IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Barton et al.
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Reexam Control No.:	90/009,329
Title:	MULTIMEDIA TIME WARPING SYSTEM

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RESPONSE TO OFFICE ACTION

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Listing of Patent Claims Under Reexamination

31. (ORIGINAL PATENT CLAIM) A process for the simultaneous storage and play back of multimedia data, comprising the steps of:

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

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

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

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

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

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

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

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

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

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

61. (ORIGINAL PATENT CLAIM) An apparatus for the simultaneous storage and play back of multimedia data, comprising:

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

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

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

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

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

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

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

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

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

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

REMARKS

INTRODUCTION

The June 4, 2010 Office Action rejects claims 31 and 61 as obvious over US 6,018,612 to Thomason et al. ("Thomason") in view of US 5,949,948 to Krause et al. ("Krause"). The Office Action proposes that Thomason's buffer management scheme meets the claim recitation that a transform object automatically flow controls source and sink objects and further proposes that a person skilled in the art would modify the Thomason system to include the I-frame detector of Krause. Additionally, the Office Action contends that the combined system would include a synchronous DMA controller which would assert a "ready line" in a manner that meets the claim recitations.

As outlined in the Second Villasenor declaration, given the well-understood meaning of the term object and the recited centralized transform object architecture, Thomason fails to meet the claim language for various independent reasons. First, Thomason lacks a transform object that intelligently manages buffers or the manipulation of the video and audio data so as to facilitate the system's ability to handle asymmetric memory demands of the source and sink objects. Second, one skilled in the art would not have used a synchronous DMA controller in the Thomason system and thus the combined system would not meet the automatic flow control limitations as suggested in the Office Action. Third, even if such a DMA controller was used in the Thomason system, the ready line assertion would not affect the flow but would rather be a function of the flow and thus would not provide the recited automatic flow control. Fourth, the ready line in the asserted combined system is not part of and does not have any interaction with the alleged transform object. Lastly, even if Thomason otherwise met the "transform object" limitation, that combined structure would still fail to provide the recited "automatic flow control" on the output side.

Additionally, it is legally and technically inappropriate to combine Thomason and Krause in the first instance. The Thomason system is architecturally incompatible with the Krause I-frame detector and attempting to combine them would create numerous fundamental technical problems. While it may be theoretically possible to dissect Thomason and Krause into their component parts and reassemble them into a new and different operable system, such combinations are plainly impermissible accordingly to the MPEP. (MPEP § 2143.01) Moreover, given that Thomason already has fast forward and reverse functionality, any advantage that might derive from the addition of Krause's I-frame detector is far outweighed by the combined system's additional cost and complexity. According to the *2010 KSR Guidelines Update* this militates strongly against a finding of obviousness. (75 Fed. Reg. 53646) This conclusion is reinforced by the fact that the owner of the Thomason patent opted to license the '389 patent instead of attempting to modify the Thomason system as proposed by the Office Action. (See Second Barton Dec. ¶14)

The extraordinary commercial success, previously demonstrated, is a direct result of the recited transform object architecture and automatic flow control. As explained in detail in the Second Barton Declaration, the transform object architecture and automatic flow control enabled smooth control of live TV, which was one of the primary drivers of the commercial demand for the TiVo DVR. Another principal driver was the price point at which the system was offered. The TiVo DVR was reasonably priced in part due to the fact that the transform object architecture conserved on memory. The confluence of these two factors, both of which derive directly from the recited transform object architecture, drove the commercial success of the TiVo product. (*See generally* Second Barton Dec.)

The remaining secondary considerations evidence is equally compelling. The '389 patent was selected for inclusion in the USPTO Museum and it has been licensed by numerous leading consumer electronics companies (Sony, Philips, Toshiba, Pioneer, etc.) as well as the leading US cable and satellite operators (Comcast, DIRECTV, etc.). Additionally, the '389 patent has been adjudged not invalid by the courts and major corporations have invested over half a billion dollars into TiVo based substantially on the strength of the '389 patent. (*See generally* Second Barton Dec.)

As more fully explained below, these facts demonstrate beyond doubt that the claimed subject matter is at once innovative, nonobvious, and revolutionary.

NEITHER THOMASON NOR KRAUSE TEACH A TRANSFORM OBJECT THAT AUTOMATICALLY FLOW CONTROLS SOURCE AND SINK OBJECTS

Claims 31 and 61 stand rejected as being unpatentable over Thomason in view of Krause. The June 4, 2010 Office Action asserts that Thomason teaches all elements of claims 31 and 61 except for the recitation that the physical data source "parses video and audio data from said broadcast data." (OA at 29) As to the parser limitation, the Office Action states that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention to employ Krause's indexing in the system of Thomason." (OA at 21)

The Office Action also expands on the rejection with respect to the recitation that the "source object is automatically flow controlled by said transform object" and the recitation that the "sink object is automatically flow controlled by said transform object." The Office Action asserts that

> [a] skilled artisan would also know that, in a traditional synchronous DMA transfer, handshaking (e.g. via a "ready" line and program control) is the way the DMA controller "regulates" the data transfer between memories. (See: DMA (Embedded Systems) page 3, paragraphs 3-4, of record) Hence a skilled artisan would understand that the DMA controller can be thought of as "self regulating" during any traditional DMA data transfer operation.

(OA at 5) The Office Action is thus understood to assert that a skilled artisan would consider it obvious to use a synchronous DMA as taught in the DMA Embedded Systems reference in place of the DMA controller(s) taught in Thomason.

Claims 31 and 61 recite an architecture in which the transform object is centrally disposed in the sense that it automatically flow controls both the source object on the input side, and also the sink object on the output side. The claims require that both the "source object," which among other things extracts video and audio data from the physical data source, and the "sink object," which among other things outputs streams to a video and audio decoder, are "automatically flow controlled by said transform object." The recited transform object is thus centrally disposed in the sense that it automatically flow controls both the source object and the sink object. Stated another way, the same transform object automatically flow controls both the source object on the input side as well as the sink object on the output side.

Hereinafter these recited architectural limitations are collectively referred to as the "centralized transform object."

Within the definition set forth in the Office Action, those of skill in the art would understand that the recited "objects" are functionally interrelated sets of state information typically sets of variable values which include information concerning the state or progress of the operations that manipulate the state information. (Second Villasenor Dec. ¶¶12-17) This flows directly from the well-understood meanings of the respective terms used in the definition set forth in the Office Action. (Id.) Therein it was noted that the term "object" was given "the widely accepted computer science meaning of a 'collection of data and operations.'" (OA at 3) The terms "collection," "data," and "operations" likewise have widely accepted meanings that provide further context and meaning to the term "object." (Id.) As explained in the Second Declaration of Professor John Villasenor, submitted herewith, the term "collection" would be clearly understood in this context to mean a set of functionally interrelated items. (Second Villasenor Dec. ¶16) This understanding of the term "collection" is supported throughout the '389 patent specification, in particular by the exemplary object class hierarchy depicted in Figure 9 and the associated passages in the detailed description explaining that in the preferred embodiment "[e]ach object (source 901, transform 902, and sink 903) is multi-threaded by definition and can run in parallel." (Id.; '389 patent 8:16-18) The term "data" would be clearly understood in this context to refer to sets of variable values or state information that reflects, among other things, the state or progress of the hardware or software operations. (Second Villasenor Dec. ¶¶13-16) This is likewise consistent with the specification of the '389 patent, which discusses at length the maintenance of data and pointers and passing of events between objects. (Id.; see, e.g., '389 patent 8:21-23, 34, 9:5-31, 10:1-18) In the preferred embodiment, for example, a "pause" event is passed to the source object, which changes the state of the receiving source object. (Id.; '389 patent 8:21-26) Lastly, the term "operations" would be clearly understood in this context to refer to software or hardware operations that manipulate the set of values or state information. (Id.) This understanding is consistent with the aforementioned portions of the '389 patent, which detail embodiments in which the variable values, reflecting state information, are maintained and manipulated. (Id.; see, e.g., '389 patent 8:21-23, 34, 9:5-31, 10:1-18)

The claims further recite that the centralized transform object "automatically flow controls" the source and sink objects. One of skill in the art would understand that the recited centralized transform object intelligently manages buffers or the manipulation of the video and audio data so as to facilitate the system's ability to handle asymmetric memory demands of the source and sink objects.[1] The specification explains that the "pipeline," which includes the recited source/transform/source object architecture, is "self-regulating" with respect to the flow of data down the pipeline. ('389 patent 8:47-51, 11:24-25) The flow control in the preferred embodiment occurs asynchronously with respect to the underlying video and audio data stream. (Second Villasenor Dec. ¶8; '389 patent 8:24-31) The specification explains that the centralized, flow-controlling transform object "allows for a simple logic design that is at the same time powerful enough to support the features described previously, including pause, rewind, fast forward and others." ('389 patent 8:28-31) Executing such "trick play" functions typically places asymmetric, asynchronous demand on the memory to provide the data required and render the frames required by the selected function. (Second Villasenor Dec. ¶9) The fact that the centralized transform object automatically flow controls on both the input side and the output side enables intelligent management to service asymmetric output demands during, for example, trick play operations. (Second Villasenor Dec. ¶¶9-10)

Thomason lacks any such centralized transform object that intelligently manages buffers or the manipulation of the video and audio data so as to facilitate the system's ability to handle asymmetric memory demands of the source and sink objects. (Second Villasenor Dec. ¶18) First, Thomason teaches the opposite of flow control – the buffer management scheme simply reacts to the flow. (Id.) Thomason's data path avoids the bus 21, where in the Thomason system the data flow might be affected. (Second Villasenor Dec. ¶¶19-20) Rather, the Thomason system is designed around a FIFO architecture wherein the data is passed from input

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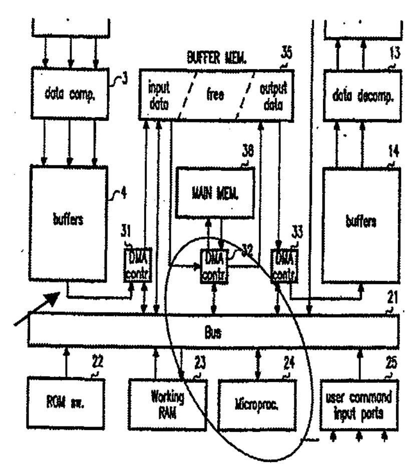
[1] In the case *TiVo Inc. v. EchoStar Communications Corp., et al., Case No. 2-04cvO1 DF,* and the proceedings related thereto Patent Owner has noted how the recited "automatic flow control" can minimize data loss, which is a benefit of the centralized transform object and automatic flow control architecture relevant to the issues presented in that case. Those representations are believed to be entirely consistent with the discussion of the related claim terms presented herein.

buffer 4 to buffer memory 35 to output buffer 14 in a sequential manner. (Id.) In other words, Thomason has no ability to control the flow – it simply passes data buffers in response to it. (Second Villasenor Dec. ¶20) Thomason merely reacts to input data rate and discards the output data in the event output-side memory demands conflict with input-side memory demands. (Second Villasenor Dec. ¶¶21-22; Thomason at 6:5-12) Accordingly, the Thomason system lacks the recited centralized transform object that intelligently manages buffers or the manipulation of the video and audio data so as to facilitate the system's ability to handle asymmetric memory demands of the source and sink objects.

