

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMAZON.COM, INC., AMAZON.COM SERVICES, LLC,
Petitioner

v.

NOKIA TECHNOLOGIES OY,
Patent Owner

Case: IPR2024-00847
IPR2024-00848

U.S. Patent No. 7,532,808

DECLARATION OF DR. MICHAEL ORCHARD

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1. I, Dr. Michael Orchard, declare as follows:

II. INTRODUCTION

2. I have been retained on behalf of Nokia Technologies OY and asked to provide opinions on two Inter Partes Review (IPR) proceedings, IPR2024-00847 and IPR2024-00848. Both relate to U.S. Patent No. 7,532,808, which I will refer to as the '808 Patent. My compensation does not depend on the outcomes of these or any other proceedings.

3. This Declaration summarizes the independent opinions I have formed to date based on the material currently available to me. I reserve the right to modify my opinions, if necessary, based on further review and analysis of information that I receive after the filing of this Declaration, including in response to any positions taken by Petitioners or their experts that I have not yet been provided with.

4. I testified at the evidentiary hearing in the International Trade Commission investigation 337-TA-1379. The 1379 case involved the '808 Patent. Amazon had previously asserted the Karczewicz and Frojdh references against the '808 Patent but dropped these references in favor of another obviousness ground before the evidentiary hearing. Thus, I have familiarity with the Karczewicz and Frojdh references from the ITC proceeding.

5. I testified at the ITC evidentiary hearing that Amazon's remaining obviousness ground (based on MPEG-1) does not render the asserted claims of the

'808 Patent obvious. The administrative law judge issued a determination finding that the asserted claims of the '808 Patent were not obvious. I understand Amazon is attempting to appeal that determination.

6. My opinions are based on the materials I considered and my study, experience, knowledge and background in the field of video coding. I am informed by my education and my extensive experience in the fields of video and multimedia coding and communications. I also relied on my review and analysis of the prior art, information provided to me, and information I have independently reviewed.

7. I am submitting the same declaration for both IPR2024-00847 and IPR2024-00848, as these petitions raise the same grounds for Claims 1-2, 6-7, 9, 23-25, 28-30, 32, 34, 36, 39-41, 43, and 65 (-00847 IPR) and Claims 10-11, 15-16, 20-22, 44, 47-49, 51-54, 58-60, 62-64 (-00848 IPR) of the '808 Patent. My cites to the petition are to the page numbers in IPR2024-00847, but my opinions and analysis apply to the arguments made in both petitions.

III. EDUCATIONAL BACKGROUND AND QUALIFICATIONS

8. Details of my professional qualifications and background are summarized below and described in my Curriculum Vitae attached to this declaration.

9. I am a Professor of Electrical and Computer Engineering at Rice University in Houston, Texas.

10. I received my Bachelor of Science in Electrical Engineering from San Diego State University in 1981. In 1986, I received a Master of Science in Electrical Engineering from San Diego State University. In 1988, I received a Master of Arts in Electrical Engineering from Princeton University. In 1990, I received a Ph.D. in Electrical Engineering from Princeton University.

11. My graduate studies were concentrated in image and video processing algorithms, with my doctoral dissertation detailing a method for displaying digital images on video display monitors with limited palette size, and advanced methods for video compression. During my graduate studies, I also worked at AT&T Bell Laboratories in the Video Communications department. After I received my Ph.D. degree, I stayed on at AT&T Bell Laboratories as a consultant while I took a position as Assistant Professor in the Department of Electrical and Computer Engineering at the University of Illinois at Urbana-Champaign. During my time at the University of Illinois, I taught the fundamental undergraduate courses in digital signal processing and graduate courses in advanced digital signal processing and image processing. I continued my academic career as an Associate Professor at Princeton University where I continued to teach classes in digital signal processing and image processing. Since 2001, I have been a Professor in the Department of Electrical and Computer Engineering at Rice University. In this position, I teach undergraduate courses on the analysis and modeling of randomness in engineering design, and on

the design of digital signal and image processing systems, as well as a lab course in electronic system design. I also teach graduate level courses in digital signal processing and digital image processing. The subject matter of these courses cover the application of image and signal processing in consumer devices, including multimedia compression for transmission over general communications channels and networks. My research continues to explore image and video compression algorithms and applications thereof, including advanced techniques of image and video compression for use in digital cameras, cellular telephones, and general computer platforms and networks.

12. I have consulted extensively in the fields of digital signal processing and image and video processing, including through consulting positions with AT&T Bell Laboratories (and later AT&T Laboratories), NEC Research Institute, Flextronics Corporation, Schlumberger, and Interdigital. These engagements have involved investigation, development and simulation of software algorithms for efficient representation of image and video data for transmission over a variety of communications channels and networks.

13. In the course of my academic and industrial career, I have published over 100 technical papers for journals and conferences on various aspects of my research, and I am named inventor on seven patents issued by the USPTO:

- U.S. Patent No. 5,047,842 – “Color image display with a limited palette size”

- U.S. Patent No. 6,556,624 – “Method and apparatus for accomplishing multiple description coding for video”
- U.S. Patent No. 6,628,845 – “Method for subpixel registration of images”
- U.S. Patent No. 6,823,018 – “Multiple description coding communication system”
- U.S. Patent No. 6,920,177 – “Method and apparatus for accomplishing multiple description coding for video”
- U.S. Patent No. 7,289,565 – “Multiple description coding communication system”
- U.S. Patent No. 8,594,205 – “Multiple description coding communication system”

14. I have served as an Associate Editor for the IEEE Transactions on Image Processing and have been Co-General Chair of OSA’s Digital Image Processing and Analysis Conference, and Technical Program Chair for the IEEE International Conference on Image Processing.

15. My research expertise has focused on image and video processing with a concentration in image and video compression. I have supervised 12 Ph.D. students in these research topics, with three currently tenured at research universities. My students and I have made significant contributions to the development of digital signal processing software algorithms for compressing image and video data,

enabling the widespread transmission of multimedia data over communications channels and networks. My research contributions in these areas led me to be named an IEEE Fellow in 2000, “for contributions to the theory and development of image and video compression algorithms.”

IV. MATERIALS REVIEWED AND TIME OF INVENTION

16. The opinions contained in this Declaration are based on the documents that I have reviewed, including the petitions and all materials cited in the petitions, my professional judgment, as well as my education, experience, and my knowledge regarding technologies related to the '808 Patent. I have also reviewed and considered Karczewicz, Frojdh (including Frojdh's provisional application), and H.263 which I understand have been designated Exhibits Ex-1006 – Ex-1009. As mentioned, I spent time analyzing these references in connection with 337-TA-1379 before Amazon dropped its arguments relating to these references. I have also reviewed the declaration and deposition transcript of Dr. Joseph Havlicek.

V. LEGAL STANDARDS

A. Overview

17. I am not an attorney or legal expert. I do not opine on matters of law. All the legal standards, which are listed in this section and which I applied in reaching the conclusions expressed throughout this Declaration, were provided and explained to me by counsel. In preparing this Declaration, I endeavored to faithfully apply these legal standards. I do not intend to offer opinions on the law. Below, I

describe the legal standards that I applied in my analysis of the claims of the '808 Patent.

18. I have been informed by counsel and I understand that an issued patent is presumed valid. I understand that the challenger of a patent's validity bears the burden of proving invalidity of that patent.

B. Patent Claims

19. I have been informed by counsel and I understand that a patent's claims describe the invention made by the inventors and describe what the patent owner owns and what the owner may prevent others from doing.

20. I have been informed by counsel that claims may describe products, such as machines or chemical compounds, or processes for making or using a product. Claims are usually divided into parts or elements called limitations.

21. I have been informed by counsel that there are independent claims and dependent claims. An independent claim sets forth all the requirements that must be met for the claim. Thus, it is not necessary to look at any other claim to determine what an independent claim covers. A dependent claim does not itself recite all of the requirements of the claim but refers to another claim for some of its requirements. In this way, a dependent claim depends on another claim. The law considers a dependent claim to incorporate all the requirements of the claims to which it refers.

22. I have been informed by counsel that a dependent claim then adds its own additional requirements. To determine what a dependent claim recites, it is necessary to look at both the dependent claim and any other claims to which it refers.

23. I have been informed by counsel that in a case where a dependent claim incorporates the limitations of an independent claim on which it depends, if a reference fails to disclose any of the limitations of the independent claim, the claims which depend on that independent claim cannot be made invalid by such a reference. As a result, any of the references or grounds at issue in this proceeding that fail to disclose or render obvious all the limitations of an independent claim necessarily also fail to disclose or render obvious all the limitations of claims which depend on that independent claim.

C. Burden of Proof for Invalidity

24. I have been informed by counsel and I understand that the party challenging the validity of an issued U.S. patent in an IPR proceeding bears the burden of proving invalidity through facts supported by a preponderance of the evidence. I have been informed that a “preponderance of the evidence” means evidence sufficient to prove that a fact is more likely true than it is not.

D. Claim Construction

25. I have been informed by counsel and I understand that the first step in determining validity is to properly construe the claims. I have further been informed

by counsel that, in this proceeding, the Board must determine the scope of the claims by using the same claim construction standard that United States District Courts use. Under this standard, the words of a claim are given their “ordinary” and “customary” meaning as would have been understood by a person of ordinary skill in the art at the time of the invention. I have been informed that such a person looks to the claims, specification, and file history in understanding the meaning of the claim terms. I have applied this understanding in this declaration.

E. Person of Ordinary Skill in the Art

26. I have been informed by counsel and I understand that a person having ordinary skill in the art may be defined by factors such as, when considered at the time of the alleged invention: (a) the levels of education and experience of the inventor and other persons actively involved in the field; (b) the types of problems encountered in the field; (c) prior art solutions to those problems; (d) rapidity with which innovations are made; and (e) the sophistication of the technology.

F. Anticipation

27. I have been informed by counsel and I understand that a patent claim can be found invalid as anticipated if each and every element of the claim, as properly construed, is found either explicitly or inherently in a single prior art reference. If the single prior art reference does not disclose explicitly or inherently any one claim limitation, then that claim is not anticipated. I have further been

informed that the single prior art reference cannot merely disclose each element; rather, it must disclose all the elements as arranged in the claim. I have been informed that for a prior art reference to “inherently” disclose something, the reference must necessarily function in accordance with, or include the claimed limitations, to anticipate. The missing descriptive matter cannot merely probably or possibly include the claimed limitations. I have further been informed by counsel that, with respect to an anticipation analysis, it is improper to combine separate, distinct embodiments of a single prior art reference.

28. I have been informed that for a reference to be anticipatory, the reference must contain an enabling disclosure. I have been informed that merely naming or describing the subject matter is insufficient if it cannot be produced without undue experimentation.

G. Obviousness

29. I have been informed by counsel and I understand that a patent claim can be found invalid as obvious if the differences between the claim and the prior art references would have been obvious to a person of ordinary skill in the art at the time of the invention, taking into account (1) the scope and content of the prior art, (2) the differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any objective indicia of non-obviousness. I have further been informed by counsel that a claim can be found to be obvious in light of either a single

prior art reference or multiple prior art references. I have been informed that references qualify as prior art for an obviousness determination only when they are analogous to the claimed invention. Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed; and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

30. I have been informed that to be obvious in light of a single prior art reference or multiple prior art references, there must be a reason either to modify the single prior art reference or to combine the two or more prior art references to achieve the claimed invention. I have been informed by counsel that this reason may come from a teaching, suggestion, or motivation to combine which may come from the reference or references themselves, the knowledge or "common sense" of one skilled in the art, or from the nature of the problem to be solved and may be explicit or implicit from the prior art as a whole.

31. I have been informed by counsel that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.

32. I have further been informed by counsel that there is no suggestion to combine, however, if a reference teaches away from its combination with another

source. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the patent, or would be led in a direction divergent from the path that was taken by the applicant, or if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. If, when combined, the references would produce a seemingly inoperative device, then they teach away from their combination. I have been informed that it is improper to combine references where the references teach away from their combination.

33. I have been informed by counsel that the degree of teaching away will depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. I have been informed that a reference teaches away, for example, if (1) the combination would produce a seemingly inoperative device, or (2) the references leave the impression that the product would not have the property sought by the applicant.

34. I have been informed by counsel that if the teachings of a prior art reference would lead one skilled in the art to make a modification that would render another prior art device inoperable, then such a modification would generally not be obvious. I have been informed that if a proposed modification would render the prior

art device unsatisfactory for its intended purpose, then the proposed modification would generally not be obvious.

35. I have been informed by counsel that it is improper to use hindsight in making an obviousness determination.

36. I have been informed by counsel that some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness must be made. I have been informed that, for example, there may be no rational underpinning to support the legal conclusion of obviousness where systems are already complete and the party challenging validity seeks to mix and match components, which each exist in the separate systems, from these complete systems.

VI. PERSON OF ORDINARY SKILL IN THE ART (POSITA)

37. Based on my review of the '808 Patent, the types of problems encountered in the art at and prior to the time of the alleged invention, prior solutions to those problems, the pace with which innovations were made during the relevant time period, the sophistication of the technology, and the educational level of active professionals in the field, I believe that a person of ordinary skill in the art, at the time of the invention, would have had at least a Bachelor's degree in electrical engineering, computer science, or computer engineering; familiarity with the relevant video coding standards as of this time; and at least two years of work experience in research, design, development, and/or testing of video coding

hardware and/or software. More education could have substituted for less work experience and vice versa.

38. All of my opinions in this Declaration are from the perspective of a person of ordinary skill in the art, as I have defined it above and during the relevant time frame (e.g., March 2002). During that time frame, I possessed at least the qualifications of a POSITA, as defined above.

VII. CLAIM CONSTRUCTION

39. I understand that claim terms are typically given their ordinary and customary meaning, as would have been understood by a person of ordinary skill in the art at the time of the alleged invention. In considering the meaning of the claims, I also understand that one must consider the claim language, specification, prosecution history, and the knowledge of a person of ordinary skill in the art at the relevant time.

40. I also understand that Petitioner and Patent owner propose claim constructions of the term “skip coding mode.” I understand this term was disputed in the co-pending ITC investigation, 337-TA-1379, for which I also filed an expert declaration supporting Patent Owner’s construction. In the 1379 Investigation, Patent Owner and Staff proposed a construction of “skip coding mode” as “a coding mode in which a zero (non-active) motion vector or a non-zero (active) motion vector is associated with each skip mode macroblock, depending on the

characteristics of the motion in image segments surrounding the macroblock in question.” This proposed construction was based on inventor’s lexicography and was ultimately adopted by the ALJ. (Ex. 2007). Petitioner proposed a similar construction, keeping the lexicography designated in the ’808 Patent, but adding the language “and residual information can be provided for each skip mode macroblock” to the end of the proposed construction. *Id.* In my opinion, the differences in proposed constructions between Petitioner and Patent Owner do not affect my ultimate opinion that the ’808 Patent is valid over the grounds asserted by Petitioner.

41. I further understand that Dr. Havlicek testified to his understanding of the term “active” and “non-active” within the agreed upon construction. I agree with Dr. Havlicek that a “non-active” motion vector is one that is always assigned zero while an “active” motion vector is a predicted motion vector that is not necessarily zero. Ex. 2014 (Havlicek Tr.) at 129:21-130:14; 130:18-131:5; 133:11-134:5.

42. The ’808 Patent provides distinct processes for generating “non-active” and “active” motion vectors:

If it is found that the surrounding region exhibits a certain type of motion, a non-zero motion vector representative of that motion is generated and associated with the current macroblock. In particular, the continuity, velocity or deviation of motion in the surrounding macroblocks or sub-blocks can be analyzed. For example, if the motion in the surrounding region exhibits a certain level of continuity, a certain common velocity, or a particular form of divergence, a motion vector representative of that motion can be assigned to the current macroblock to be coded. On the other hand, if the region surrounding the current macroblock does not exhibit such continuity, common velocity or

divergence and has an insignificant level of motion, the macroblock to be coded is assigned a zero motion vector, causing it to be copied directly from the reference frame, just as if it were a conventional SKIP mode macroblock.

Ex. 1001 at 14:23-51.

According to the invention, skip (or SKIP) mode macroblocks in a video coding system adapt to the motion of surrounding image segments. If active motion is detected around a macroblock to be coded/decoded, motion parameters conforming to the motion are generated and the macroblock is motion compensated. In this way, no additional information needs to be transmitted from the encoder to the decoder.

Ex. 1001 at 15:61-67; *See also e.g.*, Ex. 1001 at 18:51-19:10, 20:6-16, 24:61-25:3,

Figure 8.

