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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ORACLE AMERICA, INC.

Petitioner

v.

Patent Owner of

U.S. Patent No. 7,415,530 to Fallon

IPR Trial No. IPR2016-00376

**PETITION FOR *INTER PARTES* REVIEW OF
CLAIM 24**

**U.S. PATENT NO. 7,415,530
UNDER 35 U.S.C. § 312 AND 37 C.F.R. § 42.104**

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I. INTRODUCTION

U.S. Patent No. 7,415,530 (“the ’530 patent”, Ex. 1101) describes the transmission and storage of both compressed and uncompressed data. By compressing incoming data before storing it, overall transmission and storage time is naturally accelerated. *See* ’530 Patent at Abstract; Ex. 1101. As acknowledged in the ’530 patent itself, this benefit was well known at the time of the alleged invention. *Id.* at 2:12-18. The alleged invention of the ’530 patent is a “data storage accelerator” that includes “one or a plurality of high speed data compression encoders that are configured to simultaneously or sequentially losslessly compress data at a rate equivalent to or faster than the transmission rate of an input data stream.” *Id.* at Abstract. The claim of the ’530 patent that is the subject of this Petition requires that data compression and storage occur faster than storage alone could occur if the data were left in uncompressed form.

The ’530 patent was the subject of one *inter partes* reexamination, although the requester stopped participating after filing the request. The examiner ultimately concluded that the references relied on by the third party requester did not disclose this allegedly inventive limitation. Reexamination No. 95/001,927, 5/31/13 Right of Appeal Notice at 6-14; Ex. 1107 (concluding that the references relied upon did not disclose “said compression and storage occurs faster than said data stream is able to be stored on said memory device in said received form.”)

A prior art reference which was not at issue in that reexamination, however, U.S. Patent No. 5,805,932 (“Kawashima”, Ex. 1103), indisputably discloses this limitation. Specifically, Kawashima discloses a high speed data compression system designed to compress an incoming data stream using a high compression ratio—through the use of any one or a combination of compression algorithms—and then to store the compressed data stream more quickly than it could be stored in uncompressed form. Kawashima at 7:1-15; Ex. 1103.

While Kawashima expressly mentions some exemplary lossless compression techniques such as the well-known Lempel-Ziv algorithm, Kawashima is agnostic as to what specific encoding technique is used. Instead, Kawashima states that the disclosed system can be used with different types of encoding techniques to achieve its goal.

The challenged claim of the ’530 patent requires that the received data stream be compressed using at least two different compression algorithms (or “encoders”) to compress different blocks of data in the stream. Compressing data using multiple encoders—specifically, compressing data using different techniques for different types of data—was well-known in the art at the time of the alleged invention. For example, U.S. Patent No. 5,467,087 to Chu (“Chu”, Ex. 1105), cited on the face of the ’530 patent, teaches that “high speed lossless data compression” can be achieved by compressing an input data stream using different

compression techniques based on the different data types of the data in the data stream. Chu at Abstract, Figures 3 and 6, 4:24-65; Ex. 1105. Likewise, U.S. Patent No. 6,253,264 to Sebastian (“Sebastian”, Ex. 1104), teaches that optimal compression can be obtained by compressing multiple data blocks using different compression techniques for each block based on the format or data type of the data in the data block. *See* Sebastian at Abstract, 19:31-48; Ex. 1104. Therefore, it would have been obvious to modify Kawashima to incorporate the use of two or more compression techniques, such as those compression techniques described by Kawashima itself, to compress different blocks of data in the incoming data stream.

Because Kawashima, Sebastian and Chu disclose similar systems and methods, including systems and methods for analyzing and compressing incoming data streams while optimizing system performance, and because Kawashima expressly states that its system can be optimized through the use of various specific encoding techniques, it would have been obvious to combine the teachings of Kawashima, Sebastian and Chu. Accordingly, Kawashima in view of Sebastian and Chu renders claim 24 of the ’530 patent obvious and unpatentable.

II. MANDATORY NOTICES

A. Real Party In Interest

Oracle America, Inc. (“Petitioner”), HP Inc., Hewlett Packard Enterprise Company, and HP Enterprise Services, LLC are the real parties-in-interest. Petitioner submits this Petition for *Inter Partes* Review (“Petition”) for review of claim 24 of U.S. Patent No. 7,415,530 (the “’530 patent”).

B. Related Matters

The following co-pending litigation matters would affect or could be affected by a decision in this proceeding: *Realtime Data LLC v Actian Corporation et al.*, E.D. Tex. Case No. 6:2015-cv-00463, *Realtime Data LLC v Dropbox, Inc.*, E.D. Tex. Case No. 6:2015-cv-00465, *Realtime Data LLC v EchoStart Corporation et al.*, E.D. Tex. Case No. 6:2015-cv-00466, *Realtime Data LLC v Oracle America, Inc., Hewlett-Packard Co. and HP Enterprise Services, LLC*, E.D. Tex. Case No. 6:2015-cv-00467, *Realtime Data LLC v Riverbed Technology, Inc. et al.*, E.D. Tex. Case No. 6:2015-cv-00468, *Realtime Data LLC v SAP America, Inc. et al.*, E.D. Tex. Case No. 6:2015-cv-00469, *Realtime Data LLC v Teradata Corporation et al.*, E.D. Tex. Case No. 6:2015-cv-00470, all filed on May 8, 2015.

The following co-pending IPRs would affect or could be affected by a decision in this proceeding: IPR2016-00373; IPR2016-00374; IPR2016-00375; IPR2016-00377.

IPR2016-00376: Petition
U.S. Patent No. 7,415,530, Claim 24

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Petitioner consents to electronic service.

III. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the relevant field is a hypothetical person to whom an expert in the relevant field could assign a routine task with reasonable confidence that the task would be successfully carried out. The level of skill in the art is evidenced by prior art references. The prior art discussed herein demonstrates that a person of ordinary skill in the field, at the time the '530 patent was effectively filed, had an undergraduate degree in computer science and two years' experience or a graduate degree in the field of data compression.

IV. CERTIFICATION OF GROUNDS FOR STANDING

Petitioner certifies pursuant to Rule 42.104(a) that the patent for which review is sought is available for *inter partes* review and that Petitioner is not

barred or estopped from requesting an *inter partes* review challenging the patent claim on the grounds identified in this Petition.

V. OVERVIEW OF CHALLENGE AND RELIEF REQUESTED

Pursuant to Rules 42.22(a)(1) and 42.104(b)(1)-(2), Petitioner challenges claim 24 of the '530 patent (Ex. 1101) and requests that the challenged claim be cancelled.

A. Prior Art

Petitioner relies upon the following prior art:¹

1. U.S. Patent No. 5,805,932 to Kawashima (“Kawashima”, Ex. 1103), which was filed on February 13, 1996, and issued on September 8, 1998, is prior art under 35 U.S.C. § 102(a) and (e).

2. U.S. Patent No. 6,253,264 to Sebastian (“Sebastian”, Ex. 1104), which was filed on March 6, 1998, claims priority to U.S. Provisional Application No. 60/036,548 (filed on March 7, 1997), and issued on June 26, 2001, is prior art under 35 U.S.C. § 102(e).

¹ The systems disclosed in these references will be referred to herein as the “Kawashima system,” “Sebastian system,” and “Chu system.” Reference to the operation of each of these systems is limited to the explicit disclosures of these references.

3. U.S. Patent No. 5,467,087 to Chu (“Chu”, Ex. 1105), which was filed on December 18, 1992, and issued on November 14, 1995, is prior art under 35 U.S.C. § 102(a), (b), and (e).

B. Grounds of Challenge

Petitioner requests cancellation of claim 24 (the “challenged claim”) of the ’530 patent as unpatentable under 35 U.S.C. § 103.

This Petition, supported by the declaration of Dr. James Storer (“Storer Declaration” or “Storer Decl.,” Ex. 1102), demonstrates that there is a reasonable likelihood that Petitioner will prevail with respect to the challenged claim and that the challenged claim is unpatentable for the reasons cited in this Petition. *See* 35 U.S.C. § 314(a).

VI. LEGAL PRINCIPLES

The challenged claim was filed prior to the effective date of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011). As such, the challenged claim should be analyzed for patentability under pre-AIA 35 U.S.C. § 103. A claim is invalid if it would have been obvious, that is “if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which [the] subject matter pertains.” 35 U.S.C. § 103(a).

In *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 415 (2007), the U.S.

Supreme Court addressed the issue of obviousness and provided an “expansive and flexible” approach it considers consistent with the “broad inquiry” set forth in *Graham v. John Deere*, 383 U.S. 1 (1966). According to the Supreme Court, a person of ordinary skill in the art is “a person of ordinary creativity, not an automaton” and “in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.” *KSR*, 550 U.S. at 420-21.

The key inquiry to determine obviousness is whether an “improvement is more than the predictable use of prior art elements according to their established functions.” *Id.* at 417. Furthermore, the Supreme Court held that “[w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.” *Id.* at 421. The Supreme Court confirmed that combinations of known options that yield predictable results are rarely patentable. *Id.* at 416 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield **predictable results**.” (emphasis added)). Further, “[i]f a person of ordinary skill in the art can implement a predictable variation, § 103 likely bars its patentability.” *Id.* at 401. The Board must ask, as guided by *KSR*, whether the

claims recite an “improvement [that] is **more than the predictable use of prior art elements according to their established functions.**” *Id.* (emphasis added).

VII. OVERVIEW OF THE '530 PATENT

A. Brief Description

The '530 patent, titled “Systems and Methods for Accelerated Data Storage and Retrieval,” was filed on October 26, 2006 and claims priority to several U.S. patent applications, the earliest of which was Application No. 09/266,394, filed on March 11, 1999, and issued as U.S. Patent No. 6,601,104 (Ex. 1108).

The '530 patent is directed to systems and methods for providing “accelerated” data storage and retrieval ('530 Patent at Abstract; Ex. 1101) and allegedly teaches systems and methods for improving data storage and retrieval “bandwidth” by using lossless data compression and decompression (*id.* at 4:42-44).