As noted above, the Office Action suggests that that the synchronous DMA ready line architecture might be used in connection with Thomason. However, one skilled in the art would not have used the asserted synchronous DMA in the Thomason system because, as explained in the DMA Embedded Systems reference itself, "[t]he hardware moves one byte or word between memory and I/O each time the I/O port signals it is ready for another transaction. . . Then, the DMA controller goes idle again, waiting for another ready signal from the port." (DMA Embedded Systems at 3; Second Villasenor Dec. ¶23) This controller architecture would be considered unsuitable for inclusion in the Thomason system because it is relatively slow whereas the Thomason architecture is premised on maximization of data rate through the FIFO pipeline. (Id: Thomason at 2:59 to 3:8) Accordingly, one skilled in the art would not have used the asserted synchronous DMA in the Thomason system. (Id.)

Even if such a DMA controller was used in the Thomason system, the assertion of the ready line would be a **function of** the data flow; it would not control data flow. (Second Villasenor Dec. ¶24) In such a combined system the ready line would be asserted in the location indicated by the arrow in the figure shown at right. (Id.) The buffer 4 would present the ready line when data was available for DMA controller to read and DMA controller 31 would react to the ready line assertion by transferring that data to buffer 35. (Id.) Again, this ready line assertion would not control the flow but rather it would be a function of the flow. (Id.)



Moreover, as also shown in the illustration, the alleged "ready line" is not part of and does not even have any interaction with the alleged transform object, CPU 24 acting in combination with DMA 32. (Second Villasenor Dec. ¶25) The Office Action states that the centralized transform object limitation is met by Thomason in that "DMA controller 32 operates under the supervision of microprocessor 24." (OA at 24) The ready line in the asserted combination, though, is not part of the alleged transform object. (Second Villasenor Dec. ¶25) The claims require that the centralized transform object automatically flow controls the source and sink, and here it can readily be seen that the asserted ready line functionality cannot fairly or reasonably be said to be part of a centralized transform object. (Id.) Rather, it is outside even the asserted source object, DMA controller 31 in combination with microprocessor 24. (Id.; OA at 24)

Separately, even if one were to conclude that Thomason's CPU 24 acting in combination with DMA 32 met the "transform object" limitation, and it does not, that combined structure still would fail to provide any sort of intelligent management of buffers or manipulation of the video and audio data so as to facilitate the system's ability to handle asymmetric memory demands **on the output side**. (Second Villasenor Dec. ¶25) As discussed above, Thomason essentially shrugs its shoulders in the event of output buffer shortage. (Second Villasenor Dec. ¶22; Thomason 6:5-12) Thomason is not able, for example, to respond in the event of an asymmetric memory demand on the output side. (Id.) Rather, Thomason teaches directly away from such a system by recommending that in event of an output side memory shortage the buffer should be immediately given to the input irrespective of the impact on the output side data flow. (Second Villasenor Dec. ¶22; Thomason 6:5-12) Accordingly, even if the combination of DMA controller 32 and CPU 24 could otherwise meet the centralized transform object limitation (and it cannot), that combined structure would still fail to provide the recited "automatic flow control" **on the output side**.

In summary, given the well-understood meaning of the term object and the recited centralized transform object architecture, **Thomason plainly fails to meet the claim language for at least the following separate and independent reasons**:

1. Thomason, even as modified by the DMA Embedded Systems Reference, lacks the recited centralized transform object that intelligently manages buffers or the manipulation of the video and audio data so as to facilitate the system's ability to handle asymmetric memory demands of the source and sink objects.
2. One skilled in the art would not have used the asserted synchronous DMA in the Thomason system.
3. Even if such a DMA controller was used in the Thomason system, the ready line assertion would not control the flow but rather be a function of the flow.
4. Moreover, the alleged "ready line" in Thomason is not part of and does not have any interaction with the alleged transform object, DMA controller 32 operating under the supervision of microprocessor 24.
5. Even if Thomason's processor 24 and DMA controller 32 otherwise met the "transform object" limitation, that combined structure would still fail to provide the recited automatic flow control of the sink object on the output side.

The Patent Owner notes that Krause does not remedy any of these defects of Thomason and for that reason the combination, even if made, would still fail to set forth a *prima facie* case of obviousness. Krause lacks the recited centralized transform object that intelligently manages buffers or the manipulation of the video and audio data so as to facilitate the system's ability to handle asymmetric memory demands of the source and sink objects. (Second Villasenor Dec. ¶¶33-34) Krause fails to disclose DMA controllers or other system hardware details and thus fails to teach a system that is adapted for use of the asserted synchronous DMA controller with a "ready line." (Id.) For at least these reasons Krause fails to remedy the above referenced defects in the Thomason system and even in combination with Thomason fails to make a *prima facie* case of obviousness. (Id.)

THE COMBINATION OF THOMASON AND KRAUSE WOULD REQUIRE RE-ARCHITECTING AND WOULD INVOLVE SUBSTANTIAL ADDITIONAL COMPLEXITY AND COST

The Office Action proposes that Thomason should be modified by addition of Krause's I-frame detector. More particularly, the Office states that

> [t]he skilled artisan would appreciate that compressor 3 could be an MPEG encoder or, additionally, that a received digital MPEG-formatted broadcast stream could be directly input to buffer 4 without the need for conversion and compression. One of ordinary skill in the art would employ the indexing of detected I-frames, i.e., "parsing," of the MPEG formatted data to identify I-frames from other video and audio data prior to storage in buffer 4.

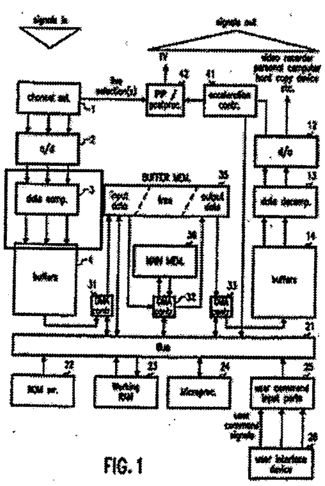


FIG. 1

(OA at 29)[2] The Office Action is accordingly understood as indicating that Krause's I-frame detector would be inserted in between Thomason's data compressor 3 and buffer 4.

Attempting to combine Thomason and Krause would create numerous technical problems that arise from the architectural incompatibility of the Thomason and Krause systems. First, Thomason's FIFO architecture cannot handle random frame access as would be required to incorporate an I-frame detector such as that taught in Krause. Use of an I-frame detector and the associated index presupposes that the system is able to asynchronously retrieve from the storage device frames at random locations dictated by, for instance, the user's fast forward or reverse function selection. (Second Villasenor Dec. ¶¶26-27; see Krause at 9:65 to 10:21, 11:41-44) The Thomason system, by contrast, is built around a FIFO architecture which is fundamentally incompatible with random frame access. (Id.) The Thomason architecture is not intended to perform, and does not permit, random frame access. (Id.)

Second, the acceleration controller in the combined system cannot interface with an I-frame detector. Thomason does not contain any provision for enabling the "user command

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[2] Patent Owner notes that the Office has ascribed a different meaning to the term parsing here. "Parsing" does not require "indexing."

signals" identified between boxes 25 and 26 of FIG. 1 to be provided to the acceleration controller. (Second Villasenor Dec. ¶28; First Villasenor Dec. ¶45) There is nothing in the Thomason specification that shows any functional connection between the user interface 26/user command ports 25 and the acceleration controller 41. (Id.) Accordingly, the combined system would be nonfunctional for the additional reason that the acceleration controller is not architecturally configured to receive the requisite commands. (Id.)

While it may be theoretically possible to dissect Thomason and Krause into their discrete component parts and reconstruct them with hindsight in a manner that would provide an operable system, combinations that would require such re-architecting are impermissible. The Manual of Patent Examining procedure provides that

> [i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious.

(MPEP § 2143.01) The Manual continues, explaining that a combination does not establish a *prima facie* case of obviousness if implementing the combination requires "**substantial reconstruction** and **redesign** of the elements shown in [the primary reference]." (Id., emphasis added)

Here, the combined system would require a complete re-architecting both with respect to the hardware and firmware. (Second Villasenor Dec. ¶¶27-29) Thomason can't be modified to include Krause without changing its fundamental FIFO architecture and re-engineering the entire system from the ground up. (Id.) Accordingly, the combination is impermissible and fails to establish a *prima facie* case of obviousness.

The *2010 KSR Guidelines Update* explains that combinations, though technically feasible, may be nonobvious where skilled artisans would not have attempted the combination due to additional effort required to make the combination or the additional complexity thereof:

> Even though the components are known, the combining step is technically feasible, and the result is predictable, the claimed invention may nevertheless be nonobvious when the combining step involves such **additional effort that no one of ordinary skill would have undertaken it without a recognized reason to do so.** When a combination invention involves **additional complexity as**

> **compared with the prior art**, the invention may be nonobvious unless an examiner can **articulate a reason for including the added features or steps**. This is so even when the claimed invention could have been readily implemented.