43. A POSITA would understand that the '808 Patent's skip coding mode is not simply a coding mode in which a skip mode macroblock may have a motion vector associated (be it zero or non-zero). Instead, the '808 Patent's skip coding mode covers the specific process for determining and associating a motion vector "... with each skipped macroblock ...". In non-active scenarios, the assigned motion vector is always zero valued, in the same manner as traditional skip mode. In active scenarios, motion vectors are predicted via motion vector prediction, the outcome of which will yield a motion vector of a certain value (which may have components of non-zero or zero value) depending on the prediction method and the motion vector values of blocks surrounding the skipped block.

VIII. BACKGROUND OF THE RELEVANT TECHNOLOGY

44. Video playback involves sequences of frames displayed quickly one after the other to give the illusion of motion. Video coding systems may divide frames into smaller segments such as blocks. The blocks are comprised of groups of pixels. Pixels are tiny, addressable units that may vary in brightness and color. The increasingly large number of pixels in modern displays and the massive range of possible values across the pixels presents a significant technical obstacle to communicating video. A large amount of data would be necessary to communicate the video in uncompressed form. Video encoding and decoding depend on a variety of techniques to compress and decompress video data while maintaining high quality and ensuring error resiliency.

45. Most video coding techniques exploit redundancies in the spatial and/or temporal domains. Relying on these redundancies, video encoders may communicate new information in a bitstream to decoders by referencing information that has already been decoded. There are two main ways of exploiting redundancy in video coding in order to create predictions of blocks of pixels—intra coding and inter coding. With intra coding, predictions are generated from already coded blocks in the same image frame. While inter coding predictions are generated from already coded blocks from different image frames known as reference pictures. Inter coding relies on motion vectors to instruct a decoder where, for a current image block, to

copy a block of pixels from a previously decoded reference frame. Typically, techniques for predicting content in image frames from already coded frames are referred to as “motion compensation” or “motion compensated prediction.”

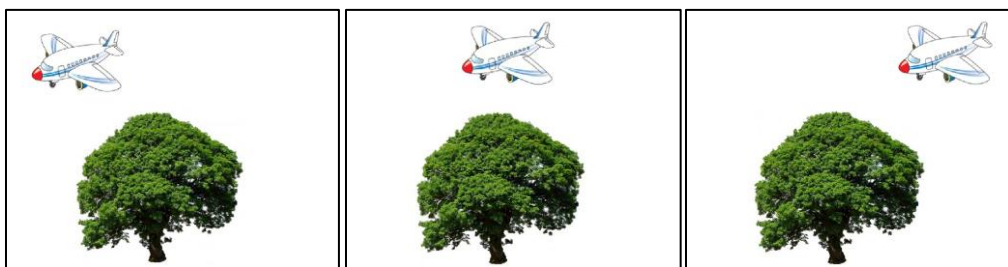
46. Motion compensated prediction is a technique wherein an encoder can signal a motion vector to instruct a decoder to copy a block of pixels from a particular region in a previously decoded frame. The decoder uses the signaled motion vector to generate a “prediction.” Though, this prediction may not be an exact duplicate of the image the user is intended to see. Therefore, the prediction may be combined with additional information, typically referred to as prediction error or residual information, to create a reconstructed image block that more closely aligns with the intended image block. The encoder communicates to the decoder how to make predictions for each block, as well as any residual information in a compressed form. Then, the decoder generates a prediction, decodes any residual information, and combines the prediction with any residual information to reconstruct a decoded image block.

A. Motion Compensation in Video Coding

47. Video coding makes storage, playback, and transmission of digital video content more efficient through, for example, decreasing the size of digital video files—without noticeably degrading the picture quality—by reducing the redundant, or perceptually irrelevant, parts of a video sequence. Efficient video

coding makes it easier to send high quality videos without the need for high transmission bandwidth and without degrading the quality of the picture. These benefits are important to many everyday applications for watching, storing, or sending videos, such as streaming videos over wireless networks, or any other network.

48. A moving object may travel across a stationary background, for instance when an airplane flies over a stationary backdrop. As another example, a camera may pan across a scene such that stationary areas appear moving while moving objects may look either slower or faster depending on the direction of panning relative to the motion of the moving objects. The images below show three video frames and illustrate how the redundant or perceptually irrelevant data (*e.g.*, pixels constituting the background) may exist across multiple frames of a video sequence. For example, the tree in each picture does not move, and the image of the plane does not change but moves across the picture. Even though the plane has moved, the image of the plane itself contains no new information.



49. In the frames shown above, the tree may correspond to redundant or perceptually irrelevant data in a video sequence. In addition, the video data relating

to the plane, which involves the motion of an object across the screen, includes a redundant image of the plane, but must account for the plane's motion. Redundancy here means "temporal redundancy," that the objects (*i.e.*, the tree and the plane) contain no new information *across* frames.

50. Temporal redundancy can be reduced using motion compensated prediction by allowing the image content of some frames in a digital video sequence to be "predicted" from one or more previously received frames in the sequence. For instance, the encoder can provide motion information to the decoder that allows the decoder to predict where the plane appearing in a previously received frame should appear in the current frame being decoded.

51. "Reference frames" (or "reference pictures") can serve as points of comparison from which the content of other frames can be predicted, for example, by tracking the motion of objects or regions between the reference frame and other frames using motion vectors.

52. Motion vectors convey both (1) direction and (2) magnitude. A "zero motion vector" will have a magnitude of zero. A non-zero motion vector will have a magnitude greater than zero and some direction. The direction of a vector can be expressed by multiple directional components (*e.g.*, horizontal or vertical components). Positive and negative numbers are used to express opposite directions.

As an example, Figure 9 of the '808 Patent depicts multiple non-zero vectors with the same direction and magnitude.

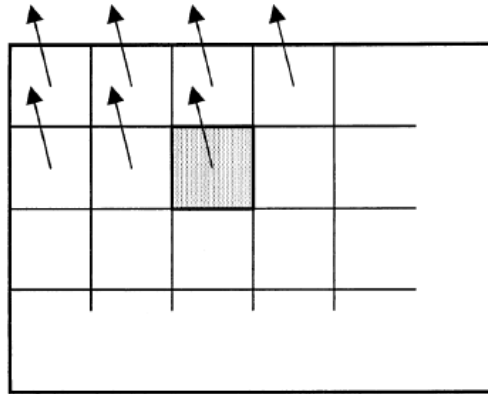


FIG. 9

'808 Patent, Figure 9 (Ex. 1001)

53. To manage the representation of motion within a frame, typical video coding systems divide each frame of a video sequence into “macroblocks,” which in a preferred embodiment are formed from regions of 16x16 image pixels. Each macroblock of a frame is encoded individually, and if motion compensation is used for coding a particular macroblock, motion vectors are associated with that macroblock to characterize its motion.

54. Video coding systems offer a variety of approaches, which may or may not involve motion compensation, for encoding the content of a macroblock. For a decoder to make any sense of the information it receives for a particular macroblock, it needs to know what approach was used by the encoder for coding the content of that macroblock. For that reason, an encoder selects a “coding mode” which it

assigns to each macroblock and transmits it to the decoder. Knowing the encoding approach defined by the “coding mode” it receives for a particular macroblock, the decoder is prepared to decode, parse, and utilize whatever subsequent information it receives for that macroblock in a correct manner. The process used by the encoder to decide which “coding mode” to assign to each macroblock is referred to as “Mode Selection”, which I will describe in more detail in the subsequent paragraphs.

55. The '808 Patent describes various coding modes associated with a particular prior art video coding system, referred to as JM1 of the Joint Video Team (JVT) coded. JM1 of the JVT codec, which would eventually become the H.264 video decoding standard, was the draft of the video coding recommendation under development by the JVT in January 2002. JVT was a combined effort by the Motion Pictures Expert Group (MPEG) of ISO/IEC and the Video Coding Experts Group (VCEG) of ITU-T. Some of the coding modes of JM1 are shown in the table below, taken from the '808 Patent:

TABLE 3		
<u>Macroblock Coding Modes of JM1</u>		
Codeword Index	Mode	UVLC Codeword
—	SKIP	Run-Length Coded
0	16 × 16	1
1	16 × 8	001
2	8 × 16	011
3	8 × 8	00001
4	8 × 4	00011
5	4 × 8	01001
6	4 × 4	01011

'808 Patent, Table 3 (Ex. 1001)

56. The coding modes shown in Table 3 above are those coding modes that use the motion compensation approaches supported by the JM1 codec for encoding a macroblock. The label, “UVLC Codeword”, in the right-most column refers to “Universal Variable Length Codes,” and they are the actual bits inserted into the video bitstream to direct the decoder to use the associated “coding mode” for a particular macroblock. Principles of information theory motivate using UVLC codewords having fewer bits for representing “coding modes” that are more likely to be used. However, it should be recognized that the bits shown in this table are merely the tip-of-the-iceberg in terms of the number of bits used for coding a particular macroblock using a particular “coding mode”. For all except the first entry on this list, one or more motion vectors, each having a horizontal and vertical component, need to be encoding and transmitted to the decoder. Also, with the exception of the first entry, after performing motion compensated prediction using the associated motion vectors, prediction error (residual information) must be encoded and transmitted for the reconstruction of pixel values of image blocks.

57. The exact count of how many bits are required for each of these modes depends on the details of each mode, and the image content of the macroblock being encoded, but three facts are worth noting: first, for all except the first entry on the list, substantial numbers (from 10’s to possibly 100’s) of bits are needed to support the corresponding coding mode; second, for particular macroblocks, the more

expensive (in terms of bits) coding modes may be capable of generating much more accurate approximations of the original macroblock than any other coding mode (that is why each is included in this state-of-the-art standard); and third, for any particular macroblock, there will be large discrepancies among the number of bits required by the various coding modes. All three of these facts are important considerations in devising the best approach for selecting a “coding mode” for any given macroblock.

B. Mode Selection in Video Coding

58. It may seem naively obvious that each macroblock should be assigned the coding mode that produces the most accurate approximation of the original macroblock being coded. However, since the earliest days of video coding standard development, it was recognized that such a naïve policy led to very poor video coding quality.

59. It should be noted that, since “Mode Selection” is a process conducted completely at the encoder, it is not formally specified by any video coding standard, since standards only specify requirements on the video decoding process. However, for at least three decades the importance to video coding quality of performing optimal mode selection has been widely recognized, and issues relating to mode selection have strongly influenced the evolution of video coding algorithms and

standards. Furthermore, the '808 Patent teaches principles of optimal mode selection both in its description of the prior art, and of the proposed invention.

60. For each macroblock of a video sequence, mode selection in video coding decides how many bits to invest in the coding of the macroblock and how much distortion (error) to accept in the approximation of the original macroblock contents. Given a targeted budget for how many bits are available for coding each unit time period (e.g. second, minute, etc.) of video, the problem of optimal mode selection can be recognized as analogous to optimal investment allocation for a financial portfolio. Summarizing the conclusion of the allocation problem, we can be confident that a particular allocation of funds is optimal if and only if a) every available dollar is invested somewhere, and b) the per-dollar return on each dollar invested by the allocation is greater than the per-dollar return of any investment opportunity not included in the allocation.

61. Applying the portfolio allocation result to video coding mode selection, a given collection of mode decisions is optimal if a) every bit available under the budget limit is applied to the encoding of some macroblock somewhere, and b) the per-bit reduction in distortion resulting from a bit invested in the selection of any mode for any macroblock is higher than the per-bit reduction in distortion that would have resulted from any bit that was not invested by not selecting some other mode for some other macroblock.

62. Though the previous paragraph describes how to recognize an optimal solution to the problem of mode selection, it doesn't describe how to reach this optimality condition. Mathematically, this problem is solved with Lagrangian optimization, which involves making mode selections based on a Lagrangian "cost function", rather than simple distortion costs. A Lagrangian cost for evaluating a selection decision is one which includes both a measure of the distortion reduction provided by the selection, as well as the addition bit cost of making the selection. The '808 patent teaches to use a Lagrangian cost for mode selection in prior art coding systems:

After these operations, the mode that minimizes a certain cost function is selected for the macroblock. The cost function typically combines the prediction error with number of estimated bits needed to code the macroblock and thus measures the relative efficiency of each coding mode. [11:14-18]

63. Similarly, the '808 teaches using optimal mode selection principles applied to the new skip mode of the invention.

Each best-match is associated with an overall cost value, for example, a linear combination of the sum of the absolute differences between the pixel values in the macroblock under examination and the best matching region in the reference frame, and an estimated number of bits required to code the mode and represent motion vectors. ... Having performed motion estimation operations for each of the available coding modes, including skip mode as modified according to the invention, encoder 600 determines which coding mode yields the smallest overall cost value and selects that mode

as the coding mode for the macroblock in question.
[17:33-39, 18:12-17]

64. For purposes of optimal mode selection, it is not sufficient to characterize the approach taken by a particular “coding mode” for producing its approximation of a macroblock. A complete description of a “coding mode” also requires a characterization of the number of bits (or estimated number of bits) that will be required by the “coding mode”.

65. Any implementation of a “coding mode” requires the actual specification of codeword bits that will be uniquely decoded to inform a decoder both i) what further information, if any, is to be expected to support the operations of the mode, and ii) what specific operations to perform for that “coding mode”.

66. Both pieces of prior art on which Petitioner bases its grounds for challenging the validity of the ‘808 invention describe operations that can be used for reconstructing macroblocks and that Petitioner alleges has similarities to operations performed in the ‘808 invention. However, even if one accepts the alleged similarities between operations, many of Petitioner’s arguments in support of both grounds fails to identify a valid “coding mode” that performs those operations.

67. In the case of Karczewicz, the term “mode” appears very sparingly to refer generally to a way of doing motion compensation, without making any attempt to define what a POSITA would recognize as a “coding mode”, as understood in the

context of the '808 specification and claims. The closest Petitioner comes to pointing to bits that identify an alleged “coding mode” is the single MCI bit [Petition, top of page 23], but Karczewicz does not teach the MCI bit to completely specify the operations of any “coding mode”. A POSITA would not understand this single bit to identify a “coding mode”.

68. In the case of Frojdh, Petitioner alleges to have found a “coding mode”:

Frojdh further discloses a coding mode (e.g., global motion compensation (GMC)) comprised of both the IGMC mode and COPY (aka SKIP) mode that teaches or suggests the recited “skip coding mode.” [Petition, p. 43, Havlicek Dec., para. 240]

Later sections of this declaration will show that this statement seriously mischaracterizes the Frojdh patent, and especially the Frojdh provisional, but at this point let’s focus on Petitioners misuse of the term “coding mode”. Figure 9 shown below from the Frojdh patent is a copy of Figure 3 from the Frojdh provisional:

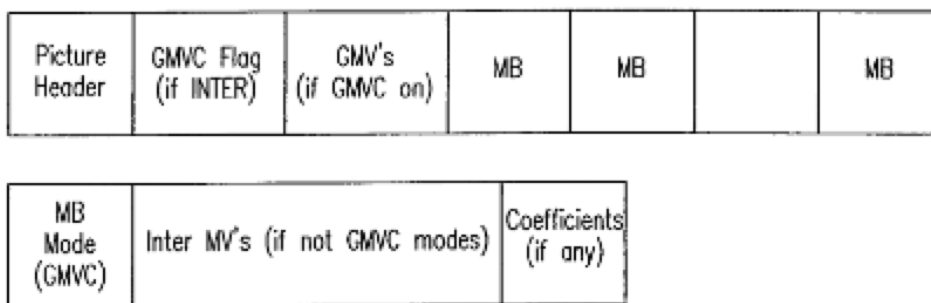


FIG. 9

69. The indication of “GMC” which Petitioner refers to as a “coding mode” is the “GMVC Flag” shown as a bit in the Picture header (the Frojdh provisional also

discloses that it could alternatively be found in the Slice header). This single bit does not fully specify to a decoder the operations that should be applied to any macroblock. For that reason, the first field in the macroblock header, shown on the second line of Fig. 9, is “MB Mode”, which specifies the “coding mode” to use on any particular macroblock. Table 1 of the Frojdh provisional shows a list of “coding modes” used in the prior art H.26L draft standard, and at the bottom paragraph of page 10 of 16 describes how the table of “coding modes” would be expanded to including GMVC “coding modes”.

70. In Petitioner’s efforts to find in Frojdh all operations required by the claims of the ‘808 patent, he picks and chooses operations from several distinct coding modes. But since the claims of the ‘808 patent require these operations to be associated with a single coding mode, Petitioner invents some new meaning of “coding mode”, one that is inconsistent with a POSITA’s understanding of “coding mode”, and is inconsistent with Frojdh’s own teachings.

