

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARASHI VISION (U.S.) LLC (D/B/A INSTA360)
Petitioner,

v.

GOPRO, INC.
Patent Owner.

Patent No. 11,336,832

Inter Partes Review No. IPR2024-01052

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *et seq.***

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. OVERVIEW OF THE TECHNOLOGY.....	2
III. THE '832 PATENT.....	3
A. Summary	3
B. Effective Filing Date	5
C. Prosecution History	5
D. Level of Ordinary Skill in the Art.....	6
IV. CLAIM CONSTRUCTION	6
V. PRECISE REASONS FOR RELIEF REQUESTED	7
A. Ground 1: Thomason and Pacurariu Render Obvious Claims 1, 2, 7-12, and 17-20.....	8
1. Summary of Thomason.....	8
2. Summary of Pacurariu	11
3. Claim 1	13
4. Claim 2: “The system of claim 1, wherein the viewing window has a one-by-one aspect ratio, the one-by-one aspect ratio reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”	36
5. Claim 7: “The system of claim 1, wherein the determination of the viewing window further includes determination of a size of the viewing window as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration.”	37
6. Claim 8: “The system of claim 7, wherein the size of the viewing window changes as the function of progress through the progress length to simulate changes in zoom for the visual content.”	39

TABLE OF CONTENTS (continued)

		Page
7.	Claim 9: “The system of claim 1, wherein the determination of the placement of the viewing window within the field of view of the visual content includes determination of a rotation of the viewing window within the field of view of the visual content.”	40
8.	Claim 10: “The system of claim 1, wherein the determination of the placement of the viewing window within the field of view of the visual content includes determination of a location of the viewing window within the field of view of the visual content, the location of the viewing window within the field of view of the visual content determining framing of the visual content.”	41
9.	Claim 11	43
10.	Claim 12: “The method of claim 11, wherein the viewing window has a one-by-one aspect ratio, the one-by-one aspect ratio reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”	45
11.	Claim 17: “The method of claim 11, wherein determining the viewing window further includes determining a size of the viewing window as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration.”	45
12.	Claim 18: “The method of claim 17, wherein the size of the viewing window changes as the function of progress through the progress length to simulate changes in zoom for the visual content.”	45
13.	Claim 19: “The method of claim 11, wherein determining the placement of the viewing window within the field of view of the visual content includes determining a rotation of the viewing window within the field of view of the visual content.”	46

TABLE OF CONTENTS (continued)

	Page
14. Claim 20: “The method of claim 11, wherein the determining the placement of the viewing window within the field of view of the visual content includes determining a location of the viewing window within the field of view of the visual content, the location of the viewing window within the field of view of the visual content determining framing of the visual content.”	46
B. Ground 2: Thomason, Pacurariu, and Watanabe Render Obvious Claims 3-6 and 13-16.....	46
1. Summary of Watanabe.....	46
2. Claim 3: “The system of claim 1, wherein the visual content includes a distortion such that a straight line within a scene depicted within the visual content appears as a curved line, the distortion of the visual content reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”	48
3. Claim 4: “The system of claim 3, wherein the distortion includes a barrel distortion or a pincushion distortion.”.....	51
4. Claim 5: “The system of claim 3, wherein the visual content includes the distortion based on capture of the visual content through a wide field of view optical element.”	52
5. Claim 6: “The system of claim 3, wherein the visual content includes the distortion based on application of the distortion to non-distorted visual content, the distortion applied to the non-distorted visual content based on the visual content including the non-distorted visual content.”	52

TABLE OF CONTENTS (continued)

	Page
6. Claim 13: “The method of claim 11, wherein the visual content includes a distortion such that a straight line within a scene depicted within the visual content appears as a curved line, the distortion of the visual content reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”	54
7. Claim 14: “The method of claim 13, wherein the distortion includes a barrel distortion or a pincushion distortion.”	54
8. Claim 15: “The method of claim 13, wherein the visual content includes the distortion based on capture of the visual content through a wide field of view optical element.”	54
9. Claim 16: “The method of claim 13, wherein the visual content includes the distortion based on application of the distortion to non-distorted visual content, the distortion applied to the non-distorted visual content based on the visual content including the non-distorted visual content.”	54
C. Ground 3: Voss and Derbanne Render Obvious Claims 1, 2, 7-12, and 17-20	54
1. Summary of Voss	54
2. Summary of Derbanne	56
3. Claim 1	58
4. Claim 2: “The system of claim 1, wherein the viewing window has a one-by-one aspect ratio, the one-by-one aspect ratio reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”	75

TABLE OF CONTENTS (continued)

		Page
5.	Claim 7: “The system of claim 1, wherein the determination of the viewing window further includes determination of a size of the viewing window as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration.”	75
6.	Claim 8: “The system of claim 7, wherein the size of the viewing window changes as the function of progress through the progress length to simulate changes in zoom for the visual content.”	76
7.	Claim 9: “The system of claim 1, wherein the determination of the placement of the viewing window within the field of view of the visual content includes determination of a rotation of the viewing window within the field of view of the visual content.”	77
8.	Claim 10: “The system of claim 1, wherein the determination of the placement of the viewing window within the field of view of the visual content includes determination of a location of the viewing window within the field of view of the visual content, the location of the viewing window within the field of view of the visual content determining framing of the visual content.”	77
9.	Claim 11	78
10.	Claim 12: “The method of claim 11, wherein the viewing window has a one-by-one aspect ratio, the one-by-one aspect ratio reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”	80

TABLE OF CONTENTS (continued)

	Page
11. Claim 17: “The method of claim 11, wherein determining the viewing window further includes determining a size of the viewing window as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration.”	80
12. Claim 18: “The method of claim 17, wherein the size of the viewing window changes as the function of progress through the progress length to simulate changes in zoom for the visual content.”	81
13. Claim 19: “The method of claim 11, wherein determining the placement of the viewing window within the field of view of the visual content includes determining a rotation of the viewing window within the field of view of the visual content.”	81
14. Claim 20: “The method of claim 11, wherein the determining the placement of the viewing window within the field of view of the visual content includes determining a location of the viewing window within the field of view of the visual content, the location of the viewing window within the field of view of the visual content determining framing of the visual content.”	81
D. Ground 4: Voss, Derbanne, and Watanabe Render Obvious Claims 3-6 and 13-16	81
1. Claim 3: “The system of claim 1, wherein the visual content includes a distortion such that a straight line within a scene depicted within the visual content appears as a curved line, the distortion of the visual content reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”	81
2. Claim 4: “The system of claim 3, wherein the distortion includes a barrel distortion or a pincushion distortion.”	83

TABLE OF CONTENTS
(continued)

	Page
3. Claim 5: “The system of claim 3, wherein the visual content includes the distortion based on capture of the visual content through a wide field of view optical element.”	83
4. Claim 6: “The system of claim 3, wherein the visual content includes the distortion based on application of the distortion to non-distorted visual content, the distortion applied to the non-distorted visual content based on the visual content including the non-distorted visual content.”	83
5. Claim 13: “The method of claim 11, wherein the visual content includes a distortion such that a straight line within a scene depicted within the visual content appears as a curved line, the distortion of the visual content reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”	83
6. Claim 14: “The method of claim 13, wherein the distortion includes a barrel distortion or a pincushion distortion.”	84
7. Claim 15: “The method of claim 13, wherein the visual content includes the distortion based on capture of the visual content through a wide field of view optical element.”	84
8. Claim 16: “The method of claim 13, wherein the visual content includes the distortion based on application of the distortion to non-distorted visual content, the distortion applied to the non-distorted visual content based on the visual content including the non-distorted visual content.”	84
VI. THE BOARD SHOULD NOT DENY INSTITUTION UNDER <i>FINTIV</i>	84

TABLE OF CONTENTS
(continued)

	Page
VII. THE BOARD SHOULD NOT DENY INSTUTION UNDER § 325(D).....	84
VIII. NOTICES AND STATEMENTS.....	87

TABLE OF AUTHORITIES

	Page
Cases	
<i>Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH,</i> IPR2019-01469, Paper 6 (Feb. 13, 2020) (precedential).....	85, 86, 87
<i>Amazon Inc. v. M2M Sols. LLC,</i> IPR2019-01204, Paper 14 (P.T.A.B. Jan. 23, 2020)	86
<i>BMW of N. Am., Inc. v. Mich. Motor Techs., LLC,</i> No. IPR2023-01031, Paper 12 (P.T.A.B. Jan. 23, 2024)	86
<i>Samsung Elecs. Co. v. Headwater Rsch. LLC,</i> No. IPR2023-01226, Paper 9 (P.T.A.B. Feb. 8, 2024).....	86
<i>Thorne Research, Inc. v. Trustees of Dartmouth Coll.,</i> No. IPR2021-00491, Paper 18 (P.T.A.B. Aug. 12, 2021).....	86
<i>In re Translogic Tech., Inc.,</i> 504 F.3d 1249 (Fed. Cir. 2007)	7
Statutes	
35 U.S.C. § 101	7
35 U.S.C. § 102(a)(1).....	56
35 U.S.C. §§ 102(a)(1) and 102(a)(2).....	8, 12, 46, 54
35 U.S.C. § 103	8
35 U.S.C. § 112	7
35 U.S.C. § 311(b)	7
35 U.S.C. §§ 311-319	1
35 U.S.C. § 325(d)	84, 85, 86, 87

TABLE OF AUTHORITIES
(continued)

	Page
Other Authorities	
37 C.F.R. § 42.6(e)(4) and 42.205(a).....	91
37 C.F.R. § 42.8(b)(1).....	87
37 C.F.R. § 42.8(b)(2).....	87
37 C.F.R. § 42.8(b)(3).....	88
37 C.F.R. § 42.8(b)(4).....	88
37 C.F.R. § 42.15(a).....	89
37 C.F.R. § 42.24	90
37 C.F.R. § 42.100 <i>et seq.</i>	1
37 C.F.R. § 42.104(a).....	88
37 C.F.R. § 42.104(b)	7
37 C.F.R. § 42.104(b)(4).....	8

Exhibit List

Exhibit Description	Exhibit #
U.S. Patent No. 11,336,832 to Stimm <i>et al.</i>	1001
Expert Declaration of Aggelos Katsaggelos	1002
File History of U.S. Patent No. 11,336,832	1003
U.S. Patent Pub. No. 2005/0168583 to Thomason	1004
U.S. Patent Pub. No. 2015/0181123 to Pacurariu <i>et al.</i>	1005
U.S. Patent No. 10,778,896 to Watanabe	1006
International Publication No. WO 2015/183636 to Voss	1007
U.S. Patent No. 10,341,564 to Derbanne <i>et al.</i>	1008
K. Vanhemert, “Horizon App Solves the Dumbest Thing About Smartphone Video,” https://www.wired.com/2014/01/camera-app-solves-single-dumbest-thing-smartphone-video/ , Wired (Jan. 22, 2014.)	1009
B. Mayo, “Horizon for iPhone Always Records Landscape Video, Independent of Device Orientation,” https://9to5mac.com/2014/01/14/horizon-for-iphone-always-records-landscape-video-independent-of-device-orientation/ , 9to5Mac (Jan. 14, 2014.)	1010
Complaint, <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400, March 29, 2024	1011
Exemplary Infringement Claim Chart for U.S. Patent No. 11,336,832, <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400, March 29, 2024	1012
International Publication No. WO 2015/038180 to Voss	1013

Petitioner Arashi Vision (U.S.) LLC (d/b/a Insta360) (“Petitioner” or “Insta360”) petitions for *inter partes* review of claims 1-20 of U.S. Patent No. 11,336,832 (“the ’832 patent” (EX1001)) in accordance with 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 *et seq.*

I. INTRODUCTION

The ’832 patent relates to “horizon leveling videos.” (EX1001, Title.) “The motion of the image capture device during the capture of the video may cause the video to depict a tilted view of a scene.” (EX1001, 1:12-14.) In order to solve this problem, the ’832 patent determines a “viewing window” to generate a horizon-leveled video content. (EX1001, Claim 1.) “[T]he placement (rotation, location, shape, and/or size) of the viewing window within the field of view of the visual content may be determined to *compensate for rotation (e.g., tilt) of the image capture device* 302 during capture such that the video appears to have been captured from an image capture device 302 with less rotation. That is, the visual content captured by the image capture device 302 may be cropped to generate horizon-leveled visual content.” (EX1001, 6:52-60 (emphasis added).)

Using a “viewing window” to crop horizon-leveled content out of a tilted scene was not new at the time of the ’832 patent in 2019. For example, as discussed in more detail below, Thomason discloses “image *rotation correction*

for video or photographic equipment.” (EX1004, Title (emphasis added), [0002].)

Likewise, Pacurariu discloses “[s]ystems and methods . . . to rotate an image recorded by an image sensor to *compensate for angular rotation or tilt of the image sensor.*” (EX1005, Abstract (emphasis added).) Similarly, Voss discloses determining an “inset rectangle” within the video frames to “*compensate for rotation . . . by essentially rotating in the inverse of the device's own rotation,* which is sampled from the device's integrated gyroscope.” (EX1007, 10:5-7 (emphasis added).)

Petitioner submits that the challenged claims are unpatentable for the reasons set forth in this Petition, as supported by Dr. Katsaggelos. (EX1002.)

II. OVERVIEW OF THE TECHNOLOGY

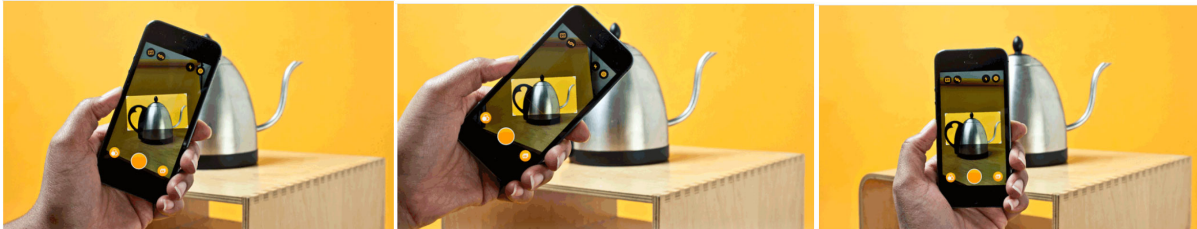
When an image capture device (*e.g.*, a camera) is not level, the resulting captured image data would depict a tilted scene. (EX1002, ¶9.) Image data depicting a titled scene is undesirable for a variety of reasons, and video data that is captured as the camera is moving may be particularly disorienting. (EX1002, ¶9.)

“Horizon-leveling” an image refers to techniques to correct the orientation of the image so that the horizon line (or any other reference line that should be horizontal) is leveled. (EX1002, ¶10.)

The idea of using measurements from sensors (*e.g.*, accelerometers,

gyroscopes, IMUs) to horizon-level image data, including video data, and the associated benefits were known by at least August 30, 2019 (earliest priority date for the '832 patent). (EX1002, ¶12.) In fact, in as early as 2014, an app called “Horizon” was available for purchase to horizon-level videos on iPhone.

(EX1009; EX1010.) The Horizon app uses the iPhone’s motion sensors (the accelerometer and gyroscope) to automatically horizon-level image data, as shown below.



(EX1009; EX1010; EX1002, ¶¶12-13.)

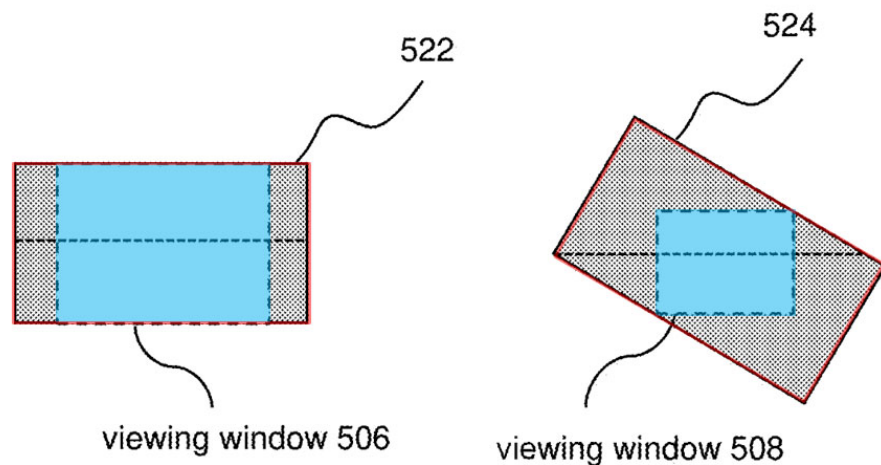
Numerous patent and patent publications, including those discussed herein, disclose this idea before the earliest priority date of the '832 patent. (EX1002, ¶14.)

III. THE '832 PATENT

A. Summary

The '832 patent relates to “horizon leveling videos.” (EX1001, Title.) If an image capture device is in motion when capturing the video, “[t]he motion of the image capture device during the capture of the video may cause the video to depict a tilted view of a scene.” (EX1001, 1:12-14.)

The '832 patent discloses techniques to generate a horizon-leveled view of the video by providing a “viewing window” of the video. (EX1001, claim 1.) The viewing window defines “extents of the visual content to be included within horizon-leveled visual content” (e.g., “a scene that is leveled with respect to ground, sea, earth, and/or the horizon”). (EX1001, claim 1, 21:15-19.) For example, Figure 5B (below) of the '832 patent shows two video frames: a video frame 522 captured when the image capture device is leveled with respect to the ground, and a video frame 524 captured when the image capture device is rotated. (EX1001, 11:19-55.) The video frame 522 already provides a leveled depiction of a scene and the system determines a *viewing window* 506 within the *field of view of the video frame 522*, which includes the leveled depiction of the scene. (*Id.*) In contrast, the video frame 524 includes a tiled depiction of a scene and the system determines a smaller *viewing window* 508 within the *field of view of the video frame 524*. (*Id.*)

**FIG. 5B**

(FIG. 5B (highlighting added)¹.)