(75 Fed. Reg. 53646, emphasis added) Accordingly, even if the combination could be readily implemented, which is not the case here, there must be reason to combine the references sufficient to overcome the disadvantages associated therewith.

In the instant case there is simply no such motivation because Thomason already has fast forward and reverse functionality and Krause's I-frame detector provides no additional functionality. (Second Villasenor Dec. ¶32) As explained in Thomason, the acceleration controller "controls the acceleration rate at which data is required, including providing for slow motion and frozen frames and frame stepping" and it also "provides for fast forward and fast reverse functions." (Id.; Thomason at 4:19-24) In the Thomason system "[l]ive transmissions and historical transmissions can be simultaneously displayed using PIP (picture-in-picture) techniques by a PIP postprocessor 42." (Id.; Thomason at 4:29-32) Krause's I-frame detector offers no additional functionality. (Id.) Krause's I-frame detector merely enables fast forward, reverse and similar functions that are already performed by the Thomason system. (Id.)

The Office Action posits that the addition of the Krause I-frame detector "would allow Thomason to more efficiently perform operations such as varying speed reverse or varying speed forward by directly retrieving the appropriate I-frames for the selected speed," but in actuality the incorporation of Krause's I-frame detector into Thomason would make those operations substantially less efficient and cumbersome due to the architectural incompatibility of the Thomason and Krause systems. (OA at 21) The combined system would require substantially more memory because the random frame access required to incorporate the I-frame detector retrieves into a buffer large blocks of data from which the needed I-frames are selected. (Second Villasenor Dec. ¶30) Thomason is already an inherently memory intensive architecture and at the time of the invention memory was much more expensive than it is today. (Id.; Thomason 6:5-12) The addition of an I-frame detector would not have been attempted in view of design constraints and parameters **especially at the time of the invention.** (Id.) In a similar vein, the combined system would present much higher disk drive access demands because I-frames would have to be asynchronously retrieved from the hard drive in response to trick play commands like 10X fast forward and reverse while at the same time capturing all of the data input to Thomason's FIFO data pipeline. (Second Villasenor Dec. ¶31) The hard drive used in such a system would also have to be considerably faster in order to enable I-frame retrieval without input data loss in a system with a commercially reasonable amount of memory. (Id.) For these reasons, and pursuant to the *2010 KSR Guidelines Update*, the claimed subject matter is not rendered obvious by the asserted combination because any advantage associated with the inclusion of Krause's I-frame detector in the Thomason system is far outweighed by the associated disadvantages. (Second Villasenor Dec. ¶32)

The incompatibility of Thomason and then known parser-based systems is evidenced by the fact that the owner of the Thomason patent, Philips Electronics, asked the Patent Owner to design its commercial DVR system and took a license to the '389 patent. Philips filed the Thomason patent application in 1993 and during the 1990s was an active developer of consumer electronics devices. (Second Barton Dec. ¶14) However, even with the Thomason technology they were unable to develop a commercially acceptable DVR. (Id.) In 1998 Philips and TiVo reached an agreement whereby Philips, obtained a license under the '389 patent (then pending), and TiVo designed a commercial DVR sold under the Philip's name. (Id.)

To summarize the reasons why it is inappropriate to combine Thomson and Krause as suggested in the Office Action, attempting the combination would create numerous technical problems that arise from the architectural incompatibility of the Thomason and Krause systems. Although it might have been theoretically possible to dissect Thomason and Krause and reconstruct their component parts into an operable system, such reconstruction is impermissible according to the MPEP. Moreover, any minimal advantage that might be gleaned from the inclusion of Krause's I-frame detector in the Thomason system is far outweighed by the additional cost and complexity. Pursuant to the *2010 KSR Guidelines Update* this militates in favor of a finding that the claimed subject matter is nonobvious. Finally, the fact that the owner of the Thomason patent opted to license the '389 patent instead of further developing the Thomason technology suggests that in actuality those in the industry well understood that Thomason was architecturally incompatible with the parser-based technology needed to deploy commercially viable DVRs.

THE EXTRAORDINARY COMMERCIAL SUCCESS RESULTED DIRECTLY FROM THE CLAIMED CENTRALIZED TRANSFORM OBJECT ARCHITECTURE

Because the Office Action indicates that the Examiner "generally agrees that TiVo products were indeed successful as opined in the Barton Declaration," (OA at 12) only a brief recap of the invention's commercial success is necessary here. TiVo estimates that it, its licensed partners, and EchoStar (an adjudged infringer of the '389 patent) have sold at least 20,000,000 licensed or infringing DVRs. (Second Barton Dec. ¶8) SI Vault magazine called the TiVo DVR, which has always included the centralized transform object architecture, the "greatest invention, period." (First Barton Dec. ¶11) The TiVo DVR was awarded several Technology and Engineering Emmy awards. (First Barton Dec. ¶8) USA Today selected the TiVo DVR as one of the "Top 25 Inventions That Changed Our Lives." (Id.) Other commentators correctly noted that "TiVo singlehandedly created the market for digital television recorders." (First Barton Dec. at Exhibit 7)

The TiVo product created the market for DVRs because it was the first commercially viable product that could manipulate a live television broadcast (Second Barton Dec. ¶9) VCRs, then prolific, could not do so. (Id.)

The TiVo solution was commercially viable for at least the following two important reasons: the **smoothness of the video control** and the **retail cost of the system. Both of these attributes derive directly from the recited transform object architecture and automatic flow control.**

The quality of the TiVo DVR's "live TV" control was substantailly enhanced by the existence of a transform object that was intelligent enough to control the flow in a manner that accommodates the additional memory needs and access requirements created by activation of trick play functions, while also minimizing loss of data on the input side. (Second Barton Dec. ¶¶10-13) When performing a trick play function such as fast rewind, for example, the system must quickly find the appropriate data and output it in the sequence demanded by the user.

The retrieval must be fast and precise. Without a transform object automatically controlling the flow, trick play operations would be visibly uneven, or choppy. (Id.) For example, to provide a smooth rewind operation, there must be an adequate cache of I-frames in the output buffer. (Id.) Similarly, on the input side, the system must be able to, among other things, control the flow of highly variable incoming data. Otherwise data could be lost or compromised. Without a transform object controlling the flow for both the input and output buffers, under certain conditions the system would not be satisfying to the user. (Id.) Accordingly, the recited centralized transform object architecture and automatic flow control provided the smooth control of live TV that was critical to the success of the TiVo DVR. (Id.)

Several major consumer electronics companies indicated that they believed that the smoothness of the TiVo trick play functionality was particularly attractive to customers. TiVo was asked to, and did, design DVRs for Toshiba, Pioneer and DIRECTV. (Second Barton Dec. ¶¶15-16) During negotiations of the underlying agreements, each one of these entities made repeated statements to the effect that the TiVo DVR's smooth trick play functions were highly attractive to customers. (Id.)

With respect to the cost of creating a commerically viable DVR, given that memory was relatively expensive in the late 1990s there was strong motivation to use DRAM to provide both an input buffer and output buffer for a hard disk drive. (Second Barton Dec. ¶¶10-13) DRAM was on the order of 100X more expensive at the time of the invention in 1998 than it is today. (See, e.g., http://agigatech.com/blog/page/2/) The memory chips were single port devices such that writing and reading routines cannot be performed at the same time. (Id.) The intelligent centralized transform object was the key technology that enabled cost-effective use of DRAM. (Id.) Thus, the intelligent centralized transform object architecture enabled at least in substantial part the delivery of an effective DVR product at a commercially viable price. (Id.)

There accordingly exists a strong nexus between the extraordinary commercial success of the TiVo product and the recited centralized transform object architecture. Without the **recited centralized transform object architecture** the commercial systems would not have provided **smooth trick play** and would not have been **manufacturable at a commercially viable**

price point. Both of these attributes contributed directly and substantially to the extraordinary commercial success of the TiVo DVR product. (Second Barton Dec. ¶¶12-13)

THE NONOBVIOUSNESS OF THE CLAIMED INVENTION IS DEMONSTRATED BY SUCCESSFUL LITIGATION, LICENSING, LONG-FELT NEED, AND FAILURE OF OTHERS

Secondary or objective evidence is often the most probative evidence on the question of obviousness including because it is perhaps the best safeguard against the temptation to engage in theoretical combinations of references that those in the industry would not in fact attempt. The Federal Circuit recently noted that "[o]ur case law is clear that this type of evidence 'must be considered in evaluating the obviousness of a claimed invention.'" *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Contractors USA, Inc.*, 2010 U.S. App. LEXIS 17181 at *14-*15, __ F.3d __ (Fed. Cir. August 18, 2010) And it has long been established that "evidence of secondary considerations may often be the **most probative and cogent evidence** in the record." *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983) (emphasis added)

Here the record shows that virtually all possible objective factors indicate that the market and the industry universally considered the claimed subject matter to be nonobvious: praise of the patent, acquiescence, successful litigation, long-felt need, and failure of others. MPEP 716.01(a) First, the invention of the '389 patent was specifically identified by the USPTO for inclusion in the USPTO Museum. (First Barton Dec. ¶10) A contemporaneous article relayed the story as follows:

> **Joining the esteemed ranks of inventions such as the toothbrush, seat belt, computer and alarm clock, several TiVo inventions are featured in a new year-long exhibit** at the United States Patent and Trademark Office (USPTO) Museum in Alexandria, Va., beginning July 13[, 2005] . . . Depicted in a three-dimensional virtual diorama, the TiVo display showcases a living room decorated with TiVo trademarked logos and icons on everything from rugs to wall decor. Set to upbeat music, a video loop displayed on a TV on the "living room" wall highlights the benefits of **TiVo's Time Warp patent (U.S. Patent No. 6,233.389)**, which covers TiVo's proprietary technology for efficiently storing and playing back TV shows.