Figure 8 illustrates a detailed block diagram of a system for accelerated data storage according to the '530 patent's preferred embodiment:

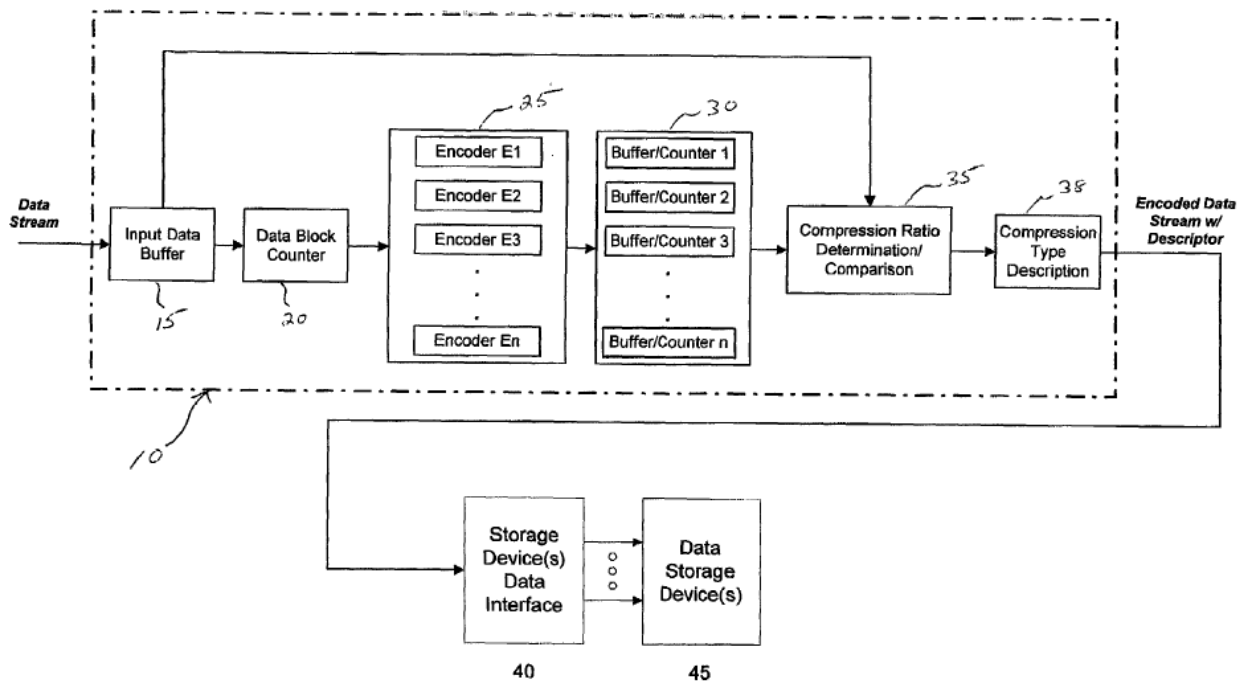


FIGURE 8

As shown above, the claimed “data storage accelerator” (10) receives an incoming “data stream” of “data blocks” and optionally stores the blocks in the “input data buffer” (15) and sends the blocks to the “data block counter” (20), where data blocks’ sizes are measured and recorded. *See id.* at 11:23-34. The “input data buffer” (15) is typically random access memory (RAM). *See Storer Decl.* at ¶ 36; Ex. 1102. The ’530 patent states that “the input buffer 15 and counter 20 are not required elements of the present invention.” ’530 Patent at 11:23-51; Ex. 1101.

The ’530 patent explains that the data blocks received and compressed by the “data storage accelerator” may range in size (also referred to in the art as

“length”) from “individual bits through complete files or collections of multiple files,” and that they may be either fixed or variable in size. *Id.* at 11:26-30; *see also* Storer Decl. at ¶ 37; Ex. 1102. The “data block counter” “counts” or “otherwise enumerates the size” of the data blocks in “any convenient units including bits, bytes, words, double words.” ’530 Patent at 11:30-33; Ex. 1101.

Data compression is performed by the “encoder module” (25). *Id.* at 11:40. This module may include any number of encoders (i.e., compression engines represented in Figure 8 as “E1,” E2,” E3,” and “En”) that may use any number of the lossless compression techniques “currently well known within the art” such as “run length, Huffman, Lempel-Ziv Dictionary Compression, arithmetic coding, data compaction, and data null suppression.” *Id.* at 11:40-46; *see also id.* at 12:41-46. The ’530 patent discloses that the compression techniques may be selected based upon their “ability to effectively encode different types of input data” (*id.* at 11:47-48), that more than one encoder may use the same compression technique (*id.* at 12:41-46), and the compression process may be performed in parallel or sequentially (*id.* at 11:62-64). In other words, using the compression process described in the ’530 patent, either the same or different data blocks may be compressed by different encoders simultaneously (in parallel), or the same or different data blocks may be compressed by different encoders sequentially, one block at a time.

After a data block is compressed by the “encoder module,” it may be buffered and its newly compressed size may be measured or “counted” by the “buffer/counter module” (30). *Id.* at 12:14-16. Next, the “compression ratio module” (35) determines the “compression ratio” obtained for each of the encoders by calculating the ratio of the size of the uncompressed data block to the size of the compressed block. *Id.* at 12:20-25. If, for example, a single data block is compressed by several different encoders $E_1 \dots E_n$, each using a different compression technique, the “compression ratio module” may also compare each calculated ratio with an “a priori-specified compression ratio threshold limit” to determine if at least one of the compressed blocks were compressed at an equal or greater ratio. *See id.* at 12:25-30. If at least one of the compressed blocks was compressed at an equal or greater ratio, then the block compressed with the highest ratio is transmitted/stored. *Id.* at 12:46-49. If none of the compressed blocks were compressed at an equal or greater ratio, then the uncompressed block is transmitted/stored. *Id.* at 12:49-53.

Before the uncompressed or compressed block is transmitted/stored, the “description module” or “compression type description” module (38) “appends” a descriptor to the block indicating, for a compressed block, the compression technique that was used, or else a “null” descriptor indicating that the block was not compressed. *Id.* at 12:33-59. The block, with its appended descriptor, is then

transmitted/stored, and the descriptor is used for “subsequent data processing, storage, or transmittal.” *Id.*

The ’530 patent describes that “accelerated data storage and retrieval” is achieved “by utilizing lossless data compression and decompression.” *Id.* at 2:58-60. For example, data storage can be “accelerated” by compressing an input data stream at a compression ratio (e.g., 3:1) that is at least equal to the ratio of the input data transmission rate (e.g., 60 megabytes per second) to the data storage rate (e.g., 20 megabytes per second) “so as to provide continuous storage of the input data stream at the input data transmission rate.” *Id.* at 3:13-18; *see also* 5:29-43. By compressing the data at this compression ratio, 60 megabytes worth of compressed data can be stored per second, even though the target storage device is capable of storing only 20 megabytes per second, thus “accelerating” the storage of data. *See* Storer Decl. at ¶ 41; Ex. 1102.

B. Summary of the Prosecution History

The ’530 patent has undergone one reexamination: Reexamination No. 95/001,927 (“the ’927 reexamination”), filed on March 2, 2012. During this reexamination, independent claims 1 and 24 were found patentable by the examiner. ’927 Reexamination, 5/31/13 Right of Appeal Notice at 6-14; Ex. 1107. In finding that these claims were patentable, the examiner found that the primary references relied upon by the third party requester, U.S. Patent Nos. 4,956,808

(“Aakre”, Ex. 1112), 4,593,324 (“Ohkubo”, Ex. 1110), and 5,150,430 (“Chu ’430”, Ex. 1109)², did not disclose the following limitation: “said compression and storage occurs faster than said data stream is able to be stored on said memory device in said received form.” *Id.* While the examiner found that references before him did disclose “fast” compression and storage systems, he concluded that none specified that those systems compressed and stored faster than storage of the uncompressed stream could otherwise occur. *See id.* at 6 (citing Aakre (Ex. 1112) at Abstract, 1:54-59, 1:62-2:4, 2:10-13, 2:17-21, 2:43-47, 3:30-50), 7 (citing Ohkubo (Ex. 1110) at Abstract, 1:54-67, 2:62-63, 2:67-3:8, 3:29-31, 4:10-14, 4:22-29), 8 (citing Chu ’430 (Ex. 1109) at 3:65-68, 4:10-12, 4:16-20, 4:24-38, 6:4-28, 17:3-6, and Figure 2).

VIII. CLAIM CONSTRUCTION

A claim in *inter partes* review is given the “broadest reasonable construction in light of the specification.” 37 C.F.R. § 42.100(b).³ *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007).

² Chu ’430 is a different patent than the Chu patent (U.S. Patent No. 5,467,087) that provides the basis for the ground of this petition.

³ Petitioner adopts this standard and reserves the right to pursue different constructions in a district court, where a different standard is applicable.

The following discussion proposes a construction and support for that construction. Any claim terms not included are given their broadest reasonable interpretation in light of the specification as commonly understood by those of ordinary skill in the art. Should the Patent Owner, in order to avoid the prior art, contend that the claim has a construction different from its broadest reasonable interpretation, the appropriate course is for the Patent Owner to seek to amend the claim to expressly correspond to its contentions in this proceeding. *See* 77 Fed. Reg. 48764 (Aug. 14, 2012).

A. The term “said compression and storage occurs faster than said data stream is able to be stored on said memory device in said received form”

1. Independent claim 24 of the ’530 patent recites the term, “said compression and storage occurs faster than said data stream is able to be stored on said memory device in said received form.” The proposed construction *wherein the time to compress and store the received data stream is less than the time to store the received data stream without compressing it.*

As explained in Section VII.A above, the ’530 patent is generally directed to “accelerated data storage and retrieval” (’530 Patent at Abstract; Ex. 1101). The ’530 patent teaches that storage “acceleration” can be achieved by receiving a data stream at an input data transmission rate (e.g., 80 megabytes per second) that is greater than the data storage rate of a target storage device (e.g., 20 megabytes per

second) and compressing the data stream at a compression ratio (e.g., 4:1) that provides a compression rate (e.g., 40 megabytes per second) that is greater than the data storage rate. *See id.* at 2:63-3:3.

Accordingly, a person of ordinary skill in the art would understand the broadest reasonable construction of the term “said compression and storage occurs faster than said data stream is able to be stored on said memory device in said received form” to mean “*wherein the time to compress and store the received data stream is less than the time to store the received data stream without compressing it.*” *See* Storer Decl. at ¶¶ 44-46; Ex. 1102 (emphasis added).

B. The term “bandwidth”

Independent claim 24 of the ’530 patent recites the term “bandwidth.” The proposed construction is the speed at which data can be transmitted or stored, and is quantified as a certain number of bits per second.

The ’530 specification uses “data [] rate” (speed) synonymously with “bandwidth.” *See, e.g.,* ’530 Patent at 5:25-43, 9:18-10:10 (equating “input bandwidth” with “input data rate,” and “bandwidth of the target storage device” with a “data storage device . . . [that] is capable of storing 20 megabytes per second” (number of bits per second)); Ex. 1101. Also, the ’530 specification notes that “[t]iming and counting [(rate)] enables determination of the bandwidth of the input data stream.” *Id.* at 9:26-27 (emphasis added). This understanding is also

consistent with the dictionary definition of bandwidth, which is “[t]he amount of data that can be transmitted in a fixed amount of time . . . [and] is usually expressed in bits per second (bps) or bytes per second.” Random House Webster’s, Computer & Internet Dictionary at 45 (3d ed. 1999); Ex. 1114.