B. Effective Filing Date

The '832 patent was filed on August 28, 2020, issued on May 17, 2022, and claims priority to a provisional application filed on August 30, 2019. For purposes of this Petition only, Petitioner relies on August 30, 2019, as the earliest effective filing date. (EX1002, ¶15.)

C. Prosecution History

The Examiner did not issue any Office Actions during the prosecution of the '832 patent. In the Notice of Allowance dated February 9, 2022, the Examiner

¹ All emphasis and annotations, such as highlighting and coloring, are added unless otherwise stated.

alleged that the closest prior art of record fail to teach the last two limitations of claim 1 (*i.e.*, “determine a viewing window ...” and “generate the horizon-leveled visual content ...”). (EX1003, pp. 33-34.)

After receiving the Notice of Allowance, Applicant amended the claims. (EX1003, pp. 19-27.) Only the preamble of claim 1 was amended. (*Id.*, p. 19.) The Examiner entered the post-allowance amendments on March 4, 2022.

D. Level of Ordinary Skill in the Art

A person of ordinary skill in the art (POSITA) in the field of the ’832 patent would have a bachelor’s degree in engineering or computer science, or equivalent field, and two years of experience working on image or video processing or digital cameras. Alternatively, a POSITA would have four years of experience working on image or video processing or digital cameras. An advanced graduate degree in the disciplines cited above may make up for the work experience indicated above. (EX1002, ¶¶36-38.)

IV. CLAIM CONSTRUCTION

For purposes of this Petition only, Petitioner does not believe any terms require a formal construction.² Each of the terms carries its “ordinary and

² Petitioner interprets the challenged claims based on the breadth of GoPro’s infringement allegations in the related International Trade Commission (ITC)

customary meaning,” which is “the meaning that the term would have to a person of ordinary skill in the art in question” at the time of the invention.³ *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (citation omitted); EX1002, ¶36.)

V. PRECISE REASONS FOR RELIEF REQUESTED

Pursuant to 37 C.F.R. § 42.104(b), Petitioner requests cancellation of the challenged claims based on the following references (EX1002, ¶¶41-46):

Prior Art Reference	Abbreviation (Exhibit No.)
U.S. Patent Pub. No. 2005/0168583	“Thomason” (EX1004)
U.S. Patent Pub. No. 2015/0181123	“Pacurariu” (EX1005)
U.S. Patent No. 10,778,896	“Watanabe” (EX1006)
International Publication No. WO 2015/183636	“Voss” (EX1007)
U.S. Patent No. 10,341,564	“Derbanne” (EX1008)

proceeding. (EX1011; EX1012.) Petitioner reserves the right to argue in the ITC proceeding that GoPro’s construction of the terms are incorrect and/or not supported by the ’832 patent specification.

³ An IPR petition may only rely on prior art patents or printed publications. 35 U.S.C. § 311(b). Petitioner reserves the right to raise other invalidity issues, such as invalidity under § 101 or § 112, in the related ITC proceeding.

The statutory grounds for the challenge of each claim are set forth below.

All of the statutory citations are AIA.

Ground	35 U.S.C. §	Claims	Prior Art Reference(s)
1	103	1, 2, 7-12, 17-20	Thomason, Pacurariu
2	103	3-6, 13-16	Thomason, Pacurariu, Watanabe
3	103	1, 2, 7-12, 17-20	Voss, Derbanne
4	103	3-6, 13-16	Voss, Derbanne, Watanabe

Below, Petitioner discusses why the challenged claims are unpatentable under the statutory grounds raised, including how and where the prior art satisfies each element of each challenged claim, as required by 37 C.F.R. § 42.104(b)(4). Petitioner’s showing establishes that there is a reasonable likelihood that it will prevail on each ground of unpatentability to each challenged claim.

A. Ground 1: Thomason and Pacurariu Render Obvious Claims 1, 2, 7-12, and 17-20

1. Summary of Thomason

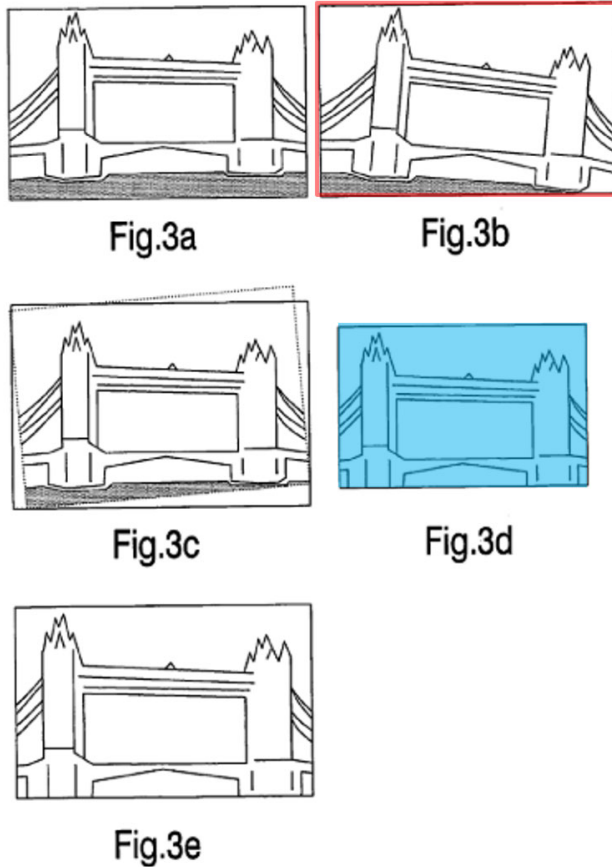
Thomason was filed on April 3, 2003, and published on August 4, 2005, qualifying as prior art to the ’832 patent under §§ 102(a)(1) and 102(a)(2). The Examiner never found, and Applicant never cited, Thomason during prosecution.

Thomason relates to “image rotation correction for video or photographic equipment.” (EX1004, Title.) Thomason recognizes that there is “a need for a

camera capable of reducing the effect of poor orientation.” (EX1004, [0002].)

Accordingly, Thomason provides several example techniques.

In a first example, “**FIG. 3b** shows the image taken with a camera angle at an angle of about 10° to the vertical.” (EX1004, [0034] (emphasis added).) “On replay, the processor 22 calculates the image on display 24 as shown in FIG. 3c, with a rotation correction applied using the camera item data angle by replay processor 22 so that true horizontals appear as horizontal. Some of the image frame of the rotation corrected image is blank, as may be seen. Accordingly, the image is cropped to eliminate blank space as illustrated in **FIG. 3d**.” (EX1004, [0036] (emphasis added).)



In another example, as shown in Figure 5 below, “the sensor array may be circular to enable arbitrary rotation to take place without any loss at the edges. Figure 5 illustrates such a *circular sensor 60* with *nominal image frame 40*. Rotation to any angle is possible without size reduction. The individual pixels of circular sensor 60 may be arranged on a hexagonal grid.” (EX1004, [0039] (emphases added).)

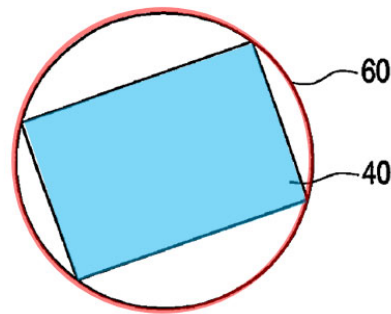


Fig.5

As another example, with reference to Figure 4 below, Thomason discloses that “the *recorded image area 50* is greater than that of the *nominal image frame 40* in order that the image may be rotated without resizing. Marginal pixels 52 outside the nominal frame 40 may be switched on only when required to avoid excessive power drain when the automatic alignment feature is not in use.” (EX1004, [0038] (emphases added).)

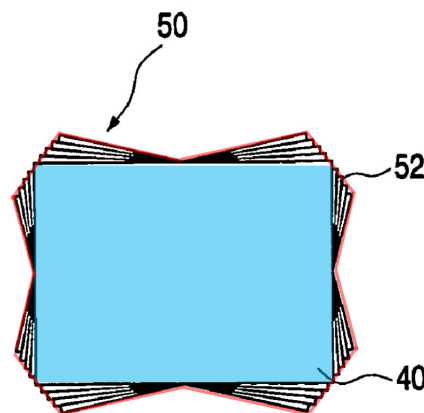


Fig.4

2. Summary of Pacurariu

Pacurariu was filed on December 19, 2013, and published on June 25, 2015,

qualifying as prior art to the '832 patent under §§ 102(a)(1) and 102(a)(2). The Examiner never found, and Applicant never cited, Pacurariu during prosecution.

Pacurariu discloses “[s]ystems and methods . . . to rotate an image recorded by an image sensor to compensate for angular rotation or tilt of the image sensor.” (EX1005, Abstract.) Pacurariu discloses that “the rotation, or tilt of images or video frames collected by the camera 100 may be corrected mathematically to *provide images or video frames that are not tilted or rotated*. Such images, for example, may be *more pleasing for viewing*.” (EX1005, [0029] (emphases added).)

For example, as shown below, “FIG. 5A illustrates a *graphical representation of the image sensor array 300* that is tilted relative to the gravitational vector 410 and relative to the horizon 415. *A reduced area of the image area 305* may be used to compensate for any rotation.” (EX1005, [0044] (emphases added).)

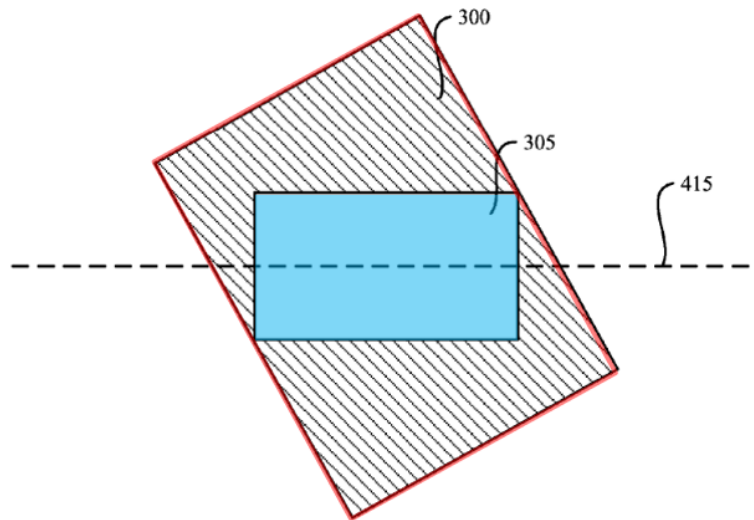


Figure 5A

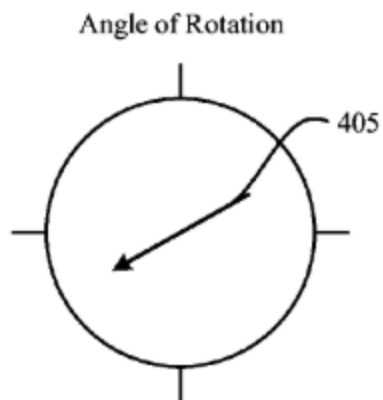


Figure 5B

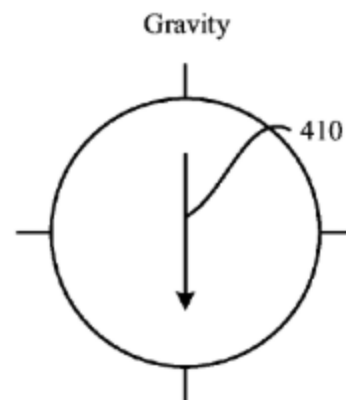


Figure 5C

3. Claim 1

- a. **Preamble: “A system for horizon leveling videos, the system comprising:”**

To the extent the preamble is limiting (which Petitioner does not concede), Thomason discloses systems that “allow the captured image to be rotated for

display to have the true horizontal displayed as horizontal.” (EX1004, Abstract.)

b. 1[a]: “one or more physical processors configured by machine-readable instructions to:”

Thomason’s system comprises a *processor 22*, which “uses the recorded rotation angle information to cause an image to be displayed on display 24 that has the horizontal [displayed as] horizontal, even if the camera was slightly misaligned when the image was recorded.” (EX1004, [0033].)

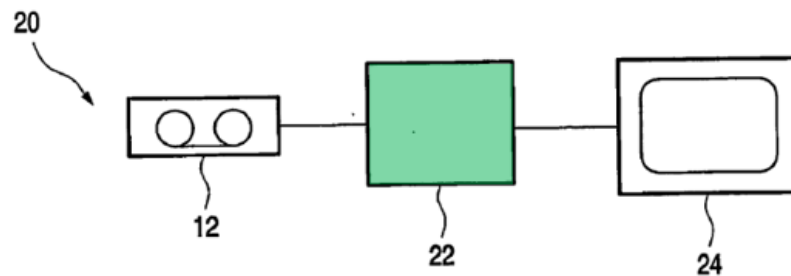


Fig.2

As another example, Thomason’s system also comprises a *processor 16* that “may function as a correction module.” (EX1004, [0042].)

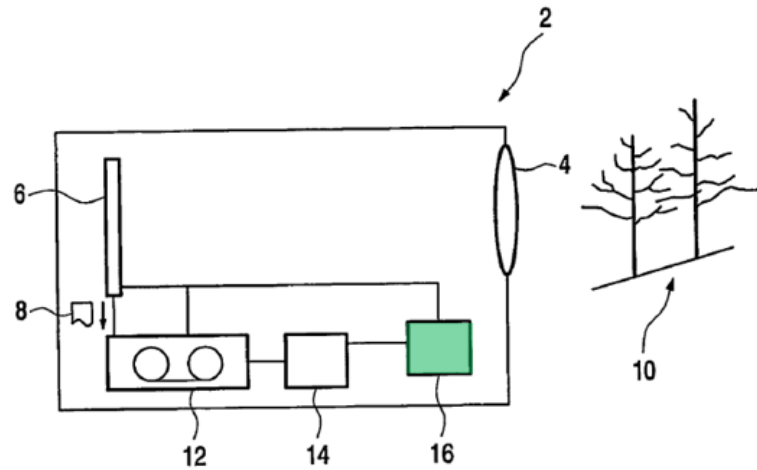


Fig.1

A POSITA would have understood that these are physical processors.

(EX1002, ¶60.)

c. 1[b][i]: “obtain video information defining a video,”

Thomason discloses “the invention is applicable to any form of camera, whether a stills camera, *a video camera*, or a camera capable of both stills and video operation.” (EX1004, [0044] (emphasis added).) Figure 1 below shows a “camera 2.” (EX1004, [0027].) “The camera may record either still images or *moving images, in the latter case by capturing a sequence of items of image data 8 representing sequential frames of the moving image.*” (EX1004, [0027] (emphasis added).) Thus, Thomason discloses obtaining video information. (EX1002, ¶61.)

Thomason’s video information defines a video, specifically including “a

sequence of items of image data 8 representing sequential frames of the moving image.” (EX1004, [0027]; EX1002, ¶62.)

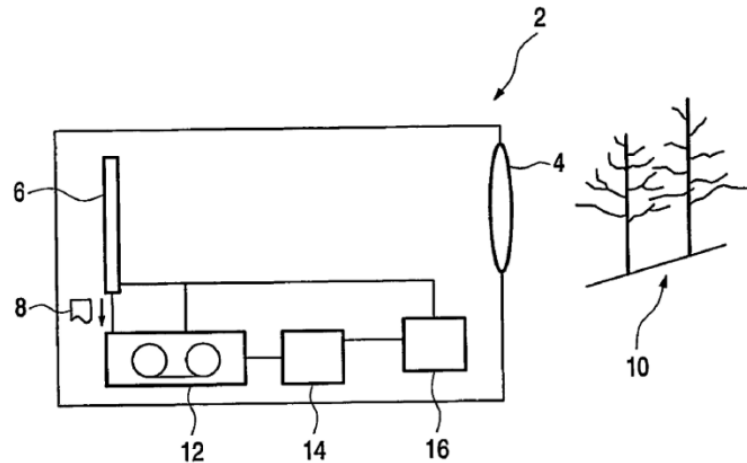


Fig.1

- d. **1[b][ii]: “the video including video content captured by an image capture device during a capture duration,”**

As shown for element 1[b][i], Thomason discloses that video content is captured by video cameras such as camera 2 in Figure 1. (*Supra* § V.A.3.c.)

Thomason’s camera 2 is an image capture device. (EX1002, ¶63.)

A POSITA would have understood that a video camera captures video content over a period of time and this period of time is the “capture duration.” (EX1002, ¶64.)

- e. **1[b][iii]: “the video content having a progress length, the video content including visual content captured at different moments within the capture duration,”**

According to the ’832 patent, “[t]he progress length of the video content

may be same as the capture duration, shorter than the capture duration (e.g., playback rate of the video content is faster than the capture rate of the video content), and/or longer than the capture duration (e.g., playback rate of the video content is slower than the capture rate of the video content).” (EX1001, 14:17-23.)

Thomason’s video content may be played back over a period of time and thus has a “progress length.” (EX1002, ¶67.) For example, Thomason discloses that “[a] playback device 20 is provided that can accept memory 12 and process the recorded image data 8 and rotation angle in replay processor 22. The processed image data is *played back* on display device 24, for example a television set.” (EX1004, [0032] (emphasis added).) This period of time during which the video is played back may be the same as the capture duration, shorter than the capture duration (e.g., if the playback is sped up), and/or longer than the capture duration (e.g., if the playback is slowed down). (EX1002, ¶67.) The period of time during which the video content is played back is a “progress length.” (EX1002, ¶67.)