(First Barton Dec. ¶10, Ex. 15) During due diligence investigations various investors likewise praised the '389 patent and indicated that they believed the '389 patent to be particularly valuable. (Second Barton Dec. ¶17)

Numerous companies, including many leading developers of consumer electronics, licensed the claimed subject matter and asked TiVo to build their DVR products. (First Barton Dec. ¶13) Among the licensees were Philips, Sony, Toshiba, Pioneer, Comcast, DirecTV, AT&T Broadband and Earthlink.[3] (Id.) Additional licenses have been granted and still others are in process. (Second Barton Dec. ¶7) Many of the licensees additionally asked TiVo to design their commercial DVR products in recognition of the superiority of the TiVo architecture. (Second Barton Dec. ¶¶14-16)

On a related note, many companies made sizeable investments in TiVo based substantially and specifically on the strength of the '389 patent. Over $500,000,000.00 was invested collectively by AOL, NBC, HBO, ShowTime, Discovery, and others. (Second Barton Dec. ¶17) A substantial motivation for many of these investments, in addition to the flexibility of the TiVo system architecture, was the strength of TiVos intellectual property, especially and in particular the '389 patent. (Id.)

The '389 patent has also been litigated and found not to be invalid. EchoStar mounted a full scale assault on the validity of the '389 patent in the case captioned *TiVo Inc. v. EchoStar Communications Corp., et al., Case No. 2-04cvO1DF* (E.D. Tx.). In that case the District Court upheld the validity of the '389 patent (and indeed the very two claims at issue in this reexamination) and the Federal Circuit affirmed. *TiVo Inc. v. EchoStar Comm.*, 516 F.3d 1290 (Fed.Cir. 2008). Moreover, the District Court has awarded TiVo more than $400 million to date in connection with EchoStar's infringement of Claims 31 and 61 of the '389 patent, recognizing at least in part the value of the claimed subject matter.

A recent BPAI decision involving secondary considerations is instructive because its fact pattern bears so much resemblance to the instant case. In *Ex Parte Technofirst S.A.*, 2010 WL 785243 (BPAI March 5, 2010), the Board considered whether a finding of obviousness in a

[3] TiVo granted several of these parties covenants not to sue, which are equivalent to patent licenses. *Transcore LP v. Elec. Trans. Consultants Corp.*, 563 F.3d 1271 (Fed. Cir. 2008)

reexamination proceeding was overcome by objective evidence of nonobviousness. The Board held (emphasis added):

> The fact that the patent has been **litigated**, not found to be invalid or unenforceable, and had parties take **licenses** thereto is indicative that Appellant's invention is not obvious. As such, we find this evidence to be **compelling with respect to obviousness** of the independent claims.

That is precisely the case here. The '389 patent has been litigated and many parties, including leading consumer electronics companies, have taken licenses. This is compelling evidence because various judges, jurors, and companies have agreed that the subject matter recited in the claims under reexamination is innovative and nonobvious.

The record also shows that the '389 patent met a long-felt need that many others in the industry tried but failed to address. No previous commercially available product could rewind a live television broadcast or simultaneously pause and record live TV. (Second Barton Dec. ¶9) TiVo was the first DVR product on the market, and it was successful precisely because its centralized transform object architecture enabled the system to do what others failed to do: provide an "easy-to-use" solution that "improves the way people enjoy television by offering the capability to pause, rewind, create slow motion and even replay live TV instantly." (First Barton Dec. ¶9; PR Newswire October 17, 2006; Second Barton Dec. ¶9)

The secondary considerations evidence is at least as compelling here as it was in the *Technofirst* case. The '389 patent was selected for inclusion in the USPTO Museum. The '389 patent has been licensed by numerous leading consumer electronics companies (Sony, Philips, Toshiba, Pioneer, etc.) as well as the leading US cable and satellite operators (Comcast, DIRECTV, etc.). The '389 patent was adjudged not invalid by the courts in the EchoStar case. Over half a billion dollars has been invested in TiVo based substantially on the strength of the '389 patent.

The foregoing evidence demonstrates that the market, the industry, and the courts have considered the subject matter claimed in the '389 patent to be innovative and nonobvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530 (Fed. Cir. 1983) It is respectfully submitted that this objective evidence is an important safeguard against the temptation to engage in theoretical combinations of references that those in the industry would not have attempted and which Philips (the owner of Thomason) in fact did not attempt.

Interview Summary

The Patent Owner thanks Examiners Ferris, Keasel and Kiss for the courtesies extended during the interview conducted on August 25, 2010. During the interview the Patent Owner conveyed the arguments delineated in the slide deck entitled "US 6,233,389 to Barton et al. Multimedia Time Warping System, Examiner Interview, 90/009,329" which is being submitted via an information disclosure statement on even date herewith. That slide deck was shown during the interview and Mr. Barton, Prof. Villasenor, and the undersigned presented the positions set forth therein.

New Declaration Evidence

The Second Barton Declaration and the Second Villasenor Declaration are submitted pursuant to 37 CFR 1.116(e) which provides that such declaration evidence "may be admitted upon a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented." The declarations are offered to address issues specifically presented for the first time in the Final Office Action. More particularly, the declarations address the position set forth in the Office Action that one skilled in the art would understand that synchronous DMA "ready line" as used in the Thomason system would satisfy the centralized transform object architecture. (OA at 5) The declarations are also offered to address the finding in the Office Action that the previous declarations were insufficient to establish a clear nexus between the merits of the claimed invention and the proposed evidence of commercial success. (OA at 12) The declarations further address the "re-architecting" issue in response to the finding in the Office Action concerning the sufficiency of the showing relating to how the combination would the change the principle of operation of Thomason. (OA at 10-11) The Patent Owner respectfully submits that the foregoing constitutes good and sufficient reason why the declaration evidence was not earlier presented and hereby requests entry of the Second Barton Declaration and the Second Villasenor Declaration.

CONCLUSION

For the foregoing reasons the Patent Owner respectfully requests confirmation of the claims under reexamination.

The absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper.

The Director is authorized to charge any fees or credit any overpayments to Deposit Account No. 09-0946.

Respectfully submitted,

Dated: September 9, 2010

/Greg H. Gardella/
Greg H. Gardella
Reg. No. 46,045

Irell & Manella LLP
1800 Avenue of the Stars
Suite 900
Los Angeles, CA 90067-4276
310.203.7915

CERTIFICATE OF SERVICE

I hereby certify that on September 9, 2010 I caused a true and correct copy of the foregoing Response to Office Action, Declaration of John D. Villasenor, Declaration of James M. Barton, Information Disclosure Statement (SB08) and Non-Patent Literature, Revocation of Power of Attorney and New Power of Attorney, and Statement Under 37 CFR 3.73(b) to be served via First Class U.S. Mail on the following:

David L. Fehrman
MORRISON & FOERSTER LLP
555 West Fifth Street
Los Angeles, CA, 90013

Date: September 9, 2010

/Greg H. Gardella/
Greg H. Gardella
Reg. No. 46045

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Barton et al.
U.S. Patent No.:	6,233,389
Issue Date:	May 15, 2001
Serial No.:	09/126,071
Filing Date:	July 30, 1998
Reexam Control No.:	90/009,329
Title:	MULTIMEDIA TIME WARPING SYSTEM

SECOND DECLARATION UNDER RULE 1.132 OF JAMES M. BARTON

I, James M. Barton, declare as follows:

1. I understand that I am submitting a declaration in connection with the above-reference reexamination proceeding pending in the United States Patent and Trademark Office for U.S. Pat. 6,233,389 ("the '389 patent"). I am a co-inventor of the '389 patent.

2. I hold a Bachelors of Science degree in Electrical Engineering and a Masters of Science Degree in Computer Science from the University of Colorado at Boulder. I have worked in the electronics industry for over 30 years. I was an engineer at Bell Laboratories and an engineering manager at Hewlett Packard and Silicon Graphics.

3. Thirteen years ago I co-founded TiVo. I am presently the Chief Technology Officer ("CTO") and Senior Vice President of Research and Development for TiVo, the owner of the '389 patent. I have first hand knowledge of product development, marketing, product deployment, business relationships with third parties, and other various business matters of TiVo from its inception to the present.

4. I am an inventor on well over 100 U.S. and international patents and applications in the area of software and electronics.

5. I previously presented a declaration in this reexamination proceeding in support of patent owner TiVo's response filed November 2, 2009. I present the following declaration in support of TiVo's response to the final office action, where claims 31 and 61 are rejected. The declaration is intended to provide information concerning issues that were discussed at the August 25, 2010 examiner interview, which I attended.

6. TiVo introduced a digital video recorder ("DVR") product in early 1999 that included all of the limitations recited in claims 31 and 61. TiVo has introduced into the market other DVR products subsequent to the initial product launch. Every TiVo DVR product sold in the market embodies and practices claims 31 and 61 of the '389 patent.

7. TiVo has licensed the '389 patent to 13 different third party entities and continues to discuss licenses with other parties. The licensed entities include Philips, Sony, Toshiba, Pioneer, Comcast, DirecTV, RCN, Suddenlink, AT&T Broadband, Earthlink, Windstream, TGC and Humax.

8. To date TiVo has sold roughly 4,000,000 DVRs. Based on my knowledge of the market I estimate that TiVo's partners have provided roughly 14,000,000 DVRs that embody and practice claims 31 and 61 of the '389 patent. Furthermore, EchoStar has been found to infringe claims 31 and 61 of the '389 patent. EchoStar has sold at least several million infringing DVRs.

9. All of the TiVo DVRs include "trick play" functions that, among other things, allow a user to rewind, fast forward and pause video/audio content streamed into a box. TiVo's DVRs were the first commercial products to include trick play functions that could for instance rewind a live television broadcast. The ability to rewind, pause and otherwise manipulate a live television broadcast revolutionized the television industry. No other available product commercially available at the time could do so. For example, conventional VCRs could not rewind a live broadcast.

10. To enhance market acceptance of such a pioneering product, TiVo's DVRs had to be sold at a price that was commercially acceptable to the consumer. To minimize cost, TiVo DVRs originally included a DRAM that provided both an input buffer and output buffer for a hard disk drive. The DRAM used in the TiVo DVR products has been a single port device such that writing and reading routines cannot be performed at the same time.

11. Constructing a DVR to include a transform object that automatically flow controls a source object and a sink object was essential to creating the trick play functions in a commercially viable product. Video, for example, is stored on the hard disk drive in MPEG

format. MPEG format includes I, B and P frames. I frames are usually significantly larger than B and P frames. In normal operation, the I, B and P frames are retrieved from the disk drive and stored in the buffer (e.g. DRAM). When performing certain trick play functions such as fast rewind, the drive only retrieves I frames. Because I frames are larger than B and P frames more output buffer space is required. Additionally, more access time for the DRAM and the disk drive is required to retrieve this larger amount of data. Because the DRAM chips have usually been single ported and have historically provided both the input and output buffers in the TiVo DVRs, there has been a need to provide a transform object that controls the flow of data into and out of the DRAMs. The transform object has to be intelligent enough to control this flow.