71. Keeping in mind that coding modes define a variety of distinct opportunities for investing bits in order to reduce distortion, developers of the earliest video coding standards (e.g. MPEG1, H.261) recognized the value of defining a coding mode that is motivated less by the reconstruction accuracy achieved by the operations specified for the mode but more by the very low number of bits that the mode requires: namely the “skipped” macroblock mode.

C. Skip Mode Macroblocks

72. Skipped macroblocks were an important feature in the earliest video coding standards and played an essential role in managing bit rate allocation in video encoding. MPEG1 aimed to code video at sufficiently low bitrates that it could not afford the bits needed to code every macroblock using standard Inter- or Intra-prediction coding modes at reasonable precision. Instead, MPEG1 produced reasonable coding quality when it used its available bitrate to code some subset of the macroblocks in the video, and just “skip” all other macroblocks. Of course, the “skipped” macroblocks could not just be ignored, so the “skip mode” was born.

73. The most distinctive feature of the skip-mode macroblock in MPEG1 is that it uses NO bitrate. The approach defined for handling the reconstruction of a skipped macroblock was not new to MPEG1. In MPEG1, a skipped macroblock is predicted using motion compensation with a motion vector of (0,0), and a residual of all “0”s is added to the motion compensated prediction. But MPEG1’s normal motion-compensated prediction mode already supports motion compensation with any motion vector (including (0,0)), and residual coding already supports adding a residual of all “0” values. Thus, in terms of the approach taken for representing the macroblock content, MPEG1’s skip coding mode is just a copy of an already existing coding mode. Instead, the distinctive feature of MPEG1’s Skip mode is that it uses 0 bits (or at least it presents itself as using 0 bits.)

Whereas the macroblock address increment within a slice for I-pictures is restricted to one, it may be larger for P-pictures. Any macroblocks thus skipped over are called “skipped macroblocks”. ... Skipped macroblocks have no VLC code. Instead they are coded by having macroblock address increment code skip over them. [Ex. 2019 (MPEG1) p. 93]

74. Though the MPEG1 specification describes “macroblock_address_increment” as information identifying the next macroblock to be coded, it can equivalently be understood to be identifying the run of macroblocks preceding the next coded macroblock as skip mode macroblocks. Thus, to evaluate the bit requirement of “skip mode” in MPEG1, we examine the coding of the macroblock address increment.

The escape code means “add 33 to the following macroblock address increment”. This allows increments greater than 33 to be coded. For example, an increment of 40 would be coded as escape plus an increment of 7: 0000_0001_0000_0010 . An increment of 70 would be coded as two escape codes followed by the code for an increment of 4: 0000_0001_0000_0000_0010_0000_11 . [Ex. 2019 p. 76]

75. In the first example provided, a run of 40 macroblocks are all identified to be skip mode macroblocks using 16 bits, for a cost of .4 bits/macroblock. In the second example, a run of 70 macroblocks are identified as skip mode macroblocks using 26 bits, for a cost of .37 bits/macroblock. In both cases, the bit cost for assigning each “skip mode macroblock” is less than half a bit per macroblock.

76. Because the Skip mode is such an inexpensive (in terms of bits) coding mode, optimal assignment of a “skip mode macroblock” does not require the skip mode reconstruction to be more accurate than other coding modes, but only that any improved accuracy provided by another coding mode not justify the significantly higher bit requirement of the other coding mode. As a consequence, large numbers of macroblocks for which the skip mode reconstruction is NOT the best available reconstruction are still assigned as skip-mode macroblocks by optimal mode selection.

77. Macroblocks from stationary backgrounds of video scenes typically result in skip mode reconstructions which are sufficiently accurate that the improved accuracy of any other coding mode does not justify its higher bitrate requirements. The effectiveness of a skip coding mode can be assessed by how heavily it is used. Given its very low bit cost, optimal mode selection should heavily favor selecting Skip mode, so unless skip mode reconstructions are very poor contenders for best reconstruction, the skip mode should be used very often.

78. MPEG2 (also known as H.262) adopted the same Skip mode as in MPEG1. Runs of skip mode macroblocks are encoded by the variable “macroblock_address_increment”, and the codes representing the runs of skip mode macroblocks are the same codes used by MPEG1. Ex. 2025 (H.262/MPEG-2) at 59-60.

79. The H.263 video coding standard adopted a different mechanism of indicating that a macroblock is not to be coded. Instead of designating a group of skip-mode macroblocks by indicating a number of macroblocks to be skipped, H.263 allocates the COD bit of each macroblock to indicate that the individual macroblock is not to be coded. While the steps defined for reconstructing a macroblock having COD=1 are identical to skip-mode reconstruction in other standards, the H.263 standard specification (Ex. 2026 (H.263) at 36) refers to these macroblocks as “Not coded” MB type, rather than “Skip” MB type. However, due to the similarities of how such blocks are reconstructed, “COD=1” macroblocks in H.263 were sometimes referred to as “skipped” macroblocks.

80. Although the development of the video coding standard that would eventually become H.264 began as improvements on the H.263 standard, it was recognized early in the development effort that assigning macroblocks not to be coded using individual COD bits was very wasteful compared with actually skipping macroblocks as in other standards. More than a year prior to the priority date of the ‘808 Patent, Gisle Bjontegaard, a main contributor to the development of the ongoing draft video coding model contributed a proposal a proposal to the April 2, 2001 Austin meeting, noting that using a single bit to signal “skip” for a macroblock “... has turned out to be very wasteful.” Ex. 2027 (VCEG-M29), Introduction. His proposal to return back to indicating runs of macroblocks to be skipped showed “...

gain for practically all sequences”, and “... significant gain is obtained for some “simple” sequences especially for high QP values.”

81. The meeting report detailing the activities of the April 2001 Austin meeting (Ex. 2028 (VCEG-MT1r7)) reported about the VCEG-M29 proposal:

... up to 36% gain (Akiyo), esp. low motion, high QP. Some minor loss of efficiency in isolated cases. Ought to be a big improvement for B pictures. Note: H.261 and H.262 had something similar and H.263's dropping this appears to have been a mistake. Ex. 2028, page 4, bottom.

The report then records that the group decided to adopt skip coding mode as proposed by Bjontegaard, and draft models after April 2001 (including the JM1 draft which provides the context for the ‘808 patent) indicated all “skip mode macroblocks” as macroblocks that are skipped by the “RUN” variable labeled “Number of Skipped Macroblocks”.

82. The coding format proposed by Bjontegaard for providing indication of the “skipped” macroblocks (i.e. skip mode macroblocks) was even more efficient at “skipping” macroblocks than the codes used in MPEG1 and MPEG2. Recall that examples cited in the MPEG1 specification showed that MPEG1 uses 16 bits to identify 40 macroblocks as “skipped”, and 26 bits to identify 70 macroblocks as “skipped”. The variable length codes proposed by Bjontegaard, and adopted into all later draft standards (including JM1 which is the context for the teachings of the ‘808 patent) use 11 bits to code a “RUN” that identifies 40 macroblocks as skipped, and

13 bits to code a “RUN” that identifies 70 macroblocks as skipped. Thus, for these two examples the average number of bits used for indicating each skip mode macroblock are .275 and .186 bits per skipped macroblock, respectively.

83. Petitioners appear to conflate a “skip mode macroblock” with any macroblock that is reconstructed in the same way that skip mode macroblocks are reconstructed. To highlight the flaw in this understanding, it should be noted that if a macroblock is assigned 16x16 Inter-prediction mode, and encodes zero values for both x- and y-components of its motion vector, and encodes zero values for all prediction errors, that macroblock would be reconstructed identically to the reconstruction of a skip mode macroblock. However, despite the fact that the reconstructed macroblock might look identical to what a reconstructed skip mode macroblock would look like, a POSITA would NOT understand this hypothetical macroblock to be a skip mode macroblock. Perhaps the most noteworthy difference between the two would be that the skip mode macroblock might use .186 bits (if it was included in a RUN of 70 “skipped” macroblocks) while the hypothetical macroblock described above might use 10-20 bits for coding the macroblock. As explained earlier in this declaration, a coding mode for a macroblock is not only the collection of operations to be applied to that macroblock, but also the bitrate requirements associated with the coding mode. As explained above, the

combination of the reconstruction processes and bitrate requirements provide the basis for “mode selection” in high-quality video coders.

84. For this reason, it is not enough for Petitioners to identify prior art that describe operations with some similarity to the operations disclosed in the ‘808 patent. For example, according to the agreed construction, “active” and “non-active” motion vectors calculated in ways that satisfy claim limitations must also be “... associated with each **skip mode macroblock**, ...”, where a POSITA understands that a “skip mode macroblock” can be one of the run of macroblocks that is identified by the “RUN” code of the JM1 syntax.

85. None of the prior art cited by Petitioner teach methods that are intended to be applied to “skip mode macroblocks”. Furthermore, most of the cited prior art have features that are incompatible with “skip mode macroblocks”. For example, any operation that requires even the smallest amount of information from the encoder is not compatible for application to “skip mode macroblocks”. In the JM1 example, described above, the 70 “skipped” macroblocks identified by the example coded “RUN” described above are allocated by the encoder to only 13 bits for all 70 of them. There is no place in the bitstream for any other bits related to any of these 70 “skipped” macroblocks. Besides the 13 bits, “skip mode macroblocks” are ignored, abandoned, and “skipped” in the transmitted bitstream. The decoder is entirely on its own in whatever operations it takes to generate a reconstruction of

any “skip mode macroblock.” The ’808 Patent provides an improved “skip coding mode” that addresses the issue with prior skip modes not being applicable in certain situations. The prior art cited by Petitioner does not appear to be addressing this same problem.

D. Technical Challenges Posed by Global Motion

86. Certain types of video effects, such as panning or zooming, result in large regions of macroblocks requiring motion vectors that are closely related to each other. In these situations, it is expected that there should be a way to encode the motion field (i.e. collection of motion vectors) much more efficiently than if they were unrelated to each other. The motion corresponding to these types of effects is called “global motion” and at least two proposals for exploiting the properties of global motion were under consideration at the time of the invention of the ’808. These proposals for efficiently coding motion were: “Global Motion Compensation” (or “GMC,” such as that used in H.263+) and “Global Motion Vector Coding” (“GMVC”). In both approaches, the encoder was required to signal information in the bitstream that would describe motion applicable to an entire image frame. (Ex. 1001 at 12:48-58). With GMC, a decoder would use that signaled information to warp a reference frame for use in motion compensated prediction. With GMVC, a decoder would rely on four signaled global motion vectors, one for each corner of a frame, and use a bilinear interpolation process based on the four global motion

vectors to determine the motion of any given segment of a frame. Both GMC and GMVC required more complex motion estimation operations to be done by encoders and greater amounts of information to be included in encoded bitstreams as compared with conventional skip coding. GMVC was proposed to the JVT as a solution to global motion (VCEG-O20). (Ex. 1001, 13:31-33).

87. While the inventor of the '808 Patent was aware of these other efforts to exploit global motion, he also recognized another consequence of "global motion" that severely undermined coding efficiency. In light of the importance of mode selection to high-quality coding (as explained earlier in this declaration), he understood the value of having a very low bitrate coding mode available as an option in the mode selection process. While the "Skip" mode provided the very low bitrate option for videos containing regions of stationary background, videos containing global, non-zero motion never used that option:

A problem with the approach adopted in JM1 of the JVT codec is that the assumption that skip mode is always the most probable is not valid. If the video sequence contains global motion (panning, zooming, etc.), skip mode is actually never used. In these cases compression efficiency is seriously degraded, especially at lower bit-rates, since the codec is forced to use high overhead macroblock coding modes. ['808, 12:41-47]

88. The '808 patent describes the technical problem it addresses as:

JM1 of the JVT codec, for example, has no special provision for taking account of global motion in video sequences. Therefore, when such motion is present it

causes the video encoder to select macroblock coding modes that explicitly model the motion. This leads to a significant degradation in coding efficiency, as the global motion component is encoded in every INTER coding macroblock (or sub-block). ['808, 13:51-58]

89. Due to these insights of the inventor, the invention of the '808 patent doesn't really attempt to solve the same problem as GMC and GMVC. Though all proposals relating to "global motion" were considered by the same working group of the JVT development team, the fact that the '808 invention was adopted into the standard while others were not adopted is not necessarily evidence that it is a better solution to the same problem. Instead, it is evidence that the inventor of the '808 found a better problem to address – a problem whose solution used absolutely no additional bitrate, contributed substantial efficiency improvement, while requiring relatively modest increased complexity. Because the solution is directed towards guiding "mode selection" to choose extremely inexpensive coding modes (in terms of bitrate) much more frequently than previously, it saves substantial bitrate on those macroblocks that use the invention, substantially increasing the bitrate available for coding other macroblocks.

90. The invention of the '808 Patent is described as a modification of the skip coding mode of the JM1 draft:

According to the invention, the coding modes used by encoder 600 correspond to those provided by JM1 of the JVT codec (shown in Table 3), with the exception that the SKIP mode is redefined to allow representation of global and regional motion. More specifically, the

SKIP mode is modified in such a way that a zero (non-active) motion vector or a non-zero (active) motion vector is associated with each skip mode macroblock, depending on the characteristics of the motion in image segments surrounding the macroblock in question. In the following this type of motion vector will be referred to as a “skip mode motion vector.”

Ex. 1001 at 17:43-53.

91. It is important to recognize that the modification of the JM1 SKIP mode disclosed in the ‘808 Patent involves the selection and calculation of the motion vector used in motion compensating a skip mode macroblock. The ‘808 patent does not disclose modifications related to, for example, how motion vectors are used to generate a motion compensated predictions, or how runs of “skipped” macroblocks are coded using the “RUN” parameter defined in JM1, or how the transmitted bitstream has absolutely no positions available for any bits associated with skip mode macroblocks except those bits used to represent the “RUN” parameter itself. Thus, a POSITA understands the invented “skip coding mode” to be just as inexpensive (in bitrate) as the JM1 skip coding mode, but improved in the way it finds motion vectors to use in its motion compensation. The stated objective is that the modified “skip coding mode” will be selected during “mode selection” more often than the original JM1 skip coding mode.

92. Key to the ’808 Patent’s skip coding mode is the ability to adapt to both active and non-active motion scenarios. This allows a single coding mode to either assign a non-active motion vector where appropriate or perform a motion vector

prediction to determine an active motion vector. A POSITA understands from the '808 specification that non-active motion vectors are always zero while active motion vectors are predicted, and thus, not necessarily zero. A predicted non-zero motion vector is capable of being a non-zero motion vector used for motion compensated prediction.¹ This means that a given block can be predicted from a group of pixels in a reference frame that is displaced by some motion vector. Non-active scenarios will always assign a zero motion vector. This means that motion compensated prediction is performed by copying a group of pixels from the reference frame with no displacement (a copy directly from the reference frame).

93. The '808 Patent achieves this improved skip coding mode through considering the motion characteristics of previously coded image segments surrounding the macroblock in question. I'll note that under the proposed construction, it is my opinion that the skip coding mode must look to "image segments" plural, meaning two or more surrounding image segments to perform this analysis. Upon considering the motion characteristics of previously coded image segments surrounding a skip coded macroblock, it is determined whether the skip coded macroblock should be associated with active or non-active motion. After this association is performed, a motion vector is generated for the skip coded block in

¹ It should be noted that the typical utility of an active motion determination is in the non-zero motion vector context.

one of two ways. Either a zero motion vector is generated (i.e., a (0,0) motion vector), or active motion vector parameters are generated (for example, using the motion vector prediction method of JM1).