Thomason’s video content includes “a sequence of items of image data 8 representing sequential frames of the moving image.” (EX1004, [0027].) A POSITA would have understood that Thomason’s “sequence of items of image data 8” are captured at different moments (sequential frames) within the capture duration. (EX1002, ¶68.)

f. 1[b][iv]: “the visual content viewable as a function of progress through the progress length, the visual content having a field of view;”

As shown for elements 1[b][i]-[iii], Thomason’s video content includes “a sequence of items of image data 8 representing sequential frames of the moving image,” and may be played back by a “playback device 20” over a progress length. (*Supra* § V.A.3.c-e.) Thus, Thomason’s video content (the sequence of items of image data) is viewable as a function of progress through the progress length. (EX1002, ¶71.)

Thomason discloses multiple examples of visual content having a field of view. As a first example, Figure 3b (below) of Thomason shows an image with a rectangular *field of view*. (EX1004, [0034]; EX1002, ¶72.)



Fig.3b

As another example, “FIG. 5 illustrates a circular image frame,” which has a circular *field of view*. (EX1004, [0024]; EX1002, ¶73.)

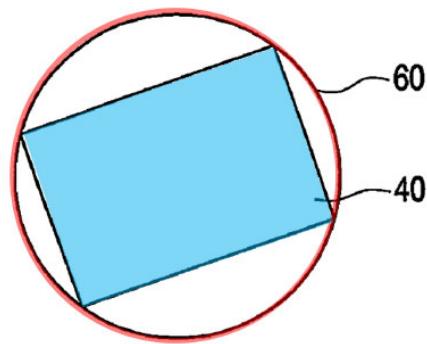


Fig.5

As another example, Figure 4 below depicts a “recorded image area 50” having a *field of view* as shown below. (EX1004, [0038]; EX1002, ¶74.)

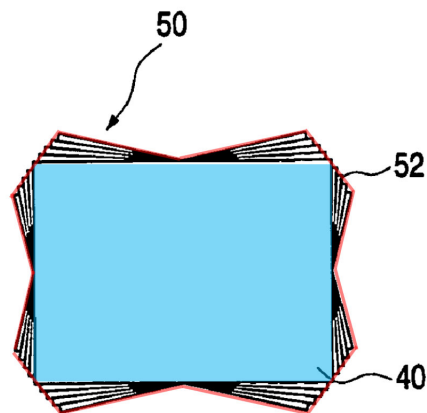


Fig.4

- g. 1[c]: “obtain rotational position information for the video, the rotational position information characterizing rotational positions of the image capture device as a function of progress through the capture duration;”

Thomason’s system includes “[a] *rotation sensor 14* [] that measures the angle of the camera to the vertical and outputs a corresponding measurement signal.” (EX1004, [0029] (emphasis added).)

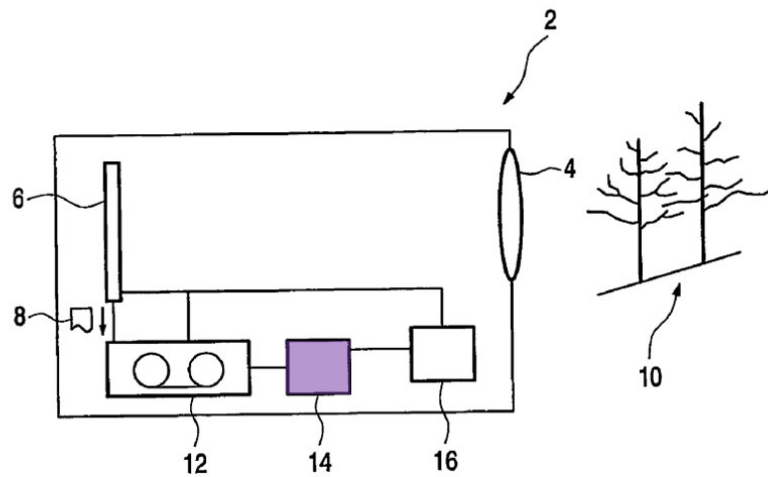


Fig.1

Thomason's rotational position information characterizes "rotational positions of the image capture device as a function of progress through the capture duration." (EX1002, ¶¶76-77.) Thomason states that video data comprises "*a sequence of items of image data 8* representing sequential frames of the moving image." (EX1004, [0027] (emphasis added).) Further, Thomason discloses "a data carrier for recording data based on *both image data representing the captured image and angle data representing the angle measured by the rotation sensor* so that a rotated image corrected to have the true horizontal in the captured image displayed as horizontal can be displayed from the data recorded on the data carrier." (EX1004, [0004] (emphasis added).) As a specific example, Thomason discloses that "[t]he image as shown in FIG. 3b is recorded in the memory *together with the data item that records the camera angle.*" (EX1004, [0035] (emphasis

added).)

Thus, each angle data is associated with a corresponding captured image in a sequence of images in a capture duration and thus is correlated with a time point over the capture duration. (EX1002, ¶77.) Thus, the angle data is characterized as a function of progress through the capture duration. (EX1002, ¶77.)

Further, Pacurariu discloses “obtain rotational position information for the video.” As shown in Figure 6 below, “[a]t block 610 the *tilt angle data of the image sensor array 300 within the camera* may be determined based on the acceleration data.” (EX1005, [0051] (emphasis added).)

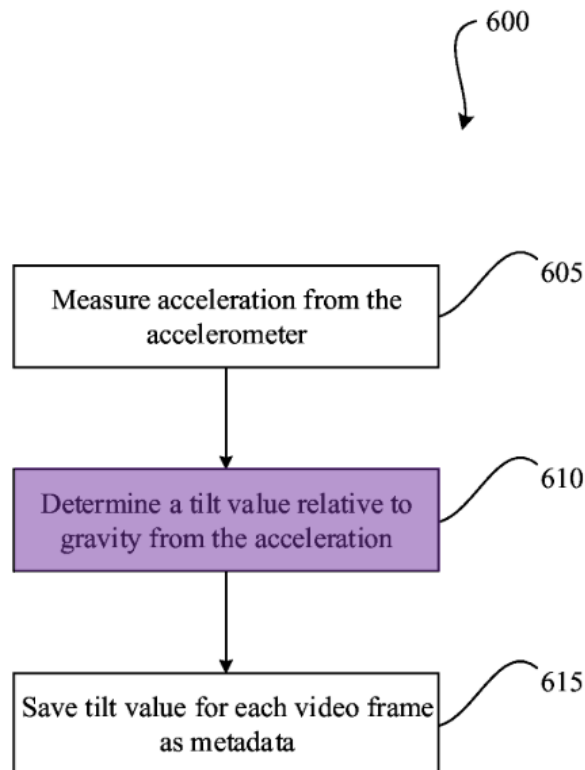


FIG. 6

“At block 615 the *tilt angle data may be saved with each video frame. The tilt angle data may be saved as metadata within a separate file or as part of each video frame.*” (EX1005, [0052].) Thus, Pacurariu discloses obtaining a tilt value for each video frame. Video frames in a video may be expressed as a function of progress through the capture duration of the video. (EX1002, ¶78.) Thus, it follows that the tilt values of the video frames may also be expressed as a function of progress through the capture duration. (EX1002, ¶¶78-79.)

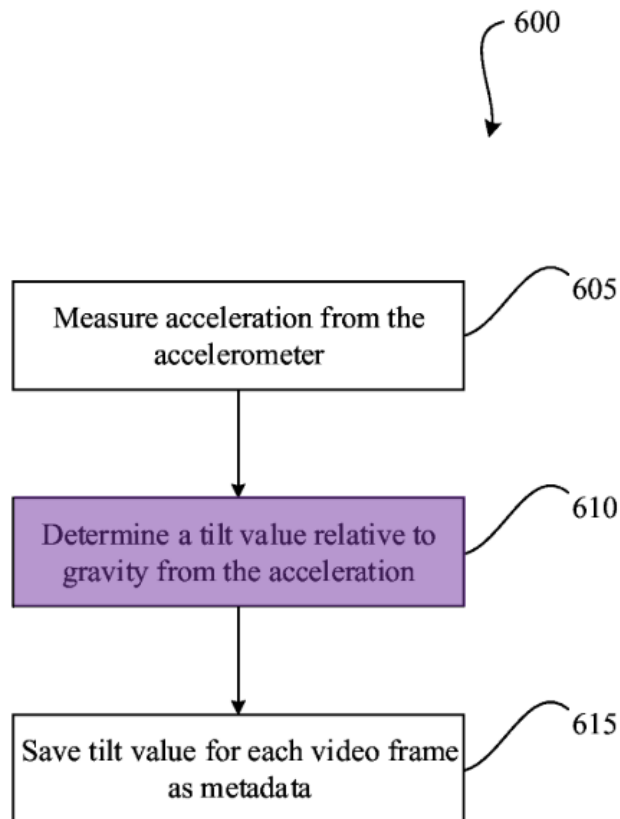


FIG. 6

It would have been obvious to combine the teachings of Thomason and

Pacurariu. Both Thomason and Pacurariu relate to techniques for rotating visual content in video data to compensate for motion of the image capture device.

(EX1004, Title; EX1005, Abstract; EX1002, ¶80.) Thus, Thomason and Pacurariu are from the same field of endeavor and reasonably pertinent to the same technical problems of improving video content. (EX1002, ¶80.)

The Thomason-Pacurariu combination results in a system in which rotational position information, such as a tilt value as taught by Pacurariu, may be obtained for each video frame in Thomason's video content, be saved as metadata or as part of each video frame as taught by Pacurariu, and be used to generate a rotated image for each video frame in Thomason's video content. (EX1005, [0052], [0055]-[0057], FIGS. 6-7; EX1002, ¶81.) Further, the Thomason-Pacurariu system determines the placement of a viewing window, such as the reduced area 305 in Figure 5A of Pacurariu, for a rectangular video frame such as Figure 3b of Thomason, allowing a horizon-leveled video frame to be obtained efficiently. (EX1002, ¶81.) Combining the technical features of Pacurariu with the teachings of Thomason would improve the horizon-leveling capabilities of Thomason in the same way. (*Id.*) Combining the teachings of Thomason and Pacurariu as such would yield predictable results of effectively and efficiently horizon-leveling video data. (*Id.*) Further, it would have been obvious to try combining the technical features of Pacurariu with the teachings of Thomason, as there is a finite number of

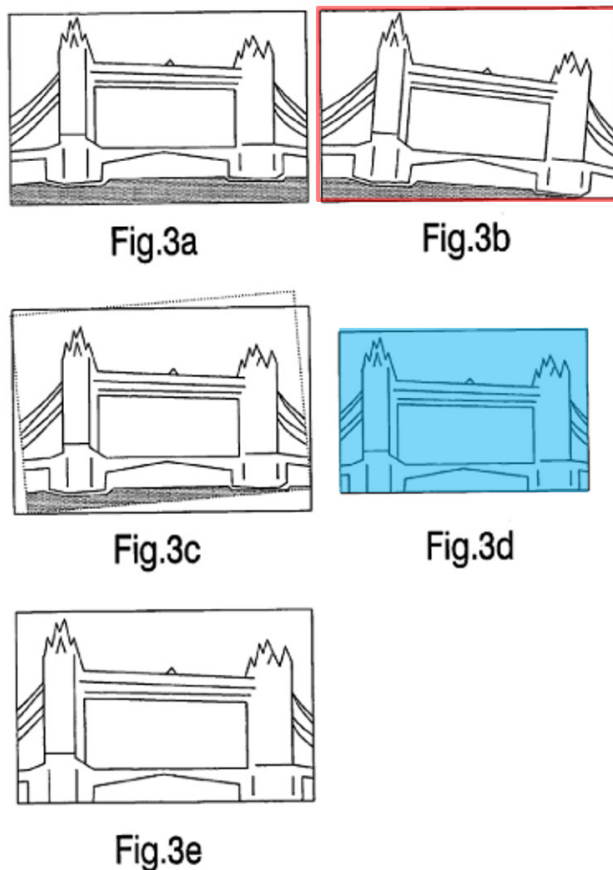
identified, predictable solutions, without requiring much effort and with a reasonable expectation of success. (*Id.*) The known benefits of Pacurariu would prompt the application of Pacurariu in the same field based on design incentives and other market forces. (*Id.*)

- h. 1[d][i]: “determine a viewing window for the visual content as a function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration,”

Thomason discloses multiple examples of viewing windows. In a first example, Figure 3b is the “visual content,” and Figure 3d is the “viewing window” determined by Thomason. (EX1002, ¶83.) “**FIG. 3b [(below)] shows the image taken** with a camera angle at an angle of about 10° to the vertical.” (EX1004, [0034] (emphasis added).) “The image as shown in FIG. 3b is recorded in the memory together with the data item that records the camera angle.” (EX1004, [0035].) “On replay, **the processor 22 calculates the image on display 24 as shown in FIG. 3c, with a rotation correction applied using the camera item data angle by replay processor 22 so that true horizontals appear as horizontal.** Some of the image frame of the rotation corrected image is blank, as may be seen. Accordingly, the image is cropped to eliminate blank space as illustrated in **FIG. 3d [(below)]**.” (EX1004, [0036] (emphases added).) Thus, the visual content in Figure 3b is rotated such that the visual content is horizon-leveled (resulting in

Figure 3c) and some outer pixels of Figure 3b are cropped to obtain Figure 3d.

(EX1002, ¶83.) Thus, Figure 3d is a viewing window that defines the extents of visual content in Figure 3b to be included as horizon-leveled content. (*Id.*)



As a second example, Figure 5 (below) of Thomason illustrates “a circular sensor 60 with *nominal image frame 40*.” (EX1004, [0039] (emphasis added).) Thomason states that “[r]otation to any angle is possible without size reduction.” (*Id.*) This means that even if the camera (its circular sensor) is rotated to an arbitrary degree (*e.g.*, 10 degrees clockwise), the system may sample a nominal image frame 40 within captured circular image (*e.g.*, 10 degrees

counter-clockwise) to define the extents of the captured circular image to be included as horizon-leveled content. (EX1002, ¶84.) Thus, the captured circular image is the “visual content,” and the image frame 40 is the “viewing window.” (EX1002, ¶84.)

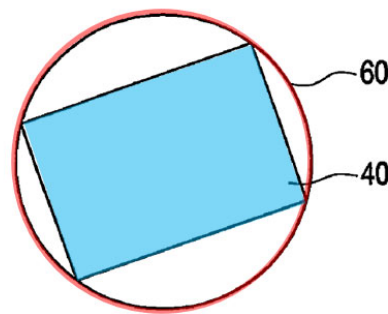


Fig.5

As another example, in Figure 4 (below) of Thomason, “*the recorded image area 50* is greater than that of the *nominal image frame 40* in order that the image may be rotated without resizing.” (EX1004, [0038] (emphases added).) Thus, the recorded image area 50 is the “visual content,” and the image frame 40 is the “viewing window.” (EX1002, ¶85.)

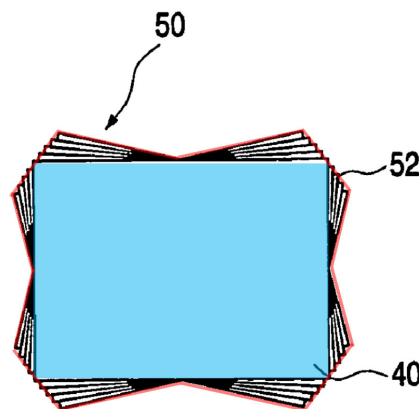


Fig.4

Thomason discloses that its viewing windows are determined “as a function of progress through the progress length.” (EX1002, ¶86.) Thomason discloses that the processed image data can be played back. (EX1004, [0032].) Thomason discloses playing back the processed sequential frames of the video (with each processed frame defined by a viewing window), thus disclosing this limitation. (EX1002, ¶86.)

Further, as shown in Figures 5A-C (below) of Pacurariu, Pacurariu determines a reduced area 305 out of an image area 300. “FIG. 5A illustrates a *graphical representation of the image sensor array 300* that is tilted relative to the gravitational vector 410 and relative to the horizon 415. A *reduced area of the image area 305* may be used to *compensate for any rotation*.” (EX1005, [0044] (emphases added).) Thus, the reduced area 305 is the “viewing window for the visual content.” (EX1002, ¶87.)

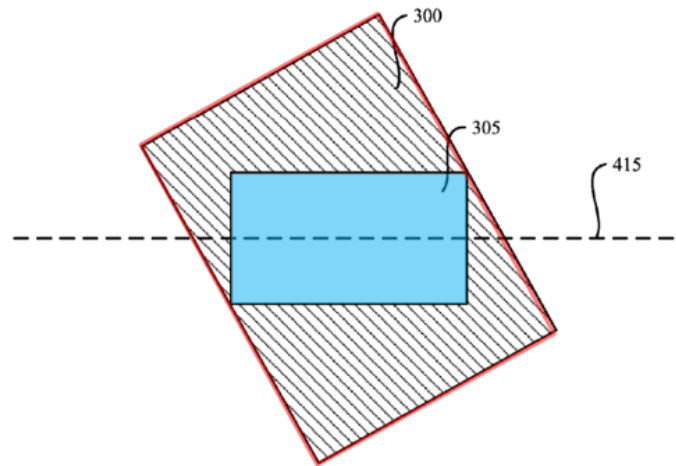


Figure 5A

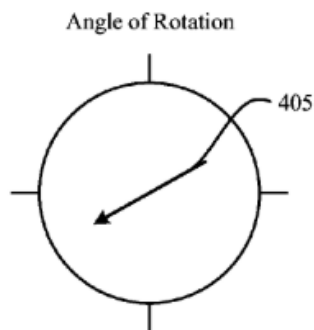


Figure 5B

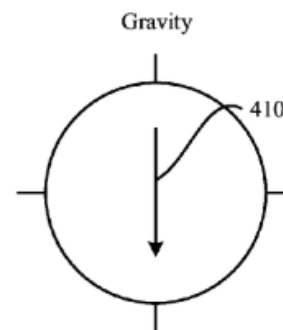


Figure 5C

Pacurariu further discloses that the viewing window is determined “as a function of progress through the progress length.” Figure 7 below shows that Pacurariu processes each video frame in a video based on a frame-specific tilt value. (EX1002, ¶88.) “At block 730 it can be determined whether the last frame has been reached. If not, then the process 700 proceeds to block 725 [sic] where the next frame in the video is selected. After which, the process 700 proceeds to

block 715 and *repeats until every frame has been operated on*. At block 730 the post processing may be complete.” (EX1005, [0057] (emphasis added).)