Accordingly, a person of ordinary skill in the art would understand the broadest reasonable construction of the term “bandwidth” to mean “the speed at which data can be transmitted or stored, and is quantified as a certain number of bits per second.” *See* Storer Decl. at ¶¶ 47-49; Ex. 1102.

IX. PRIOR ART REFERENCES

A. Kawashima

U.S. Patent No. 5,805,932 to Kawashima (“Kawashima”, Ex. 1103), which was filed on February 13, 1996, and issued on September 8, 1998, is prior art under 35 U.S.C. § 102(a) and (e). Kawashima was among hundreds of references cited during the original prosecution of the ’530 patent, but it was never discussed during the original prosecution or the reexamination of the ’530 patent.

Kawashima discloses a data compression and transmission/storage system that maximizes the effective bandwidths of the system’s transmissions channels and storage devices while maximizing the system’s storage capacity. Figures 1, 3, and 8 show basic components of the Kawashima system, and will be referred to throughout this petition.

FIG. 1

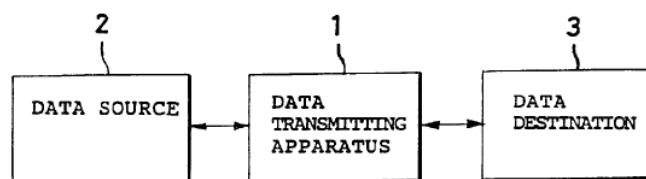


FIG. 3

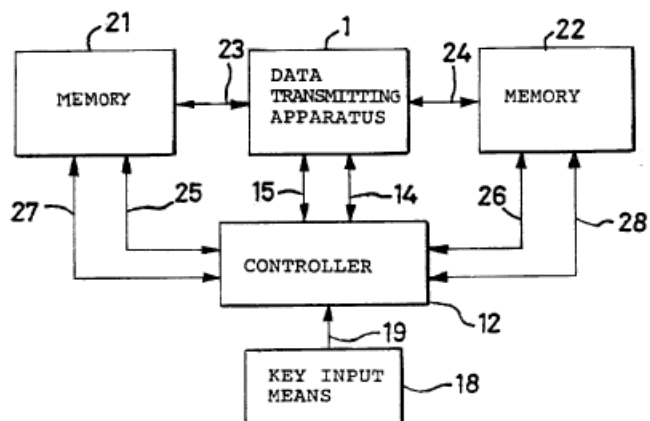
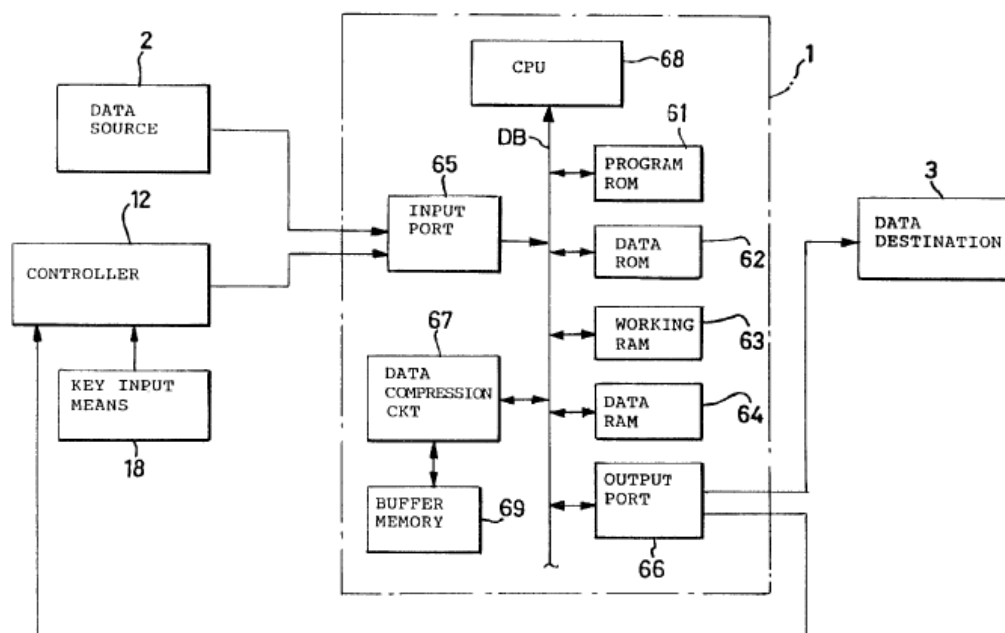


FIG. 8



Kawashima discloses a data transmission/storage system that analyzes the compressibility of data before transmission/storage. Kawashima at Abstract; Ex. 1103. Figures 1 and 8 above show a “data transmitting apparatus 1” that is connected to “data source 2” and “data destination 3.” Kawashima at 21:15-18 (Figure 1), 25:8-22 (Figure 8); Ex. 1103. “Data source 2” and “data destination 3” each may comprise a “communication device” or an “external memory device having an internal storage medium[.]” *Id.* at 21:27-34. Similarly, Figure 3 shows a “data transmitting apparatus 1” that is connected to “memories 21, 22” through “data buses 23, 24.” *Id.* at 22:16-18.

Kawashima explains that the “data processing apparatus 1” in Figure 8, which is analogous to the “data transmitting apparatus 1” in Figure 1, includes, for example, an “input port 65 and an output port 66 for inputting data from and outputting data to external circuits,” a “data RAM 64 for storing data from the data source 2,” a “data compression circuit 67 for compressing data stored in the data RAM 64 and storing the compressed data in a given area in the data RAM 64” for further transmission to “data destination 3,” and a CPU (control and logic/arithmetic unit) 68 for controlling the system’s various circuits. *Id.* at 25:8-22.

Kawashima addresses the problem of optimally transmitting/storing large amounts of data quickly. *See, e.g., id.* at 1:61-67, 2:58-3:32. Kawashima observes

that the “advent of multimedia information processing”—for example, the transmission of audio and video data in real time—has increased the amount of storage space and memory needed to store and run software programs at a greater rate than the increase in capacity of available storage and memory devices. *Id.* at 1:61-66; *see also* Storer Decl. at ¶ 54; Ex. 1102. This, Kawashima notes, makes “data compression technology”—which, if effective, can reduce the size of data without eliminating any of its content—“more and more important” to data transmission/storage. Kawashima at 1:66-67; Ex. 1103; *see also* Storer Decl. at ¶ 54; Ex. 1102.

Accordingly, Kawashima teaches a compression and transmission/storage system that is designed to compress data and transmit/store the compressed data more quickly than it can transmit/store the data in uncompressed form, as explained in detail further below. Specifically, the Kawashima system achieves fast data compression and transmission/storage by compressing an incoming data stream only if that data stream can be compressed at a relatively high compression ratio that is preset by the system or the system’s user. Kawashima at 7:1-15; Ex.

1103. Figures 43 and 44⁴ below illustrate the effect of compression ratios on the speed of data compression and transmission/storage.⁵

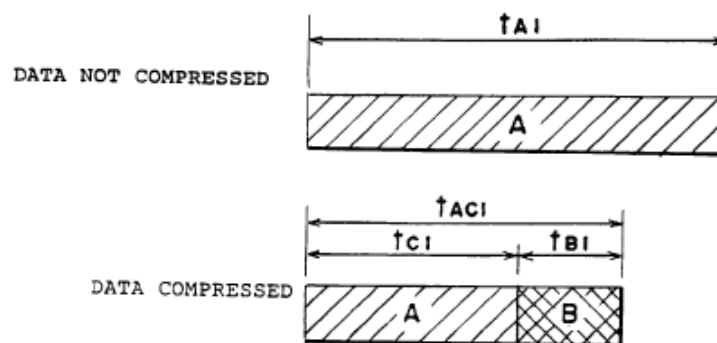
As shown in Figure 43 below, if a data stream is compressed at a relatively high compression ratio, then compression will result in a significantly smaller-sized data stream so that compression and transmission/storage will occur significantly more quickly than transmission/storage of the uncompressed data stream. That is, the time it takes to compress at this relatively high ratio will be more than offset by the significant reduction in the amount of time needed to

⁴ Kawashima refers to t_{A1} and t_{C1} in Figure 43 (Kawashima at 3:8-15; Ex. 1103) and t_{A2} and t_{C2} in Figure 44 as the time required for “transmitting” data. But Kawashima treats data “transmission” as covering not only the actual transportation of data, but also the accessing (reading) and storing (writing) of data. *See, e.g., id.* at 22:10-11 (“data is transmitted, i.e., data is read and written”), 21:40-41(same); *see also id.* at 22:55-60, 23:32-37, 24:9-13, 21:51-57; Storer Decl. at ¶ 55 (and accompanying footnote); Ex. 1102.

⁵ A “compression ratio” is the ratio of the size of data in uncompressed form to the size of that data in compressed form. *See id.* The size of data is commonly referred to in the art as its “length,” and is quantified by the number of bytes in a given set of data. *See id.* The more the data is compressed, the smaller number of bytes of the data in compressed form, and the higher the compression ratio. *See id.*

transmit/store the smaller-sized compressed data stream. Accordingly, the time needed to compress data (which Kawashima calls t_{B1}) and transmit/store the compressed data (which Kawashima calls t_{C1}) (the total time of which Kawashima calls t_{AC1}) will be less than the time needed to transmit/store the same data in uncompressed form (which Kawashima calls t_{A1}). See Kawashima at 3:8-23; Ex. 1103.

FIG. 43

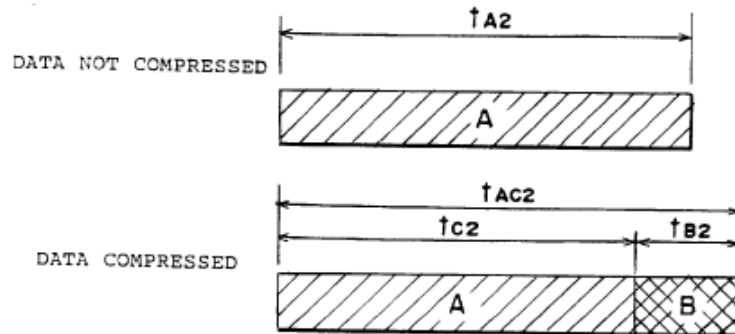


Referring to the lower portion of Figure 43, Kawashima expressly accounts for the time it takes to compress data (as shown in the double hashed area marked “B” of length t_{B1}) in addition to the time it takes to transmit/store the compressed data (the region labeled “A” of length t_{A1}). See Storer Decl. at ¶ 57; Ex. 1102.