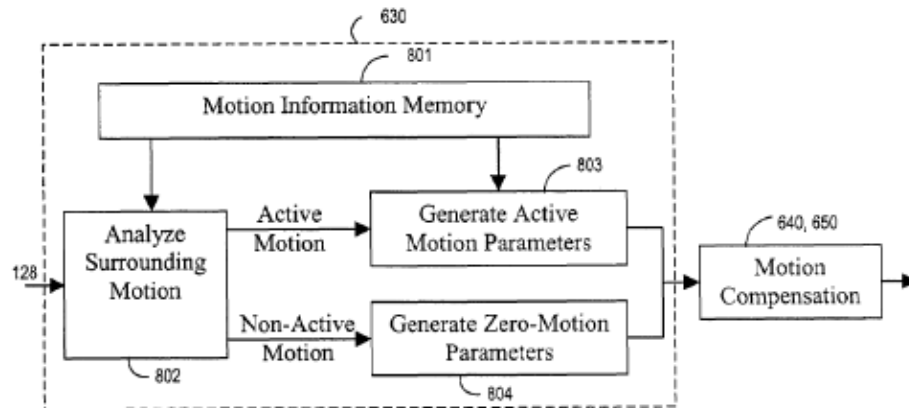


FIG. 8

'808 Patent, Figure 8 (Ex.1001)

94. Because the '808 Patent's skip coding mode calculates the motion vector to use in motion compensation entirely based on previously coded neighboring motion, the '808's newly defined "skip coding mode" meets the constraints of a JM1 skip mode macroblock: namely, that the only bits required for the invented skip coding mode are the bits used by JM1 for coding the "RUN" parameter, identifying skip mode macroblocks, and no additional bits are required:

This approach enables the motion analysis of the surrounding region performed in the encoder to be duplicated exactly in the decoder. This, in turn, means that according to the invention, no additional information must be sent to the decoder in order to model global or regional motion. [Ex. 1001, 14:60-64]

95. Also consistent with the unmodified features of the JM1 skip coding mode (as well as skip coding modes of all other video coding standards), the invented skip coding mode remains an extremely inexpensive coding option since it allocates no additional bits for representing either motion or residual error:

Depending on the coding mode, the compressed video data included in the bit-stream for an INTER-coded macroblock may comprise a combination of VLC encoded prediction error information for each block, motion vector information for the macroblock (or sub-blocks) and encoded control information including an indication of the coding mode used to encode the macroblock in question. If a macroblock is encoded in skip mode, no prediction error or motion vector information relating to the macroblock is included in the bit-stream. [Ex. 1001 at 20:43-55.]

96. While the objective of the ‘808 Patent was to introduce a skip coding mode that would be very frequently used in regions of videos having “global motion”, the real challenge was to achieve this objective without interfering with the success of the original JM1 skip coding mode in being very frequently used in regions of videos having stationary backgrounds. A novelty of the ‘808 invention lies in its success at offering a single, very inexpensive skip coding mode for both active and non-active scenarios while meeting the constraints of skip mode macroblocks, that no additional bits are required except, in the context of JM1, the small number of “RUN” parameter bits used to identify skip mode macroblocks.

97. The success of the ‘808 invention in achieving its objective is evidenced by the fact that it was adopted into the H.264 standard and is credited with at least a part of that standard’s impressive coding efficiency. Additional commentary on the ‘808 invention’s success in its objective of increasing the use of skip coding mode as a way of saving bitrate over a large number of macroblocks can be found in later reports. For example, a 2007 paper exploring additional improvements to the ‘808 contribution motivates its proposal with:

In general, H.264 SKIP mode macroblock has great impact on coding efficiency because about 30 – 70 % of macroblocks are set as skip mode. Ex. 2024 (Improvement of H.264 Skip Mode), Abstract.

98. A POSITA understands that these 30-70 % of macroblocks likely use an average of .15 - .25 bits for each macroblock, which is probably a negligible fraction of the bitrate available for coding each video frame. Thus, the remaining 30-70 % of macroblocks are able to be coded with perhaps twice as many bits as would have been available without the use of skip mode.

99. No prior art presented by Petitioner discloses or renders obvious a single coding mode that considers surrounding motion to determine whether an active or non-active motion vector should be associated with a skip mode macroblock. Petitioner puts forth combinations of modes that it alleges do either active or non-active motion. The prior art coding modes cited by petitioner either

always address active motion or always address non-active motion, like prior video coding standards.

IX. THE '808 PATENTS' PRIORITY DATE

100. I understand that in order to claim priority to a provisional application, the specification of the provisional must enable an ordinarily skilled artisan to practice the invention claimed in the non-provisional application. In my opinion, this requirement is met by the '808 Patent's provisional application, U.S. Provisional App. No. 60/365,072 (the "'072 Provisional") (Ex. 1005). I understand that the Board, in its institution decision, found that "Patent Owner does not [] show why the '072 provisional's written description supports any of the challenged claims." (Institution Decision, 46). I provided testimony regarding the '072 Provisional's support for the asserted claims in the ITC hearing which I will reference below to support my opinion. I note that in the Initial Determination of the ITC investigation, it was determined that "the asserted claims are entitled to the priority date of the provisional application." Ex. 2016 59.

101. The '072 Provisional was filed on March 15, 2002. (Ex. 1005, 1). The '072 Provisional incorporates JM1, which was the working draft of the H.264 Standard at that time, and discusses JM1's SKIP mode. The '072 Provisional explains that JM1's SKIP mode efficiency suffers because it relied on the "assumption of SKIP being always the most probable mode." Ex. 1005, ¶ 8. This is

not an accurate assumption when a video contains global motion, as JM1's SKIP is not capable of accurately representing global motion. Ex. 1005, ¶ 8. This is reflected in the '808 Patent's specification at 12:41-47:

A problem with the approach adopted in JM1 of the JVT codec is that the assumption that skip mode is always the most probable is not valid. If the video sequence contains global motion (panning, zooming, etc.), skip mode is actually never used. In these cases compression efficiency is seriously degraded, especially at lower bit-rates, since the coded is forced to use high overhead Mmacroblock [sic] coding modes.

See also, Ex. 1005 at ¶ 0008 (stating the same).

102. The '072 Provisional provides a redefinition of JM1's SKIP mode wherein "the SKIP mode Macroblocks in a video coding sequence adapt to the motion of the surrounding image segments." (Ex. 1005, ¶ 19). The '072 Provisional explains this is achieved through creating a new skip coding mode wherein "[i]f active motion is detected around the Macroblock to be coded/decoded, motion parameters conforming to the motion is generated and the Macroblock is motion compensated. [Thus], there is no additional information that needs to be transmitted from the encoder to the decoder." Ex. 1005, ¶ 20. The '072 Provisional provides a block diagram detailing how this new SKIP mode would classify and treat "active motion" and "non-active" motion.

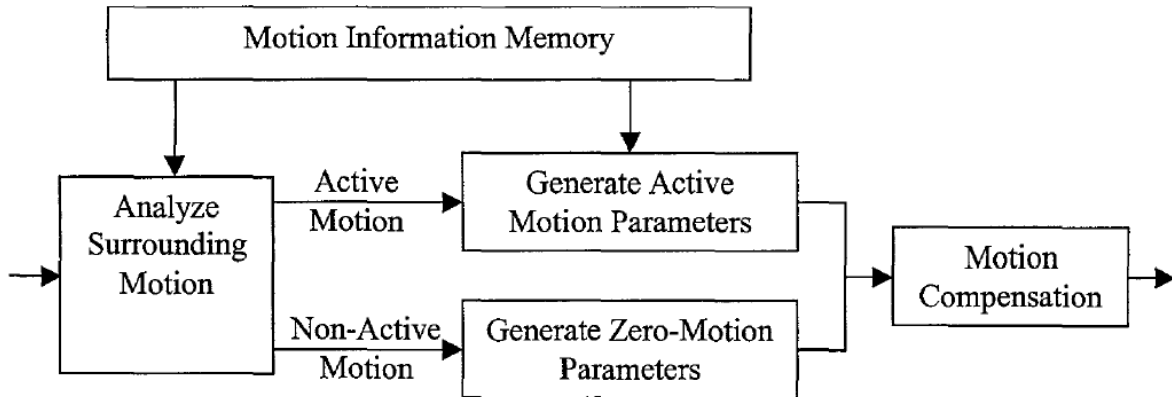


Figure 2: Encoding and decoding block for SKIP mode Macroblocks in a system according to a particular embodiment of the invention.

Ex. 1005 at Fig. 2.

103. The '072 Provisional provides written description support for at least two embodiments practiced by the Challenged Claims. I refer to these embodiments as the “threshold analysis” and the “conditional analysis.” A POSITA would understand that both of these embodiments are enabled by the disclosures of the '072 Provisional.

E. The “Threshold Analysis” Embodiment of the '072 Provisional

104. The Threshold Analysis is described in the '808 Patent at 19:28-51:

In a first preferred embodiment of the invention surrounding motion analysis block 802 classifies the motion in the region surrounding the macroblock according to the following three step procedure. Firstly, surrounding motion analysis block retrieves motion information for the macroblocks or sub-blocks surrounding the macroblock to be coded (i.e. previously encoded macroblocks neighboring the macroblock to be coded, as shown in FIG. 9) and generates a median motion vector prediction for the macroblock. The median motion vector prediction is

formed, for example, in a manner analogous to that used in motion vector prediction according to JM1 of the JVT codec (see T. Weigand: “Joint Model Number 1”, Doc. JVT-A003, Joint Video Team of ISO/IEC MPEG and ITU-T VCEG, January 2002). Next surrounding motion analysis block determines if any of the resulting motion vector components has an absolute value larger than a certain threshold value (for example half a pixel). If this condition is fulfilled, the motion is classified as “active motion”, otherwise it is classified as “non-active motion”. Finally, depending on the classification result, surrounding motion analysis block 802, sends an indication to either the active motion parameter generation block 803 or the zero motion parameter generation block 804 to in order to generate the appropriate skip mode motion parameters.

105. This embodiment is described in the '072 Provisional at ¶¶ 34-38:

In the preferred embodiment of the invention the ‘Analyze Surrounding Motion’ block consists of three steps:

[Step 1] – Generate median motion vector prediction for the Macroblock as for example in reference 1²

[Step 2] – If any of the resulting motion vector components has absolute value larger than a threshold (for example half a pixel) the motion is classified as ‘Active Motion’. Otherwise it is classified as ‘Non-Active Motion’.

[Step 3] – Depending on the classification result, activate the appropriate block to generating the motion parameters.

The ‘Generate Active Motion Parameters’ block in the preferred embodiment simply passes the median motion parameters, already generated in the ‘Analyze Surrounding Motion’ block, to the ‘Motion Compensation’ block. This minimizes the implementation complexity, since there is no need to generate additional motion parameters. The ‘Generate Zero-Motion Parameters’ block passes zero motion parameters to the ‘Motion Compensation’ block effectively causing the

² Reference 1 is JM1, which details a method for median motion vector prediction using three surrounding macroblocks to calculate a median motion vector. A POSITA would understand how to use JM1’s motion vector prediction method.

‘Motion Compensation’ block to copy the Macroblock from the reference frame.

106. While the Threshold Analysis utilizes JM1’s median motion vector prediction, the use of this motion vector in the reconstruction of skip mode macroblocks is a novel innovation of the ‘808 patent. In the Threshold Analysis embodiment, the median motion vector plays two independent roles in the reconstruction of skip mode macroblocks, each role being a novel innovation. First, the median motion vector is used to decide whether to use an “active” or “non-active” motion vector for the subsequent reconstruction of the skip mode macroblock. Petitioner has failed to identify any prior art teachings that provide each skip mode macroblock two options for the motion vector to use in reconstruction. Secondly, when a skip mode macroblock takes the “active” motion vector option, the median motion vector is used for reconstruction of the skip mode macroblock.

107. In my opinion, the Threshold Analysis enables a POSITA to practice the Challenged Claims, including the proposed construction of “skip coding mode.”

F. The “Conditional Analysis” Embodiment of the ’072 Provisional

108. The Conditional Analysis embodiment looks to whether stationary motion characteristics exist in image segments surrounding the macroblock in question. Depending on whether stationary motion information is present, the

Conditional Analysis assigns either “active” or “non-active” motion. The ’808 Patent provides this embodiment at 20:12-25:

In a second preferred embodiment of the invention the surrounding motion analysis block analyses the motion in vicinity of the macroblock to be coded and classifies it as either “active motion” or “non-active motion”. In the case of “active motion” the active motion parameter generation block is activated and in the case of “non-active motion” the zero motion parameter generation block is activated. In this embodiment the classification to the “non-active motion” category takes place if either or both of the two conditions below are true, otherwise the motion is classified as “active motion”:

Condition 1: The macroblock immediately above or the macroblock immediately to the left of the macroblock under consideration is not available (that is, is out of the picture or belongs to a different slice).

Condition 2: The macroblock or block immediately above, or the macroblock or block immediately to the left that are used in motion vector prediction for the 16×16 INTER mode has a zero motion vector and uses the latest picture as reference in motion compensation.

109. The ’072 Provisional provides adequate disclosure of the Conditional Analysis in paragraph 24:

The motion analysis in ‘Analyze Surrounding Motion’ block can be implemented in various ways. For example, continuance, velocity, or deviation of the surrounding motion can be included in the analysis. Also, the coding modes of the already processed Macroblocks can be included. For example, if there is one or more stationary neighboring Macroblocks, ‘Non-Active Motion’ can be declared.

110. Notably, the ’072 Provisional provides that “if there is one or more stationary neighboring Macroblocks, ‘Non-Active Motion’ can be declared.” Ex. 1005 at ¶ 24. In my opinion, a POSITA would understand the reference to “neighboring Macroblocks” in paragraph 24 to include reference to the macroblock

immediately above and the macroblock immediately to the left of skip mode macroblock being reconstructed. In addition, a POSITA would understand a “stationary” macroblock to be one that as a zero motion vector. Thus, in my opinion the Conditional Analysis enables a POSITA to practice the Challenged Claims, including the proposed construction of “skip coding mode.”

G. The Embodiments Disclosed in the '072 Provisional Practice the Challenged Claims

111. I understand that Petitioner contests whether the '072 Provisional provides written description for the following claim limitations:

- “forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector” (claims 1, 7);
- “providing in an encoded bitstream an indication of the skip coding mode” (claim 1);
- “receiving an indication of a skip coding mode for a first segment” (claim 7).

Pet. at 3.

- “A video encoder for encoding a video sequence” (claim 10);
- “A video decoder for decoding an encoded video sequence” (claim 16);

- “a coding controller for assigning a skip coding mode to a first segment” (claim 10);
- “a multiplexer for providing in an encoded bitstream an indication of the skip coding mode” (claim 10);
- “a demultiplexer for receiving an indication of a skip coding mode assigned to a first segment” (claim 16);
- “a motion estimation block for assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment” (claim 10).

Ex. 1003 at ¶ 50.

112. To support my opinion, I will walk through the independent claims, identifying support for each claim limitation within the provisional. I will address claims 7 and 16 together, identifying support for the relevant apparatus decoding portions and then proceed to claims 1 and 10.

113. The '072 Provisional provides support for claim limitations 7(pre), 16[pre], 7(a), and 16[a]:

Claim Limitation	Language	Exemplary Provisional Support
7(Pre); 16[pre]	A (method of) [video decoder for] decoding an encoded video sequence, the method comprising:	[0004], [0006], [0014], [0019], and [0021]
7(a); 16[a]	[a demultiplexer for] receiving an indication of a skip coding mode for a first segment;	[0006], [0007], [0014], [0017], [0020], [0022], Figs. 1 (referring to JM1, reference 1) and 2.

Code	Mode	Codewor
0	SKIP	1
1	16x16	001
2	16x8	011
3	8x16	00001
4	8x8	00011
...	...	...

Figure 1 : Macroblock modes for JM1

[0007] The SKIP mode indicates that the Macroblock is to be copied from the reference video frame. NxM modes in the table above indicate the size of the motion blocks. For example, if 16x8 mode is indicated, the Macroblock is divided into two subblocks of size 16x8 pixels each and both of these subblocks will have motion information of their own.

[0020] If active motion is detected around the Macroblock to be coded/decoded, motion parameters conforming to the motion is generated and the Macroblock is motion compensated. This way, there is no additional information that needs to be transmitted from the encoder to the decoder.

Ex. 1005 at Fig. 1, [0007], [0020]

114. The graphic above illustrates support for these claim limitations within the '072 Provisional. For example, Figure 1 provides coding modes which would be used in the decoding of an encoded video. Additionally, paragraph 7 provides that SKIP “indicates that the macroblock is to be copied from the reference video frame.” Ex. 1003 at ¶ 7. Paragraph 20 goes on to provide how the skip coding mode is redefined in the invention to address surrounding motion wherein “if active motion is detected around the Macroblock to be coded/decoded, motion parameters conforming to the motion is generated and the Macroblock is motion compensated.” Ex. 1003 at ¶ 20. In my opinion, a POSITA would understand that these paragraphs are disclosing “receiving an indication of a skip coding mode for a first segment” as challenged by Petitioner.

115. Dr. Havlicek also contends that the term “a demultiplexer for receiving an indication of a skip coding mode assigned to a first segment” (claim 16) is not disclosed in the provisional. I disagree with Dr. Havlicek’s opinion for several reasons. First, Figure 1 of the ’072 Provisional provides several coding modes along with a codeword for each mode. A POSITA would understand that a demultiplexer would be used to parse the bitstream and retrieve the indication of a skip coding mode. Additionally, I understand that Dr. Havlicek admitted that, when given the appropriate standard or method, a POSITA would understand to implement a demultiplexer in a decoder. Ex. 2014 at 20:6-15..