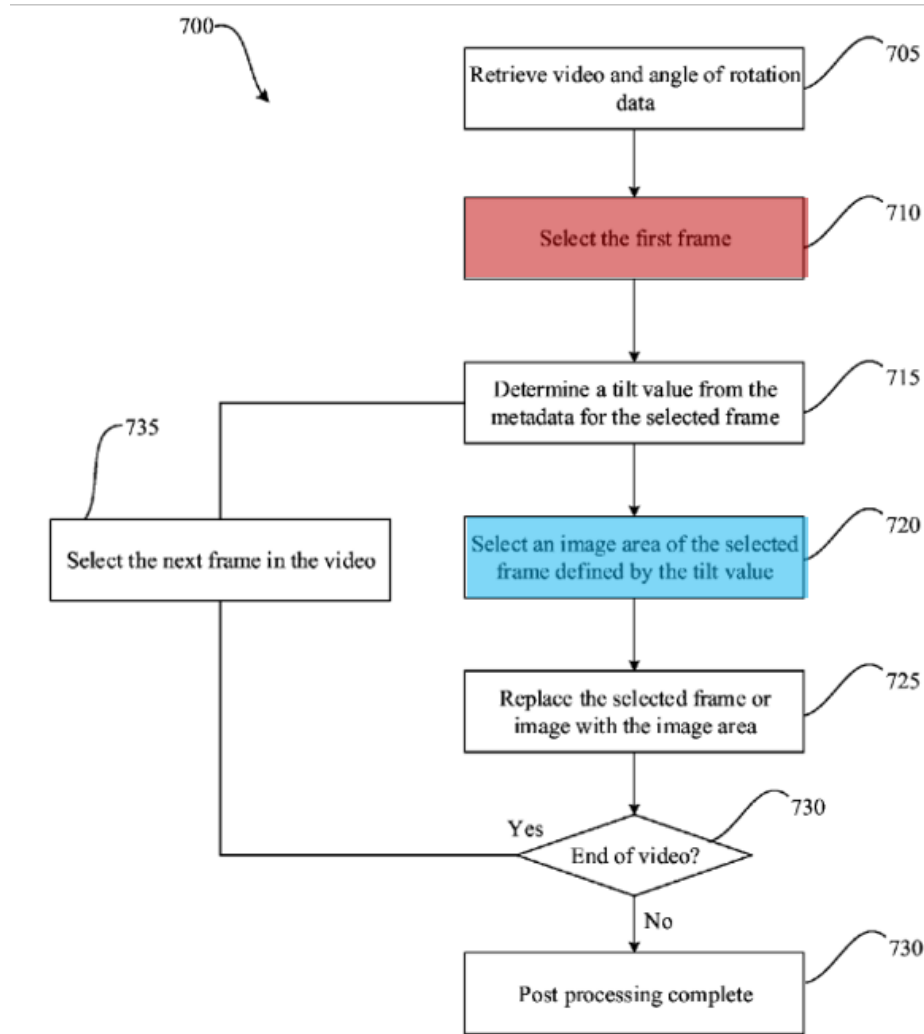


Figure 7

Figure 7 above shows that Pacurariu determines a viewing window for each video frame based on a frame-specific tilt value. (EX1002, ¶89.) Pacurariu provides a playback of processed sequential frames of the video (with each

processed frame defined by a viewing window), thus disclosing that the viewing window is determined for the visual content as a function of progress through the progress length. (EX1002, ¶89.) It would have been obvious to combine the teachings of Thomason and Pacurariu. (*Supra* § V.A.3.g.)

Thomason discloses horizon-leveling either during post-processing or in real time. (EX1002, ¶¶90-91.) For example, Thomason states, “[c]onveniently, the stored image data can simply be the data output by the digital recording sensor and the angle measured by the rotation sensor, leaving correction to occur on playback.” (EX1004, [0008].) This means that Thomason discloses storing the original, uncorrected image data and then, during post-processing, generating the horizon-leveled visual content during post-processing. (EX1002, ¶90.)

Thomason also discloses “[a]lternatively, the camera may include a correction module for correcting the image data captured by the camera based on the output of the digital recording sensor and storing the corrected image data in the memory.” (EX1004, [0009].) This means that Thomason discloses directly generating and storing the horizon-leveled visual content in real time. (EX1002, ¶91.)

Pacurariu also discloses horizon-leveling either during post-processing or in real time. (EX1002, ¶92.) Pacurariu states that “the orientation data may be compared with the horizon and/or a gravity vector and used to mathematically

rotate the recorded image area as the image is being sampled from the image sensor, as the image is being saved into memory, or during post processing.”

(EX1005, [0026]; *see also* EX1005, [0041], [0046].)

- i. **1[d][ii]: “the viewing window defining extents of the visual content to be included within horizon-leveled visual content as the function of progress through the progress length,”**

As shown for element 1[d][i], Thomason discloses multiple examples of viewing windows. (*Supra* § V.A.3.h.) Each example of the viewing window defines a portion of the captured visual content to be included within horizon-leveled visual content. (EX1002, ¶93.) “The stored data is based both on the image data and the output angle data to allow the captured image to be rotated for display to have the true horizontal displayed as horizontal.” (EX1004, Abstract.)

As shown for element 1[d][i], the viewing window is determined for the visual content as a function of progress through the progress length. (*Supra* § V.A.3.h.)

As shown for element 1[d][i], Pacurariu also discloses this limitation. (*Supra* § V.A.3.h.) It would have been obvious to combine the teachings of Thomason and Pacurariu. (*Supra* § V.A.3.g.)

- j. **1[d][iii]: “wherein determination of the viewing window includes determination of a placement of the**

viewing window within the field of view of the visual content as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration; and”

As shown for element 1[d][i], Thomason discloses multiple examples of viewing windows and the determination of the placement of the viewing windows. (*Supra* § V.A.3.h; EX1002, ¶¶96-99.) The determination is based on rotation data. (*Id.*)

As shown for element 1[d][i], the viewing window in Thomason is determined for the visual content as a function of progress through the progress length. (*Supra* § V.A.3.h.) Thus, the placement of the viewing window is also determined as the function of progress through the progress length. (EX1002, ¶100.)

Pacurariu also discloses this limitation. Pacurariu discloses “determination of a placement of the viewing window within the field of view of the visual content.” In Figure 3 below, the area 300 is “the field of view of the visual content.” (EX1002, ¶101.) “FIG. 3 illustrates a *graphical representation of an image sensor array 300* . . . The *image area 305*, for example, may represent the portion of *the field of view* that the user would like recorded as an image or a video frame.” (EX1005, [0040] (emphases added).)

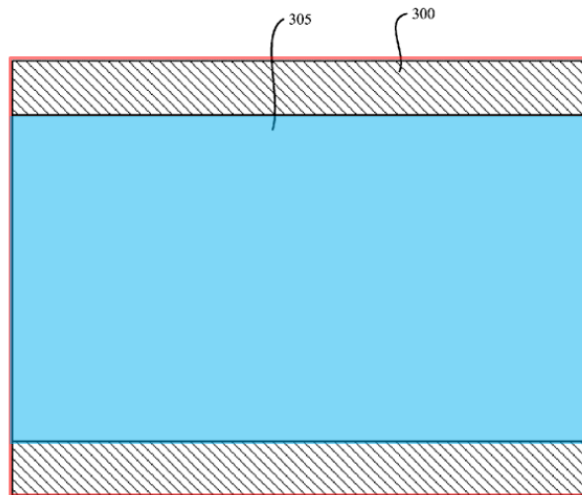


Figure 3

As shown in Figure 5A below, Pacurariu discloses “determination of a placement of the viewing window within the field of view of the visual content.”

“FIG. 5A illustrates a *graphical representation of the image sensor array 300* that is tilted relative to the gravitational vector 410 and relative to the horizon 415. A *reduced area of the image area 305* may be used to *compensate for any rotation.*” (EX1005, [0044] (emphases added).) The image area 300 is the “field of view of the visual content,” and the reduced area 305 is the “viewing window.” (EX1002, ¶102.)

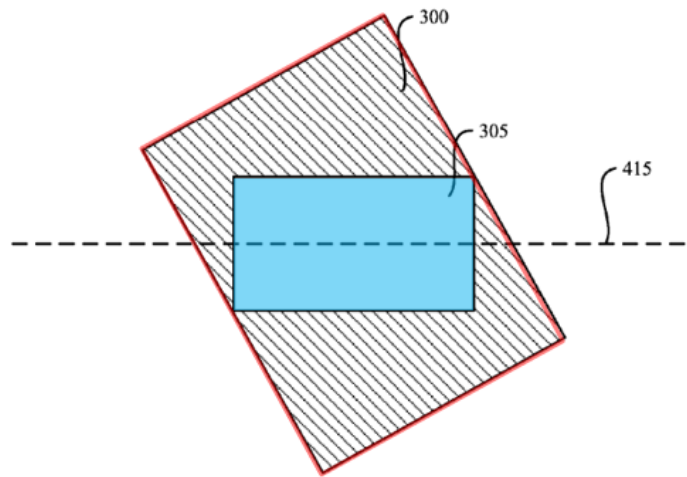


Figure 5A

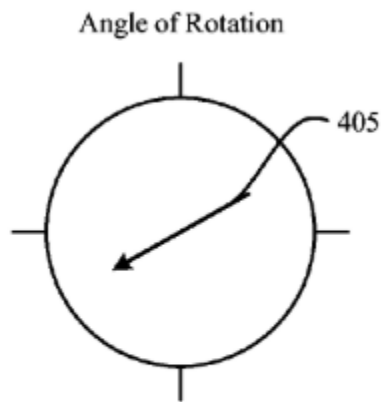


Figure 5B

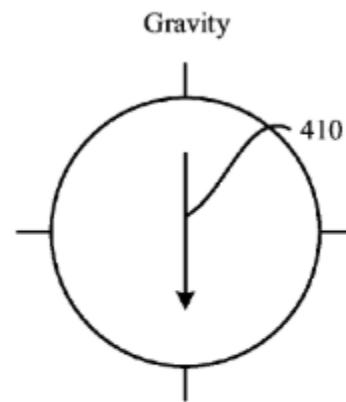


Figure 5C

As shown for element 1[d][i], the viewing window in Pacurariu is determined for the visual content as a function of progress through the progress length. (*Supra* § V.A.3.h.)

It would have been obvious to combine the teachings of Thomason and Pacurariu. (*Supra* § V.A.3.g.)

- k. **1[e][i]: “generate the horizon-leveled visual content based on the viewing window, the horizon-leveled visual content including a punchout of the extents of the visual content defined by the viewing window,”**

Thomason generates horizon-leveled visual content for display. “[T]he processor 22 uses the recorded rotation angle information to cause an image to be displayed on display 24 that has the horizontal [displayed as] horizontal, even if the camera was slightly misaligned when the image was recorded.” (EX1004, [0033].)

According to the ’832 patent, a “punchout of the visual content may refer to an output of one or more *portions* of the visual content for presentation (e.g., current presentation, future presentation based on video generated using the punchout).” (EX1001, 16:4-7 (emphasis added).) As shown for elements 1[d][i]-1[d][iii], Thomason similarly generates the horizon-leveled visual content by determining a portion of the recorded image data as defined by the viewing window. (*Supra* §§ V.A.3.h-V.A.3.j; EX1002, ¶¶107-110.)

As shown for element 1[d][i], Pacurariu also discloses this limitation. (*Supra* §V.A.3.h.) It would have been obvious to combine the teachings of Thomason and Pacurariu. (*Supra* § V.A.3.g.)

- l. **1[e][ii]: “wherein inclusion of the extents of the visual content defined by the viewing window within the horizon-leveled visual content effectuates horizon leveling of the visual content.”**

In the various examples of Thomason, the inclusion of the visual content as defined by the viewing window effectuates horizon leveling of the visual content. (*Supra* §§ V.A.3.h-V.A.3.j; EX1002, ¶113.) “In this way, the image data can be used to output a corrected image with the horizontal of the scene captured by the camera displayed horizontally even if the camera is not exactly aligned.” (EX1004, [0005].)

As shown for element 1[d][i], Pacurariu also discloses this limitation. (*Supra* § V.A.3.h.) It would have been obvious to combine the teachings of Thomason and Pacurariu. (*Supra* § V.A.3.g.)

4. Claim 2: “The system of claim 1, wherein the viewing window has a one-by-one aspect ratio, the one-by-one aspect ratio reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”

In Thomason, “FIG. 7 illustrates a frame aspect ratio of 1:1 in a circular image frame.” (EX1004, [0026].) This is shown by the square image frame in Figure 7 below. (EX1002, ¶116.) Further, a POSITA would have understood that the one-by-one aspect ratio may make an off-axis horizon appear less noticeable compared to a wider aspect ratio. (EX1002, ¶117.)

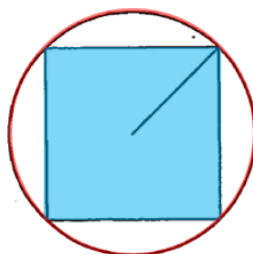
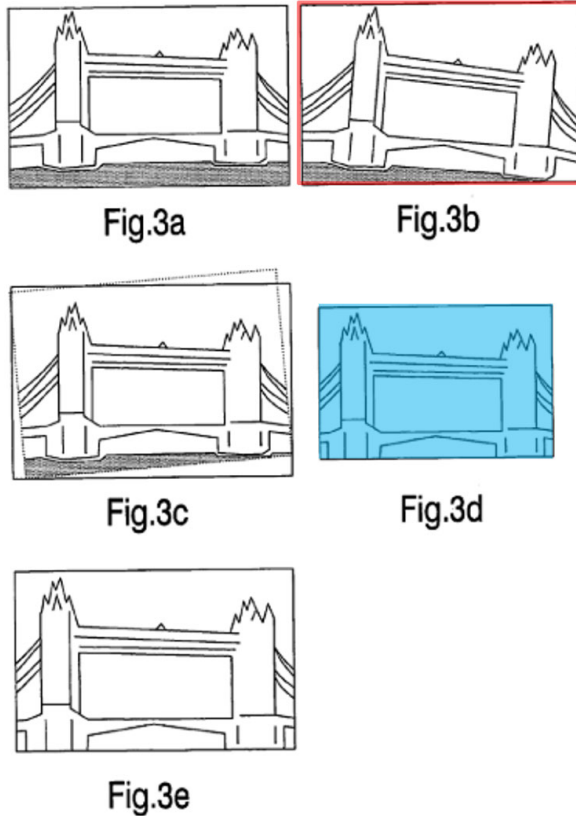


Fig.7

5. **Claim 7: “The system of claim 1, wherein the determination of the viewing window further includes determination of a size of the viewing window as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration.”**

As shown in Figures 3b-d below, Thomason applies a “rotation correction” to Figure 3b “so that true horizontals appear as horizontal,” as shown in Figure 3c. (EX1004, [0036].) “[T]he image is cropped to eliminate blank space as illustrated in FIG. 3d.” (EX1004, [0036].) Thus, depending on the degree of rotation, more or less of the image would need to be cropped to obtain the viewing window showing horizon-leveled visual content. (EX1002, ¶119.) For example, Figure 3b is taken with a camera angle at an angle of about 10° to the vertical, but if it is taken with a camera angle at an angle of about 20° to the vertical, more of the image may need to be cropped to obtain the viewing window showing horizon-leveled visual content, resulting in a viewing window having a smaller size. (EX1002, ¶119.)



Thus, in Thomason, the size of the viewing window may be dependent on the rotational position of the camera—a more tilted camera angle may result in a smaller viewing window because there is less visual content in the image that may be horizon-leveled. (EX1002, ¶¶120-121.) Thus, in Thomason, for each image in the video, the size of the viewing window is determined based on the corresponding rotational position of the camera. (*Id.*)

Because the viewing window in Thomason is determined as a function of progress through the progress length as shown in element 1[d][i], and the determination of the viewing window includes determination of its size, a POSITA

would understand that the size of the viewing window is also determined as the function of progress through the progress length. (*Supra* § V.A.3.h; EX1002, ¶¶121-122.)

6. Claim 8: “The system of claim 7, wherein the size of the viewing window changes as the function of progress through the progress length to simulate changes in zoom for the visual content.”

As shown in claim 7, the size of the viewing window changes as the rotational position of the camera changes and is determined as the function of progress through the progress length. (*Supra* § V.A.5.)

A POSITA would understand that a smaller viewing window may make the object in the viewing window appear more zoomed-in. (EX1002, ¶124.) For example, Thomason discloses that Figure 3d is resized to Figure 3e, specifically, “the corrected image 42 is resized so that the final image frame 44 is the same size as original image frame 40.” (EX1004, [0037].) Comparing to Figure 3a (the original image, below), the scene in Figure 3e appears more zoomed-in because the objects appear larger. (EX1002, ¶124.) Thus, the changing size of the viewing window (Figure 3d) simulates changes in zoom for the visual content. (EX1002, ¶124.)

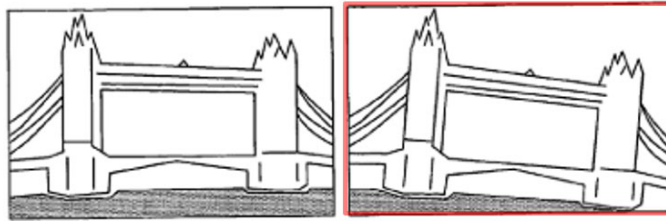


Fig.3a

Fig.3b

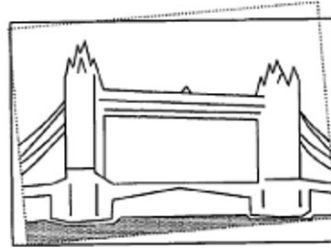


Fig.3c

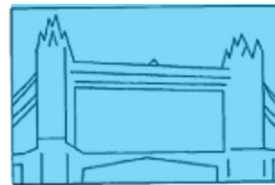


Fig.3d



Fig.3e

7. **Claim 9: “The system of claim 1, wherein the determination of the placement of the viewing window within the field of view of the visual content includes determination of a rotation of the viewing window within the field of view of the visual content.”**

As shown in Figure 4 and Figure 5 below, Thomason determines a rotation of the *image frame 40* within the recorded image data. (EX1002, ¶125.)