Conversely, as shown in Figure 44 below, if a data stream is compressed at a relatively low compression ratio, compression will result in an insignificantly smaller-sized data stream that will be transmitted/stored in roughly the same amount of time as an uncompressed data stream. Therefore, the time it takes to

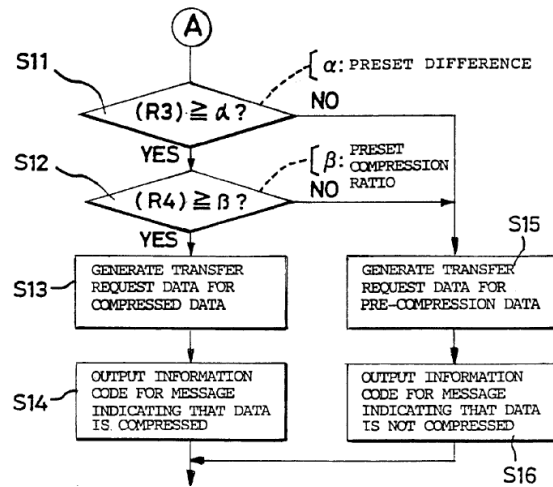
compress at this relatively low ratio will not be offset by the insignificant reduction in the amount of time needed to transmit/store the insignificantly smaller-sized compressed data stream. *See* Kawashima at 3:24-32; Ex. 1103.

FIG. 44



The Kawashima system is therefore designed with the objective of compressing and transmitting/storing a compressed data stream only if it determines that the incoming data stream can be compressed at a relatively high ratio, which Kawashima refers to as a “preset ratio,” “preset compression ratio,” or “preset condition.” As shown in Figure 11, the data is compressed only if the actual savings from compression (“actual difference”) exceeds the threshold (“preset difference”) and the compression ratio (“actual compression ratio”) exceeds the threshold (“preset compression ratio”). *Id.* at 28:64-29:47.

FIG. 11



In particular, Kawashima teaches compressing a portion of a received data stream to calculate a predicted compression ratio of the entire stream, and then compressing the remaining portion of the received data stream and transmitting/storing the stream in compressed form if the predicted compression ratio is equal to or greater than a preset value. *See, e.g., id.* at 36:43-47, 38:50-59.

Kawashima recognizes that any lossless technique (e.g., “the known Huffman coding technique or LZW (Lempel-Ziv and Welch) coding technique”) or lossy technique can be used for compression. *See id.* at 3:65-4:6; *see also id.* at 25:23-30 (noting that “[t]he data compression circuit 67 is a circuit for compressing supplied data in a loss-less manner [T]he loss-less data compression technique itself used by the data compression circuit 67 has no direct bearing on the present invention [I]t may be the LZW compressing technique.”); Storer Decl. at ¶ 61; Ex. 1102. However, Kawashima also recognizes

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that compressing different data types with “different attributes[,] including bit map data and an execution file in addition to text data,” can yield different compression ratios. *See* Kawashima at 36:6-20; Ex. 1103. For example, Kawashima recognizes that the expected compression ratio from the use of a compression technique for text data would yield “only a small error with respect to an actual compression ratio” for a file having text data. *See id.* at 36:6-14. However, the same compression technique would yield “a large error if the same calculations” if carried out for bit map data and execution files. *See id.* at 36:14-20.

B. Sebastian

U.S. Patent No. 6,253,264 to Sebastian (“Sebastian”, Ex. 1104), which was filed on March 6, 1998, claims priority to U.S. Provisional Application No. 60/036,548 (filed on March 7, 1997), and issued on June 26, 2001, is prior art under 35 U.S.C. § 102(e). Sebastian was among hundreds of references cited during prosecution of the ’530 patent, but it was never discussed during original prosecution or reexamination of the ’530 patent.

Sebastian discloses systems and methods for optimally compressing multiple data blocks using different compression techniques (e.g., Lempel-Ziv, Huffman, and arithmetic coding) on different data blocks based on the format or data type of the data in the data block. *See* Sebastian at Abstract, 19:31-48; Ex. 1104.

Sebastian’s preferred compression system uses an architecture called a “Base-

Filter-Resource” (BFR) system, which integrates the advantages of format or data type-specific compression into a “general-purpose compression tool” designed to serve a wide range of data types. *See id.* at 1:45-50 (referring to data “type” as a data “format”).

The Sebastian system includes different “filters” (encoders) that each support a specific “data format” (data type), such as for Excel XLS worksheets or Word DOC files. *Id.* at 1:50-51. If an installed filter “matches the format of the data to be encoded, the advantages of format-specific compression can be realized for that data.” *Id.* at 1:55-57. If an installed filter does not match up with the format of data to be encoded, a “generic” (default) filter is used which “achieves performance similar to other non-specific data compression systems (such as PKZip, Stacker, etc.).” *Id.* at 1:58-60; *see also id.* at 4:9-23 (other suitable generic filters include those with compression performance similar to generic compression systems that employ Lempel-Ziv (LZ) engines or a SZIP engine). Accordingly, by using data type-specific encoders in combination with default encoders, Sebastian achieves the advantage of being able to handle a “wide range of data formats,” including those that may not be recognized by the compression system. *See id.* at 1:45-60.

Sebastian is concerned not only with optimizing compression performance and ratios, but also optimizing the broader data processing, compression, and

transmission/storage system as a whole. Specifically, Sebastian teaches that selection of the “optimum” compression algorithm should take into account the “desired trade-off” between “compression performance” and the “speed” of the overarching data processing system. *Id.* at 17:49-52. For example, Sebastian explains that “[m]aximum compression can be achieved by encoding [compressing] the full data block using each possible combination of algorithms, but this requires more processing time than most real-world applications can spare.” *Id.* at 21:32-35.

But Sebastian also recognizes that better compression performance and greater compression ratios can help optimize overall system performance. For example, Sebastian teaches that data compression can help optimize limited bandwidth transmissions channels—i.e., because more data can be transmitted through channels with limited bandwidth if the data is compressed. *Id.* at 3:31-36 (“The output of the encoder is encoded [compressed] data 4, which can be . . . transmitted to the decoder 5 (in which case the encoding the source data [is] to be transmitted faster when the transmission channel bandwidth is limited).”).

Additionally, Sebastian teaches methods for simultaneously optimizing data analysis, data compression, and overall system performance. For example, Sebastian teaches an optimal pre-compression identification procedure that uses a “search tree method to reduce the time needed to check the list” of available

compression techniques, algorithms, or encoders when many such encoders are installed in a data processing and compression system. *Id.* at 5:26-28. Finally, Sebastian teaches that the transmissions/storage systems connected to but not part of the compression system can adjust compression and decompression operations in order to accommodate changes in the overall systems including “available transmission channel bandwidth.” *Id.* at 3:51-55.

C. Chu

U.S. Patent No. 5,467,087 to Chu (“Chu”, Ex. 1105), which was filed on December 18, 1992, and issued on November 14, 1995, is prior art under 35 U.S.C. § 102(a), (b), and (e). Chu was among hundreds of references cited during prosecution of the ’530 patent, but it was never discussed during original prosecution or reexamination.

Chu, as its title indicates, teaches “high speed lossless data compression.” Chu at Title; Ex. 1105. Like Sebastian, Chu discloses systems and methods for optimally compressing an input data stream using different compression techniques (e.g., Lempel-Ziv, Huffman, and arithmetic coding) for the data based on the different data types of the data in the data stream. *Id.* at Abstract, Figures 3 and 6, 4:24-65. Chu teaches compressing data in this manner in order to “maximiz[e] the compression ratio for that input data stream.” *Id.* at Abstract.

Chu also teaches that flexible and efficient data compression can be achieved by “alter[ing] the rate of [data] compression.” *Id.* Chu teaches that the speed of compression can be adjusted by applying different compression techniques—for example by “switching” from one Lempel-Ziv method (e.g., LZ1 type method) to a different Lempel-Ziv method (e.g., LZ2 type method), as shown in Figure 6 below. *Id.* at Figure 6; *see also* Storer Decl. at ¶ 71; Ex. 1102.

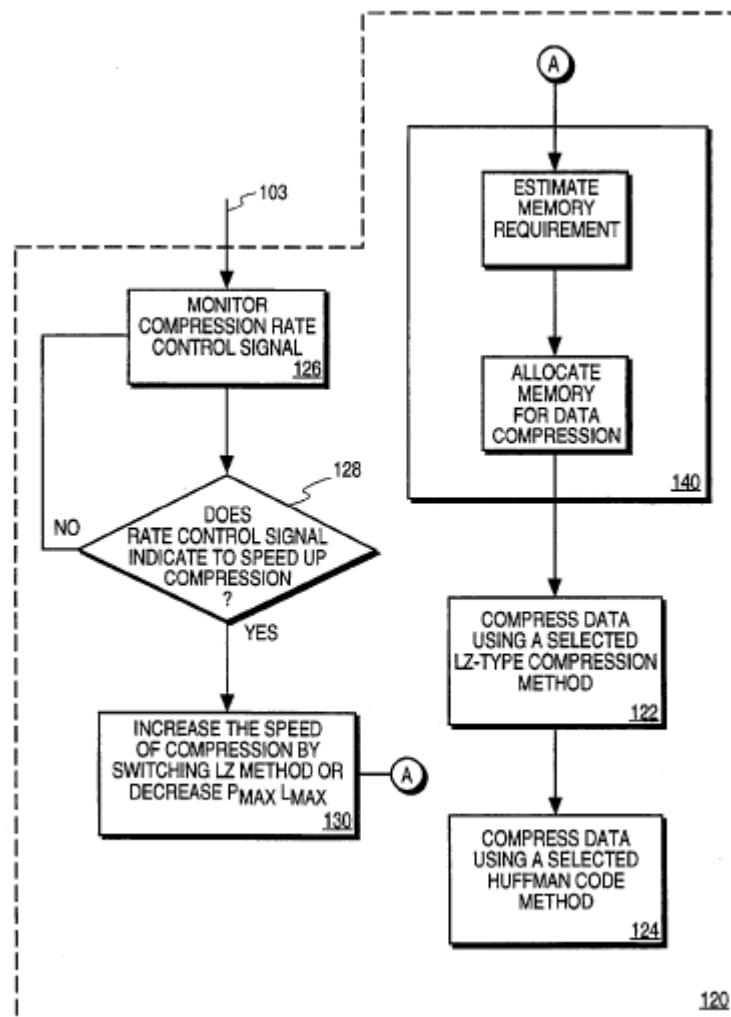


FIG. 6

FIG. 6 also discloses adjusting the speed of compression by adjusting pmax and lmax values as disclosed in 130. The pmax and lmax values refer to the size of a history buffer that builds the encoding dictionary database, which corresponds to system parameters for adjusting a history buffer size (e.g., as used in LZ-1 as taught in Chu). *See, e.g.*, Chu at 2:45-3:22; Ex. 1105; Storer Decl. at ¶ 72; Ex. 1102. Lowering the pmax and lmax values creates a smaller history buffer size, and allows for a faster rate of compression (at the trade-off of having a lower compression ratio). *See, e.g.*, Chu at 2:45-3:22; 5:45-59; Ex. 1105; Storer Decl. at ¶ 72; Ex. 1102. Conversely, increasing the pmax and lmax values creates a larger history buffer size, and allows for a higher compression ratio (at the trade-off of a slower rate of compression). *See, e.g.*, Chu at 2:45-3:22; 5:45-59; Ex. 1105; Storer Decl. at ¶ 72; Ex. 1102.