Claim Limitation	Language	Exemplary Provisional Support
7(b); 16[b]	[a motion compensated prediction block for] assigning either a <u>zero motion vector</u> or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment; and	[0014], [0007], [0011], [0017]-[0026], [0030]-[0038], and Figs. 2 and 3
7(c); 16[c]	[a motion compensated prediction block for] <i>forming a prediction</i> for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector.	[0004], [0007], [0014], [0017], [0032], [0033], and Fig. 2

Figure 2: Encoding and decoding block for SKIP mode Macroblocks in a system according to a particular embodiment of the invention.

[0014] In one embodiment of this invention, the SKIP mode Macroblocks in a video coding system adapt to the motion of the surrounding image segments. If active motion is detected around the Macroblock to be coded/decoded, motion parameters conforming to the motion is generated and the Macroblock is motion compensated.

[0024] The motion analysis in ‘Analyze Surrounding Motion’ block can be implemented in various ways. For example, continuance, velocity, or deviation of the surrounding motion can be included in the analysis. Also, the coding modes of the already processed Macroblocks can be included. For example, if there is one or more stationary neighboring Macroblocks, ‘Non-Active Motion’ can be declared.

Ex. 1005 at Fig. 2, [0014], [0024]

116. Turning to claims 7(b), 16[b], 7(c), 16[c], I point to paragraphs 14 and 24 along with Figure 2 of the ’072 Provisional. Paragraph 14 provides “[i]n one embodiment of this invention, the SKIP mode Macroblocks in a video coding system

adapt to the motion of the surrounding image segments. If active motion is detected around the Macroblock to be coded/decoded, motion parameters conforming to the motion is generated and the Macroblock is motion compensated.” Ex. 1003 at ¶ 14. A POSITA would understand that Figure 2 depicts the process for encoding and decoding a skip coded macroblock according to the invention, wherein either an active motion vector is assigned and active motion parameters are generated to be used in motion compensation, or non-active motion is assigned and a zero motion vector is to be used in motion compensation. A POSITA would be familiar with the concept of motion compensation and forming predictions using motion compensation. Thus, a POSITA would appreciate that the ’072 Provisional discloses “forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector” (claim 7, 16).

117. The ’072 Provisional also provides support for the encoding claims:

Claim Limitation	Language	Exemplary Provisional Support
1(Pre); 10[Pre]	A (method of) [video encoder for] encoding a video sequence, the method comprising:	[0004], [0014], [0019], and [0021]
1(a); 10[a]	<i>[a coding controller for]</i> assigning a skip coding mode to a first segment (of a first frame of the sequence);	[0006], [0007], [0008], [0014], [0017], [0022] and Fig. 2

[0019] In one possible embodiment of the invention the SKIP mode Macroblocks in a video coding system adapt to the motion of the surrounding image segments.

Code	Mode	Codeword
0	SKIP	1
1	16x16	001
2	16x8	011
3	8x16	00001
4	8x8	00011
...	...	...

Figure 1 : Macroblock modes for JM1

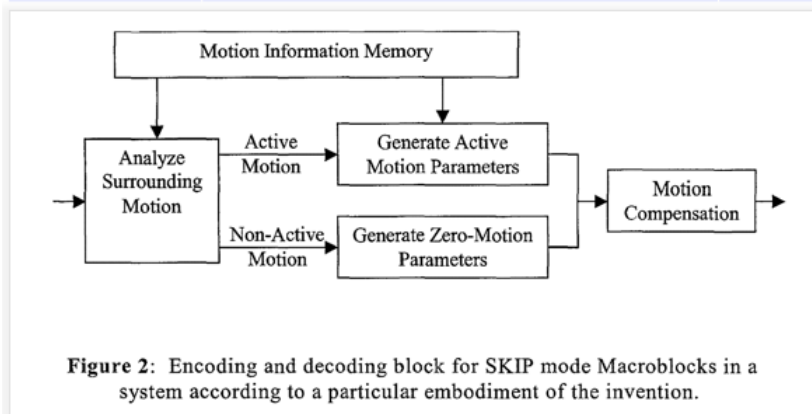
[0006] In a typical video codec, the image to be coded is divided into Macroblocks of size 16x16 pixels. Each of the Macroblocks is assigned a coding mode depending on the characteristics of the Macroblock and motion in the video sequence. The coding modes of one state of the art codec JM1 of the JVT (Joint Video Team) in reference 1 are described in figure 1.

[0008] A problem with the solution disclosed in reference 1 is that the assumption of SKIP being always the most probable mode is not valid. If the video sequence contains global motion (panning, zooming, etc.) the SKIP mode is actually never used. In these cases compression efficiency is seriously hurt especially on lower bitrates, since the codec is forced to use high overhead Macroblock modes.

Ex. 1005 at Fig. 1, [0006], [0008], [0019]

118. Paragraph 6 of the '072 Provisional states “[e]ach of the Macroblocks is assigned a coding mode depending on the characteristics of the Macroblock and motion in the video sequence.” Ex. 1003 at ¶ 6. As such, a POSITA would understand the '072 Provisional to disclose “a video encoder for encoding a video sequence” and “a coding controller for assigning a skip coding mode to a first segment.” A POSITA would understand that a coding controller is the structure corresponding to the assignment of coding modes, such as those disclosed in Figure 1. The coding controller of the '072 Provisional is adapted to use the JM1 coding modes with a modification to the skip mode. I further understand that Dr. Havlicek agreed that a POSITA would understand how to implement a coding controller into a video coding system. Ex. 2014 at 48:14–50:20.

Claim Limitation	Language	Exemplary Provisional Support
1(b); 10[b]	[a motion estimation block for] assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment; and	[0011]-[0012], [0014], [0017]-[0026], [0030]-[0038], and Figs. 2 and 3
1(c); 10[c]	[a motion estimation block for] forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector; and	[0004], [0014], [0017], [0032], [0033], and Fig. 2



Code	Mode	Codewor
0	SKIP	1
1	16x16	001
2	16x8	011
3	8x16	00001
4	8x8	00011
...	...	...

Figure 1 : Macroblock modes for JM1

Ex. 1005 at Figs. 1, 2

119. Once again, I look to Figures 1 and 2 to support my opinion that the '072 Provisional adequately discloses the claim limitation related to motion compensation. A POSITA would understand that a “motion estimation block” would be used by an encoder to assign either a zero motion vector or a predicted non-zero motion vector and forming a prediction based on this assigned motion vector. Figure 1 provides the various coding modes of JM1 and Figure 2 details how a skip coded block would be processed, with the final step being motion compensation.

Claim Limitation	Language	Exemplary Provisional Support
1(d); 10[d]	[a multiplexer for] providing in an encoded bitstream an indication of the skip coding mode, wherein no further motion vector information for the first segment is coded in the encoded bitstream.	[0004], [0023]

Code	Mode	Codeword
0	SKIP	1
1	16x16	001
2	16x8	011
3	8x16	00001
4	8x8	00011
...	...	...

Figure 1 : Macroblock modes for JM1

[0004] The invention relates generally to a telecommunication system and more in particular to a method for motion compensation in video coding.

[0023] There are many possible implementations for the present invention and one advantage of the invention is that there is no additional information that needs to be transmitted from the encoder to the decoder.

Ex. 1005 at Fig. 1, [0004], [0023]

120. Finally, I look to paragraphs 4 and 23 along with Figure 1 to inform my opinion regarding limitations 1(d) and 10[d]. Paragraph 4 explains that “[t]he invention relates generally to a telecommunication system and more in particular to a method for motion compensation in video coding. Ex. 1003 at ¶ 4. Paragraph 23 explains that one of the benefits of the invention is that “no additional information [] needs to be transmitted from the encoder to the decoder.” Ex. 1003 at ¶ 23. A POSITA would readily understand that in video coding, an encoder would provide an indication of the skip coding mode in a bitstream and that no further information need be sent. Additionally, a POSITA would understand that a multiplexer is commonly used by encoders to form the encoded representation of the bitstream.

121. Consistent with my testimony on this topic in the related ITC Investigation, support for each claim limitation can be found in the provisional application as shown by the chart below:

U.S. PATENT NO. 7,532,808	EXEMPLARY CITATIONS TO U.S. PROVISIONAL APPLICATION NO. 60/365,072
1. [A] A method of encoding a video sequence, the method comprising:	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method of encoding a video sequence. <i>See e.g.,</i> U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0019], and [0021].
[B] assigning a skip coding mode to a first segment of a first frame of the sequence;	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method of assigning a skip coding mode to a first segment of a first frame of the sequence. <i>See e.g.,</i> U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0006], [0007], [0014], [0017], [0018], [0022], FIG. 2, and FIG. 3.
[C] assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment; and	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method of assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment <i>See e.g.,</i> U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
[D] forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method of forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned

U.S. PATENT NO. 7,532,808	EXEMPLARY CITATIONS TO U.S. PROVISIONAL APPLICATION NO. 60/365,072
motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector; and	<p>motion vector is one of the zero motion vector and the predicted non-zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0017], [0018], [0019], [0020], [0021], [0024], [0025], [0026], [0027], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
[E] providing in an encoded bitstream an indication of the skip coding mode, wherein no further motion vector information for the first segment is coded in the encoded bitstream.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method of providing in an encoded bitstream an indication of the skip coding mode, wherein no further motion vector information for the first segment is coded in the encoded bitstream</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0023].</p>
2. A method according to claim 1, wherein the second segment is a previously encoded segment neighboring the first segment.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 1, wherein the second segment is a previously encoded segment neighboring the first segment.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0018], [0019], [0020], [0021], [0024], [0025], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], and FIG. 3.</p>
6. A method according to claim 1, wherein if the second segment has zero motion vector, the zero motion vector is assigned for skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 1, wherein if the second segment has zero motion vector, the zero motion vector is assigned for skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033],</p>

U.S. PATENT NO. 7,532,808	EXEMPLARY CITATIONS TO U.S. PROVISIONAL APPLICATION NO. 60/365,072
motion vector.	[0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
7. [A] A method of decoding an encoded video sequence, the method comprising:	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method of decoding an encoded video sequence. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0019], and [0021].
[B] receiving an indication of a skip coding mode for a first segment;	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method of receiving an indication of a skip coding mode for a first segment. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0006], [0007], [0014], [0017], [0018], [0022], FIG. 2, and FIG. 3.
[C] assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment; and	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method of assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
[D] forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method of forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0017], [0018], [0019],

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and the predicted non-zero motion vector.	[0020], [0021], [0024], [0025], [0026], [0027], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
9. A method according to claim 7, wherein if a segment in a previously decoded region Surrounding the first segment has zero motion vector, the zero-motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 7, wherein if a segment in a previously decoded region Surrounding the first segment has zero motion vector, the zero-motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0018], [0019], [0020], [0021], [0024], [0025], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], and FIG. 3.
10. [A] A video encoder for encoding a video sequence, the encoder comprises:	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a video encoder for encoding a video sequence, <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0019], and [0021].
[B] a coding controller for assigning a skip coding mode to a first segment;	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a coding controller for assigning a skip coding mode to a first segment. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
[C] a motion estimation block for	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a motion estimation block for

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assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment; and	<p>assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
[D] forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector; and	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0017], [0018], [0019], [0020], [0021], [0024], [0025], [0026], [0027], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
[E] a multiplexer for providing in an encoded bitstream an indication of the skip coding mode, wherein no further motion vector information for the first segment is coded in the encoded bitstream.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a multiplexer for providing in an encoded bitstream an indication of the skip coding mode, wherein no further motion vector information for the first segment is coded in the encoded bitstream</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0023].</p>
11. An encoder according to claim 10, wherein the second segment is a previously	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses an encoder according to claim 10, wherein the second segment is a previously encoded segment neighboring the first segment

U.S. PATENT NO. 7,532,808	EXEMPLARY CITATIONS TO U.S. PROVISIONAL APPLICATION NO. 60/365,072
encoded segment neighboring the first segment.	<i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0018], [0019], [0020], [0021], [0024], [0025], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], and FIG. 3.
15. An encoder according to claim 10, wherein if a segment in a region surrounding the first segment has zero motion vector, the encoder is arranged to assign the zero motion vector for the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses an encoder according to claim 10, wherein if a segment in a region surrounding the first segment has zero motion vector, the encoder is arranged to assign the zero motion vector for the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0017], [0019], [0023], [0024], [0025], and FIG. 2.
16. [A] A video decoder for decoding an encoded video sequence, the decoder comprising:	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a video decoder for decoding an encoded video sequence, the decoder comprising <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0019], and [0021].
[B] a demultiplexer for receiving an indication of a skip coding mode assigned to a first segment;	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a demultiplexer for receiving an indication of a skip coding mode assigned to a first segment <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0023].
[C] a motion compensated prediction	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a motion compensated prediction

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block for assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment; and	<p>block for assigning either a zero motion vector or a predicted non-zero motion vector for the skip coding mode for the first segment based at least in part on the motion information of a second segment neighboring the first segment</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
[D] forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses forming a prediction for the first segment with respect to a reference frame based at least in part on the assigned motion vector for the skip coding mode, wherein the assigned motion vector is one of the zero motion vector and the predicted non-zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0017], [0018], [0019], [0020], [0021], [0024], [0025], [0026], [0027], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
20. A decoder according to claim 16, wherein if a segment in a region surrounding the first segment has zero motion vector, the zero motion vector is assigned for the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a decoder according to claim 16, wherein if a segment in a region surrounding the first segment has zero motion vector, the zero motion vector is assigned for the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0017], [0019], [0023], [0024], [0025], and FIG. 2.</p>

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of the reference frame associated with the zero motion vector.	
21. A multimedia terminal, comprising an encoder according to claim 10.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a multimedia terminal, comprising an encoder according to claim 10. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0019], and [0021].
22. A multimedia terminal, comprising a decoder according to claim 16.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a multimedia terminal, comprising a decoder according to claim 16. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [0014], [0019], and [0021].
23. A method according to claim 1, wherein if the second segment has a non-zero motion vector, the method further comprising deriving the predicted non-zero motion vector based at least in part on the motion vector of the second segment; and the predicted non-zero motion vector is assigned for the skip coding mode of the first segment; and the prediction for the first segment is formed by a motion compensated prediction with respect to the reference frame based at least in part on the predicted non-zero motion vector.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 1, wherein if the second segment has a non-zero motion vector, the method further comprising deriving the predicted non-zero motion vector based at least in part on the motion vector of the second segment; and the predicted non-zero motion vector is assigned for the skip coding mode of the first segment; and the prediction for the first segment is formed by a motion compensated prediction with respect to the reference frame based at least in part on the predicted non-zero motion vector. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.