Depending on the rotation of the camera, the rotation of the viewing window 40 is determined to compensate for the rotation of the camera. (EX1002, ¶125.) Thus, Thomason’s determination of the placement of the viewing window (image frame

40) includes determination of a rotation of the viewing window within the field of view of the visual content. (EX1002, ¶125.) Figure 3 of Thomason provides another example. (*Id.*)

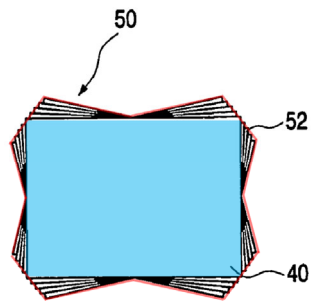


Fig.4

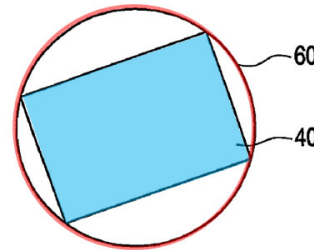


Fig.5

8. **Claim 10: “The system of claim 1, wherein the determination of the placement of the viewing window within the field of view of the visual content includes determination of a location of the viewing window within the field of view of the visual content, the location of the viewing window within the field of view of the visual content determining framing of the visual content.”**

In the various examples of Thomason, the location of the viewing window is determined within the recorded image data. (*Supra* §§ V.A.3.h - V.A.3.j; EX1002, ¶¶127-129.) As shown below, Thomason determines a location for each *viewing window* within the *field of view* such that the viewing window includes horizon-leveled visual content. (*Id.*)

The location of the viewing window in turn dictates the framing of the visual content to be displayed. (*Supra* §§ V.A.3.h - V.A.3.j; EX1002, ¶129.)

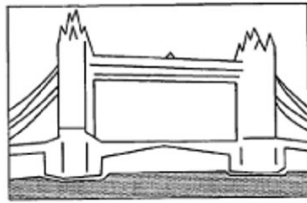


Fig.3a



Fig.3b

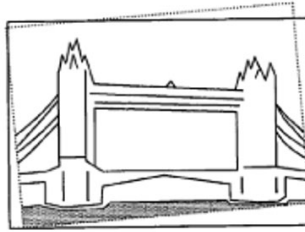


Fig.3c



Fig.3d



Fig.3e

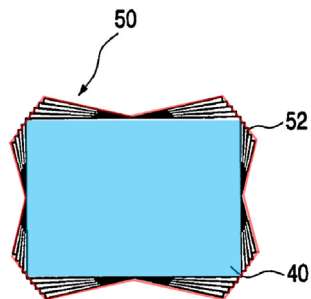


Fig.4

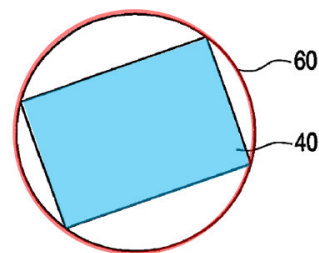


Fig.5

Pacurariu also discloses this limitation. (*Supra* §§ V.A.3.h-V.A.3.j; EX1002, ¶130.)

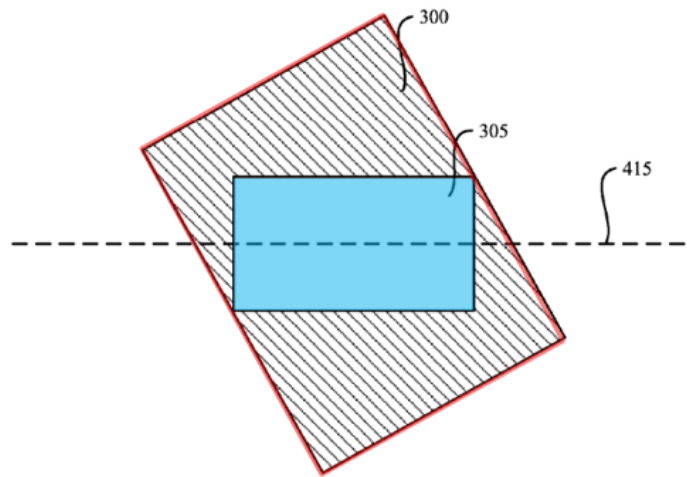


Figure 5A

9. Claim 11

- a. **Preamble: “A method for horizon leveling videos, the method performed by a computing system including one or more processors, the method comprising:”**

The preamble recites limitations similar to claim 1’s preamble and element 1[a], but claim 11 requires a “method.” (EX1002, ¶132.) Thomason discloses “a *method* of processing image information[.]” (EX1004, [0017] (emphasis added); claim 10; EX1002, ¶132.) Thomason also discloses “the method performed by a computing system including one or more processors.” (*Supra* § V.A.3.b.)

- b. **11[a][i]: “obtaining, by the computing system, video information defining a video,”**

Element 11[a][i] mirrors element 1[b][i]. (EX1002, ¶134.)

- c. **11[a][ii]: “the video including video content captured by an image capture device during a capture duration,”**

Element 11[a][ii] mirrors element 1[b][ii]. (EX1002, ¶135.)

- d. **11[a][iii]: “the video content having a progress length, the video content including visual content captured at different moments within the capture duration,”**

Element 11[a][iii] mirrors element 1[b][iii]. (EX1002, ¶136.)

- e. **11[a][iv]: “the visual content viewable as a function of progress through the progress length, the visual content having a field of view;”**

Element 11[a][iv] mirrors element 1[b][iv]. (EX1002, ¶137.)

- f. **11[b]: “obtaining, by the computing system, rotational position information for the video, the rotational position information characterizing rotational positions of the image capture device as a function of progress through the capture duration;”**

Element 11[b] mirrors element 1[c]. (EX1002, ¶138.)

- g. **11[c][i]: “determining, by the computing system, a viewing window for the visual content as a function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration,”**

Element 11[c][i] mirrors element 1[d][i]. (EX1002, ¶139.)

- h. **11[c][ii]: “the viewing window defining extents of the visual content to be included within horizon-leveled visual content as the function of progress through the progress length,”**

Element 11[c][ii] mirrors element 1[d][ii]. (EX1002, ¶140.)

- i. **11[c][iii]: “wherein determining the viewing window includes determining a placement of the viewing window within the field of view of the visual content**

as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration; and”

Element 11[c][iii] mirrors element 1[d][iii]. (EX1002, ¶141.)

- j. 1[d][i]: “generating, by the computing system, the horizon-leveled visual content based on the viewing window, the horizon-leveled visual content including a punchout of the extents of the visual content defined by the viewing window,”**

Element 11[d][i] mirrors element 1[e][i]. (EX1002, ¶142.)

- k. 1[d][ii]: “wherein inclusion of the extents of the visual content defined by the viewing window within the horizon-leveled visual content effectuates horizon leveling of the visual content.”**

Element 11[d][ii] mirrors element 1[e][ii]. (EX1002, ¶143.)

- 10. Claim 12: “The method of claim 11, wherein the viewing window has a one-by-one aspect ratio, the one-by-one aspect ratio reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”**

Claim 12 mirrors claim 2. (EX1002, ¶144.)

- 11. Claim 17: “The method of claim 11, wherein determining the viewing window further includes determining a size of the viewing window as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration.”**

Claim 17 mirrors claim 7. (EX1002, ¶145.)

- 12. Claim 18: “The method of claim 17, wherein the size of the viewing window changes as the function of progress**

through the progress length to simulate changes in zoom for the visual content.”

Claim 18 mirrors claim 8. (EX1002, ¶146.)

- 13. Claim 19: “The method of claim 11, wherein determining the placement of the viewing window within the field of view of the visual content includes determining a rotation of the viewing window within the field of view of the visual content.”**

Claim 19 mirrors claim 9. (EX1002, ¶147.)

- 14. Claim 20: “The method of claim 11, wherein the determining the placement of the viewing window within the field of view of the visual content includes determining a location of the viewing window within the field of view of the visual content, the location of the viewing window within the field of view of the visual content determining framing of the visual content.”**

Claim 20 mirrors claim 10. (EX1002, ¶148.)

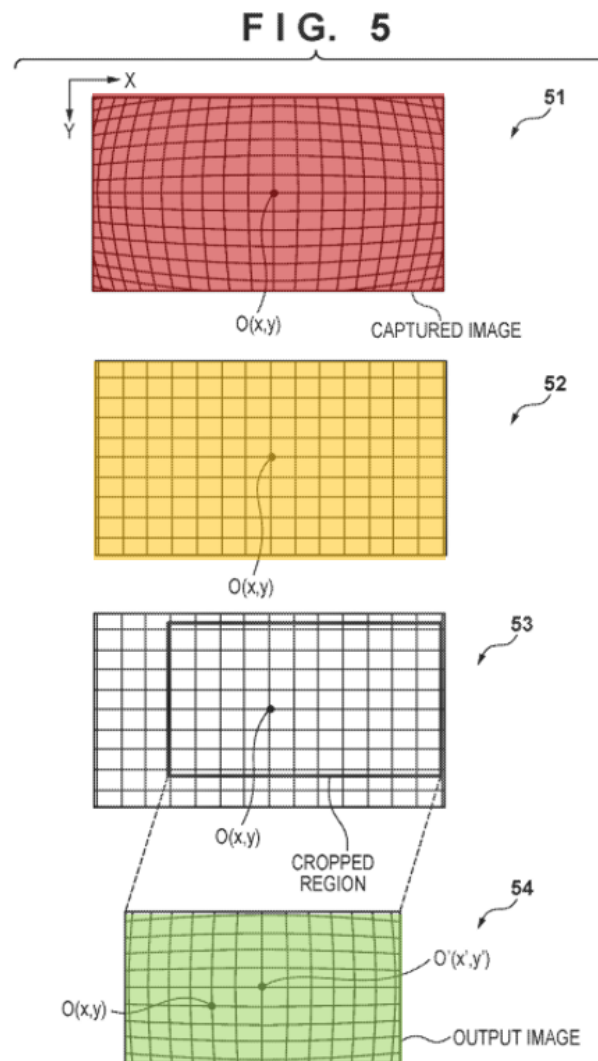
B. Ground 2: Thomason, Pacurariu, and Watanabe Render Obvious Claims 3-6 and 13-16

1. Summary of Watanabe

Watanabe was filed on April 16, 2018, and published on October 18, 2018, qualifying as prior art to the '832 patent at least under §§ 102(a)(1) and 102(a)(2). The Examiner never found, and Applicant never cited, Watanabe during prosecution. Watanabe relates to “an image processing apparatus that generates a natural-looking image even from an image in which image shake has been corrected and distortion has been intentionally added.” (EX1006, Abstract.)

Figure 5 below illustrates an imaging processing method of Watanabe.

Image 51 is a captured image having a “barrel distortion,” which “has occurred caused by aberration of the photographing lens.” (EX1006, 11:9, 13.) Watanabe’s system performs distortion correction to remove the distortion, resulting in **non-distorted image 52**. (EX1006, 11:21-23; EX1002, ¶150.)



The system then performs image shake correction to obtain a cropped region 53, specifically, “[t]he image shake correction circuit 107 determines a cropping

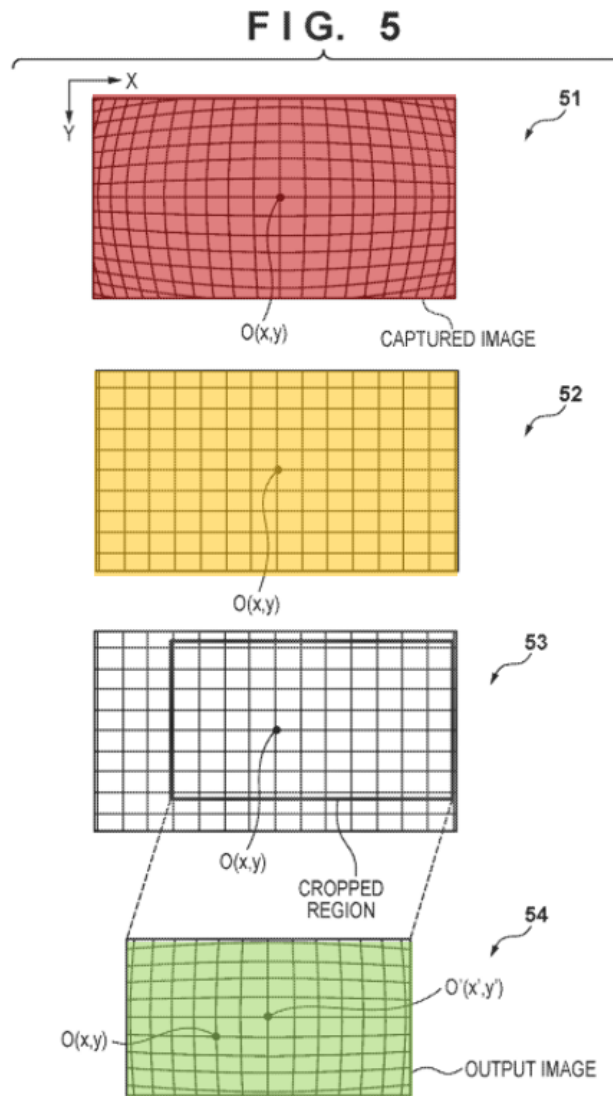
region so as to eliminate image shake resulting from shake of the video camera 100, based on an image shake correction amount calculated by the image shake correction amount calculation circuit 203.” (EX1006, 11:26-30.)

Lastly, the system intentionally adds a distortion to the cropped region 53 to obtain *distorted image 54*, specifically, “[t]he distortion addition circuit 108 adds a distortion effect to the image subjected to image shake correction (54, FIG. 5).” (EX1006, 11:37-39 (emphasis added).) The addition of the distortion is done “to generate a moving image that does not appear unnatural when observed.” (EX1006, 11:53-54.)

2. **Claim 3: “The system of claim 1, wherein the visual content includes a distortion such that a straight line within a scene depicted within the visual content appears as a curved line, the distortion of the visual content reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”**

Figure 5 (below) of Watanabe discloses two examples of visual content including distortions. First, “*51 schematically shows distortion* of an image captured by the image sensor 103 and stored in the image memory 105.” (EX1006, 11:7-9 (emphasis added).) Further, Figure 5 depicts a process in which “image *distortion shown in 51 of FIG. 5 is corrected* (removed) (52, FIG. 5),” “[t]he image shake correction circuit 107 performs image shake correction on the image in 52,” and “[t]he *distortion addition circuit 108 adds a distortion* effect to

the image subjected to image shake correction (54, FIG. 5).” (EX1006, 11:22-25, 37-39 (emphases added).) Thus, both images 51 and 54 include distortions. (EX1002, ¶152.) As shown below, various straight lines within a scene appear as curved lines. (EX1002, ¶152.)



A POSITA would have understood that an off-axis horizon may be less noticeable in a distorted image than in a non-distorted image, for example, because

the curvature may make the off-axis horizon less noticeable. (EX1002, ¶153.)

It would have been obvious to combine the teachings of Thomason, Pacurariu, and Watanabe. (EX1002, ¶154.) Thomason, Pacurariu, and Watanabe all relate to correcting video data based on motion of the image capture device. (EX1004, Abstract; EX1005, Abstract; Watanabe, 5:22-26; EX1002, ¶154.) Thus, Thomason, Pacurariu, and Watanabe are from the same field of endeavor and reasonably pertinent to the same technical problems of improving video content. (EX1002, ¶154.)

Watanabe teaches additional image processing techniques, first correcting distortion before performing image shake correction, and then intentionally adding distortion after performing image shake correction to “generate a moving image that *appears natural after image shake correction.*” (EX1006, 1:47-48 (emphasis added); EX1002, ¶155.) These techniques may be combined with the teachings of Thomason and Pacurariu to generate horizon-leveled video content that also appears more natural looking, with a reasonable expectation of success. (EX1002, ¶155.) For example, the Thomason-Pacurariu-Watanabe combination may remove image distortions from a captured image (*e.g.*, caused by characteristics of the image sensor) as taught by Watanabe, obtain horizon-leveled visual content as taught by Thomason and Pacurariu, and intentionally add certain distortions such that the resulting image appear more natural looking as taught by Watanabe.

(EX1002, ¶156.)

The technical features of removing undesirable distortions and adding desirable distortions improves the video quality produced by the Thomason-Pacurariu combination, yielding the predictable result of making the video content appear more natural looking. (EX1002, ¶157.) A POSITA would be motivated to use the known techniques of Watanabe to improve similar devices of Thomason and Pacurariu in the same way. (*Id.*) Further, it would have been obvious to try combining the teachings of Thomason, Pacurariu, and Watanabe. (*Id.*) Thus, it would have been obvious to a POSITA to combine the additional imaging processing techniques of Watanabe with the teachings of Thomason and Pacurariu to obtain a more natural-looking video for display. (*Id.*) The known benefits of Watanabe would prompt the application of Watanabe in the same field based on design incentives and other market forces. (*Id.*)

3. Claim 4: “The system of claim 3, wherein the distortion includes a barrel distortion or a pincushion distortion.”

Watanabe discloses image 51 in Figure 5 includes “barrel distortion.”

“Here, *barrel distortion* that is centered on image coordinates (x,y) corresponding to the intersection between an optical axis O and the image sensor (which is assumed here to match the center coordinates of the image) has occurred caused by aberration of the photographing lens 102.” (EX1006, 11:9-14 (emphasis added).)