X. THE CHALLENGED CLAIM IS NOT PATENTABLE

The challenged claim recites features well known by persons of ordinary skill in the field of data transmission, compression, and decompression by the time of the alleged invention of the '530 patent. *See* Storer Decl. at ¶¶ 73-126; *see also id.* at ¶¶ 29-32; Ex. 1102. Based on the prior art described below, the claimed system in the challenged claim of the '530 patent is an obvious combination of known functions that perform in expected ways. *See id.* at ¶¶ 73-126.

XI. IDENTIFICATION OF HOW CLAIM 24 IS UNPATENTABLE

Pursuant to Rule 42.104(b)(4)-(5), specific grounds identified below and discussed in the Storer Declaration (Ex. 1102) show in detail the prior art disclosures that make the challenged claim obvious.

A. Claim 24 is Obvious in View of Kawashima, Sebastian, and Chu

1. Motivation to Combine Kawashima, Sebastian, and Chu

It would have been obvious to a person of ordinary skill in the art to combine the teachings of Kawashima, Sebastian, and Chu. *See id.* at ¶¶ 74-75. All three references are in the same technical field of data compression. *See, e.g.,* Kawashima at 1:9-25; Ex. 1103; Sebastian at Abstract, 1:30-60; Ex. 1104; Chu at Abstract; Ex. 1105. All three references teach systems and methods of optimizing not only data compression, but also overall system performance, including maximizing the bandwidths of transmission channels and storage capacity. *See, e.g.,* Kawashima at 2:58-3:32 (teaching optimal interconnected compression and transmission/storage systems); Ex. 1103; Sebastian at 3:31-36, 3:51-55, 5:26-28 (teaching optimal interconnected compression, transmission/storage, and computer processing systems); Ex. 1104; Chu at Abstract, 8:6-11 (teaching “data compression for memory allocation efficiency”); Ex. 1105. Regarding data compression in particular, all three references recognize that certain compression methods compress certain types of data well but not all types of data, and all three references teach systems and methods for compressing a data stream containing

different types of data. *See, e.g.*, Kawashima at 36:15-20; Ex. 1103; Sebastian at 1:13-33; Ex. 1104; Chu at Abstract, Figures 3 and 6, 4:24-65; Ex. 1105. All three references also teach the general use of the same types of compression techniques (e.g., Huffman and Lempel-Ziv type methods). *See, e.g.*, Kawashima at 4:1-3; Ex. 1103; Sebastian at 17:15-40; Ex. 1104; Chu at 2:13-44, 4:38-65; Ex. 1105.

Therefore, all three references recognize the significance of analyzing incoming data to determine data type and teach systems and methods of efficiently determining the data type of incoming data (e.g., by reviewing header information associated with the data) in order to best compress such data. *See, e.g.*, Kawashima at 36:6-32; Ex. 1103; Sebastian at Abstract, 4:46-54; Ex. 1104; Chu at Abstract, 2:63-3:8, 4:38-65; Ex. 1105. It would therefore have been obvious to combine the teachings of Kawashima, Sebastian and Chu to solve the common problem of optimally compressing a collection of data blocks containing different types of data, such as, as expressly identified by Kawashima, in an incoming data stream containing “bit map” data and “execution” files. *See* Kawashima at 36:15-20; Ex. 1103; Storer Decl. at ¶ 74; Ex. 1102. Moreover, Kawashima recognizes that compressing different data types with “different attributes[,] including bit map data and an execution file in addition to text data,” can yield different compression ratios. Kawashima at 36:6-20; Ex. 1103. Therefore, Kawashima recognizes the

efficacy of using different compression techniques for different data types. *See*

Storer Decl. at ¶ 74; Ex. 1102.

The Kawashima system is focused on the overall efficiency of the transmission/storage aspects of compressing an incoming data stream whereas Sebastian and Chu are focused on the details of the compression process. *See, e.g., supra* Sections IX.A, IX.B, and IX.C. Kawashima accounts for an incoming data stream with multiple data types during, for example, the process of calculating predicted compression ratios of an incoming data stream by weighting the average compression ratio of sample portions of that stream with the number of data types detected, to account for the fact that not all of this data will be compressed as effectively with the single compression technique applied by the Kawashima system as described in Kawashima. *See* Kawashima at 36:6-32; Ex. 1103; Storer Decl. at ¶ 75; Ex. 1102. It would have been obvious for a person of ordinary skill in the art concerned with the common and obvious problem of optimally compressing a data stream containing different types of data to modify the Kawashima system to incorporate Sebastian's and Chu's teachings of using different compression techniques to compress the different data types detected in the data stream, including by using the same different types of techniques taught by both references (e.g., Huffman and Lempel-Ziv type methods). *See* Storer Decl. at ¶¶ 74-75; Ex. 1102. Doing so would amount to nothing more than the

combination of familiar elements according to known methods to yield predictable results. *See KSR Int'l Co.*, 550 U.S. at 415, 417, 420-21; Storer Decl. at ¶¶ 74-75; Ex. 1102.

2. Independent Claim 24 is Obvious in View of Kawashima, Sebastian and Chu.

All of the limitations recited in claim 24 are obvious over Kawashima in view of Sebastian and Chu. *See Storer Decl.* at ¶¶ 76-126; Ex. 1102.

Claim 24	
	24. A system comprising: [Preamble]
A	a memory device; and
B	a data accelerator, wherein said data accelerator is coupled to said memory device,
C	a data stream is received by said data accelerator in received form,
D	wherein a bandwidth of the received data stream is determined,
E	said data stream includes a first data block and a second data block,
F	said data stream is compressed by said data accelerator to provide a compressed data stream by compressing said first data block with a first compression technique and said second data block with a second compression technique, said first and second compression techniques are different,
G	wherein a data rate of the compressed data stream is adjusted, by modifying a system parameter, to make a bandwidth of the compressed data stream compatible with a bandwidth of the memory device,

Claim 24	
H	said compressed data stream is stored on said memory device,
I	said compression and storage occurs faster than said data stream is able to be stored on said memory device in said received form,
J	a first data descriptor is stored on said memory device indicative of said first compression technique, and
K	said first descriptor is utilized to decompress the portion of said compressed data stream associated with said first data block.

i. The preamble of Claim 24 is disclosed in Kawashima.

The preamble of claim 24 of the '530 patent recites: “[a] system.”

Kawashima discloses a data compression and transmission/storage system that, as explained in detail further below, maximizes the effective bandwidths of the system’s transmissions channels and storage devices while maximizing the system’s storage capacity. *See* Storer Decl. at ¶¶ 77-80; Ex. 1102. Figures 1, 3, and 8, as illustrated in Section IX.A above, show basic components of the Kawashima system.

Figures 1 and 8 show a “data transmitting apparatus 1” that is connected to “data source 2” and “data destination 3.” Kawashima at 21:15-18 (Figure 1), 25:8-22 (Figure 8); Ex. 1103. “Data source 2” and “data destination 3” each may comprise a “communication device” or an “external memory device having an internal storage medium[.]” *Id.* at 21:27-34. Similarly, Figure 3 shows a “data

transmitting apparatus 1” that is connected to “memories 21, 22” through “data buses 23, 24.” *Id.* at 22:16-18.

Kawashima explains that the “data **processing** apparatus 1” in Figure 8, which is analogous to the “data **transmitting** apparatus 1” in Figure 1, includes, for example, an “input port 65 and an output port 66 for inputting data from and outputting data to external circuits,” a “data RAM 64 for storing data from the data source 2,” a “data compression circuit 67 for compressing data stored in the data RAM 64 and storing the compressed data in a given area in the data RAM 64” for further transmission to “data destination 3,” and a CPU (control and logic/arithmetic unit) 68 for controlling the system’s various circuits. *Id.* at 25:8-22 (emphasis added).

ii. Limitation A of Claim 24 is disclosed in Kawashima.

Limitation A of claim 24 of the ’530 patent recites: “a memory device.” This limitation is found in Kawashima. *See* Storer Decl. at ¶¶ 81-82; Ex. 1102.

Kawashima discloses a data compression and transmission/storage system that includes a memory device that stores data compressed by the system, as specifically shown and described in Kawashima with reference to Figures 3 through 8. In Figure 8, the “data compression circuit 67” compresses input data and stores it “in a given area in the data RAM 64” (memory) (Kawashima at 25:18-21; Ex. 1103) for further transmission to an “external memory device” located at

“data destination 3” (*id.* at 25:55-57, *see also* 21:27-34 (“data destination 3 may alternatively comprise . . . an external memory device”)). In Figure 3, for example, the “data transmitting apparatus 1 either compresses [input] data or does not compress the [input] data, and transmits the [compressed or uncompressed] data to the memory 22 which is the data destination.” *Id.* at 22:38-41.

iii. Limitation B of Claim 24 is disclosed in Kawashima.

Limitation B of claim 24 of the ’530 patent recites: “a data accelerator, wherein said data accelerator is coupled to said memory device.” This limitation is found in Kawashima. *See* Storer Decl. at ¶¶ 83-87; Ex. 1102.

Kawashima discloses a data compression and transmission/storage system which includes a “data accelerator” that is “coupled” to the memory device described in Section XI.A.2.ii above.

In the Kawashima system, data is transmitted/stored faster—i.e., “accelerated”—by compressing it before storing it, as shown in Figure 43 below and explained in more detail in Section XI.A.2.x further below.

FIG. 43

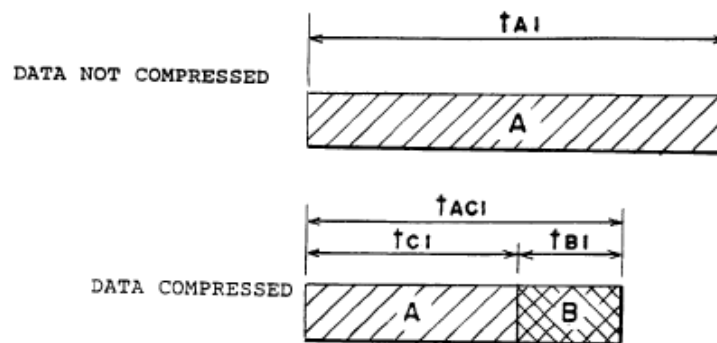


Figure 43 illustrates that if data is compressed at a high enough compression ratio, it can be both compressed, transmitted/ stored more quickly (t_{AC1}) than it can be transmitted/ stored in uncompressed form (t_{A1}). *See also* Kawashima at 3:8-23; Ex. 1103.