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<p>24. A method according to claim 1, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from the reference picture, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p>	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 1, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from the reference picture, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p> <p><i>See e.g.,</i> U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
<p>25. A method according to claim 1, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from a second reference picture immediately preceding the picture second segment belongs to, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment</p>	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 1, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from a second reference picture immediately preceding the picture second segment belongs to, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p> <p><i>See e.g.,</i> U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>

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of the reference frame associated with the zero motion vector.	
28. A method according to claim 1, further comprising: deriving the predicted non-zero motion vector based at least in part on the motion vector of the second segment.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 1, further comprising: deriving the predicted non-zero motion vector based at least in part on the motion vector of the second segment</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
29. A method according to claim 1, further comprising: deriving the predicted non-zero motion vector based at least in part on the motion vector of the second segment and motion vector of a third segment neighboring the first segment.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 1, further comprising: deriving the predicted non-zero motion vector based at least in part on the motion vector of the second segment and motion vector of a third segment neighboring the first segment.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
30. A method according to claim 1, wherein no residual information is provided for the first segment in the encoded bitstream.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 1, wherein no residual information is provided for the first segment in the encoded bitstream.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004] and [0023].</p>
32. A method according to claim 7, wherein if the second segment has a	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 7, wherein if the second segment has a zero motion

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zero motion vector, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.	<p>vector, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
34. A method according to claim 7, wherein if the second segment has a non-zero motion vector, the method further comprising deriving the predicted non zero motion vector based at least in part on the motion vector of the second segment; and the predicted non-zero motion vector is assigned for the skip coding mode of the first segment; and the prediction for the first segment is formed by a motion compensated prediction with respect to the reference frame based at least in part on the predicted on-zero motion vector.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 7, wherein if the second segment has a non-zero motion vector, the method further comprising deriving the predicted non zero motion vector based at least in part on the motion vector of the second segment; and the predicted non-zero motion vector is assigned for the skip coding mode of the first segment; and the prediction for the first segment is formed by a motion compensated prediction with respect to the reference frame based at least in part on the predicted on-zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
36. A method according to claim 7, wherein if the	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 7,

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<p>second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from the reference picture, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p>	<p>wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from the reference picture, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
<p>39. A method according to claim 7, further comprising: deriving the predicted non-zero motion vector based at least in part on the motion vector of the second segment.</p>	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 7, further comprising: deriving the predicted non-zero motion vector based at least in part on the motion vector of the second segment.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
<p>40. A method according to claim 7, further comprising: deriving the predicted non-zero motion vector based at least in part on the motion vector of the second segment and motion vector of a third</p>	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 7, further comprising: deriving the predicted non-zero motion vector based at least in part on the motion vector of the second segment and motion vector of a third segment neighboring the first segment.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024],</p>

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segment neighboring the first segment.	[0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
41. A method according to claim 7, wherein no residual information is provided for the first segment in the encoded bitstream.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 7, wherein no residual information is provided for the first segment in the encoded bitstream. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004] and [0023].
43. A method according to claim 7, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from a second reference picture immediately preceding the picture second segment belongs to, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 7, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from a second reference picture immediately preceding the picture second segment belongs to, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
44. An encoder according to claim 10, wherein if the second segment has a non-zero motion vector, the motion estimation block	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses an encoder according to claim 10, wherein if the second segment has a non-zero motion vector, the motion estimation block is further arranged to derive the predicted non-zero motion vector based at least in part on the motion vector of

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is further arranged to derive the predicted non-zero motion vector based at least in part on the motion vector of the second segment; and the predicted non-zero motion vector is assigned for the skip coding mode for the first segment; and the prediction for the first segment is formed by a motion compensated prediction with respect to the reference frame based at least in part on the predicted non-zero motion Vector.	<p>the second segment; and the predicted non-zero motion vector is assigned for the skip coding mode for the first segment; and the prediction for the first segment is formed by a motion compensated prediction with respect to the reference frame based at least in part on the predicted non-zero motion Vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
47. An encoder according to claim 10, wherein the motion estimation block further arranged to derive the predicted non-zero motion vector based at least in part on the motion vector of the second segment.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses an encoder according to claim 10, wherein the motion estimation block further arranged to derive the predicted non-zero motion vector based at least in part on the motion vector of the second segment.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
48. An encoder according to claim 10, wherein the motion estimation block further arranged to derive the predicted non-zero	U.S. Provisional Application No. 60/365,072 (EX. 1005) an discloses encoder according to claim 10, wherein the motion estimation block further arranged to derive the predicted non-zero motion vector based at least in part on the motion vector of the second segment and motion vector of a third segment

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motion vector based at least in part on the motion vector of the second segment and motion vector of a third segment neighboring the first segment.	neighboring the first segment. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
49. An encoder according to claim 10, wherein no residual information is provided for the first segment in the encoded bitstream.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses an encoder according to claim 10, wherein no residual information is provided for the first segment in the encoded bitstream. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004] and [0023].
51. An encoder according to claim 10, wherein if the second segment has a zero motion vector, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses an encoder according to claim 10, wherein if the second segment has a zero motion vector, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
52. An encoder according to claim 10, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses an encoder according to claim 10, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from the reference picture, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a

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from the reference picture, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.	<p>corresponding segment of the reference frame associated with the zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
<p>53. An encoder according to claim 10, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from a second reference picture immediately preceding the picture second segment belongs to, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p>	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses an encoder according to claim 10, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from a second reference picture immediately preceding the picture second segment belongs to, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
<p>54. A decoder according to claim 16, wherein if the second segment has a</p>	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a decoder according to claim 16, wherein if the second segment has a zero motion</p>

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zero motion vector, the zero-motion vector is assigned to the skip coding mode for the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.	<p>vector, the zero-motion vector is assigned to the skip coding mode for the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
58. A decoder according to claim 16, wherein the motion estimation block further arranged to derive the predicted non-zero motion vector based at least in part on the motion vector of the second segment.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a decoder according to claim 16, wherein the motion estimation block further arranged to derive the predicted non-zero motion vector based at least in part on the motion vector of the second segment.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.</p>
59. A decoder according to claim 16, wherein the motion estimation block further arranged to derive the predicted non-zero motion vector based at least in part on the motion vector of the second segment and motion vector of a third segment neighboring the first segment.	<p>U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a decoder according to claim 16, wherein the motion estimation block further arranged to derive the predicted non-zero motion vector based at least in part on the motion vector of the second segment and motion vector of a third segment neighboring the first segment.</p> <p><i>See e.g.</i>, U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033],</p>

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	[0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
60. A decoder according to claim 16, wherein no residual information is provided for the first segment in an encoded bitstream.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a decoder according to claim 16, wherein no residual information is provided for the first segment in an encoded bitstream. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004] and [0023].
62. A decoder according to claim 16, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from the reference picture, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion Vector.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a decoder according to claim 16, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from the reference picture, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion Vector. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
63. A decoder according to claim 16, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from a second reference picture immediately preceding the picture second segment belongs	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a decoder according to claim 16, wherein if the second segment has a zero motion vector and the second segment is predicted using motion-compensated prediction from a second reference picture immediately preceding the picture second segment belongs to, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.

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to, the zero motion vector is assigned to the skip coding mode of the first segment and the prediction for the first segment is formed with respect to a corresponding segment of the reference frame associated with the zero motion vector.	<i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.
64. A decoder according to claim 16, wherein no further motion vector information for the first segment is retrieved from an encoded bitstream.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a decoder according to claim 16, wherein no further motion vector information for the first segment is retrieved from an encoded bitstream. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004] and [0023].
65. A method according to claim 7, wherein no further motion vector information for the first segment is retrieved from the encoded bitstream.	U.S. Provisional Application No. 60/365,072 (EX. 1005) discloses a method according to claim 7, wherein no further motion vector information for the first segment is retrieved from the encoded bitstream. <i>See e.g.</i> , U.S. Provisional Application No. 60/365,072 (EX. 1005) at [0004], [00014], [0017], [0018], [0019], [0020], [0021], [0022], [0023], [0024], [0025], [0026], [0030], [0031], [0032], [0033], [0034], [0035], [0036], [0037], [0038], FIG. 2, and FIG. 3.

122. In my opinion, the '072 Provisional provides adequate support to enable a POSITA to practice the Challenged Claims of the '808 Patent.

X. THE GROUNDS IN THE PETITION DO NOT ANTICIPATE OR RENDER OBVIOUS THE CHALLENGED CLAIMS

A. Ground 1: Karczewicz

123. In my opinion, Intl. Pat. Pub. No. WO 01/11891 (“Karczewicz”) does not anticipate or render obvious the challenged claims of the ’808 Patent. Karczewicz is titled “Apparatus and method for compressing a motion vector field” and names Marta Karczewicz, Jani Lainema, and Bogdan-Paul Dobrin as inventors.

i. Karczewicz Overview

124. Karczewicz discloses a method and apparatus for coding a video sequence using affine motion vector fields. (Ex. 1006, 1:7-8). Karczewicz teaches various methods for coding and predicting motion vector fields with affine motion modeling. (*Id.*, 1:9-10, 14:2-5, 31:14-25). Motion vector fields are three-dimensional space representations of motion projected onto an image. Karczewicz describes the use of motion coefficients to weight six basis functions common to the encoder and decoder for use with motion vector fields that represent different types of motion, such as rotation and skewing. Affine motion modeling is not a coding mode, but rather a method of modeling motion. This method of motion modeling was not implemented in any of the major video coding standards such as MPEG-1, H.263, or H.264. *See id.* at 9:7-11. Instead, H.263 and H.264 utilize translational motion vectors that represent straight line movement in the x and y directions. *Id.* A POSITA would understand that Karczewicz is directed to providing ways of coding affine

motion coefficients (and refinement coefficients in the case of affine motion field prediction), not novel coding modes.

125. Considering this context provided for Karczewicz, it is my opinion that Petitioner's Ground 1 fails to invalidate the '808 Patent. Petitioners assert that Karczewicz discloses different coding modes, however, as explained above, that is incorrect. Karczewicz does not discuss coding modes, but rather different methods for representing affine motion. Karczewicz states "there are several different ways in which a given segment can be coded." (Ex. 1006, 17:1-2). A POSITA would understand that Karczewicz is describing different methods of utilizing affine motion fields in coding a segment.

126. I understand that Petitioner asserts that Karczewicz discloses five "coding modes." (Pet., 18–19). The first three "modes" are allegedly described on Ex. 1006, page 17. However, the authors make clear that these "modes" are not compatible with "skip coding" modes. First, the authors state:

The choice of which option to use is made in the encoder on the basis of the "rate-distortion" considerations ..."
(Ex. 1006, 17:2-4).

Since the choice is made at the encoder, based on information only available to the encoder, the choice itself needs to be transmitted to the decoder, in addition to any other information required by the coding "mode." For "skip mode macroblocks" the only available bits are those that represent the skip mode, such as the "RUN"

parameter. Second, the authors summarize the bit requirements of all 3 modes described on page 17:

Basically, there are two types of information that must be transmitted to the decoder in order to enable correct reconstruction of a given segment. These are: 1.) selection information, enabling the decoder to select the correct neighboring segment(s) to use in prediction; 2.) motion coefficient information. Whenever a segment is coded using a prediction field, whether there is an associated refinement field or not, it is necessary to provide information about the neighboring segment(s) used in the prediction. (Ex. 1006, 17:19-25).

As no bits are allowed to be transmitted to support “skip mode macroblock” reconstruction, these three “modes” do not qualify as processes that can be applied to skip mode macroblocks.

127. The other two “modes” cited by Petitioner are described on Ex. 1006, page 31, and correspond to INTRA coding mode, and the standard, prior-art skip mode of MPEG1, MPEG2, or JVT-B118. The fifth option identified by Petitioner (i.e. prior art skip coding mode) does qualify as a process that can be applied to skip mode macroblocks but bears no resemblance to the ‘808 skip coding mode, since it corresponds exactly to the prior art identified in the ‘808 specification. A key difference between the ‘808 invention and these “coding modes” from Karczewicz cited by Petitioner involves a choice made at the encoder based on information not available to the decoder, whereas the ‘808 invention involves a choice made at the

decoder based on information already available at the decoder deciding between an “active” or “non-active” process to apply to reconstructing skip mode macroblocks.

128. Petitioner shows persistent confusion between a statement that a value, field, or segment equals zero, and a statement that a value, field, or segment is not coded. For example, on various occasions Petitioner points out that the affine motion fields described in Karczewicz might have a zero value. This zero value affine motion field is computed and influences a choice made by the encoder, but this needs to be used by the decoder, which means that the zero value must be coded and transmitted. This is distinct from the ’808 Patent’s process for choosing whether a zero (non-active) or non-zero (active) motion vector should be associated with a skip coded block based on motion characteristics of image segments surrounding a given skip mode macroblock. The ’808 offers an improved approach to reconstructing “skip mode macroblocks”, while the Karczewicz teachings, even when they produce zero-valued results, are incompatible with processing “skip mode macroblocks”. Dr. Havlicek’s understanding of “active” and “non-active,” as found in the agreed upon portion of the claim construction confirms this. Ex. 2014 at 129:21-130:14 (agreeing that a non-active motion vector will always be zero); 130:18-131:5 (“active means not necessarily zero”); 133:11-134:5. Karczewicz provides no disclosure of assigning a motion vector generated for a block based on

an active/non-active classification made at the decoder through considering surrounding motion.

129. Petitioner again appears confused by the distinction between “zero-valued” information and information that is “not-coded” when stating that “Karczewicz does not discuss what happens if a prediction error of zero is calculated[, but a] POSITA would have found it obvious ... to not send prediction error if the prediction error was calculated as zero.” (Pet. 20). A POSITA would understand that prediction error that is being coded must always correspond to some bits being inserted into the bitstream indicating the value of that error. If the prediction error is zero, bits representing the value “0” must be inserted in the bitstream. Petitioner’s assertion that “A POSITA would have understood where prediction error is calculated to be zero, these standards would simply send the code signaling the end of a segment” is inapposite to the inclusion of residual information. First, a POSITA would understand that a mode capable of using residual information must signal whether or not the residual information is included for a block. Second, the end of segment signal is irrelevant as to whether prediction error is coded. Petitioner’s misconceptions of the consequences of “zero-valued” prediction errors computed by the encoder prevents us from understanding clearly how its new alleged “coding mode” found in Karczewicz would treat prediction error. Is there some suggestion of a mechanism to inform a decoder whether prediction error is or is not

present? I find no such suggestion in Karczewicz, and Petitioner fails to identify any related teachings in Karczewicz. Petitioner is also silent on how this would relate to any consideration of surrounding motion as required by all parties' proposed constructions. I am unaware of any assertion by Petitioner that Karczewicz would be modified to direct the decoder to consider the motion characteristics in surrounding image segments to determine how to generate motion vectors (active or non-active).

130. Even if we ignore any bitrate used to represent prediction error (zero or non-zero), Petitioner is mistaken to suggest that a reconstruction consisting only of a prediction field does not require any bits to be transmitted. Karczewicz teaches the opposite:

Basically, there are two types of information that must be transmitted to the decoder in order to enable correct reconstruction of a given segment. These are: 1.) selection information, enabling the decoder to select the correct neighboring segment(s) to use in prediction; 2.) motion coefficient information. Whenever a segment is coded using a prediction field, whether there is an associated refinement field or not, it is necessary to provide information about the neighboring segment(s) used in the prediction. (Ex. 1006, 17:19-25).

Whenever a segment is represented by a prediction field calculated at the encoder using the teachings of Karczewicz, the encoder chooses how it uses neighboring segment information to produce the best prediction, and the encoder needs to send the choices it makes to the decoder for the prediction to be useful in reconstructing

the segment. Thus, such an approach is incompatible with the reconstruction of skip mode macroblocks, which receive no information at all from the encoder other than an indication that the macroblock has been skipped.

131. I also disagree with Petitioner’s assertion that a POSITA would have understood that two “separate coding modes” correspond to the alleged “two independent functionalities” of the ’808 Patent’s skip coding mode. (Pet. 22). First of all, one of the two “coding modes” that Petitioner refers to is the one discussed in the previous few paragraphs, which conclude that this “coding mode” is not even compatible with the reconstruction of any “skip mode macroblock”. Secondly, Petitioner’s assertion only refers at most to two of the at least three functionalities required of the ’808 invention. In order for the ’808 invention to be suitable for coding skip mode macroblocks (which have no possibility for information other than the fact they are skipped), another consideration required by the invention is a consideration of surrounding motion to be performed *at the decoder* in order to classify the motion as either “active” or “non-active” motion. (An encoder would also need to perform this functionality as part of its mode selection process when evaluating the skip coding mode.) Petitioner fails to identify (and I am unable to find) any teachings in Karczewicz for providing this functionality.

132. It is important to emphasize that the difference between the various types of analyses that are disclosed in Karczewicz and the type required for the ’808

invention is more significant than only the place where it is performed. The analysis performed at the encoder *uses* the segment (macroblock) being coded in the analysis it performs, for calculating all the cost functions that the encoder uses for making its choices. (See, for example, Claim 61) The analysis performed at the decoder that is required by the '808 invention *cannot use* the segment being coded. A decoder is not capable of performing this type of analysis because 1) a decoder does not choose how to code a block, and 2) a decoder does not have the information necessary to perform this analysis (uncompressed or RAW data).

133. I understand that Petitioner also relies on Karczewicz's disclosure of "motion coefficient indication" (MCI) bits to support its argument that Karczewicz invalidates the '808 Patent. To begin with, Petitioners are incorrect in stating:

... a POSITA would have understood a zero MCI bit indicates that a segment is assigned a "skip coding mode."
(Pet. 22).

As explained multiple times in the paragraphs above: "Whenever a segment is coded using a prediction field, whether there is an associated refinement field or not, it is necessary to provide information about the neighboring segment(s) used in the prediction." (Ex. 1006, 17:22-25). A POSITA would understand the fact that any information at all is required for performing a coding mode makes it incompatible with the basic requirements of a "skip coding mode".

134. But even if we ignore the fact that “modes” having a zero MCI are not even compatible with the requirements of skip mode macroblocks, any indicator, like MCI, that is active for multiple encoder choices for coding various “modes” is not suitable as an indicator of “skip coding mode”. This is because once a “skipped” macroblock is assigned to be skipped, it is not possible for it is not possible for any additional information to be associated with it. Without knowing the reason, among multiple possible reasons, the encoder had for skipping a particular macroblock, the decoder has no way of knowing which reconstruction process the encoder expects to be used to reconstruct the said skipped macroblock.