Image 54 in Figure 5 also includes barrel distortion “to generate a moving image that does not appear unnatural when observed”. (EX1006, 11:53-54; EX1002, ¶158.) Watanabe further discloses “it is known that image distortion caused by aberration can be classified into *barrel distortion* and *pincushion distortion*[.]” (EX1006, 1:16-18 (emphases added).) It would have been obvious to combine the teachings of Thomason, Pacurariu, and Watanabe. (*Supra* § V.B.2.)

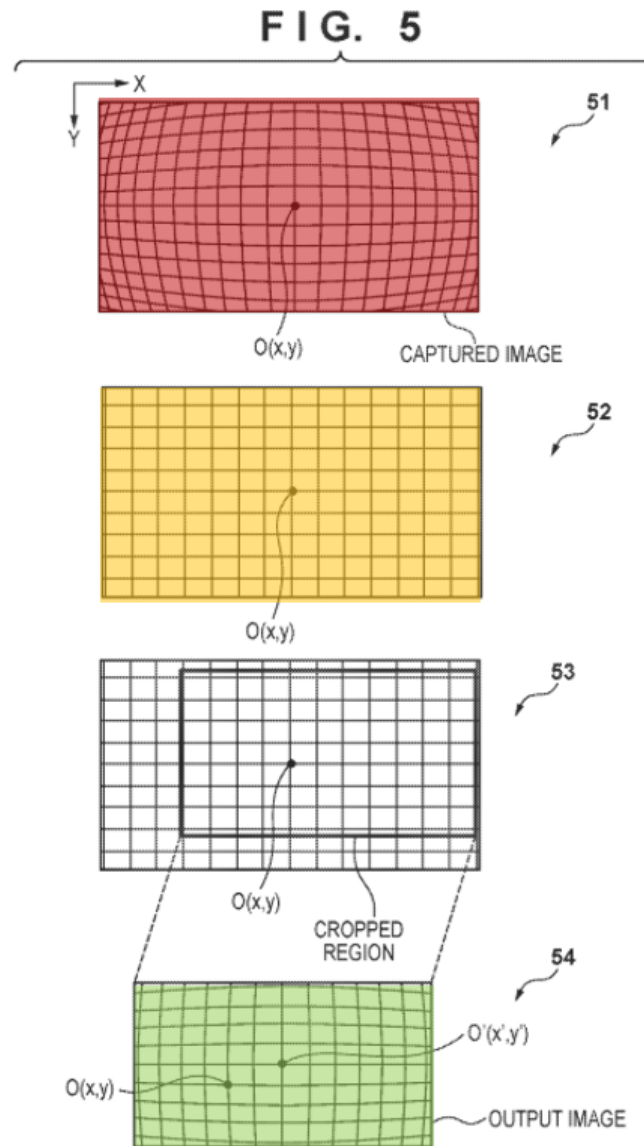
4. Claim 5: “The system of claim 3, wherein the visual content includes the distortion based on capture of the visual content through a wide field of view optical element.”

Watanabe discloses “an image shot using a (super) wide-angle lens such as a fisheye lens is recognized to have distortion caused by aberration as one feature.” (EX1006, 9:33-35.) Further, “[a] wide conversion lens enables wider angle shooting than the photographing lens 102, but causes more intense barrel distortion.” (EX1006, 16:20-22.)

A POSITA would have understood that Watanabe’s “wide-angle lens” and “wide conversion lens” are examples of “wide field of view optical element.” (EX1002, ¶160.) It would have been obvious to combine the teachings of Thomason, Pacurariu, and Watanabe. (*Supra* § V.B.2.)

5. Claim 6: “The system of claim 3, wherein the visual content includes the distortion based on application of the distortion to non-distorted visual content, the distortion applied to the non-distorted visual content based on the visual content including the non-distorted visual content.”

The operations of Figure 5 are discussed with reference to claim 3. (*Supra* § V.B.2.) In Figure 5 below, the *image 52* is the “non-distorted visual content” to which a distortion is applied. (EX1002, ¶161.)



It would have been obvious to combine the teachings of Thomason, Pacurariu, and Watanabe. (*Supra* § V.B.2.)

6. **Claim 13: “The method of claim 11, wherein the visual content includes a distortion such that a straight line within a scene depicted within the visual content appears as a curved line, the distortion of the visual content reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”**

Claim 13 mirrors claim 3. (EX1002, ¶163.)

7. **Claim 14: “The method of claim 13, wherein the distortion includes a barrel distortion or a pincushion distortion.”**

Claim 14 mirrors claim 4. (EX1002, ¶164.)

8. **Claim 15: “The method of claim 13, wherein the visual content includes the distortion based on capture of the visual content through a wide field of view optical element.”**

Claim 15 mirrors claim 5. (EX1002, ¶165.)

9. **Claim 16: “The method of claim 13, wherein the visual content includes the distortion based on application of the distortion to non-distorted visual content, the distortion applied to the non-distorted visual content based on the visual content including the non-distorted visual content.”**

Claim 16 mirrors claim 6. (EX1002, ¶166.)

C. Ground 3: Voss and Derbanne Render Obvious Claims 1, 2, 7-12, and 17-20

1. Summary of Voss

Voss was filed on May 19, 2015, claims earliest priority to a provisional application filed on May 27, 2014, and published on December 3, 2015, qualifying as prior art to the '832 patent under §§ 102(a)(1) and 102(a)(2). The Examiner never found, and Applicant never cited, Voss during prosecution.

Voss discloses a system that “dynamically maintain[s] a horizontal framing of a video.” (EX1007, Abstract). As shown in Figure 2 (below) of Voss, as the image capture device rotates over time, an *inset rectangle* updates to include different portions of the visual content. (EX1002, ¶169.) “The inset rectangle 225 is transformed to compensate for rotation 220, 230, 240 by essentially rotating in the inverse of the device's own rotation, which is sampled from the device’s integrated gyroscope.” (EX1007, 10:5-7.)

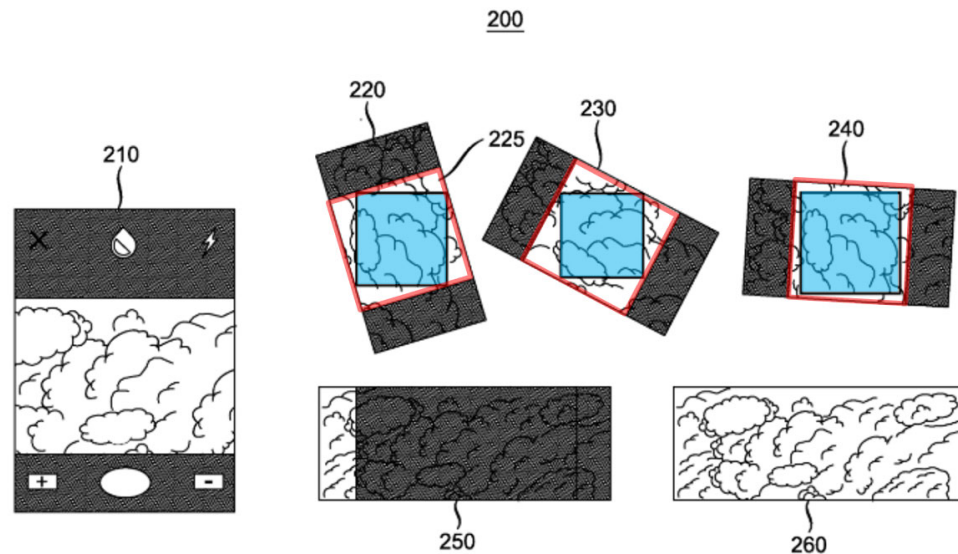


FIG. 2

A better rendering of Figure 2 appears to be provided in a related application of Voss. (EX1002, ¶171.) The related application International Publication No. WO 2015/038180 show what appears to be the original photographic version of Figure 2, reproduced below, in which the clouds in the inset rectangle 225 have substantially the same orientation despite rotation of the device. (EX1013, FIG. 2;

EX1002, ¶171.) The slight variations in the orientation across three images may be due to movement of the clouds over time as the video is taken. (EX1002, ¶171.)

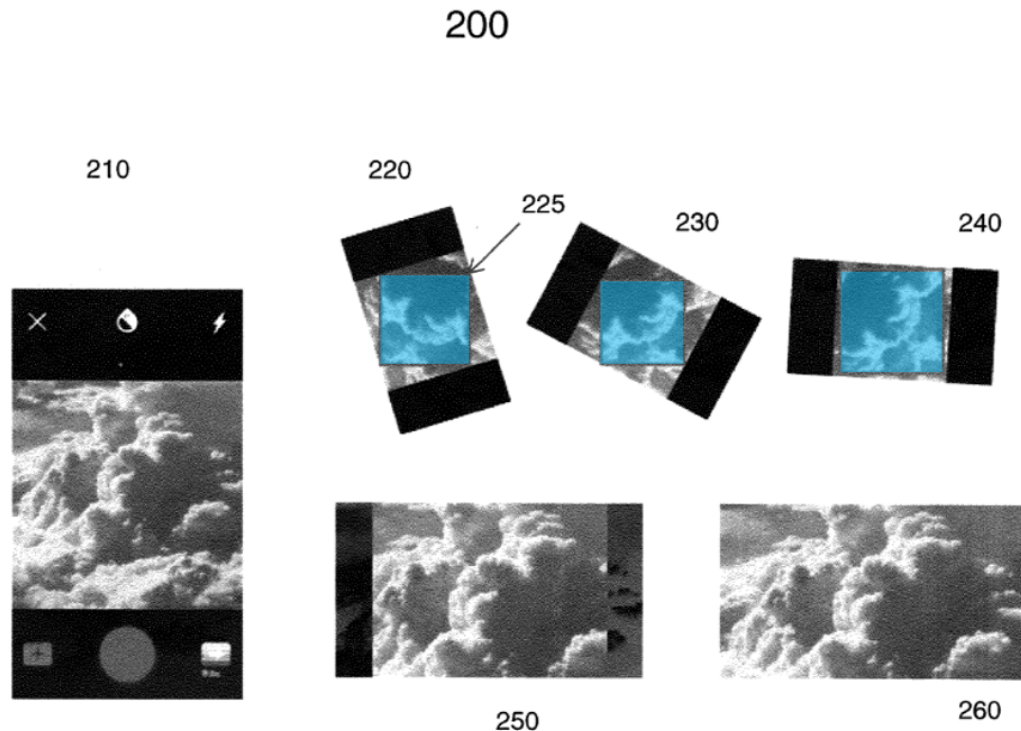


FIG. 2

2. Summary of Derbanne

Derbanne was filed on October 2, 2018, claims earliest priority to a provisional application filed on May 18, 2018, and published on July 2, 2019, qualifying as prior art to the '832 patent under § 102(a)(1). The Examiner never found, and Applicant never cited, Derbanne during prosecution.

Derbanne discloses systems and methods for “stabilizing videos using positions of an image capture device during a capture duration.” (EX1008, 1:6-7.)

Derbanne discloses an “*optical field of view*” and a “*capture field of view*,” and the “optical field of view may be greater than a capture field of view for generating video content.” (EX1008, 1:65-66 (emphases added).)

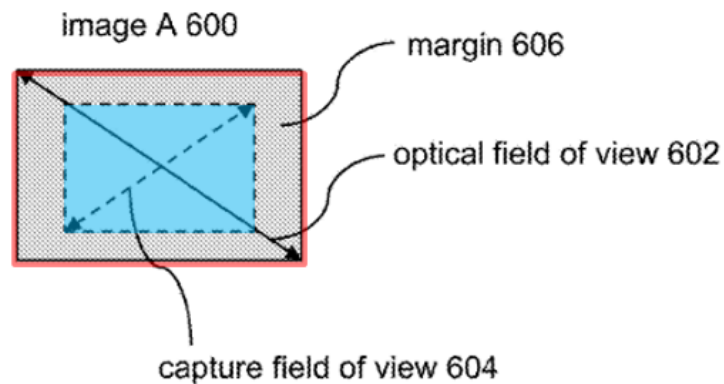
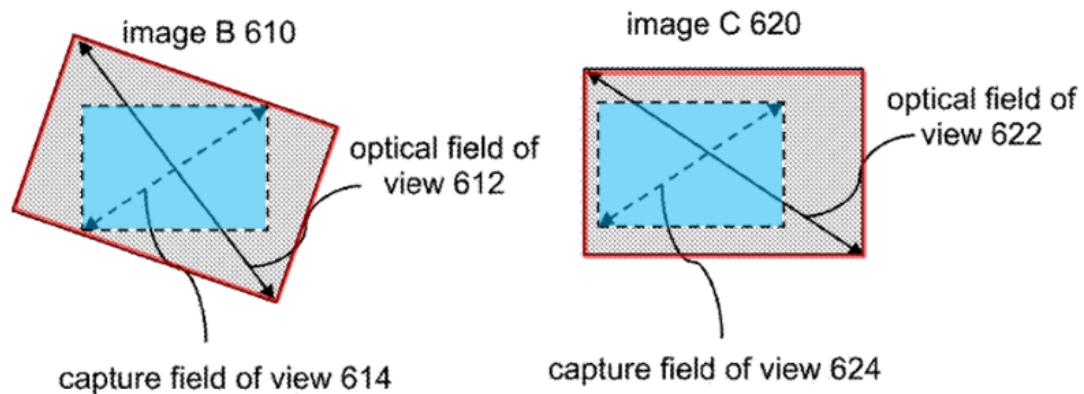


FIG. 6A

Derbanne further discloses that “[t]he orientations of the *capture field of view* for the images with respect to the *optical field of view* of the images may determine which portions of the visual content of the images (punch-outs) may be used to generate a video.” (EX1008, 12:66-13:2 (emphases added).) For example, Figure 6B below illustrates example orientations of a capture field of view with respect to an optical field of view. (EX1008, 13:18-36.)

**FIG. 6B****3. Claim 1**

- a. Preamble: “A system for horizon leveling videos, the system comprising:”**

To the extent the preamble is limiting (which Petitioner does not concede), Voss discloses the preamble. For example, Voss discloses a system that “dynamically maintain[s] a horizontal framing of a video.” (EX1007, Abstract).

- b. 1[a]: “one or more physical processors configured by machine-readable instructions to:”**

Voss’ system comprises one or more processors. (EX1007, 6:20-7:9.) For example, Figure 1 shows a *processor 150*, which “may be a single processor or more than one processor as known by one skilled in the art.” (EX1007, 6:21-22 (emphasis added).) Voss’ processor 150 is configured by machine-readable instructions, for example, to “process[] audio and video content for play back” and “execute subroutines in the mobile phone used to manipulate data similar to a

computer.” (EX1007, 7:1-6.) A POSITA would have understood that these are physical processors that are physically included in systems. (EX1002, ¶175.)

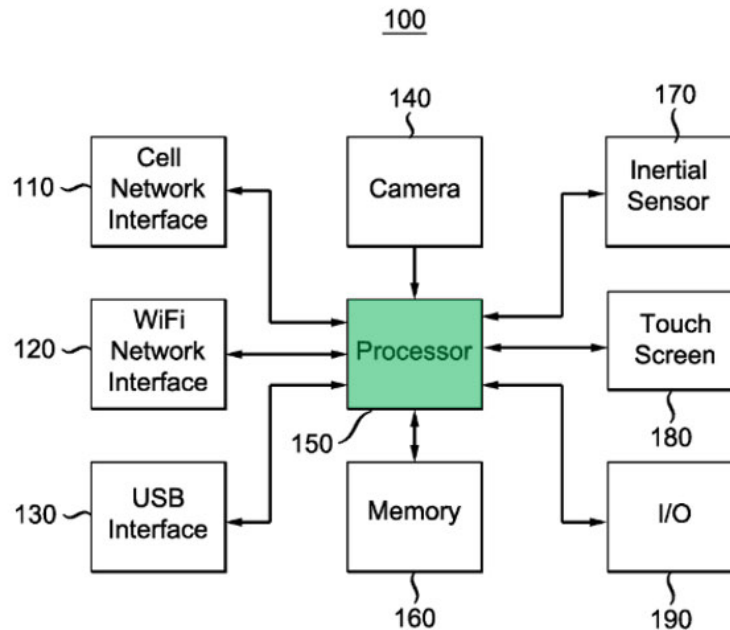


FIG. 1

c. 1[b][i]: “obtain video information defining a video,”

In Voss, “holding a button for a predetermined time, such as 3 seconds, may indicate that a video has been selected and video recording on the mobile device will continue until the button is actuated a second time.” (EX1007, 11:21-12:2.) Voss’ system “saves [] the capture data as a video file in a video file format, such as mpeg or the like.” (EX1007, 15:2-3). The video file is the “video information defining a video.” (EX1002, ¶176.)

d. 1[b][ii]: “the video including video content captured by an image capture device during a capture duration,”

Voss states that “video recording on the mobile device will continue until the button is actuated a second time.” (EX1007, 12:1-2). The mobile device is an example “image capture device.” (EX1002, ¶177.)

Voss discloses a “capture duration.” Voss discloses that “[o]nce the image capture indication has been received by the main processor 510, the device begins to save the data sent from the image sensor 520. In addition, the system initiates a timer. The system then continues to capture data from the image sensor as video data. In response to a second indication from the capture indication, indicating that capture has been ceased 530, the system stops saving data from the image sensor and stops the timer.” (EX1007, 14:10-15.) Thus, Voss captures the video content over a period of time. The period of time during which the video content is captured is “the capture duration.” (EX1002, ¶178.)

e. 1[b][iii]: “the video content having a progress length, the video content including visual content captured at different moments within the capture duration,”

Voss discloses a “progress length.” Voss’ system “saves [] the capture data as a video file in a video file format, such as mpeg or the like.” (EX1007, 15:2-3.) Further, Voss’s “main processor 150 also processes audio and video content for *play back* either directly on the device or on an external device through the

audio/video interface.” (EX1007, 7:1-3 (emphasis added).) Thus, Voss’s video content may be played back over a period of time. The period of time during which the video content is played back is a “progress length.” (EX1002, ¶180.)