12. Without a transform object automatically controlling the flow into the DRAM in these TiVo DVRs, trick play operations would have been visibly uneven, or choppy. For example, to provide a smooth rewind operation, especially in single-ported DRAM DVRs, there generally has to be an intelligent management of the buffers or data handling or else the output will at least periodically be starved of the required frames.

13. The transform object architecture and automatic flow control was critical to the provision of the smooth control of live TV which drove the sales of the TiVo DVR products.

14. The face of the Thomason patent indicates that it was assigned to Philips. Philips was one of the world's largest consumer electronics companies and sold products such as VCRs. During the 1990s Philips was an active in the design and development of consumer electronics devices. However, to my knowledge they did not develop a commercially viable DVR on their own. In 1998 Philips and TiVo agreed to develop a DVR to be sold under the Philips name. A photo showing the TiVo designed Philips DVR is attached as Exhibit A. The Philips DVR embodied and practiced claims 31 and 61 of the '389 patent.

15. TiVo also designed DVR products for Sony Electronics, including a satellite receiver box for DIRECTV and a box sold under the Sony name. A photo of the Sony box is attached as Exhibit B. The Sony DVRs embodied and practiced claims 31 and 61 of the '389 patent.

16. TiVo also designed DVRs that were sold by Toshiba, Pioneer and DIRECTV. Each one of these DVRs embodied and practiced claims 31 and 61 of the '389 patent. During negotiations for the agreements with TiVo, each one of these entities made repeated statements as to the customer attractiveness of the trick play functions and the smooth manner in which the TiVo DVRs performed these functions.

17. TiVo received over $500,000,000.00 in investments from third party entities such as AOL, NBC, HBO, ShowTime, Discovery, Sony and Philips. A Philips employee was also a board member of TiVo. AOL invested $200,000,000.00 in TiVo and requested that TiVo design a DVR for them. These entities performed technical due diligence before investing in TiVo. All of these entities were enthusiastic about the customer attractiveness of the trick play functions and the smooth and reliable way in which the TiVo DVRs performed these functions. These entities also expressed that TiVo's intellectual property, including the '389 patent, was considered to be an important corporate asset.

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

Executed on September 9, 2010 at Alviso, California.

James M. Barton

EXHIBIT A

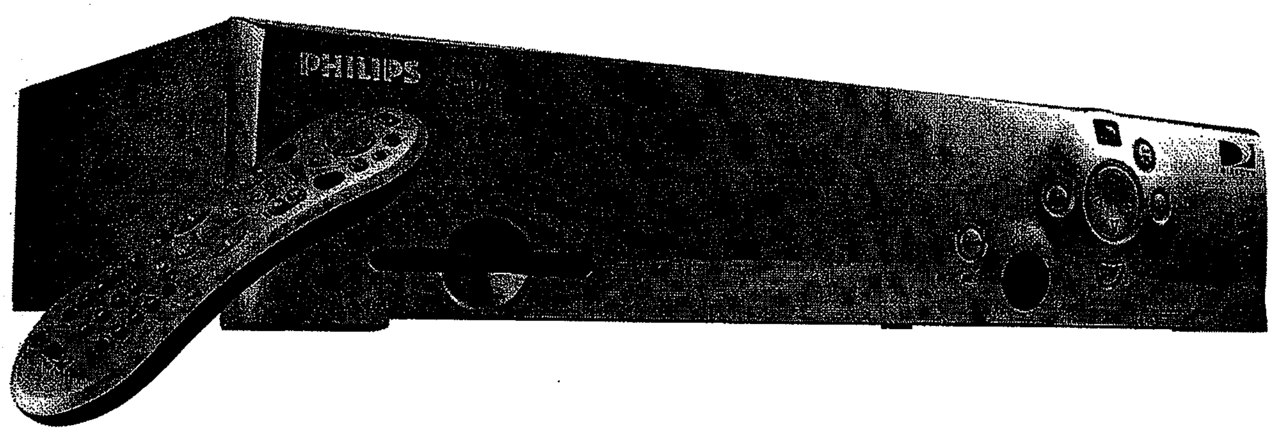
0.0 01

DIRECTV® DVR powered by TiVo®

DSR 7000

Receive and record your favorite programs with ease

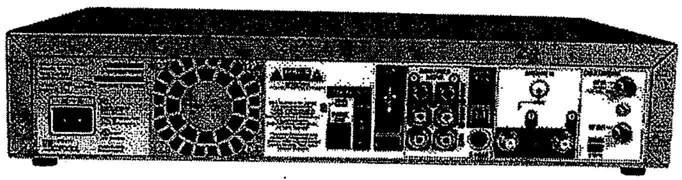
- **Combine access** to over 225 digital-quality channels of DIRECTV® programming with the convenience and control of the DIRECTV Digital Video Recorder.
- **Digitally record** up to 35 hours* of DIRECTV® programming to watch whenever you're ready.
- **Dual Tuners** allow you to record two shows at the same time or watch one while recording another.**
- **Use Season Pass™** to automatically record every episode of your favorite shows.
- **Use WishList™** to find and record programs that match your interests.
- **DIRECTV Advanced Program Guide™** for access to up to 14 days of program listings.



PHILIPS

Digital Video Recorder

DSR 7000



DSR7000

Technical Specifications

Satellite In:	F-type connector - female(2)
Video Decoding:	MPEG-2, 4:3 and 16:9 video format
Video Out:	S-Video 4-pin mini DIN, Composite Video RCA (2), F-type connector - female
Audio Decoding:	MPEG-1 layer II
Audio Out:	Stereo L/R RCA (2-pairs), Optical SPDIF Digital
RF In:	F-type connector - female
RF Out:	F-type connector - female, Channel 3 or 4 switchable
Telephone:	RJ-11 female, 2-wire
Control Out:	3.5mm mini jack sockets (2)
Card Slot:	Access card for service
Power :	120V, 60Hz, 40W
Operating Temperature:	5 C to 45 C
Operating Humidity:	5% to 80%
Dimensions:	15in.W x 12in.D x 3in.H
Weight:	11.4 lbs.
Remote Control:	37 button (two AA batteries included)
Accessories Port:	Two USB 2.0 ports
Optional Accessories:	DIRECTV 18" dual - LNB satellite dish, DIRECTV PLUS™ oval satellite dish, DIRECTV phase III multi-satellite antenna

Packaged with required accessories

UPC 0 37849 93827 0

For more information about Philips satellite products
and accessories, please contact:
Philips Digital Video/Set Top Boxes
64 Perimeter Center East
Atlanta, GA 30346
Telephone: (770) 821-2400

www.philips.com or AOL keyword: philips

*Actual recording capacity depends on type of programming being recorded.

Specifications are subject to change without notice.

**For full functionality, this recorder requires connection of two (2) satellite inputs from dual LNB DIRECTV system dish antenna.

PHILIPS

Features At A Glance

Combine access to over 225 digital-quality channels of DIRECTV® programming with the convenience and control of digital video recording.

Control Live TV

Pause, rewind, slow motion or instant replay live TV anytime.

Season Pass™

Use Season Pass to automatically record every episode of your favorite shows every time they air – even if the date and time slot change.

WishList™

WishList will find and record DIRECTV® programming based on your favorite actors, directors, teams, or interests.

Movies and Events

Access up to 31 premium movie channels and as many as 60 pay-per-view movie choices per month.

Sports

Access to major professional and college sports subscriptions including NFL, NBA, MLB, NHL, WNBA, MLS, and NCAA.

40GB Hard Disk

35 hours* of digital recording of your favorite DIRECTV® programming allows you to watch TV on your schedule.

Dual Tuners

Allows you to record two shows at the same time or watch one while recording another.**

Advanced Program Guide™

Enables you to browse upcoming programs and events 14 days before they air.