135. As Dr. Havlicek explained in his deposition, signaling either one of the two proposed “modes” that allegedly constitute the ’808 Patent’s skip coding mode would require not only the MCI bit but also an additional indication in the bitstream to inform the decoder of the decoding process to be used. Ex. 2014 at 149:7-19; 153:10-21. In short, Dr. Havlicek’s proposed combination of “modes” is not a combination at all. It is two distinct modes that require explicit signaling of each “mode” in the bitstream. It is not clear how a POSITA would achieve a modification in which these two “modes” are combined, as the function of the suggested single coding mode would vary greatly from the function of any “mode” described in Karczewicz, much less an unclear combination of them.

136. Petitioner’s citing that “the decision to code a second segment with [zero motion vector] or [potential non-zero motion vector] depends on the motion characteristics in the neighboring segment(s)” (Pet. 23) accurately characterizes Karczewicz’s disclosures relating to mode selection as performed by the encoder. However, the second “assigning” element of ‘808 Claim 1 does not merely require the assigning of a zero motion vector or a predicted non-zero motion vector ...”, but also that the “assign(ed)” motion vector is “... for the skip coding mode for the first segment”. Regardless of what features the “assigning” process might have at the encoder, the fact that it is performed at the encoder, and that “skip mode macroblocks” receive no bits that might communicate the “assigned motion vector” to the decoder, make it clear that any “assigned” motion vector cited by Petitioner is not “... for the skip coding mode for ...” any segment being decoded, and thus does not meet the second “assigning” limitation of ‘808’s Claim 1.

137. At least for the reasons stated above, Karczewicz does not teach a “skip coding mode” as described in the ’808 Patent and does not invalidate the Challenged Claims of the ’808 Patent.

ii. A POSITA would not have been motivated to combine two of Karczewicz’s mutually exclusive modes of operation

138. As discussed above, Karczewicz discloses an MCI bit that provides information regarding the presence of refinement motion coefficients for a given block. The MCI bit is set to zero when no refinement information is present and is

set to one when refinement information is present. The sole function of the MCI bit is to instruct the decoder as to whether it should expect to receive refinement information. Ex. 1006, 37:5-13. The MCI bit is not an indication of a coding mode as it provides no information as to the coding mode selected for a macroblock or whether the block is to be represented by a motion prediction field. *Id.* 17:8-18, 31:22-25. Karczewicz discloses a separate signaling in the bitstream for the disclosed coding options. (See, e.g., Ex. 1006, Figure 2 (signaling both prediction motion vector field and refinement motion vector field information)). Dr. Havlicek notes this in his deposition testimony, referring to this as “the otherwise nameless bit” that provides an indication as to whether “a prediction field” is used for the block or not. Ex. 2014 at 153:10-154:7.

139. I understand that the Board, for institution purposes, found Petitioner’s arguments regarding Karczewicz persuasive because the MCI can be set to zero in two coding scenarios. Institution Decision at 31. The first scenario is where a segment is coded “using a zero-motion vector field, e.g., a copy from the reference frame.” (*Id.*) This instructs that the segment is to always be assigned a zero motion vector. The second scenario is where a segment is “represented as a prediction field only ... when the segment can be adequately represented in terms of the motion field of one or more of its previously coded neighbors.” (*Id.*). In this scenario, it is indicated that the segment is assigned a predicted motion vector field. While the

MCI bit is set to zero for both of these scenarios in Karczewicz, it does not delineate between the two situations. As discussed above, additional information is required to indicate how the segment has been encoded and is to be decoded.

140. In my opinion, it is unclear how a POSITA “would have been able to fit those modes together.” I.D. at 35. It is also unclear how a POSITA would have any expectation of success in doing so, particularly given that it is unclear what putting the “modes” together would look like. A segment can only have one coding mode at a time. Ex. 2014 at 66:1-6; Ex-1008 (Frojdth Provisional) at 9. I have seen no suggestion of how this proposed combination of “modes” would function by Petitioner. As such, the MCI bit does not provide an indication of a skip coding mode as claimed by the ’808 Patent and it is not clear how Karczewicz could be modified to do so.

iii. Dependent Claims 23, 28-29, 34, 39-40

141. Dependent claims 23, 28-29, 34, and 39-40 all include a “derivation” step for the predicted non-zero motion vector. I understand that Petitioner asserts the derivation step is akin to the assigning the skip coding mode. Pet. 28-30. However, I also note that Dr. Havlicek understands the derivation step to be the process of producing a predicted motion vector. Ex. 2014 at 112:16-21. In my opinion, the derivation step relates to process of deriving the predicted non-zero motion vector,

using a motion vector prediction method such as is disclosed in JM1. Dr. Havlicek's understanding closely aligns with this.

142. My opinion is based on the fact that the '808 Patent distinguishes between two steps in the video coding process. First, there is "assigning a skip coding mode," as in claims 1 and 7, with either a zero (non-active) or non-zero (active) motion vector. Second, the process includes "deriving the predicted non-zero motion vector," as in claims 23, 28-29, 34, 39-40. This step is performed when active motion is assigned. The first step (assigning a skip coding mode) includes determining whether the segment in question should treat the motion as active (non-zero) or non-active (zero) based on the motion information of a second segment neighboring the first segment. Ex. 1001, claims 1, 7. This decision between active and non-active determines whether and how the determining step proceeds. In the case of non-active motion, a zero motion vector is automatically generated and assigned to the skip coding mode and no determination step is required. For active motion, the determination step must then determine the non-zero motion vector using a process such as motion vector prediction.

143. As such, Karczewicz fails to disclose the determining step. This is because Karczewicz includes no means for distinguishing between active and non-active when a specific coding method is assigned to a given segment.

B. Grounds 2A and 2B: Frojdh

144. U.S. Patent App. Pub. No. 2003/0123738 (“Frojdh”) does not anticipate or render obvious the Challenged Claims of the ’808 Patent. Frojdh is titled “Global Motion Compensation for Video Pictures” and names Per Frojdh, Rickard Sjoberg, and Torbjorn Einarsson as inventors.

i. Frojdh is not Entitled to its Provisional Priority Date

145. Frojdh is directed to a method for video compression that employs global motion compensation (GMC). Ex. 1007, at [0002]. Frojdh describes a method where macroblocks are grouped into slices and GMC information such as motion vectors are transmitted on a slice level. (*Id.*). Frojdh explains that when a GMC flag is enabled for a slice, it is followed by the transmission to the decoder of some number of global motion vectors (GMV’s), as shown in Fig. 9 of Ex. 1007 (also Fig. 3 of Provisional Ex. 1008). Note: while Fig. 9 shows the GMVC Flag and accompanying global motion vectors in the context of a picture header, Frojdh also teaches alternatively to include the same fields in a slice header.

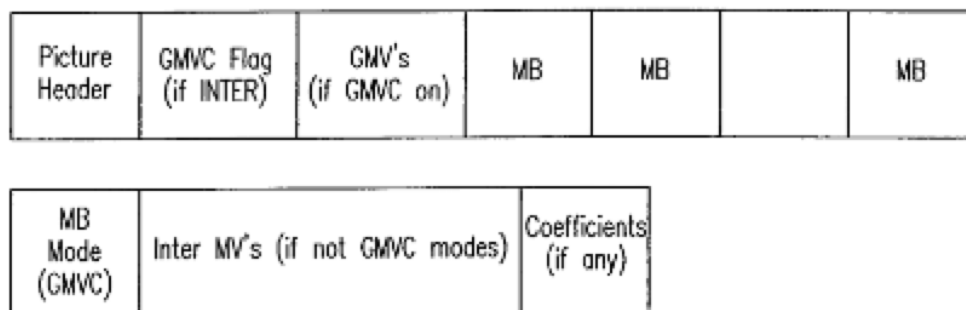


FIG. 9

The global motion vectors are used to generate a warped version of a reference frame, as depicted in Fig. 1 shown below.

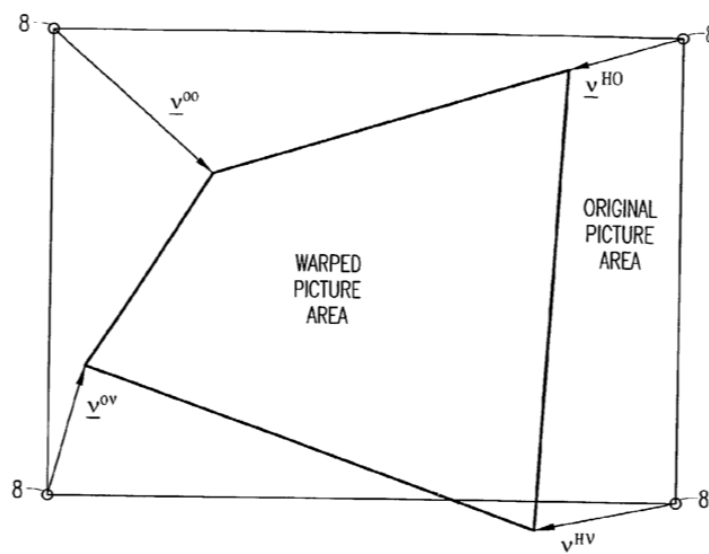


FIG. 1

146. When the GMC flag is enabled, “... a macroblock COPY mode signals that the encoder shall copy the macroblock from the (global) motion compensated reference picture.” Ex. 1008, p. 12, item #12. Note that the motion vector used in this COPY mode when GMC is enabled does not qualify as a “... zero (non-active) motion vector”, as used either in the ‘808 specification, or in claim construction of the term “skip coding mode” that was agreed to by both parties.

147. Among alternate coding modes introduced by Frojdh for use when the GMC flag is enabled is a mode called Implicit Global Motion Compensation (“IGMC”). In IGMC, the GMC-enabled macroblock COPY mode described in the previous paragraph is reinterpreted to define a mode which lacks any transform

coded residual information or explicitly signaled motion vector information. Ex. 1008, p. 12, item #15.

148. It is my opinion that all features of Frojdh are not entitled to the priority date of its provisional application because new subject matter was added to the publication that post-dates the '808 Patent. A brief review of the timeline of publications is helpful for understanding the relationship among various contributions. The Frojdh provisional application was filed on Nov. 30, 2001. The disclosures of the '808 invention were first filed as the '072 provisional application on March 15, 2002, followed shortly by a submission of the same subject matter, JVT-C027, to the H.26L development effort for the May 6-10, 2002 meeting in Fairfax, VA. In the report summarizing the activities and conclusions issued at the end of the Fairfax meeting, the contributions of JVT-C027 were reported as being adopted into the draft standard Ex. 2018 (JVT-C001d3), p. 9 . The next Joint Committee Draft Standard of H.264 prepared for the July 22-26, 2002 JVT meeting in Klagenfurt, Austria and dated July 16, 2002 incorporated the "skip coding mode" invented in the '808 in section 9.3.1.3. Ex. 2029 (JVT-D017d2) at 47. Finally, more than four months after the '808 invention had been incorporated into the widely available Joint Committee Draft of H.264, the Frojdh Patent Application Publication, '738, was filed on Nov. 27, 2002.

149. Since the Frojdth provisional application clearly predates the contributions of the '808 patent and the Frojdth Patent Application Publication clearly post-dates the wide-spread distribution of the '808 invention in the form of the Joint Committee Draft of the H.264 video coding standard, special attention must be paid to differences between the Frojdth provisional and Publication to understand which subject matter deserves priority over the contributions and claims of the '808 patent and which do not.

150. A careful reading of the Frojdth provisional reveal that the only mode for which macroblocks are characterized as being “skipped” is the prior-art skip mode of H.26L and previous coding standards. Ex. 1008, pp. 7, 9. In this early discussion of the prior art H.26L standard (Ex. 1008, p. 9) the provisional also uses the term “COPY mode” to refer to the H.26L coding mode associated with skipping macroblocks.

151. From page 10 of Ex. 1008 to the end, the Frojdth provisional only includes two references to the H.26L COPY coding mode and they are both in the last paragraph of page 10. Taken from that paragraph:

The COPY mode is replaced by GMVC_COPY In the syntax of Table 1 and its caption, GMVC_COPY replaces COPY.

Both these two mentions of a “COPY” mode in this paragraph refer only to the fact that the COPY mode of H.26L is replaced (i.e. not used) when GMC is enabled. For

the remainder of the provisional, Frojdh finds no role, nor makes any reference, to the COPY (or SKIP) mode of the prior-art H.26L video coding standard.

152. Instead, in item 12 (on page 12) the provisional defines a new macroblock COPY mode when GMC is enabled:

12. When GMC is enabled, **a macroblock COPY mode** signals that the encoder shall copy the macroblock from the (global) motion compensated reference picture. Hence the displacements or motion vectors are given by the (interpolated) global motion vectors. No coefficients are code. [Ex. 1008, p. 12]

A POSITA would understand from this disclosure that this new “COPY mode” is clearly NOT the prior-art COPY mode of H.26L.

153. Immediately after the introduction of “a macroblock COPY mode” in item 12, in item 15 (also on page 12), the provisional defines another possible GMC-enabled coding mode:

When GMC is enabled, no explicit global motion vector is sent. We refer to this as Implicit Global Motion Compensation (IGMC), where **the macroblock COPY mode** is reinterpreted an inter MB mode without coefficients. Just as for inter MB modes, the motion vectors for this mode are defined by the prediction from neighboring blocks. This mode can be used for macroblocks with only one motion vector (16x16 block). [Ex. 1008, p. 12]

A POSITA understands the reference to “the macroblock COPY mode” in the description of IGMC in item 15 to be referring back to “a macroblock COPY mode” that was just defined in item 12.

154. Following the directions provided prior to item 12, a POSITA would understand that the coding modes defined in items 12 through 19 are simply definitions of “possible modes” for coding when GMC is enabled. Thus, a POSITA finds no teachings in this section relating to whether or how the modes defined in items 12 and 15 might (or might not) be used together.

155. A POSITA finds only one suggestion touching on how the possible use of the GMC-enabled COPY mode and IGMCM might be related:

We also introduce a new mode for global motion compensation, which we call Implicit Global Motion Compensation (IGMCM). This mode can be used as a tool in many coding scenarios where a more useful MB mode than COPY with GMC based on explicit MV's can minimize the total number of bits spent on motion vectors.
[Ex. 1008, p. 13]

A POSITA understands this disclosure to suggest that IGMCM (item 15) and GMC-enabled COPY mode (item 12) might be used in place of each other. A POSITA would also understand the stated motivation of this choice as being to control the required motion vector bits, since IGMCM requires no bits for motion vectors, while GMC-enabled COPY requires bits for describing the global motion vectors (GMV's in Fig. 9) in the slice or picture header.

156. It is my opinion that changes, modifications, and additions to the contents of the Frojdh provisional in the Nov., 2002 Frojdh publication make both significant and subtle changes to the teachings of the Frojdh provisional, and that

only those Frojdh teachings found in the Nov., 2001 provisional deserve priority over the '808 patent.

157. It is my opinion that paragraph [0022] of Frojdh (Ex. 1007, [0022]) changes the related teachings of the Frojdh provisional and does not deserve priority over the '808 patent. From the Frojdh publication:

... the invention introduces a new mode for global motion compensation, referred to as Implicit Global Motion Compensation (IGMC). This mode can be used as a tool in many coding scenerios which require a more useful MB mode than **COPY mode, in order to** minimize the total number of bits needed for motion vectors. **In COPY mode the motion vector is always zero. In contrast, IGMC uses implicit motion vectors that are predicted.**

Form the Frojdh provisional:

We also introduce a new mode for global motion compensation, which we call Implicit Global Motion Compensation (IGMC). This mode can be used as a tool in many coding scenerios which require a more useful MB mode than **COPY with GMC based on explicit MV's** **can** minimize the total number of bits spent on motion vectors.

The bolded sections of the two texts show changes made in the Nov. 2002 publication, and a POSITA would understand these to substantially change the teachings of the provisional into a distinctly different teaching. While the change from "COPY with GMC based on explicit MV's" to "COPY mode" might generously be described as introducing some ambiguity as to which COPY mode is being referred to, the addition of "In COPY mode the motion vector is always zero"

significantly changes the clear intention of the paragraph of the provisional. Thus, it is my opinion that the changed teachings of paragraph [0022] do not deserve priority over the '808 patent.