Further, it would have been obvious to a POSITA that Voss’ video file has a progress length and includes visual content captured at different moments within the capture duration. (EX1002, ¶181.) At the time of the invention in 2019, a video file format typically included a series of image frames captured at different moments within the time period during which the video is captured (the capture duration). (EX1002, ¶181.) Each image frame is time-stamped or associated with a specific point in time, indicating when it may be displayed during playback. (EX1002, ¶181.)

Further, Derbanne discloses this limitation. Derbanne states, “[v]ideo content may define visual content viewable as a function of progress through a *progress length* of the video content. Video content may include video frames that define visual content. That is, visual content of the video content may be included within *video frames* of the video content.” (EX1008, 13:49-53 (emphases added).) It would have been obvious to a POSITA that Voss’ “video frames” are captured at different moments within the capture duration. (EX1002, ¶182.)

It would have been obvious to combine the teachings of Voss and Derbanne. Both Voss and Derbanne relate to techniques for rotating visual content in video

data to compensate for motion of the image capture device. (EX1007, Abstract, 10:5-7; EX1008, 13:2-8; EX1002, ¶183.) The Voss-Derbanne combination results in a system in which data (captured video data, rotational position information) is captured, stored, and maintained in accordance with the teachings of Derbanne, and a punchout may be generated, yielding the predictable result of improving the video management and processing capabilities of Voss. (EX1002, ¶184.) A POSITA would be motivated to use the known techniques of Derbanne to improve Voss in the same way. (*Id.*) Further, it would have been obvious to try combining the teachings of Voss and Derbanne, as these technical features of Derbanne may be combined with the teachings of Voss without requiring much effort and with a reasonable expectation of success. (*Id.*) The known benefits of Derbanne would prompt the application of Derbanne in the same field based on design incentives and other market forces. (*Id.*)

f. 1[b][iv]: “the visual content viewable as a function of progress through the progress length, the visual content having a field of view;”

Voss’s “main processor 150 also processes audio and video content for *play back* either directly on the device or on an external device through the audio/video interface.” (EX1007, 7:1-3 (emphasis added).) Thus, Voss’ video content is viewable. (EX1002, ¶185.) As shown in element 1[b][iii], Voss’ video content may be played back over a period of time and the period of time during which the

video content is played back is “the progress length.” (*Supra* § V.C.3.e.) A POSITA would understand providing a playback of video content over a progress length, as taught by Voss, means that the video content is “viewable as a function of progress through the progress length.” (EX1002, ¶185.)

Voss discloses “the visual content having a field of view.” Voss states “An inset rectangle 225 is inscribed within the overall sensor that is best-fit to the maximum boundaries of the sensor given the desired optimal aspect ratio for the given (current) orientation.” (EX1007, 10:2-4.) Figure 2 depicts several example maximum boundaries of the sensor given the desired optimal aspect ratio. (EX1002, ¶186.) Each of these constitutes *a field of view* of the visual content, or at least a portion of the field of view. (EX1002, ¶186 (emphasis added).)

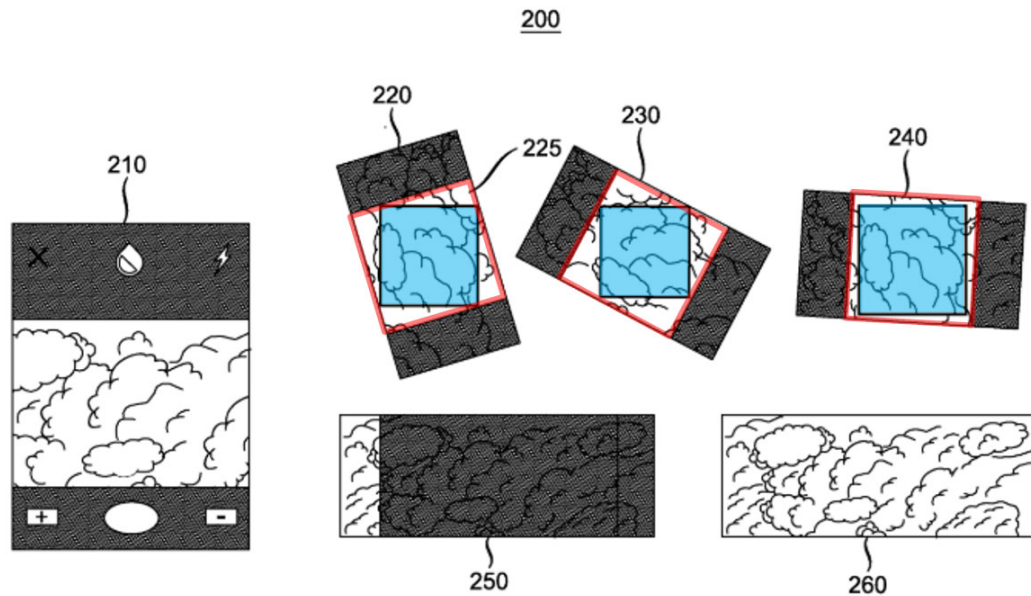


FIG. 2

Further, it would have been obvious for Voss' video file to include visual content viewable as a function of progress through the progress length. (EX1002, ¶187.) As discussed above, at the time of the invention in 2019, a video file format typically included a series of image frames and each image frame is time-stamped. (*Supra* § V.C.3.e; EX1002, ¶187.) During playback of the video data, the series of image frames may be displayed sequentially per the timestamps over time (through the progress length). (EX1002, ¶187.)

Further, Derbanne states, “[v]ideo content may define visual content *viewable as a function of progress through a progress length of the video content.*” (EX1008, 13:49-51 (emphasis added).) Derbanne further discloses a system in which “images with an *optical field of view* may be captured by an

image capture device during a capture duration.” (EX1008, 1:18-20 (emphasis added).) Figure 6B depicts example optical fields of view 612 and 622. It would have been obvious to combine the teachings of Voss and Derbanne. (*Supra* § V.C.3.e.)

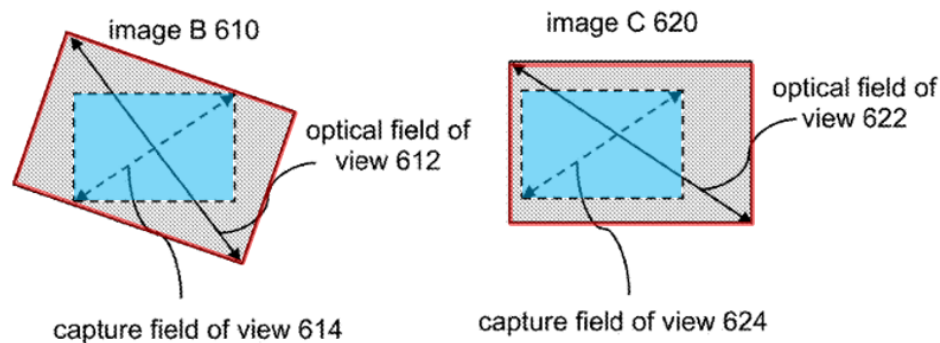


FIG. 6B

- g. **1[c]: “obtain rotational position information for the video, the rotational position information characterizing rotational positions of the image capture device as a function of progress through the capture duration;”**

Voss’ system includes “*inertial sensor 170*.” (EX1007, 7:4 (emphasis added).) “The inertial sensor 170 may be a gyroscope, accelerometer, axis orientation sensor, light sensor or the like, which is used to determine a horizontal and/or vertical indication of the position of the mobile device.” (EX1007, 9:1-3.)

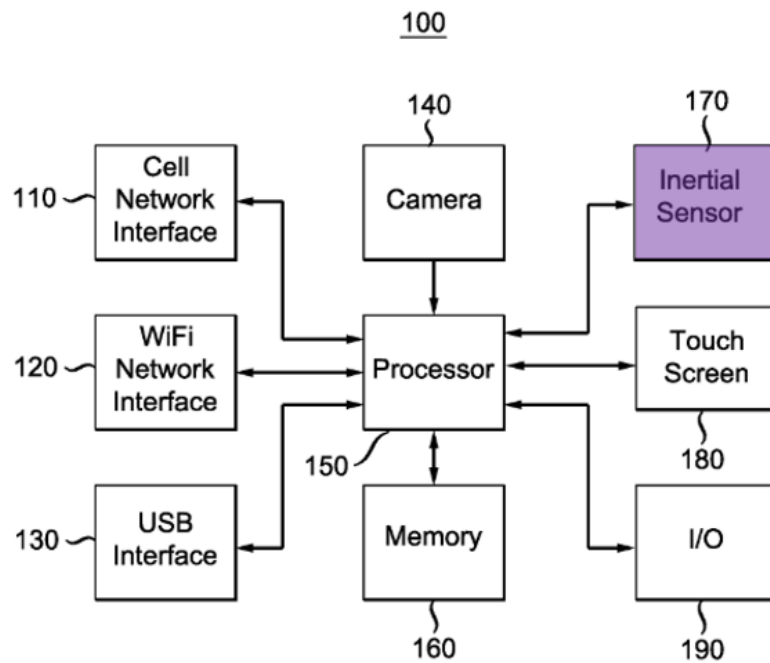


FIG. 1

Voss discloses “the rotational position information characterizing rotational positions of the image capture device as a function of progress through the capture duration.” Voss establishes associations between rotational measurements and various time points through the capture duration of the video. (EX1002, ¶¶190-191.) In Voss, “[o]nce the appropriate capture sensor is selected, the system then requests a measurement from an inertial sensor 330. . . . The measurement sensor may send periodic measurements to the controlling processor thereby continuously indicating the vertical and/or horizontal orientation of the mobile device.” (EX1007, 12:4-10.) “[T]he frequency of rotational measurements may be increased during video capture to provide more accurate positional information *in*

time with the video.” (EX1007, 16:23-17:2 (emphasis added), FIG. 7.) “After the inertial sensor has returned an indication of the vertical and/or horizontal orientation of the mobile device, the mobile device depicts an inset rectangle on the display indicating the captured orientation of the video or image 340. As the mobile device is rotated, the system processor *continuously synchronizes inset rectangle with the rotational measurement received from the inertial sensor 350.*” (EX1007, 12:14-18 (emphasis added).) Thus, Voss’ system establishes associations between rotational measurements and various time points through the capture duration of the video. (EX1002, ¶191.)

Further, Derbanne discloses obtaining “position information,” which “may characterize positions of the housing 312 based on specific translational and/or rotational positions of the housing 312 and/or based on changes in translational and/or rotational positions of the housing 312 *as a function of progress through the capture duration.*” (EX1008, 5:53-57 (emphasis added).) Further, “[t]he position output signal may convey position information that characterizes positions of the housing 312 at different moments (points in time, time durations) within the capture duration.” (EX1008, 5:49-52.) It would have been obvious to combine the teachings of Voss and Derbanne. (*Supra* § V.C.3.e.)

- h. **1[d][i]: “determine a viewing window for the visual content as a function of progress through the progress length based on the rotational positions of the image**

capture device as the function of progress through the capture duration,”

Voss discloses “determine a viewing window for the visual content . . . based on the rotational positions of the image capture device as the function of progress through the capture duration.” As shown in Figure 2 below, “[t]he *inset rectangle* 225 is transformed to *compensate for rotation* 220, 230, 240 by essentially rotating in the inverse of the device's own rotation, which is sampled from the device's integrated gyroscope.” (EX1007, 10:5-7 (emphases added).) Voss’ inset rectangle is a “viewing window” determined based on rotational information of the image capture device. (EX1002, ¶194.)

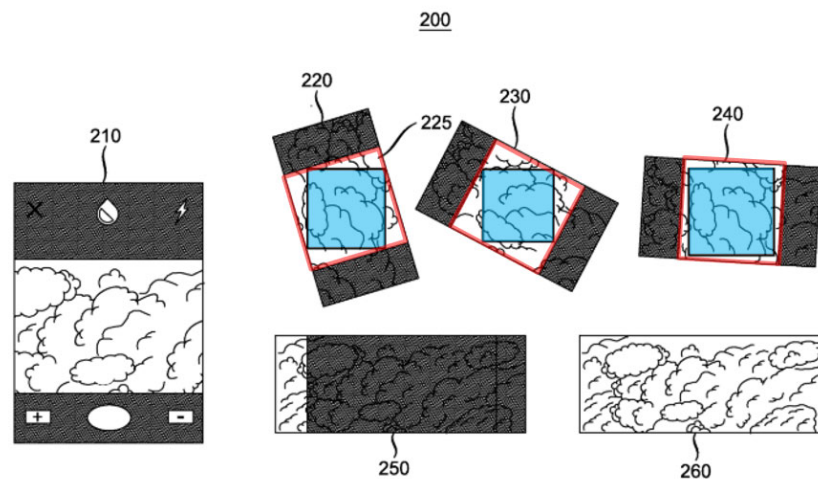


FIG. 2

Voss discloses that the processed image data may be played back, stating that “main processor 150 also processes audio and video content for *play back* either directly on the device or on an external device through the audio/video

interface.” (EX1007, 7:1-3 (emphasis added).) Thus, Voss discloses playing back the processed video (with processed frames defined by viewing windows as shown in Figure 2), thus disclosing that the viewing window is determined for the visual content as a function of progress through the progress length. (EX1002, ¶195.)

Further, Derbanne discloses “[v]ideo content may define visual content viewable *as a function of progress through a progress length of the video content.*” (EX1008, 13:49-51 (emphasis added).) The Voss-Derbanne combination would process the video content in Derbanne’s format, which is “viewable as a function of progress through a progress length of the video content” as taught by Derbanne, to determine the viewing windows for different frames in the video content, thus determining a viewing window for the visual content “as a function of progress through the progress length.” (EX1002, ¶197.)

Voss discloses horizon-leveling during post-processing or in real time. “The system permits the user to freely rotate the device while filming, while visualizing the final output in an overly on the device viewfinder or screen during shooting. The *resulting recording is subsequently corrected* to maintain a single orientation with a stable horizon.” (EX1007, 3:6-9 (emphasis added), 9:15-19, 15:23-16:6, FIG. 6.) Thus, Voss discloses first capturing/generating a video stream that is displayed and then, during post-processing, determining the overlay to generate horizon-leveled visual content. (EX1002, ¶198.)

Voss also discloses horizon-leveling in real time. “Thus, as the device is rotated, the controlling processor can continuously update the display and save the video or image in a way which has a continuous consistent horizon.” (EX1007, 12:10-12.) With reference to Figure 4, Voss states “[a]n inscribed rectangle 440, as described previously, may also be overlaid on the image to indicate an aspect ratio of the image or video *to be captured.*” (EX1007, 14:2-5 (emphasis added).) Thus, Voss discloses directly generating and storing the horizon-leveled visual content in real time. (EX1002, ¶199.)

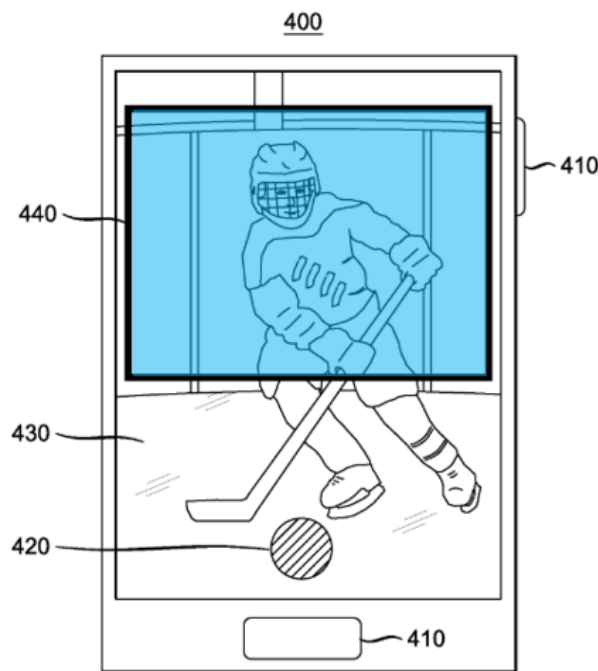


FIG. 4

- i. 1[d][ii]: “the viewing window defining extents of the visual content to be included within horizon-leveled visual content as the function of progress through the progress length,”

In Voss, “[t]he transformed inner rectangle 225 is inscribed optimally inside the maximum available bounds of the overall sensor minus the padding.”

(EX1007, 10:7-9.) As shown in Figure 2 below, each of the inset rectangles (marked in blue) defines the extents of visual content. (EX1002, ¶200.)