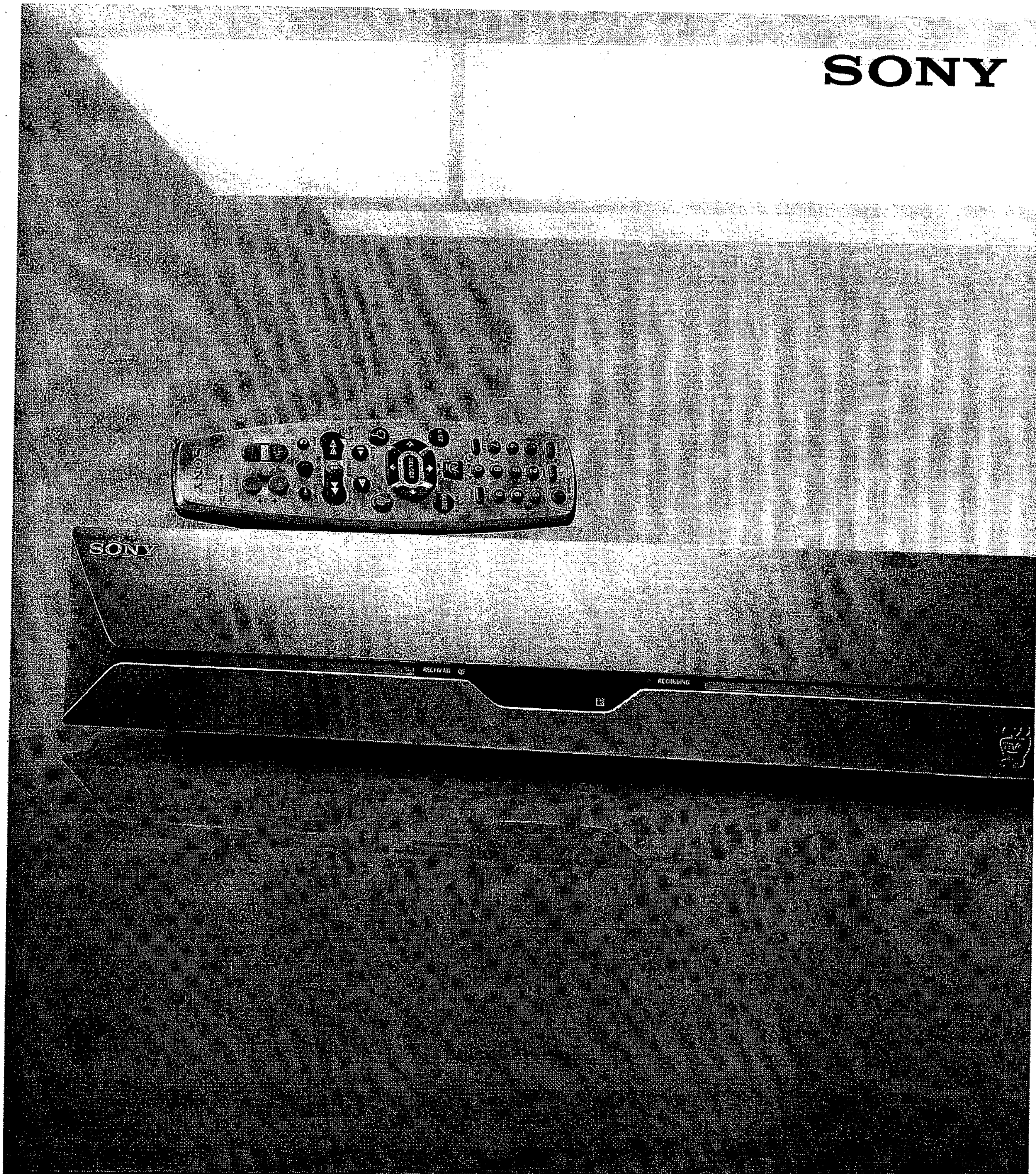
Surround Sound

Dolby Digital™ 5.1, Dolby ProLogic, and stereo audio for live and recorded shows.

Software Upgrades

Updates automatically performed to continually offer current enhancements when they become available.

EXHIBIT B



2001 HOME NETWORK PRODUCTS

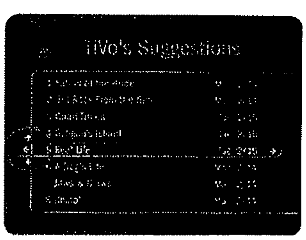
SVR-2000 DIGITAL NETWORK RECORDER

MAKING SENSE OF A 500-CHANNEL WORLD TAKES POWERFUL INTELLIGENCE.

Imagine coming home from work and turning on your television. Instead of surfing through all those channels, looking in vain for something you might like, imagine accessing a menu of your favorite TV shows already recorded for your convenience! That's the magic of the Sony SVR-2000 Digital Network Recorder with TiVo™ Service. It's the foolproof way to manage and enjoy the hundreds of channels in today's TV landscape. Now you can enjoy the very best that television has to offer, every single time you turn it on!

NOW THERE'S ALWAYS SOMETHING GOOD ON TELEVISION. Sony's first home VCR sparked a revolution – giving ordinary viewers their first measure of control over the TV schedule. People could record shows for later viewing or even watch one show while they recorded another. Now Sony unleashes the next generation. The Sony SVR-2000 Digital Network Recorder with TiVo™ Service uses tapeless digital recording to personalize your TV schedule.

• TiVo's Suggestions. The SVR-2000 is constantly thinking, seriously, of ways to make the TV experience simpler, more convenient and above all more enjoyable. You can rate your favorite TV shows with up to three Thumbs Up™ and tag your least favorite shows with up to three Thumbs Down™. The SVR-2000 then uses your ratings to automatically find and record shows similar to your favorites! These shows appear on the Now Playing list, your personal menu of recorded programs.



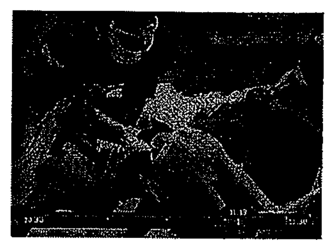
• Season Pass™ service. Tell TiVo once and it will automatically find and record every episode of your favorite show, every time it airs – even if the television network lineup changes! You'll never need to surf through channels, looking for something to watch. Just go straight to your favorites!

• Wish List. Select your favorite actors, directors and keywords and the SVR-2000 can display every upcoming show that matches your choices. Want to record them all? Just touch a button and it's done!

• Now Playing List. Just press the LIST button to see an easy on-screen menu of your recorded shows. You simply move down the menu to the show that you want to watch and press a button. Bingo! Instant access.

CONTROL LIVE TELEVISION. The SVR-2000 automatically stores up to 30 minutes of the TV shows you've been watching – a feature that leads to a host of useful options.

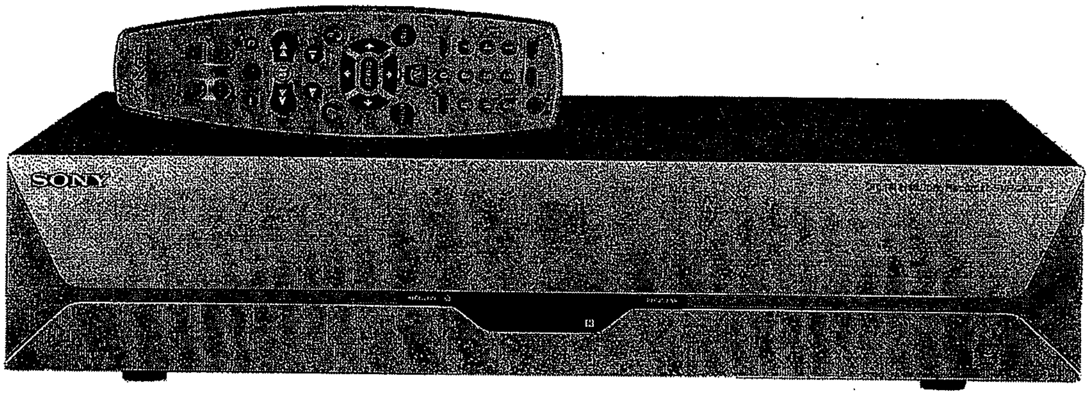
• Pause live television. Never again miss out because of a phone call. Simply press Pause and the SVR-2000 continues recording. When you return, you can pick up where you left off at the touch of a button.



• Instant replays. They're perfect for sports or lines of dialog that you missed. The SVR-2000 enables you to pause, rewind, enjoy frame-by-frame slow motion and create your own instant replays.

• "Catch up" to live TV. After your instant replay, use the Advance button to return to the live broadcast.

RECORD UP TO 30 HOURS WITHOUT VIDEOTAPE.[1] The SVR-2000 captures television picture and sound on a built-in hard disk drive – an arrangement that means high quality and superb convenience.



• **Digital quality.** You'll see high-quality MPEG-2 digital video. You'll hear spectacular digital audio.

• **Selectable quality.** The SVR-2000 lets you choose the recording quality to suit your programming needs. Choose Basic (recommended for cartoons and news), Medium (for sitcoms and soaps), High (for dramas and movies) and Best Quality (for sports and action).

• **Instant access.** With hard disk recording, you'll never need to fast-forward or rewind to your show, the way you do with videotape. All your recorded shows are available in an instant! And you can use the Advance button to jump instantly to the end of a recorded show.

• **High-speed search.** The SVR-2000 offers forward and reverse search at 3x, 18x and 60x speeds. (At 60x, you can zip through an entire hour of programming in just one minute.)

• **Record one show while you play back another.** The SVR-2000 can simultaneously record and play! For example, during the recording process, you can start watching the show you're recording from the beginning. Or watch any other program already recorded on the SVR-2000.

YOUR COMPLETE GUIDE TO TELEVISION. The TiVo Service has complete listings for over 13,000 cable systems, most direct broadcast satellite systems (DIRECTV®, Primestar and Dish Network/Echostar) and over-the-air TV broadcasting. For your convenience, the SVR-2000 includes a built-in modem. Once a day, your SVR-2000 automatically calls in to the TiVo computer to update its 14-day program guide and to upgrade your SVR-2000 with new features and content. So you're always up-to-date!

• **TiVo programming guide.** Updated daily, this on-screen programming grid includes 14 days of listings. You can search for shows by name, channel and time. And you can schedule automatic recordings straight from the guide.

• **TiVoMatic™ recording.** When a network advertises a show that looks good and the TiVoMatic icon is displayed, you can automatically record the show by touching a button. For example, if you're watching NBC news, you see an ad for Dateline NBC and you see the TiVoMatic icon, you can record the show automatically!

• **Network Showcases.** This TiVo feature lists some of the best TV programs from some of the biggest TV networks. You can record any of the shows with a single touch of a button.

• **TiVolution™ Magazine.** This editorial guide keeps you current on noteworthy specials, movies and television events.

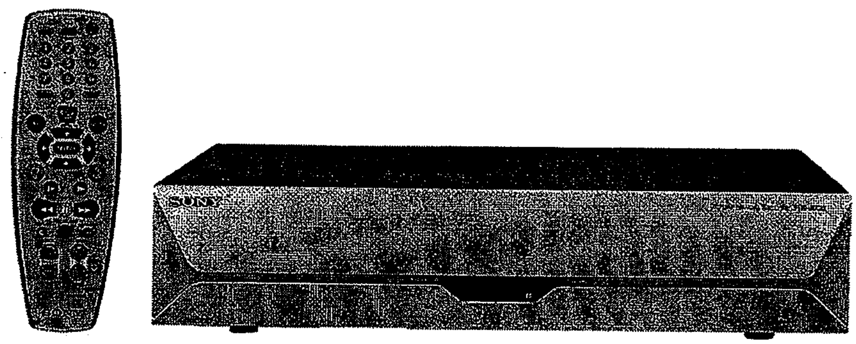
• **TiVo Takes™.** This exclusive preview show highlights the best in upcoming entertainment, where available.[2] When you see a preview you like, you can record the show by simply touching a button.

THE BEST FRIEND YOUR VCR EVER HAD. Even a tapeless digital recorder can still work seamlessly with your Sony VCR! Auto VCR Transfer makes it easy to transfer any recorded show from the SVR-2000 to a Sony VCR. So you can save shows for later viewing – while you save space on the hard disk drive.