Accordingly, the component in the Kawashima system that performs the data compression (or the component wherein the data compression is performed) is the “data accelerator”—i.e., the “data transmitting apparatus 1” in Figures 3 and 8, and, more specifically, the “data compression circuit 67” in data transmitting apparatus 1 as shown in Figure 8. *Id.* at 22:38-41 (Figure 3), 25:8-22 (Figure 8). These components are “coupled” to the memory device described in Section XI.A.2.ii above. For example, in Figure 8, the “data transmitting apparatus 1” (data accelerator) is “connected” (coupled) to “data destination 3.” *Id.* at 25:8-22 (Figure 8); *see also* 21:15-18 (Figure 1). Kawashima explains that “data destination 3” may comprise an “external memory device having an internal

storage medium” (memory). *Id.* at 21:27-34. Similarly, Figure 3 shows a “data transmitting apparatus 1” (data accelerator) that is “connected” (coupled) to “memories 21, 22” (memory). *Id.* at 22:16-18. Figure 8 also shows “data compression circuit 67” connected to “data RAM 64.” *Id.* at 25:8-22.

iv. Limitation C of Claim 24 is disclosed in Kawashima.

Limitation C of claim 24 of the ’530 patent recites: “a data stream is received by said data accelerator in received form.” This limitation is found in Kawashima. *See* Storer Decl. at ¶¶ 88-89; Ex. 1102.

Kawashima discloses a “data accelerator”—i.e., the “data transmitting apparatus 1” in Figures 3 through 8, and, more specifically, the “data compression circuit 67” in Figure 8. Kawashima at 22:38-41 (Figure 3), 25:8-22 (Figure 8); Ex. 1103. These components receive a stream of data in received form and transmit/store this data either in received form or in compressed form. *See, e.g., id.* at 7:15-32 (describing means for storing a portion of an incoming stream of data while the system compresses another “portion” of the stream). For example, the “data transmitting apparatus 1” in Figure 3 receives a data stream in received form from the “memory 21” before transmitting the data (either in received or compressed form) to “memory 22.” *Id.* at 2:36-41. Likewise, the “data processing apparatus 1” in Figure 8 receives a stream of data in received form from the “data source 2” before transmitting the data (either in received or compressed form) to

“data destination 3.” *Id.* at 25:8-22, 55-60. Data source 2 includes a “data processing system for processing an inputted analog signal or digital data [(data stream)].” *Id.* at 21:18-26. In Figure 8, the “data compression circuit 67” receives data in received form from “data RAM 64” (which previously received that data in received form from “data source 2”). *Id.* at 25:8-22. The “data compression circuit 67” then stores that data (either in received or compressed form) “in a given area in the data RAM 64.” *Id.*

v. Limitation D of Claim 24 is obvious in view of Kawashima and Sebastian.

Limitation D of claim 24 of the ’530 patent recites: “wherein a bandwidth of the received data stream is determined.” This limitation is obvious in view of Kawashima and Chu. *See* Storer Decl. at ¶¶ 90-92; Ex. 1102.

Sebastian teaches that after the Sebastian system compresses data, that data may be stored in memory or transmitted elsewhere, in which case it would be “transmitted faster when the transmission channel bandwidth is limited.” Sebastian at 3:31-36; Ex. 1104. Sebastian further teaches that while data storage, retrieval, and transmissions applications may not be part of a compression system, they may adjust certain compression and decompression operations according to “systems conditions such as available transmission channel bandwidth.” *Id.* at 3:51-55.

As discussed *supra* (*see, e.g.*, Section XI.A.1), it would have been obvious to combine the teachings of Kawashima and Sebastian. *See* Storer Decl. at ¶ 92; Ex. 1102. All are in the field of data compression, all are concerned with optimizing not only the compression process but also overall system processes, all recognize the importance of efficiently analyzing data for different data types in order to optimally compress the data, and all are directed towards achieving optimal compression and high compression ratios. *See, e.g., supra* Sections IX.A, IX.B, and IX.C; Storer Decl. at ¶ 92; Ex. 1102.

vi. Limitation E of Claim 24 is disclosed in Kawashima.

Limitation E of claim 24 of the '530 patent recites: “said data stream includes a first data block and a second data block.” This limitation is found in Kawashima. *See* Storer Decl. at ¶¶ 93-94; Ex. 1102.

Kawashima discloses an input data stream, as explained in Section XI.A.2.iv above. Kawashima explains that the data streams the Kawashima system can receive and compress include multiple “files” or multiple “**blocks** of fixed length divided from the files.” *See* Kawashima at 40:32-35 (emphasis added) (“Some systems compress data by files or blocks of fixed length divided from files. The data transmitting apparatus 1 according to the first and second embodiments are also applicable to these systems.”); Ex. 1103; Storer Decl. at ¶ 94; Ex. 1102.

vii. Limitation F of Claim 24 is obvious in view of Kawashima and Sebastian, as well as obvious in view of Kawashima and Chu.

Limitation F of claim 24 of the '530 patent recites: “said data stream is compressed by said data accelerator to provide a compressed data stream by compressing said first data block with a first compression technique and said second data block with a second compression technique, said first and second compression techniques are different.” This limitation is obvious in view of Kawashima and Sebastian, as well as obvious in view of Kawashima and Chu. *See* Storer Decl. at ¶¶ 95-101; Ex. 1102.

Kawashima explains that the Kawashima system’s data accelerator (for example, the “data transmitting apparatus 1” in Figures 3 through 8 as well as the “data compression circuit 67” in Figure 8) can compress a data stream consisting of multiple “files” or multiple “blocks of fixed length divided from the files.” *See* Kawashima at 40:32-35; *see also id.* at 7:15-32 (data stream); Ex. 1103. The Kawashima system also uses a “loss-less data compression **process**” (*see, e.g., id.* at 1:9-17, 3:8-15 (emphasis added)) and Kawashima teaches that different lossless compression **techniques** include “the known Huffmann [*sic*] coding **technique**” as well as the “LZW (Lempel-Ziv and Welch) coding **technique**” (*id.* at 4:1-3 (emphasis added)). Kawashima also discloses compressing with a lossless data compression technique that has already been compressed with some other

unknown, undisclosed, or unidentified compression technique. *Id.* at 2:20-28.

Kawashima, however, intentionally does not specify a preferred number of or particular selection of different lossless compression techniques to be used by the Kawashima system. This is because, as Kawashima explains, the “loss-less data compression technique itself used by the data compression circuit 67 has no direct bearing on the present invention.” *Id.* at 25:26-30. In other words, the compression process in the Kawashima system is designed to be used in conjunction with any number of known lossless compression techniques. *See* Storer Decl. at ¶ 96; Ex. 1102. Nevertheless, Kawashima notes that the “LZW compressing technique,” which it describes as a dictionary-based technique, is among the lossless compression techniques that can be used. Kawashima at 25:26-46; Ex. 1103.

Sebastian teaches the use of the same types of lossless compression techniques taught by Kawashima—e.g., Huffman and Lempel-Ziv type methods—as well as other lossless techniques such as arithmetic coding. Sebastian at 19:31-48; Ex. 1104. Sebastian further teaches a compression process that uses a plurality of these techniques on an incoming data stream depending on the various types of data in the stream. *See id.* at Abstract, 19:31-48.

The Sebastian patent’s preferred system includes different compression algorithms/techniques (which Sebastian refers to as “filters”) that each support a

specific data type or format, such as for Excel XLS worksheets or Word DOC

files. *Id.* at 1:50-52. Sebastian discloses that these techniques can be applied on a block-by-block basis. *Id.* at Abstract, 2:33-42, 4:9-15. If the system has an installed technique that supports the data type of the data to be compressed, the system will use that technique to compress the data. *See id.* at 1:55-57. If the system does not have an installed technique that specifically supports the data type of the data to be encoded, a “generic” technique is used, which “achieves performance similar to other non-specific data compression systems (such as PKZip, Stacker, etc.).” *Id.* at 1:58-60; *see also id.* at 4:9-23 (other suitable generic techniques include those with compression performance similar to generic compression systems that employ Lempel-Ziv (LZ) engines or a SZIP engine). Accordingly, by using data type-specific techniques in combination with one or more generic techniques, the Sebastian system achieves the advantage of being able to optimally compress a “wide range” of data types or format. *See id.* at 1:45-60.

As discussed *supra* (*see, e.g.*, Section XI.A.1), it would have been obvious to a person of ordinary skill in the art to combine the teachings of Kawashima and Sebastian to solve the common and obvious problem of optimally compressing a data stream containing different types of data, each type of which can be optimally compressed using different compression techniques. *See Storer Decl.* at ¶ 99; Ex.

1102. Both therefore recognize the significance of analyzing incoming data to determine data type and teach systems and methods of efficiently determining the data type of incoming data (by reviewing header information associated with the data) in order to optimally compress such data. *See, e.g.*, Kawashima at 36:6-32; Ex. 1103; Sebastian at Abstract, 2:33-42, 4:46-54; Ex. 1104. Kawashima is concerned with maximizing the bandwidths of data transmissions/storage systems by compressing data at a high ratio. *See* Kawashima at 3:8-32; Ex. 1103.

Kawashima suggests that any lossless encoding technique can be used to achieve sufficiently high compression ratios and even teaches the general use of the same types of compression techniques taught by Sebastian (e.g., Huffman and Lempel-Ziv type methods). *See id* at 4:1-3, 25:26-30; Sebastian at 17:15-40; Ex. 1104; Storer Decl. at ¶ 99; Ex. 1102. It would therefore have been obvious for a person of ordinary skill in the art to modify the system taught in Kawashima to incorporate Sebastian's teachings of using a combination of different compression techniques (e.g., Huffman and Lempel-Ziv type methods) to optimally compress different types of data in an incoming data stream. *See* Storer Decl. at ¶¶ 99; Ex. 1102. Doing so would accomplish Kawashima's fundamental objective of compressing data at a high ratio in order to compress data and transmit/store the compressed data more quickly. *See id.*

Chu describes a “compression rate adjustment process 130” indicating to an “LZ-type compression process 122” whether “to use LZ-1 or LZ-2 compression in accordance with data compression rate control signal 103 to adjust the compression time for compressing data.” Chu at 6:54-59; Ex. 1105. That is, Chu describes switching between LZ-1 and LZ-2 compression in response to a rate control signal within the same data stream. *See* Storer Decl. at ¶ 100; Ex. 1102. Accordingly, Chu teaches that different compression techniques may be applied to different blocks of data. *Id.*

