhibit B# 3 Proposed Order)(fmm) (Entered: 10/14/2005)
10/14/2005	27	RESPONSE in Opposition re 26 MOTION to Dismiss MOTION for Extension of Time to file response to re: 1 MOTION to Quash subpoenas MOTION for Extension of Time to file response to re: 1 MOTION to Quash subpoenas filed by Homer Knearl. (Schlossberg, Ellen) (Entered: 10/14/2005)

US District Court Civil Docket

U.S. District - Texas Eastern
(Marshall)

2:04cv1

Tivo Inc v. Echostar Comm, et al

This case was retrieved from the court on Wednesday, April 26, 2006

Date Filed: 01/05/2004	**Class Code:** FRC, JURY, MREFHM, PATENT
Assigned To: Judge David Folsom	**Closed:** no
Referred To: Magistrate Judge Caroline Craven	**Statute:** 35:271
Nature of suit: Patent (830)	**Jury Demand:** Both
Cause: Patent Infringement	**Demand Amount:** $0
Lead Docket: None	**NOS Description:** Patent
Other Docket: 5:05-cv-00081-DF	
Jurisdiction: Federal Question	

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Date	#	Proceeding Text
01/05/2004	1	Original Complaint with JURY DEMAND filed. Cause: 35:271 Patent Infringement (poa) (Entered: 01/07/2004)
01/05/2004	--	Demand for jury trial by TIVO Inc (poa) (Entered: 01/07/2004)
01/05/2004	--	Magistrate consent forms mailed to TIVO Inc (poa) (Entered: 01/07/2004)
01/05/2004	2	Form mailed to Commissioner of Patents and Trademarks. (poa) (Entered: 01/07/2004)
01/09/2004	--	Summons(es) issued for Echostar Comm, Echostar DBS Corp & given to atty's runner (ktd) (Entered: 01/09/2004)
01/15/2004	3	Amended complaint by TIVO Inc , (Answer due 1/26/04 for Echostar DBS Corp, for Echostar Comm) amending [1-1] complaint adding dfts EchoStar Tech Corp, Echosphere Ltd Liab (ktd) (Entered: 01/15/2004)
01/15/2004	--	Summons(es) issued for EchoStar Tech Corp, Echosphere Ltd Liab & given to pla's runner (ktd) (Entered: 01/15/2004)
01/15/2004	6	Form mailed to Commissioner of Patents and Trademarks. (ktd) Additional attachment(s) added on 1/28/2005 (ehs,). (Entered: 01/22/2004)
01/20/2004	4	Return of service executed as to Echostar DBS Corp 1/12/04 Answer due on 2/2/04 for Echostar DBS Corp (ktd) Additional attachment(s) added on 1/28/2005 (ehs,). (Entered: 01/21/2004)
01/20/2004	5	Return of service executed as to Echostar Comm 1/12/04 Answer due on 2/2/04 for Echostar Comm (ktd) Additional attachment(s) added on 1/28/2005 (ehs,). (Entered: 01/21/2004)
01/26/2004	7	Return of service executed as to EchoStar Tech Corp, Echosphere Ltd Liab 1/16/04 Answer due on 2/5/04 for EchoStar Tech Corp, for Echosphere Ltd Liab (ktd) Additional attachment(s) added on 1/28/2005 (ehs,). (Entered: 01/27/2004)
01/29/2004	8	Secty's Return of service executed as to Echostar DBS Corp 1/20/04 Answer due on 2/9/04 for Echostar DBS Corp (ktd) Additional attachment(s) added on 1/28/2005 (ehs,). (Entered: 01/30/2004)
01/29/2004	9	Secty's Return of service executed as to Echostar Comm 1/20/04 Answer due on 2/9/04 for Echostar Comm (ktd) Additional attachment(s) added on 1/28/2005 (ehs,). (Entered: 01/30/2004)
02/04/2004	10	Secretary of State certificate of service served upon Echosphere Ltd Liab on 1/28/04 (poa) (Entered: 02/04/2004)
02/05/2004	11	Stipulation to extend time to close of business on 3/1/04 for dft's answer or response (ktd) (Entered: 02/05/2004)
02/09/2004	12	Secretary's Return of Service Executed as to EchoStar Technologies Corporation by c/rrr mail on 1/27/2004, answer due: 2/16/2004. (ktd,) (Entered: 02/13/2004)
02/27/2004	13	APPLICATION to Appear Pro Hac Vice by Attorney Rachel Krevans for Echostar Communications Corporation; Echostar DBS Corporation; EchoStar Technologies Corporation and Echosphere Limited Liability Company. (ktd,) (Entered: 03/01/2004)
02/27/2004	14	APPLICATION to Appear Pro Hac Vice by Attorney Zachariah A. Higgins for Echostar Communications Corporation; Echostar DBS Corporation; EchoStar Technologies Corporation and Echosphere Limited Liability Company. (ktd,) (Entered: 03/01/2004)