158. It is my opinion that paragraph [0055] of Frojdth (Ex. 1007, [0055]) introduces significant confusion and ambiguity into the related teachings of the Frojdth provisional and does not deserve priority over the '808 patent. . From the Frojdth publication:

In an embodiment referred to as Implicit global motion compensation (IGMC) no explicit motion vector is sent with the encoded slice 40. Instead, the macroblock COPY **(aka SKIP)** mode is reinterpreted as an Inter macroblock mode without coefficients ...

Form the Frojdth provisional:

... no explicit global motion vector is sent. We refer to this as Implicit Global Motion Compensation (IGMC), where the macroblock COPY mode is reinterpreted an inter MB mode without coefficients.

In this case, one might guess that the short insertion of “(aka SKIP)” in the publication would not be able to significantly alter the teachings of the provisional. However, a POSITA would understand that Frojdth reserves the word “skip” to references to the prior-art "skip" coding modes of H.26L and earlier standards, and the insertion of “SKIP” in this setting raises confusion and ambiguity into what “macroblock COPY mode” is being referred to in this passage. No such ambiguity exists in the original item 15 of the Frojdth provisional, especially the term “**the**

macroblock COPY mode” appears immediately below the introduction of “a macroblock COPY mode” in item 12.

159. The significance of the ambiguity introduced into the otherwise clear teaching of the Frojdh provisional in paragraph [0055] of the publication is highlighted by the Petitioner’s own confusion apparently at least partially due to the Nov., 2002 insertion of “(aka SKIP)” into the original disclosure of the provisional:

Frojdh further discloses a coding mode (e.g., global motion compensation (GMC)) comprised of both the IGMC mode and COPY (aka SKIP) mode that teaches or suggests the recited “skip coding mode.” Havlicek, para. 240 [Petition, page 43]

In explaining this conclusion, Petitioner cites that:

GMC therefore allows either COPY mode (zero motion vector) or IGMC mode (predicted motion vector that can be non-zero or zero). Havlicek, para. 241 [Petition, page 43]

demonstrating that the ambiguity introduced by the “(aka SKIP)” inserted in Nov., 2002 was significant enough to lead both Havlicek and Petitioner to mischaracterize “the macroblock COPY mode” of the provisional description of item 15 as one which uses “zero motion vector”, rather than one that does not.

160. Thus, it is my opinion that the targeted ambiguity inserted into paragraph [0055] in Nov., 2002 does not deserve priority over the ‘808 patent.

161. Despite the changes to the teachings of the provisional in the Nov. 2002 publication, many of the teachings of the provisional are faithfully preserved. For

example, paragraph [0054] of the publication faithfully preserves the disclosure of GMC-enabled COPY mode of the provisional, and clearly associates this mode with “a COPY mode signal” Ex. 1007, [0054]. Thus, a POSITA (overlooking the confusing inserted “(aka SKIP)”) would correctly understand references to “a COPY mode” in the very next paragraph to be referring to the same GMC-enabled COPY mode (which does not use a zero (non-active) motion vector).

162. In my opinion, the entirety of paragraph 56 of the Frojdh publication discloses new subject matter to the original teachings of the Frojdh provisional, and does not deserve priority over the ‘808 patent. However, even if the correct priority date of paragraph [0056] is ignored, Petitioner’s use of paragraph [0056] is unjustified by a correct reading. Petitioner states:

Frojdh further discloses “a bitstream representing a coded image block can include a syntactic element which may be interpreted to indicate either the IGMC mode or the COPY mode.” Frojdh, [0056]; FrojdhProv, 11-12. Frojdh therefore teaches or suggests “providing in an encoded bitstream an indication of the skip coding mode.” Havlicek para. 259-60 [Petition, pp. 48-49]

A POSITA would understand the choice between the IGMC mode and the COPY mode referred to in [0056] to be a choice between IGMC and the GMC-enabled COPY mode defined in paragraph [0054], neither of which involves use of zero (non-active) motion vectors. Thus, a POSITA would find nothing in paragraph

[0056] that discloses the “zero (non-active) motion vector” required by the construction of “skip coding mode” that was agreed to by both parties.

163. Thus it is my opinion that both i) paragraph [0056] is not supported by any teachings of the Frojdh provisional, and thus does not deserve priority over the ‘808 patent, and ii) even overlooking its priority, paragraph [0056] does not disclose at least one feature of the “skip coding mode” which is the subject of the claims of the ‘808 patent.

ii. Frojdh Does not Disclose or Render Obvious the ‘808 Patent

164. As stated above, it is my opinion that the subject matter relied upon by Petitioner in its Grounds 2A and 2B is not entitled a priority date of the Frojdh provisional application. Nevertheless, Petitioner’s arguments still fail to disclose or render obvious the ‘808 Patent for the reasons below.

165. In contrast to the Frojdh proposal relating to IGMCM, the ‘808 invention introduces a new skip mode that supports the ability of any skip mode macroblock to choose either traditional skip mode reconstruction (using a non-active motion vector) or an “active” motion compensated reconstruction (using an active motion vector predicted by the decoder). (See Ex. 1001, Fig. 8, 18:28-33). Contrasting the capabilities of the two proposals for skip mode macroblock reconstruction, it is apparent that the ‘808 invention requires a functionality not present in the Frojdh proposal.

166. Under the Frojdh proposal, each skip mode macroblock simply needs to instruct operations required to support either IGMC mode or COPY mode. Which operations are performed for each skip mode macroblock is directed by the GMC flag bit, received at the slice level and computed by the encoder, presumably based on an assessment of how each mode works on the macroblocks making up the slice. Under the '808 invention, each skip mode macroblock must support either “active” or “non-active” reconstruction, and have a system to choose which of these modes of reconstruction it should perform based on a consideration of motion in previously coded surrounding image segments.

167. Not surprisingly, the differences between the Frojdh proposal and the '808 invention account for the fact that the systems and methods taught by Frojdh fail to meet the limitations of the claims of the '808. In particular, claim limitations referring to features required by the '808 invention for it to operate properly are not present in the Frojdh proposal which does not require (and has no use for) those features.

168. On the other hand, Frojdh discloses two distinct coding modes, COPY and IGMC, which must be explicitly signaled in the bitstream by both the GMC slice flag and other signaling. When the GMC slice flag is enabled, the decoder interprets signaling for the COPY mode as IGMC mode. IGMC mode always performs motion vector prediction. As explained, Petitioner incorrectly believes that COPY as

described in Frojdh's claimed invention always uses a zero motion vector and copies directly from the reference frame. In other words, if one ignores the GMC aspects of Frojdh, Frojdh needs two separate coding modes to the '808 Patent's one redefined skip coding mode even under Petitioner's mistaken interpretation (with reference to Figure 9 in Frojdh, when the GMC flag is on, your coding modes are constrained)). Because Frojdh does not rely on a consideration of surrounding motion to make any determination between active or non-active motion vector generation, additional information must be included in the bitstream, such as the GMC flag.

169. Frojdh only discusses implicitly switching, "by means of other code elements," between IGMG and COPY mode in paragraph 56, which as discussed above is not supported by the Frojdh provisional application and is thus not prior art to the '808 Patent. Ex. 1007 at 56. Moreover, it is unclear what Frojdh means by such implicit switching "by means of other code elements." A POSITA would not understand other code elements to involve motion from surrounding neighbors. Petitioner does not clarify. In any event, Frojdh is silent on any consideration of surrounding motion. Paragraph 56 of Frojdh fails to disclose a skip coding mode as claimed by the '808 Patent.

170. Frojdh makes no distinction between "active" and "non-active" motion vector generation and there is no indication that this was a type of distinction

intended by the inventor of the '808 Patent. Petitioner ignores this distinction in relying on the fact that a predicted motion vector may be predicted to be zero. (Pet. 41-42). Frojdh's IGMC mode must always perform a prediction and thus, always requires increased computation on the decoder side to arrive at a motion vector assignment for the IGMC coded macroblock. In the event that IGMC's prediction produced a zero motion vector, a POSITA would not understand this to be a zero (non-active) motion vector. I understand that Dr. Havlicek shares my opinion that an "active" motion vector is not necessarily zero and a "non-active" motion vector is always zero. Havlicek Tr. at 129:21-130:14; 130:18-131:5; 133:11-134:5. IGMC as described by Frojdh always performs active motion estimation, regardless of the characteristics of motion in surrounding image segments. A POSITA would not understand this to function in the same manner as the skip coding mode claimed by the '808 Patent.

171. I understand that the Board, in granting institution, relied on Frojdh's IGMC mode as disclosing the '808 Patent's skip coding mode. It seems the Board reached this conclusion because Frojdh's IGMC mode, when performing a median motion vector calculation, may arrive at a predicted zero motion vector, or a predicted non-zero motion vector. ID at 52. In my opinion, this reasoning is misguided, as it ignores the components of "skip coding mode" as defined in the '808 Patent and as understood by a POSITA. The Board's decision is contrary to

both my opinion and Dr. Havlicek's opinion, that the terms "active" and "non-active" as they appear in the agreed upon construction provide insight into how a motion vector is determined (automatic assignment of a non-active motion vector versus calculation of an active motion vector).

172. The '808 Patent provides ample support for the concept of generating active or non-active motion parameters. This can be seen, for example, in Figure 8 of the '808 Patent:

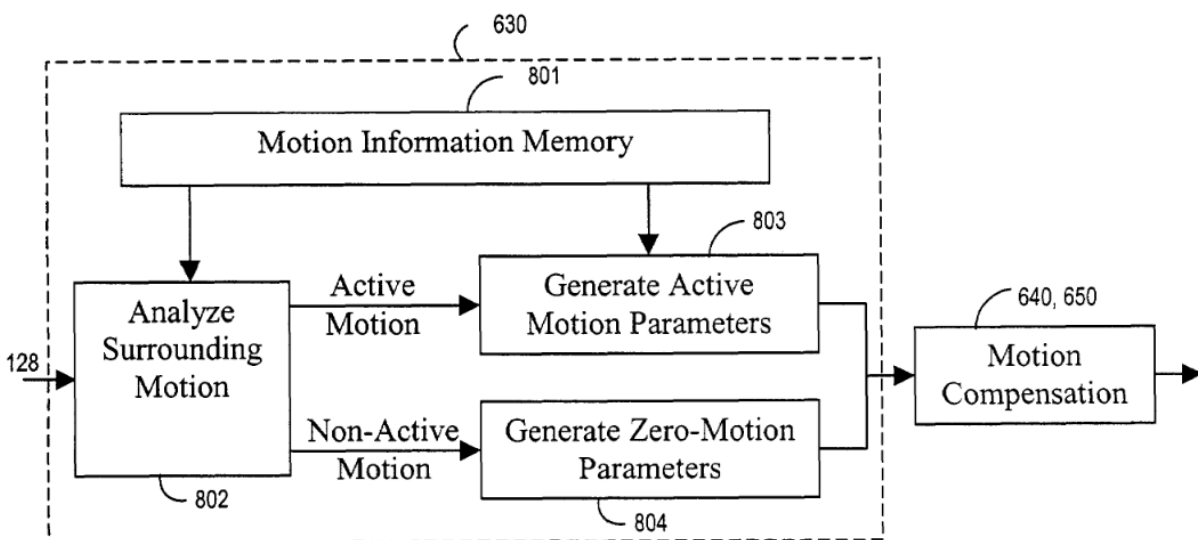


FIG. 8

173. The '808 Patent teaches that when a skip coded macroblock is associated with a zero (non-active) motion vector, "it is treated in the same way as a conventional skip mode macroblock and copied directly from the reference frame." '808 Patent at 14:23-29. A POSITA would understand this to mean that if a non-active motion vector is associated with a skipped macroblock, then the skip coded

macroblock is always assigned a zero motion vector. However, if a non-zero (active) motion vector is associated with the skip coded macroblock, then “a non-zero motion vector representative of that motion is generated.” ’808 Patent at 14: 30-35. The ’808 Patent provides examples of how this active motion generation can be accomplished, for example using the motion vector prediction methods of JM1. ’808 Patent at 19:28-51. A novelty of the ’808 Patent is the fact that a single coding mode, using a single indication, is capable of performing either of these two motion generation processes. IGMC is not capable of this, because it will always perform “active” motion generation.

174. Petitioner also ignores basic concepts of coding hierarchy in asserting that Frojdh teaches or suggests a skip coding mode such as IGMC mode, or GMC with IGMC and COPY. Pet. 44-45. To begin, A POSITA would understand GMC is not a macroblock coding mode. GMC is signaled at the slice level. Havlicek Tr. at 78:14-19; 82:8-15; Ex-1008 at 11. Frojdh provides “a schematic diagram representing proposed global motion compensation in H.26L on picture and macroblock levels” in Figure 9:

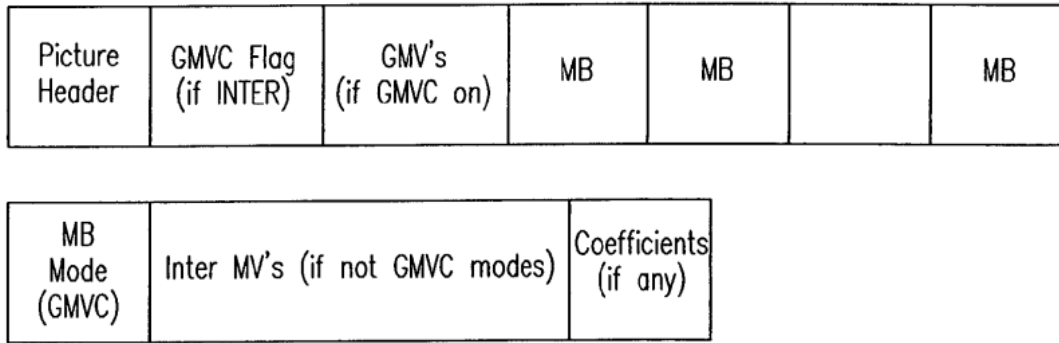


FIG. 9

Ex. 1007, [0034].

175. This figure shows the proposed syntax hierarchy present in Frojdh, with the GMC flag being signaled after the picture header and before the macroblock “MB” syntax. The macroblock mode “MB Mode” is signaled separately for each macroblock. Frojdh teaches that “IGMC mode can be used to replace the COPY mode in coding an image block.” Ex. 1007, [0055]. A POSITA would understand then, that Frojdh recognizes IGMC and COY as separate coding modes which can only be chosen by the selection of the MB mode as shown in Figure 9. In that case, Petitioner fails to have shown a coding mode in which both active and non-active are available.

176. Petitioner’s reliance on GMC is also flawed because GMC is signaled on the slice level, which is inconsistent with the “first segment” limitations in the claims. Further limitation 1[d] requires that an indication of the skip coding mode be included in the bitstream, wherein no further motion vector information for the first segment is coded in the encoded bitstream. Under Petitioner’s interpretation of

Frojd, this indication would be the GMC flag for the slice, however, GMC mode requires additional motion vector information to be included in the bitstream:

The method comprises ... applying a signal to each encoded slice to indicate whether global motion compensation (GMC) is used in reconstructing its corresponding original slice, and if so, including GMC information with the encoded slice. (Ex. 1007, [0024])

and

... the GMC information contained in a given encoded slice comprises or represents a set of encoded global motion (GM) vectors. (*Id.*, [0025].)

177. I also understand that Petition alleges that “Frojd further discloses how COPY mode (and the associated [zero motion vector]) ‘is the cheapest mode to signal. In fact, run-length coding is used to signal a number of copied (skipped) macroblocks with one codeword.’” Pet., 46 (citing Ex. 1007, [0047]; Ex. 1008, 8-9). However, even putting aside the Petition’s misinterpretation of Frojd, Petitioner ignores the fact that when in GMC mode, IGMC replaces the COPY mode. Ex. 1007, [0055]. As such, IGMC and COPY mode use the same signal. If we accept Petitioner’s mistaken identification of prior art COPY as the COPY used in GMC, then a POSITA would recognize that that COPY and IGMC use the same signaling and no motion information, and therefore require exactly the same amount of bits. Therefore, a POSITA would not find it obvious to enable the use of both IGMC and COPY with GMC enabled at least because Petitioners do not provide any

explanation of how one would enable the use of both IGMC and COPY. To enable such a use would require a modification of Frojdh to change the signals for IGMC and COPY such that both could be sent simultaneously (and each would be sent as distinct modes). In any event, this would still not disclose the skip coding mode of the '808 Patent, as this hypothetical additional signaling to distinguish between IGMC and COPY is distinct from the '808 Patent's surrounding motion approach.

178. For the reasons stated above, it is my opinion that Frojdh does not anticipate or render obvious the Challenged Claims of the '808 Patent.

Dated:
March 20, 2025

M. B. Orchard

Dr. Michael Orchard