SUBSCRIBING TO THE TIVO SERVICE. The Sony SVR-2000 works exclusively with the TiVo Personal TV Service™. You can subscribe to the service for either $9.95 per month or a one-time fee of $249 for the life of the SVR-2000. You can activate the TiVo service by calling 1-877-367-8486 (1-877-For-TiVo) or going to www.tivo.com/activate.

SVR-2000 DIGITAL NETWORK RECORDER WITH THE TiVo SERVICE

- Tapeless digital recording
- Pause live television; automatically saves up to the last 30 minutes of TV you've watched
- Perform your own slow motion and instant replay
- Records up to 30 hours of television[1]
- Simultaneous record and playback from hard disk drive
- High speed picture search at 3x, 18x and 60x normal speed in forward and reverse
- Frame-by-frame advance in forward and reverse
- Status Bar shows where you are in a recorded program
- Season Pass™ function records every episode of a show
- TiVo's Suggestions finds and records shows similar to your favorites
- Wish List finds upcoming shows with your favorite actors, directors or keywords
- TiVo Takes preview show, where available[2]
- TiVoMatic™ recording
- Network Showcases
- TiVo Live TV guide provides listings for 14 days of shows
- Multi-brand remote also operates key functions on many brands of TVs and A/V receivers[3]
- Two sets of A/V outputs
- S-Video output
- RF input for cable or local antenna
- Future software upgrade capability
- Stylish silver design



Video line input	S-Video 4 pin mini DIN (1) Composite video phono jack (1)
Video line outputs	S-Video 4 pin mini DIN (1) Composite video phono jack (2)
Audio line input	Stereo L/R phono jacks (1 pair)
Audio line outputs	Stereo L/R phono jacks (2 pairs)
RF input	F type female (1)
RF output	F type female (1)
Telephone interface	RJ-11 female 2-wire (1)
Control outputs	3.5 mm Mini jacks (2)
Hard disk capacity	30 GB
Recording time	30 hours at Basic Quality 19 hours at Medium Quality 14 hours at High Quality 9 hours at Best Quality
Power requirements	120 V AC, 60 Hz
Power consumption, max	40 w
Dimensions (W x H x D)	17 x 3-7/8 x 11-1/2" (430 x 97 x 290.5 mm)
Weight	9 lbs., 1 oz. (4.1 kg)
Supplied accessories	Remote control (1) Size AA batteries (2) AC power cord RF coaxial cable Audio/Video cables (2) Infrared control cable with two Infrared blasters (1) Serial control cable (1) Serial adapter (1) S-Video cable (1) Phone cord (1) Phone splitter (1)

FRAME-BY-FRAME ADVANCE. Enables you to study sports plays in forward and reverse.

FUTURE SOFTWARE UPGRADE CAPABILITY. Enables future refinements, by accepting new versions of the operating software automatically as part of the TiVo Service.

HIGH-SPEED SEARCH. Forward and reverse search at 3x, 18x and 60x speeds. At 60x, you can zip through an entire hour of programming in just one minute.

INSTANT REPLAY. Automatically replays the last eight seconds of live TV at the touch of a button.

MULTI-BRAND REMOTE CONTROL. Simplifies operation by also controlling key functions on many brands of TVs and A/V receivers.[3]

NETWORK SHOWCASES. Highlight listings for some of the biggest shows from some of the biggest networks – just for TiVo subscribers.

PAUSE LIVE TELEVISION. The digital hard disk recorder holds up to 30 minutes[1] of the shows you've been watching, which enables you to pause live television, answer the phone and then return to a show where you left off.

RF INPUT. Accommodates a broadcast TV antenna or cable.

SEASON PASS RECORDING. Automatically finds and records every episode of your favorite show, every time it airs.

SIMULTANEOUS RECORD AND PLAYBACK. Enables you to watch a show from the hard drive – even while you're recording a new show!

STATUS BAR. On-screen bar across the bottom of the picture that shows where in the recorded program you are. For recording of live TV, the Status Bar shows where you are in relation to the start and end time of the live show.

S-VIDEO OUTPUT. Achieves high resolution, crisp picture edges and clear color.

TAPELESS RECORDING. The SVR-2000 records up to 30 hours of programming onto a built-in hard disk drive.[1]

TiVo PROGRAMMING GUIDE. Includes 14 days of listings. You can schedule automatic recordings directly from the guide.

TiVo SERVICE. Subscription service that includes a special 14-day program guide updated daily, the ability to rate your favorite programs to find others that match your interests, exclusive daily updates on what's current on television, plus the ability to pause live television and schedule shows for automatic digital recording.

TiVo'S SUGGESTIONS. Automatically records shows similar to the ones you like, as indicated by your Thumbs Up/Thumbs Down rating.

TiVo TAKES.[2] Where available, this exclusive show, just for TiVo subscribers delivers highlights from upcoming shows and TivoMatic previews.

TiVoMATIC RECORDING. When a network advertises a show that looks good, you can automatically record it by touching a button. (Requires compatible network previews.)

TWO SETS OF A/V OUTPUTS. One for your television. One for your A/V receiver.

WISHLIST™. Enables you to find programs based on your favorite actors, directors and keywords. Displays and records all upcoming shows that match your criteria.

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[1] Actual recording capacity depends on programming recorded.

[2] TiVo Takes: Coming Soon. May not be available in all areas.

[3] Multi-brand remote: May not operate some brands or models.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Barton et al.
U.S. Patent No.:	6,233,389
Issue Date:	May 15, 2001
Serial No.:	09/126,071
Filing Date:	July 30, 1998
Reexam Control No.:	90/009,329
Title:	MULTIMEDIA TIME WARPING SYSTEM

<u>SECOND DECLARATION UNDER RULE 1.132 OF DR. JOHN D. VILLASENOR</u>

I, John D. Villasenor, declare as follows:

1. I received my PhD from Stanford University in 1989. From 1997-2002, I was vice chairman of the Electrical Engineering Department at University of California, Los Angeles. I am currently a professor of electrical engineering at UCLA.

2. My research has been featured on the cover of *Scientific American* magazine and in numerous technical journals. I am an inventor on approximately 19 issued patents and have over 100 peer reviewed journal articles and conference proceedings.

3. I previously presented a declaration in this reexamination proceeding in support of patent owner TiVo's response filed November 2, 2009. I present the following declaration in support of TiVo's response to the final office action, where claims 31 and 61 are under reexamination. This declaration is intended to provide information and opinions concerning issues that were discussed at the August 25, 2010 examiner interview, which I attended.

4. As was discussed at the interview, the claims at issue here focus on an architecture in which there is what the claims refer to as a "transform object." This transform object occupies what can be characterized as a central position within the recited architecture. The claims at issue recite that this transform object automatically flow controls the source object (located on the input side) and the sink object (located on the output side).

5. One of skill in the art would understand that the recited centralized transform object intelligently manages buffers or the manipulation of the video so as to facilitate the system's ability to handle asymmetric memory demands of the source and sink objects.

6. According to the recitations of claims 31 and 61, there is a flow of data through the system of the claims at issue. The data comes in in from the physical source, passing through a disk drive or similar storage (where the data may stay for some time), and then flowing from the disk drive to a display (for example, a television monitor). One

could think of the flow as being subdivided into two pieces, the first being the flow from the physical source onto the disk drive and the second being the flow from the disk drive to the display.

7. The flow of data is automatically controlled by the transform object, as recited in the claims. The specification states (column 8, lines 48-49) that this automatic flow control manifests itself in a self-regulating of the flow. The specification explains at column 11, lines 24-25 that the "[f]low control is automatic because of the way the pipeline is constructed." The "pipeline" referred to here is the source/transform/sink object architecture discussed in claims 31 and 61 and in the specification including at column 8, line 9 to column 10, line 18. This architecture is "self-regulating" with respect to the flow of data down the pipeline as noted at column 8, lines 47-51 and column 11, lines 24-25. In other words, the transform object is not merely self-regulating in an abstract sense. Rather, it controls the flow of data through the pipeline.

8. Importantly, the transform object may be configured in many embodiments to exert flow control asynchronously with respect to the underlying video and audio data stream. The specification explains that the preferred flow control mechanisms occur "asynchronously to the data going through the pipeline. Thus, control of the flow of video streams is asynchronous and separate from the streams themselves. This allows for a simple logic design that is at the same time powerful enough to support the features described previously, including pause, rewind, fast forward and others." ('389 patent at column 8, lines 24-31) The specification explains that the centralized, flow-controlling transform object "allows for a simple logic design that is at the same time powerful enough to support the features described previously, including pause, rewind, fast forward and others." ('389 patent column 8, lines 28-31) Elsewhere the specification teaches that the contemplated features also include pausing, "fast/slow reverse" and "fast/slow play." ('389 patent at column 6, lines 43-46).

9. These functions, sometimes referred to as "trick play" functions, place asymmetric, variable, and often heavy demands on system components such as the memory and processor. For instance, during fast forward the system accesses primarily i-frames. This places asymmetric, heavy demand on the output side. Asymmetric demands may also be imposed on the input side, for instance when the incoming video data rate is highly variable. During such periods of heavy, asymmetric demand, additional buffers are required on the input and/or output side to provide the data required to render the frames required to capture the data or by the user selected trick play function.

10. The automatic flow control which is exercised by the transform object facilitates intelligent management of the asymmetric demands placed on the input side (source object) and the output side (sink object). For example, it becomes possible in certain circumstances to temporarily reduce the flow on the input side in order to allow more resources to be devoted to the more challenging output flow in trick play. Conversely,

during periods of asymmetrically high data input rate (such as during scenes from action movies involving rapid scene changes), it is possible in certain circumstances to allocate relatively more buffers to the source object to avoid the dropping of video data on the input side.

11. For these reasons, a person skilled in the art would, in my opinion, understand from the claims and specification of the '389 patent that the transform object of the invention intelligently manages buffers or the manipulation of the video data so as to facilitate the system's ability to handle asymmetric memory demands of the source and sink objects.

12. The word "object" which is used as part of the claim term "transform object" has a well known meaning in computer science, being a collection of data and operations (as mentioned in the Office Action at page 3).