One of ordinary skill in the art would have been motivated to combine the teachings of Kawashima and Chu to solve the common and obvious problem of optimally compressing a data stream containing different types of data, each type of which can be optimally compressed using different compression techniques. *See id.* at ¶ 101. Both references teach systems and methods of optimizing not only data compression, but also overall system performance, including maximizing the bandwidths of transmission channels and storage capacity. *See, e.g.,* Kawashima at 2:58-3:32 (teaching optimal interconnected compression and transmission/storage systems); Ex. 1103; Chu at Abstract, 8:6-11 (teaching “data compression for memory allocation efficiency”); Ex. 1105. Regarding data compression in particular, both references recognize that certain compression methods compress certain types of data well, and both references teach systems

and methods for compressing a data stream containing different types of data. *See, e.g.,* Kawashima at 36:15-20; Ex. 1103; Chu at Abstract, Figures 3 and 6, 4:24-65; Ex. 1105. Both references also teach the general use of the same types of compression techniques (e.g., Huffman and Lempel-Ziv type methods). *See, e.g.,* Kawashima at 4:1-3; Ex. 1103; Chu at 2:13-44, 4:38-65; Ex. 1105. Both references therefore recognize the significance of analyzing incoming data to determine data type and teach systems and methods of efficiently determining the data type of incoming data in order to best compress such data. *See, e.g.,* Kawashima at 36:6-32; Ex. 1103; Chu at Abstract, 2:57-3:8, 4:38-65; Ex. 1105. It would therefore have been obvious to combine the teachings of Kawashima and Chu to solve the common problem of optimally compressing a collection of data blocks containing different types of data, such as, as expressly identified by Kawashima, in an incoming data stream containing “bit map” data and “execution” files. *See* Kawashima at 36:15-20; Ex. 1103; Storer Decl. at ¶ 101; Ex. 1102. Moreover, Kawashima recognizes that compressing different data types with “different attributes[,] including bit map data and an execution file in addition to text data,” can yield different compression ratios. *See* Kawashima at 36:6-20; Ex. 1103. Therefore, Kawashima recognizes the efficacy of using different compression techniques for different data types. *See* Storer Decl. at ¶ 101; Ex. 1102.

viii. Limitation G of Claim 24 is obvious in view of Kawashima, Sebastian, and Chu.

Limitation G of claim 24 of the '530 patent recites: “wherein a data rate of the compressed data stream is adjusted, by modifying a system parameter, to make a bandwidth of the compressed data stream compatible with a bandwidth of the memory device.” This limitation is obvious in view of Kawashima, Sebastian, and Chu. *See id.* at ¶¶ 102-109.

Sebastian teaches that compressed data can be “transmitted faster when the transmission channel bandwidth is limited” than uncompressed data. Sebastian at 3:31-36; Ex. 1104. Sebastian teaches that while data storage, retrieval, and transmissions applications may not be part of a compression system, they may adjust certain compression and decompression operations (system parameters) according to “systems conditions such as available transmission channel bandwidth.” *Id.* at 3:51-55. A person of ordinary skill in the art would understand that data storage, retrieval, and transmissions applications may adjust compression and decompression system parameters according to other “systems conditions” and “bandwidths” such as the bandwidth of the memory device. *See Storer Decl.* at ¶ 103; Ex. 1102.

Chu teaches that flexible and efficient data compression can be achieved by “alter[ing] the rate of compression.” Chu at Abstract; Ex. 1105. Chu teaches that the speed of compression can be adjusted by applying different compression

techniques—for example by “switching” to a different Lempel-Ziv technique, as shown in Figure 6 below.

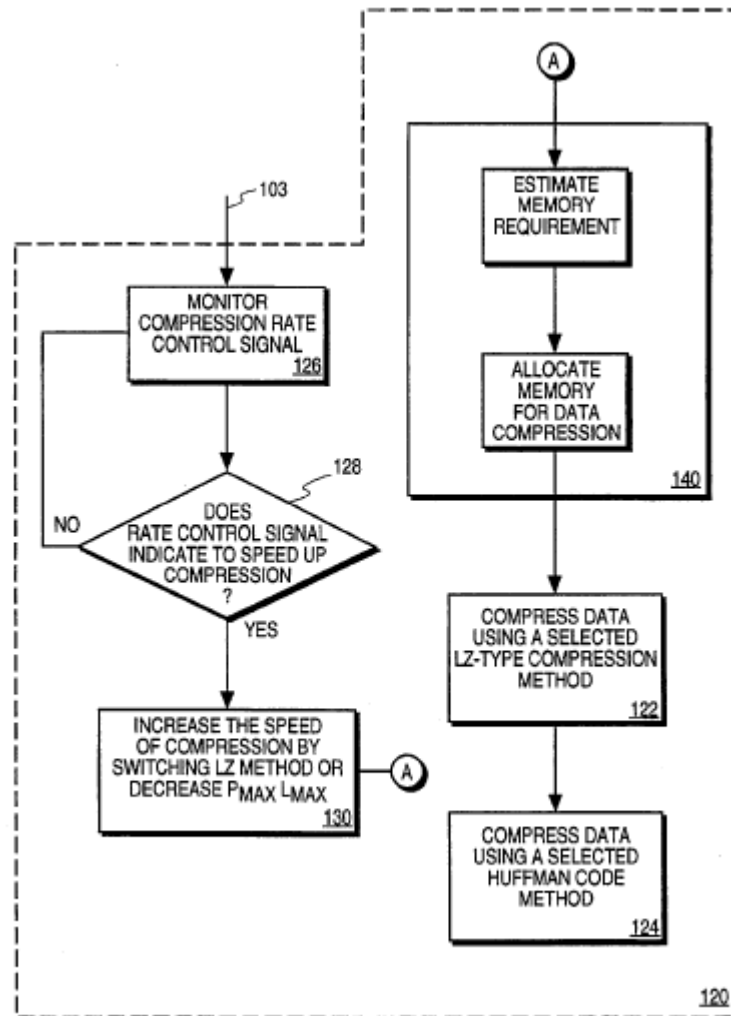


FIG. 6

As illustrated in Figure 6 above, Chu teaches that a “system memory allocation process 140 is provided to allow the system or the user control of the amount of system memory to be allocated for data compression.” *Id.* at 6:15-19.

In one embodiment, the “compression rate adjustment process 130 . . . indicates to LZ-type compression process 122 whether to use LZ-1 or LZ-2 compression in accordance with data compression rate control signal 103 to adjust the compression time for compressing data.” *Id.* at 6:54-59. In addition to being taught in Chu, one of ordinary skill in the art would understand that different methods of the Lempel-Ziv family, such as a parameter indicating whether LZ-1 or LZ-2 compression methods are employed, allow for different trade-offs between the rate of compression and the compression ratio. *See* Storer Decl. at ¶ 106; Ex. 1102. “Rate control” is a standard term of the art, and is understood by one of skill in the art to refer to the issue of making two bandwidths compatible. *Id.*

In another embodiment, Chu teaches that the memory allocation process “estimates the memory requirement in accordance to the identified input data type, a selected compression ratio, a selected speed of data compression, a selected pmax and lmax value, or a selected combination of these features.” Chu at 6:23-28; Ex. 1105. The pmax and lmax values refer to the size of a history buffer that builds the encoding dictionary database, which corresponds to system parameters for adjusting a history buffer size (e.g., as used in LZ-1 as taught in Chu). *See, e.g., id.* at 2:45-3:22; Storer Decl. at ¶ 107; Ex. 1102. Lowering the pmax and lmax values creates a smaller history buffer size, and allows for a faster rate of compression (at the trade-off of having a lower compression ratio). Conversely,

increasing the pmax and lmax values creates a larger history buffer size, and allows for a higher compression ratio (at the trade-off of a slower rate of compression). *See, e.g.*, Chu at 2:45-3:22; 5:45-59; Ex. 1105; Storer Decl. at ¶ 107; Ex. 1102.

Accordingly, Chu teaches modifying a system parameter (e.g., by either switching between LZ-1 and LZ-2 or adjusting the pmax and lmax values) to adjust the data rate of the compressed stream. *See* Storer Decl. at ¶ 108; Ex. 1102. Chu teaches that this modification can be made to adjust compression speed and performance to account for rate control considerations and to account for changes in the availability of system memory to process this compression. *See id.* It would have been obvious to a person of ordinary skill in the art to practice this teaching in Chu to adjust compression speed and performance to account for restrictions or limitations in other types of memory—for example, to account for the differences in the bandwidth of the compressed data stream and the bandwidth of the memory device to which the compressed data is to be stored. *See id.* Chu therefore discloses this limitation. *See id.*

As discussed *supra* (*see, e.g.*, Section XI.A.1), it would have been obvious to combine the teachings of Kawashima, Sebastian, and Chu. *See id.* at ¶ 109. All are in the field of data compression, all are concerned with optimizing not only the compression process but also overall system processes, all recognize the

importance of efficiently analyzing data for different data types in order to optimally compress the data, and all are directed towards achieving optimal compression and high compression ratios. *See, e.g., supra* Sections IX.A, IX.B, and IX.C; Storer Decl. at ¶¶ 109; Ex. 1102.

ix. Limitation H of Claim 24 is disclosed in Kawashima.

Limitation H of claim 24 of the '530 patent recites: “said compressed data stream is stored on said memory device.” This limitation is found in Kawashima. *See* Storer Decl. at ¶¶ 110-111; Ex. 1102.

Kawashima discloses that after the Kawashima system's data accelerator compresses data, that compressed data is stored on a memory device. As explained in Section XI.A.2.iii above, the Kawashima system's “data accelerator” (i.e., the “data transmitting apparatus 1” (Figure 3), “data processing apparatus 1” (Figure 8), and “data compression circuit 67” (Figure 8), Kawashima at 22:38-41 (Figure 3), 25:8-22 (Figure 8); Ex. 1103) is coupled to the system's memory device (i.e., the “memory . . . 22” (Figure 3), “data destination 3” (Figure 8), and “data RAM 64” (Figure), *id.* at 22:16-24, 25:8-22). Kawashima discloses that the memory device stores data compressed by the data accelerator. *See, e.g., id.* at 22:38-41 (“The data transmitting apparatus 1 either compresses the transferred data or does not compress the transferred data, and transmits the data to the memory 22 which is the data destination.” (Figure 3)), 25:18-22 (“a “data compression circuit 67 for

compressing data stored in the data RAM 64 and storing the compressed data in a given area in the data RAM 64”) (Figure 8), 22:55-57 (“Data (compressed data or uncompressed data) stored in the data RAM 64 and destined for the data destination 3 is supplied through the output port 66 to the data destination 3” (Figure 8)).

x. Limitation I of Claim 24 is disclosed in Kawashima.

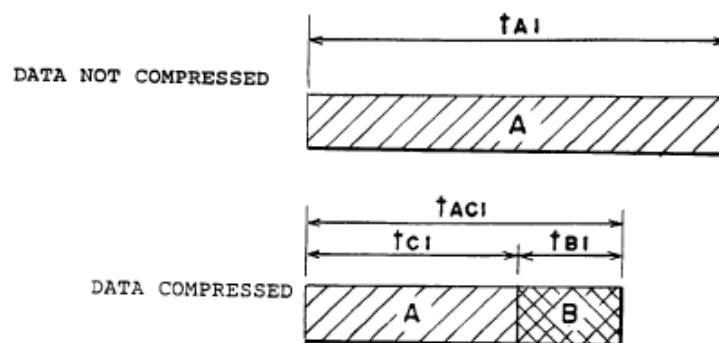
Limitation I of claim 24 of the ’530 patent recites: “said compression and storage occurs faster than said data stream is able to be stored on said memory device in said received form.” This limitation is found in Kawashima. *See Storer Decl.* at ¶¶ 112-117; Ex. 1102.