13. In the case of the present invention, the data associated with each of the source object, transform object, and sink object would include information regarding the flow. The specification explains that the preferred embodiment is implemented in terms of C++ classes. This is stated expressly at col. 8, lines 9-10, and is also consistent with other statements in the specification, for example the statement at col. 8, lines 66-67 that "[t]he MediaSwitch class 909 calls the allocEmptyBuf method of the TmkClipCache 912 object" and the reference at col. 9, lines 52-53 to "objects derived from the TmkXfrm class." C++ classes are a feature of the C++ language designed to group collections of functionally interrelated data and operations. The data would be the data members of the class while the operations are the methods of the class. Specific objects in C++ are generally called class instances. The state of an object in C++ is recorded in the data members and the associated data structures.

14. The specification makes repeated references to the manipulation of data and to particular operations carried out by objects, often identified by a name. The specification states that "[t]o obtain the buffer, the source object 901 asks the down stream object in his pipeline for a buffer (allocEmptyBuf)" and that the "sink . . . calls nextFullBuf which tells the transform 902 that it is ready for the next filled buffer." ('389 patent at column 8, lines 45 to 54) The specification continues: "When the sink 903 is finished with a buffer (i.e., it has consumed the data in the buffer) it calls releaseEmptyBuf . . . The MediaSwitch class 909 calls the allocEmptyBuf method of the TmkClipCache 912 object and receives a PES buffer from it. . . When the Vela decoder class 916 is finished with the buffer it calls releaseEmptyBuf." (Col. 8, line 55 to col. 9, line 17).

15. The objects disclosed in the specification are described as managing various aspects of the system operation. The specification teaches as follows in this regard: "The source object 901 takes data out of a physical data source, such as the Media Switch, and places it into a PES buffer. . . . The MediaSwitch class 909 . . . goes out to the circular buffers in the Media Switch hardware and generates PES buffers. . . . The

TmkClipCache 912 maintains a cache file 918 on a storage medium. . . . The Vela decoder class 916 talks to the decoder 921 in the hardware. . . . The control object 917 accepts commands from the user and sends events into the pipeline to control what the pipeline is doing. For example, if the user has a remote control and is watching TV, the user presses pause and the control object 917 sends an event to the sink 903, that tells it pause." Col. 8, line 43 to col. 9, line 27.

16. The term "data" would thus be understood in this context to refer to a set of variable values or state information that reflects the state or progress of the operations. The term "operations" in this context would be understood refer to operations that manipulate the set of values or state information. Lastly, the term "collection" would be understood in this context to refer to a set of functionally interrelated data and operations, as explained in the specification.

17. Consistent with the individual meanings of the terms "collection," "operation" and "data," the term "object" in this context would in my opinion be understood by those skilled in the art to refer to a functionally interrelated set of state information typically a set of variable values which include information concerning the state or progress of the operations that relate to the state information.

18. Turning now to the Thomason reference on which the Examiner relies, it does not disclose a centralized entity like the claimed transform object that controls the flow, intelligently managing buffers or the manipulation of the video data so as to facilitate the system's ability to handle asymmetric memory demands of the source and sink objects. Thomason's teachings are in a sense the opposite of flow control, in that Thomason simply reacts to the flow and does not control it. This is so, as I discuss below, even taking into account the Examiner's proposed modification of Thomason with teachings from the DMA Embedded Systems reference.

19. Thomason employs a FIFO architecture, for example in columns 5 and 6 and in FIGS. 1, 3a, 3b, and 4. In that FIFO architecture, data flows from the input buffers 4 to the buffer memory 35 to the main memory 36 and then back from there to the buffer memory 35 and to the output buffers 14. The FIFO architecture and data structures depicted in FIGS. 1, 3a, 3b, and 4 are designed on the assumption of a sequential one-directional flow – video comes in and passes through the channel selector 1, analog-to-digital converter 2, data compressor 3, buffers 4, buffer memory 35, main memory 36, buffers 14, data decompressor 13, digital-to-analog converter 12, acceleration controller 41, and PIP/postprocessing element 42.

20. Thomason's FIFO architecture bypasses the bus 21 for the audio and video data flow, since it includes three DMA controllers 31, 32, 33 which each have their own data path separate from bus 21 to the buffers and, in the case of DMA controller 32, to main memory 36. This data path may be seen in FIG. 1 of Thomason as arrows going from buffers 4 to DMA controller 31, from DMA controller 31 to buffer memory 35, from buffer memory 35 to DMA controller 32, from DMA controller 32 to main memory 36

and vice versa, from DMA controller 32 to buffer memory 35, from buffer memory 35 to DMA controller 33, and from DMA controller 33 to buffers 14. The existence of these separate data paths conveys that they would be used to perform the DMA for speed and efficiency reasons.

21. Thomason does not disclose any capability to control the flow. Rather, Thomason just manages buffers in a reactive way in response to the flow. There is no disclosure in Thomason of the kind of intelligent management performed by the recited centralized transform object architecture, as might for example occur if the user has chosen a trick play mode.

22. In particular, the Thomason reference is silent about what happens if there is a greater need for resources such as buffers on the output side of the flow. In fact, due to trick play, it is on the output side where the system management is more complicated. This means in effect that Thomason is unsuited to effectively manage situations where the output is overtaxed by data flow demands.

23. One skilled in the art would not have used the synchronous DMA described in the DMA Embedded Systems reference in the Thomason system. The DMA Embedded Systems reference explains that "[t]he hardware moves one byte or word between memory and I/O each time the I/O port signals it is ready for another transaction. . . Then, the DMA controller goes idle again, waiting for another ready signal from the port." This type of DMA controller would be considered ill suited for the Thomason system because it is comparatively slow. The Thomason architecture, by contrast, is designed to maximize the data rate through the FIFO pipeline.

24. Even if one were to add to the system of Thomason the synchronous DMA of the DMA Embedded Systems reference, the "ready" line of that reference would not be controlling the flow. It would be asserted in the communications between input buffers 4 and the DMA controller 31. Use by the input buffers 4 to tell the DMA controller, in effect, "we have another word or byte for you," would prompt DMA controller 31 to pull that word or byte and send it to buffer memory 35. The "ready" line would thus not be controlling the flow, but rather would be a function of the flow.

25. Turning now to a separate issue, the Office Action identifies the "transform object" with the microprocessor 24 and DMA controller 32. Even to the extent one could say that the "ready" line exercises flow control, which I believe it does not, that "ready" line – being located along the path between input buffers 4 and DMA controller 31 – is not connected to either microprocessor 24 or DMA controller 32. Thus, any flow control that might arguably be carried out by the "ready" line would not be carried out, as the claims require, by the "transform object." In addition, the "ready" line identified above pertains to the input side of the flow, and thus to the source object recited in the claim. Even if one were to agree that the "ready" line identified above gave rise to flow control, there would be no flow control of the sink (output side) object.

26. Turning now to a possible combination of Thomason with Krause, one of the difficulties with such a combination is that if one starts to use an index of MPEG i-frames such as that taught in Krause, random access to the MPEG-encoded video stream is needed. The i-frames in an MPEG stream are separated from each other by frames of other types, and it is necessary to be able to skip over the frames of other types and get to just the i-frames.

27. In contrast, as already discussed at length above, the Thomason system uses a FIFO architecture that is not designed for random access to the video frames. The system is designed for moving information through the system in a sequential manner and is not adapted to access the data or frames in a non-sequential or random manner. In short, Thomason's disclosure is thus of a system not designed for, or compatible with, random frame access.

28. In my previous declaration at paragraph 45 I explained that Thomason does not contain any provision for enabling the "user command signals" identified between boxes 25 and 26 of FIG. 1 to be provided to the acceleration controller. I also explained how there is nothing in the Thomason specification that shows any functional connection between the user interface 26/user command ports 25 and the acceleration controller 41.

29. In order to combine the i-frame detector of Krause with the Thomason system the latter would have to be extensively rearchitected in light of the foregoing issues. For instance, Thomason would have to be altered so that it could accommodate random frame access, which is fundamentally inconsistent with its FIFO architecture.

30. A further deficiency of a combination of Thomason with Krause is that the combined system would be more complex and costly and yet less efficient. This would happen, for example, because the system would require additional memory to provide random frame access. Such additional memory would be required in order to hold the additional blocks of data that would need to be retrieved from which the i-frames would have to be selected. This would not be a good idea in Thomason's system which is already memory hungry. Thomason proposes to discard video data in buffers read from main memory 36, even though that makes it necessary to later reread the video data (col. 6, lines 5-12), in order to move memory buffers from output to input. Thomason's proposal reflects the fact that in the 1990s memory was a good deal more expensive than it is today and designers would go to great lengths to reduce memory consumption.

31. In addition to additional memory requirements, there would also be much higher demands on the main memory 36 when one is doing, for example, 10X fast forward. In this case one has to move through ten times as many of Thomason's FIFO data structures from main memory 36. For example, if main memory 36 is a hard drive, then a much faster hard drive would be needed in order to handle this demand using

Thomason combined with Krause while limiting oneself to a commercially reasonable amount of RAM.

32. A final point to be made with respect to combining Thomason with Krause is that there is no advantage to the combination to the extent that Thomason already has what is described as a working implementation of trick play. There is no apparent reason why one would prefer Krause's trick play to what Thomason already claims to have. Any advantage one might gain from using Krause's trick play would be greatly outweighed by the disadvantages discussed above. A person of skill in the art at the time of the invention would simply not make such a combination given these disadvantages, particularly in light of the practical cost constraints to which a DVR would be subject.

33. Looking at Krause's disclosure, it does not help to correct any of the deficiencies of Thomason which have been described above. For example, Krause does not have any disclosure of a transform object like that which is claimed in claims 31 and 61. There is very little disclosure in Krause's description of the system's management of buffers. Krause does not address intelligent management of buffer use or data handling in order to accommodate the special demands of trick play which were discussed above.

34. Krause also does not discuss a DMA controller at all. The words "DMA" and "direct memory access" are not found in Krause. The hardware of Krause is shown at FIGS. 1 and 5. Thus, Krause does not have any teaching about the use of a system with synchronous DMA and a "ready" line, as suggested by the Office Action.

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

Date: Sept 9, 2010

Dr. John D. Villasenor