Kawashima discloses a compression and transmission/storage system that is designed to compress data and transmit/store the compressed data more quickly than it can transmit/store the data in uncompressed form, as explained in detail below.

The Kawashima system achieves fast data compression and transmission/storage by transmitting/storing the compressed version of an incoming data stream when that data stream can be compressed at a relatively high compression ratio that is preset by the system or the system’s user. Kawashima at 7:1-15; Ex. 1103. Figures 43 and 44 below illustrate the effect of compression ratios on the speed of data compression and transmission/storage.

As shown in Figure 43 below and also explained in Section IX.A above, if a data stream is compressed at a relatively high compression ratio, then compression will result in a significantly smaller-sized data stream so that compression and transmission/storage will occur significantly more quickly than transmission/storage of the uncompressed data stream. That is, the time it takes to compress at this relatively high ratio will be more than offset by the significant reduction in the amount of time needed to transmit/store the smaller-sized compressed data stream. Accordingly, the time needed to compress data (which Kawashima calls t_{B1}) and transmit/store the compressed data (which Kawashima calls t_{C1}) (the total time of which Kawashima calls t_{AC1}) will be less than the time needed to transmit/store the same data in uncompressed form (which Kawashima calls t_{A1}). *See id.* at 3:8-23.

FIG. 43



Referring to the lower portion of Figure 43, Kawashima expressly accounts for the time it takes to compress data (as shown in the double-hashed area marked

“B” of length t_{B1}) in addition to the time it takes to transmit/store the compressed data (the region labeled “A” of length t_{A1}). *See* Storer Decl. at ¶ 116; Ex. 1102.

The Kawashima system is therefore designed with the objective of compressing and transmitting/storing a compressed data stream when it determines that the incoming data stream can be compressed at a relatively high ratio. *See id.* at ¶ 117. Accordingly, the Kawashima system compresses and stores a compressed data stream faster than said data stream is able to be stored on said memory device in said received form. *See id.* at ¶¶ 112-117.

xi. Limitation J of Claim 24 is obvious in view of Kawashima and Sebastian.

Limitation J of claim 24 of the ’530 patent recites: “a first data descriptor is stored on said memory device indicative of said first compression technique.” This limitation is obvious in view of Kawashima and Sebastian. *See id.* at ¶¶ 118-121.

Sebastian discloses that after the appropriate compression technique is applied to compress a data block, the “encoded” (compressed) “data stream” includes an “identification (ID) code” (descriptor) indicating which “filter” (compression technique) was used to “encode” (compress) the data. *See* Sebastian at 5:15-18; Ex. 1104; Storer Decl. at ¶¶ 119; Ex. 1102. Sebastian also discloses that “the output of the encoder” (the encoded data and the identification (ID) code) “can be stored in memory.” Sebastian at 3:31-32; Ex. 1104.

As discussed *supra* (*see, e.g.*, Section XI.A.1), it would have been obvious to a person of ordinary skill in the art to combine the teachings of Kawashima and Sebastian. *See* Storer Decl. at ¶¶ 120-121; Ex. 1102. Both recognize the significance of analyzing incoming data to determine data type and teach systems and methods of efficiently determining the data type of incoming data (by reviewing header information associated with the data) in order to optimally compress such data. *See, e.g.*, Kawashima at 36:6-32; Ex. 1103; Sebastian at Abstract, 4:46-54; Ex. 1104. Both teach the general use of the same types of compression techniques (*e.g.*, Huffman and Lempel-Ziv type methods). *See, e.g.*, Kawashima at 4:1-3; Ex. 1103; Sebastian at 17:15-40; Ex. 1104. It would therefore have been obvious for a person of ordinary skill in the art to modify the system taught in Kawashima to incorporate Sebastian's teachings of using a plurality of compression techniques to optimally compress different types of data in an incoming data stream and subsequently generate and store descriptors indicating which techniques were used to, for example, assist with decompression. *See* Storer Decl. at ¶¶ 120-121; Ex. 1102.

Moreover, the '530 patent itself recognizes that one of ordinary skill in the art would know how to extract from a compressed data block a descriptor indicative of the compression algorithm applied. *See* '530 Patent at 14:5-10 (describing a "descriptor extraction module 60" that receives an "input data block

and then parses, lexically, syntactically, or otherwise **analyzes the input data**

block using methods known by those skilled in the art to extract the data

compression type descriptor associated with the data block.” (emphasis

added)); Ex. 1101. Therefore, it would not only have been obvious, but completely

expected for a compression system to generate, store, and even append to a

compressed data block a descriptor indicative of the compression algorithm

applied, for use during decompression. *See* Storer Decl. at ¶¶ 120-121; Ex. 1102.

xii. Limitation K of Claim 24 is obvious in view of Kawashima and Sebastian.

Limitation K of claim 24 of the '530 patent recites: “said first descriptor is utilized to decompress the portion of said compressed data stream associated with said first data block.” This limitation is obvious in view of Kawashima and Sebastian. *See id.* at ¶¶ 122-125.

Sebastian discloses that after a data block is compressed, the compressed data includes an “identification (ID) code” (descriptor) indicating which “filter” (compression technique) was used to “encode” (compress) the data, and the “decoder has to have a corresponding decoding filter.” *See* Sebastian at 5:15-18; Ex. 1104; Storer Decl. at ¶ 123; Ex. 1102. Sebastian further discloses that during decompression, the “decoder” retrieves the encoded data from memory and reverses the compression techniques used to encode the data. *See* Sebastian at 3:37-39; *see also id.* at 3:31-32 (encoded data stored in memory); Ex. 1104; Storer

Decl. at ¶ 123; Ex. 1102. A person of ordinary skill in the art would have understood that in order to efficiently reverse the compression techniques during decompression, the decoder would refer to the identification (ID) code indicating which compression techniques were originally applied. *See* Storer Decl. at ¶ 123; Ex. 1102.

As discussed *supra* (*see, e.g.*, Sections XI.A.1 and XI.A.2.xi) it would have been obvious to a person of ordinary skill in the art to combine the teachings of Kawashima and Sebastian. *See id.* at ¶¶ 124-125. Both recognize the significance of analyzing incoming data to determine data type and teach systems and methods of efficiently determining the data type of incoming data (by reviewing header information associated with the data) in order to optimally compress such data. *See, e.g.*, Kawashima at 36:6-32; Ex. 1103; Sebastian at Abstract, 4:46-54; Ex. 1104. Both teach the general use of the same types of compression techniques (*e.g.*, Huffman and Lempel-Ziv type methods). *See, e.g.*, Kawashima at 4:1-3; Ex. 1103; Sebastian at 17:15-40; Ex. 1104. It would therefore have been obvious for a person of ordinary skill in the art to modify the system taught in Kawashima to incorporate Sebastian's teachings of using a plurality of compression techniques to optimally compress different types of data in an incoming data stream and subsequently generate, store, and use during decompression descriptors indicating

which compression techniques were used. *See* Storer Decl. at ¶¶ 124-125; Ex.

1102.

Moreover, the '530 patent itself recognizes that one of ordinary skill in the art would know how to extract from a compressed data block a descriptor indicative of the compression algorithm applied. *See* '530 Patent at 14:5-10 (describing a “descriptor extraction module 60” that receives an “input data block and then parses, lexically, syntactically, or otherwise **analyzes the input data block using methods known by those skilled in the art to extract the data compression type descriptor associated with the data block.**”) (emphasis added); Ex. 1101. Therefore, it would not only have been obvious, but completely expected for a compression system to generate and store a descriptor indicative of the compression algorithm applied, for use during decompression, and to use that descriptor during decompression. *See* Storer Decl. at ¶¶ 124-125; Ex. 1102.

XII. Conclusion

Based on the foregoing, claim 24 of the '530 patent recites subject matter that is obvious. The Petitioner requests institution of an *Inter Partes* Review to cancel the challenged claim.

IPR2016-00376: Petition
U.S. Patent No. 7,415,530, Claim 24
Respectfully submitted,

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IPR2016-00376: Petition
U.S. Patent No. 7,415,530, Claim 24

CERTIFICATE OF SERVICE

I hereby certify that, on December 28, 2015, I caused a true and correct copy
of the foregoing materials:

- Petition for *Inter Partes* Review of U.S. Patent No. 7,415,530, Claim 24
- Exhibits 1101-1120
- Table of Exhibits
- Oracle America, Inc. Power of Attorney

to be served via FedEx on the following attorney of record as listed on PAIR:

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TABLE OF EXHIBITS

Exhibit	Description
1101	U.S. Patent No. 7,415,530 (“’530 Patent”)
1102	Declaration of Professor James A. Storer, Ph.D. (“Storer Decl.”)
1103	U.S. Patent No. 5,805,932 (“Kawashima”)
1104	U.S. Patent No. 6,253,264 (“Sebastian”)
1105	U.S. Patent No. 5,467,087 (“Chu”)
1106	U.S. Patent No. 7,079,051 (“Storer ’051”)
1107	’927 Reexamination File History, 5/31/13 Right of Appeal Notice
1108	U.S. Patent No. 6,601,104 (“’104 Patent”)
1109	U.S. Patent No. 5,150,430 (“Chu ’430”)
1110	U.S. Patent No. 4,593,324 (“Ohkubo”)
1111	U.S. Patent No. 5,794,229 (“French”)
1112	U.S. Patent No. 4,956,808 (“Aakre”)
1113	U.S. Patent No. 3,394,352 (“Wernikoff”)
1114	Random House Webster’s, Computer & Internet Dictionary at 45 (3d ed. 1999)
1115	Storer, <i>Data Compression: Methods and Theory</i> , Computer Science Press (1988) (“Storer 1988”)
1116	D. Huffman, “A Method for the Construction of Minimum-Redundancy Codes,” Proceedings of the IRE 40, 1098-1101 (1952)
1117	J. Ziv and A. Lempel, “A Universal Algorithm for Sequential Data Compression,” IEEE Transactions on Information Theory 23:3, 337-343 (1977)

IPR2016-00376: Petition

U.S. Patent No. 7,415,530, Claim 24

Exhibit	Description
1118	J. Ziv and A. Lempel, “Compression of Individual Sequences Via Variable-Rate Coding,” IEEE Transactions on Information Theory (1978)
1119	U.S. Patent No. 5,379,036 (“Storer ’036”)
1120	U.S. Patent No. 4,876,541 (“Storer ’541”)