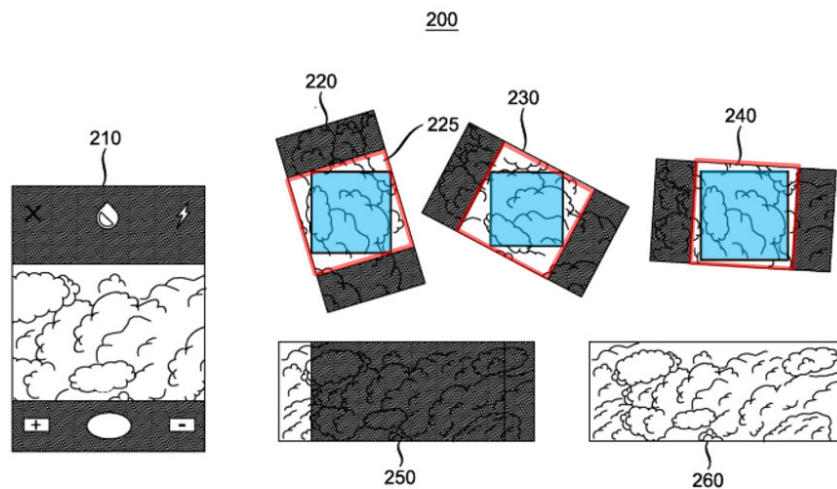


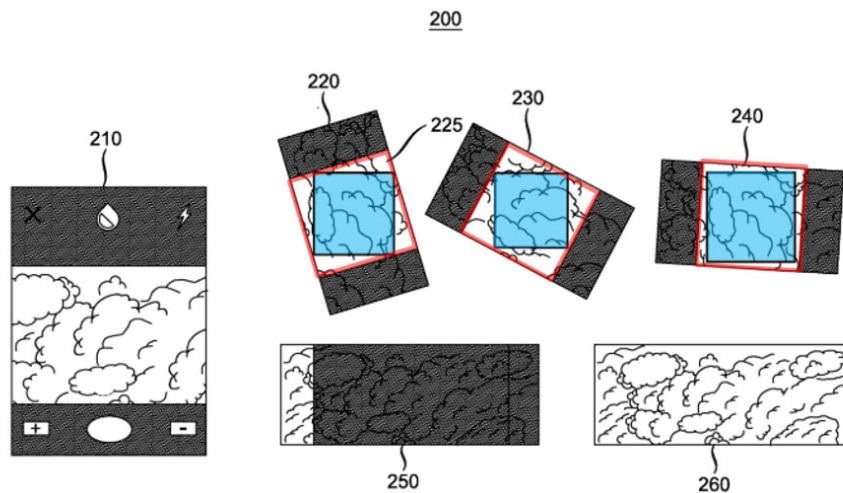
FIG. 2

The visual content in the inset rectangle is horizon-leveled, because “[t]he inset rectangle 225 is transformed to compensate for rotation 220, 230, 240 by essentially rotating in the inverse of the device's own rotation[.]” (EX1007, 10:5-7.) “The resulting recording is subsequently corrected to maintain a single orientation with a stable horizon.” (EX1007, Abstract.)

As shown for element 1[d][i], the viewing window in the Voss-Derbanne combination is determined for the visual content as a function of progress through the progress length. (*Supra* § V.C.3.h.)

- j. 1[d][iii]: “wherein determination of the viewing window includes determination of a placement of the viewing window within the field of view of the visual content as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration; and”

Voss discloses “determination of a placement of the viewing window within the field of view of the visual content.” Voss describes the placement determination of the inset rectangle as follows: “[a]n *inset rectangle* 225 is inscribed within the overall sensor that is best-fit to the *maximum boundaries of the sensor* given the desired optimal aspect ratio for the given (current) orientation.” (EX1007, 10:2-4 (emphases added).)



The determination of placement is “based on the rotational positions of the image capture device as the function of progress through the capture duration.” As

shown in Figure 2 of Voss, as the image capture device rotates over time, the inset rectangle is placed in different places within the boundaries to compensate for the device's own rotation at different time points. (EX1002, ¶204.)

As shown for element 1[d][i], the viewing window in the Voss-Derbanne combination is determined for the visual content as a function of progress through the progress length. (*Supra* § V.C.3.h.)

- k. **1[e][i]: “generate the horizon-leveled visual content based on the viewing window, the horizon-leveled visual content including a punchout of the extents of the visual content defined by the viewing window,”**

Voss discloses “generate the horizon-leveled visual content.” “The resulting recording is subsequently corrected to maintain a single orientation with a *stable horizon*.” (EX1007, Abstract (emphasis added).) Voss further states that “as the device is rotated, the controlling processor can continuously update the display and save the video or image in a way which has a *continuous consistent horizon*.” (EX1007, 12:10-12 (emphasis added).)

Voss discloses that the horizon-leveled visual content is generated “based on the viewing window.” The horizon-leveled visual content is defined by the inset rectangle overlay discussed above. (EX1002, ¶207.) “The exemplary mobile device application is operative for allowing a user to record in any framing and freely rotate their device while shooting, visualizing the final output in an overlay

on the device's viewfinder during shooting and ultimately correcting for their orientation in the final output.” (EX1007, 9:15-19.)

Voss discloses “the horizon-leveled visual content including a punchout of the extents of the visual content defined by the viewing window.” As shown in Figure 2 of Voss, the inset rectangle defines a portion of the visual content for presentation. (EX1002, ¶208.)

Further, Derbanne discloses element 1[e][i]. Derbanne states, “[v]ideo content is generated based on visual content of the images within the *punch-outs*.” (EX1008, Abstract (emphasis added).) “A punch-out of an image may refer to one or more portions of the image that is used for presentation, such as a cut-out of the image or a cropped portion of the image. A punch-out of an image may include one or more visual portions of the image presented on a display and/or one or more visual portion portions [sic] of the image used to generate video frames of video content.” (EX1008, 8:10-16.) “[T]he orientation component 106 may determine how the punch-outs for the images may be oriented with respect to the capture field of view for the images.” (EX1008, 13:3-5.)

- I. **1[e][ii]: “wherein inclusion of the extents of the visual content defined by the viewing window within the horizon-leveled visual content effectuates horizon leveling of the visual content.”**

Voss discloses that its operations “effectuate[] horizon leveling of the visual

content.” Voss states that “as the device is rotated, the controlling processor can continuously update the display and save the video or image in a way which has a *continuous consistent horizon.*” (EX1007, 12:10-12 (emphasis added).)

4. Claim 2: “The system of claim 1, wherein the viewing window has a one-by-one aspect ratio, the one-by-one aspect ratio reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”

Voss discloses that “[t]he user may optionally indicate a preferred final video or image ration, such as *1:1*, 9:16, 16:9, or any other ratio selected by the user.” (EX1007, 12:22-23.) Voss also discloses “the sampled rectangle is 1:1.” (EX1007, 10:18.)

A POSITA would have understood that the one-by-one aspect ratio may make an off-axis horizon appear less noticeable comparing to a wider aspect ratio. (EX1002, ¶212.)

5. Claim 7: “The system of claim 1, wherein the determination of the viewing window further includes determination of a size of the viewing window as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration.”

Voss discloses “a determination of a size of the viewing window” based on rotational data. As shown in Figure 2 below, the size of the inset rectangle changes over time based on different rotational positions of the image capture device. (EX1002, ¶213.)

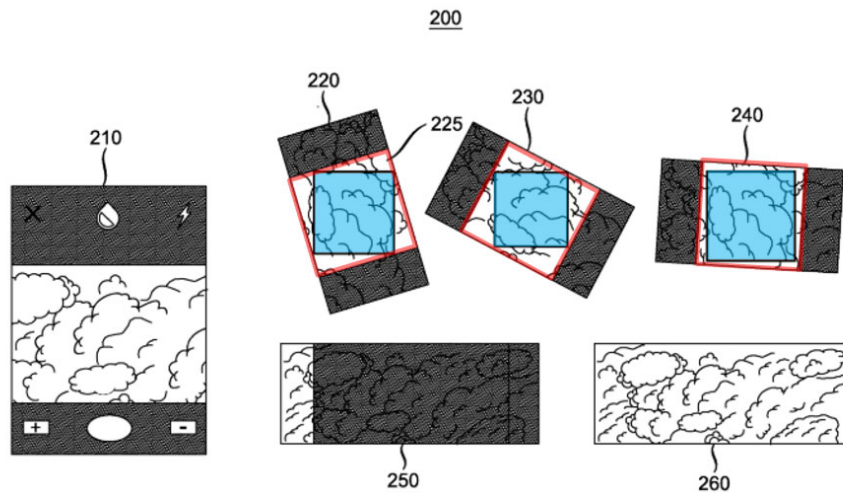


FIG. 2

As shown for element 1[d][i], the viewing window in the Voss-Derbanne combination is determined for the visual content as a function of progress through the progress length. (*Supra* § V.C.3.h.) A POSITA would understand that the size of the viewing window would also be determined as the function of progress through the progress length. (EX1002, ¶214.)

- 6. Claim 8: “The system of claim 7, wherein the size of the viewing window changes as the function of progress through the progress length to simulate changes in zoom for the visual content.”**

As shown for claim 7, the viewing window may change its size. (*Supra* § V.C.5.) Further, Voss discloses “the framing of the image inside the output box is maintained regardless of the aspect ratio. Thus, no matter how the device is oriented, scene is zoomed in or out to keep consistent framing.” (EX1007, 13:10-12.) Voss further discloses “where maximum resolution is desired, the zooming in

and out may change the size of the object of interest.” (EX1007, 13:14-15; EX1002, ¶216.)

7. **Claim 9: “The system of claim 1, wherein the determination of the placement of the viewing window within the field of view of the visual content includes determination of a rotation of the viewing window within the field of view of the visual content.”**

Voss discloses “determination of a rotation of the viewing window.” In Voss, “[t]he inset rectangle 225 is transformed to compensate for rotation 220, 230, 240 by essentially rotating in the inverse of the device’s own rotation, which is sampled from the device’s integrated gyroscope.” (EX1007, 10:5-7.)

8. **Claim 10: “The system of claim 1, wherein the determination of the placement of the viewing window within the field of view of the visual content includes determination of a location of the viewing window within the field of view of the visual content, the location of the viewing window within the field of view of the visual content determining framing of the visual content.”**

Voss discloses “determination of a location of the viewing window.” As shown in Figure 2, the location of the inset rectangle within the field of view changes over time based on different rotational positions of the image capture device.

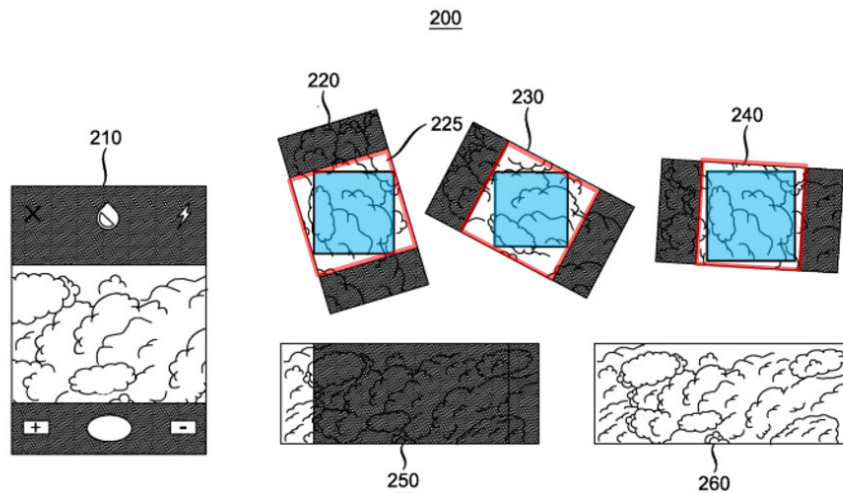


FIG. 2

Voss discloses the location of the viewing window determines “framing of the visual content.” As shown in Figure 2, different locations of the inset rectangle result in framing of different visual content. (EX1002, ¶218.)

9. Claim 11

- a. **Preamble: “A method for horizon leveling videos, the method performed by a computing system including one or more processors, the method comprising:”**

The preamble mirrors the preamble of claim 1 and element 1[a]. (EX1002, ¶219.) Voss discloses “[a] method and apparatus for dynamically maintaining a horizontal framing of a video.” (EX1007, Abstract.) Voss also discloses “the method performed by a computing system including one or more processors”. (*Supra* § V.C.3.b.)

- b. **11[a][i]: “obtaining, by the computing system, video information defining a video,”**

Element 11[a][i] mirrors element 1[b][i]. (EX1002, ¶220.)

- c. **11[a][ii]: “the video including video content captured by an image capture device during a capture duration,”**

Element 11[a][ii] mirrors element 1[b][ii]. (EX1002, ¶221.)

- d. **11[a][iii]: “the video content having a progress length, the video content including visual content captured at different moments within the capture duration,”**

Element 11[a][iii] mirrors element 1[b][iii]. (EX1002, ¶222.)

- e. **11[a][iv]: “the visual content viewable as a function of progress through the progress length, the visual content having a field of view;”**

Element 11[a][iv] mirrors element 1[b][iv]. (EX1002, ¶223.)

- f. **11[b]: “obtaining, by the computing system, rotational position information for the video, the rotational position information characterizing rotational positions of the image capture device as a function of progress through the capture duration;”**

Element 11[b] mirrors element 1[c]. (EX1002, ¶224.)

- g. **11[c][i]: “determining, by the computing system, a viewing window for the visual content as a function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration,”**

Element 11[c][i] mirrors element 1[d][i]. (EX1002, ¶225.)

- h. **11[c][ii]: “the viewing window defining extents of the visual content to be included within horizon-leveled visual content as the function of progress through the progress length,”**

Element 11[c][ii] mirrors element 1[d][ii]. (EX1002, ¶226.)

- i. **11[c][iii]: “wherein determining the viewing window includes determining a placement of the viewing window within the field of view of the visual content as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration; and”**

Element 11[c][iii] mirrors element 1[d][iii]. (EX1002, ¶227.)

- j. **1[d][i]: “generating, by the computing system, the horizon-leveled visual content based on the viewing window, the horizon-leveled visual content including a punchout of the extents of the visual content defined by the viewing window,”**

Element 11[d][i] mirrors element 1[e][i]. (EX1002, ¶228.)

- k. **1[d][ii]: “wherein inclusion of the extents of the visual content defined by the viewing window within the horizon-leveled visual content effectuates horizon leveling of the visual content.”**

Element 11[d][ii] mirrors element 1[e][ii]. (EX1002, ¶229.)

- 10. **Claim 12: “The method of claim 11, wherein the viewing window has a one-by-one aspect ratio, the one-by-one aspect ratio reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”**

Claim 12 mirrors claim 2. (EX1002, ¶230.)

- 11. **Claim 17: “The method of claim 11, wherein determining the viewing window further includes determining a size of the viewing window as the function of progress through the progress length based on the rotational positions of the image capture device as the function of progress through the capture duration.”**

Claim 17 mirrors claim 7. (EX1002, ¶231.)

12. **Claim 18: “The method of claim 17, wherein the size of the viewing window changes as the function of progress through the progress length to simulate changes in zoom for the visual content.”**

Claim 18 mirrors claim 8. (EX1002, ¶232.)

13. **Claim 19: “The method of claim 11, wherein determining the placement of the viewing window within the field of view of the visual content includes determining a rotation of the viewing window within the field of view of the visual content.”**

Claim 19 mirrors claim 9. (EX1002, ¶233.)

14. **Claim 20: “The method of claim 11, wherein the determining the placement of the viewing window within the field of view of the visual content includes determining a location of the viewing window within the field of view of the visual content, the location of the viewing window within the field of view of the visual content determining framing of the visual content.”**

Claim 20 mirrors claim 10. (EX1002, ¶234.)

D. Ground 4: Voss, Derbanne, and Watanabe Render Obvious Claims 3-6 and 13-16

1. **Claim 3: “The system of claim 1, wherein the visual content includes a distortion such that a straight line within a scene depicted within the visual content appears as a curved line, the distortion of the visual content reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”**

Watanabe discloses claim 3. (*Supra* § V.B.2.)

It would have been obvious to combine the teachings of Voss, Derbanne,

and Watanabe. (EX1002, ¶236.) Watanabe’s “image shake correction circuit 107 crops and reads out, from the image memory 105, an image . . . and changes the cropping position of the image so as to offset shake of the video camera 100.” (EX1006, 5:22-26.) Thus, Voss, Derbanne, and Watanabe are from the same field of endeavor and reasonably pertinent to the same technical problems. (EX1002, ¶236.)

Watanabe teaches additional image processing techniques to improve the quality of the video content, which may be easily combined with the teachings of Voss and Derbanne with a reasonable expectation of success. (EX1002, ¶237.) The combination of Voss, Derbanne, and Watanabe results in a system that achieves horizon-leveling of visual content while incorporating the advantages of Watanabe to generate natural looking horizon-leveled video content. (EX1002, ¶237.)

The technical features of removing undesirable distortions and adding desirable distortions, yielding the predictable result of making the video content appear more natural looking. (EX1002, ¶239.) A POSITA would be motivated to use the known techniques of Watanabe to improve similar devices of Voss and Derbanne in the same way. (*Id.*) Further, it would have been obvious to try combining the teachings of Voss, Derbanne, and Watanabe, as distortion removal and addition may be implemented without requiring much effort and with a

reasonable expectation of success. (*Id.*) The known benefits of Watanabe would prompt the application of Watanabe in the same field based on design incentives and other market forces. (*Id.*)

2. Claim 4: “The system of claim 3, wherein the distortion includes a barrel distortion or a pincushion distortion.”

Watanabe discloses claim 4. (*Supra* § V.B.3.)

It would have been obvious to combine the teachings of Voss, Derbanne, and Watanabe. (*Supra* § V.D.1.)

3. Claim 5: “The system of claim 3, wherein the visual content includes the distortion based on capture of the visual content through a wide field of view optical element.”

Watanabe discloses claim 5. (*Supra* § V.B.4.) It would have been obvious to combine the teachings of Voss, Derbanne, and Watanabe. (*Supra* § V.D.1.)

4. Claim 6: “The system of claim 3, wherein the visual content includes the distortion based on application of the distortion to non-distorted visual content, the distortion applied to the non-distorted visual content based on the visual content including the non-distorted visual content.”

Watanabe discloses claim 6. (*Supra* § V.B.5.) It would have been obvious to combine the teachings of Voss, Derbanne, and Watanabe. (*Supra* § V.D.1.)

5. Claim 13: “The method of claim 11, wherein the visual content includes a distortion such that a straight line within a scene depicted within the visual content appears as a curved line, the distortion of the visual content reducing impact of an off-axis horizon depicted within the horizon-leveled visual content.”

Claim 13 mirrors claim 3. (EX1002, ¶244.)

6. **Claim 14: “The method of claim 13, wherein the distortion includes a barrel distortion or a pincushion distortion.”**

Claim 14 mirrors claim 4. (EX1002, ¶245.)

7. **Claim 15: “The method of claim 13, wherein the visual content includes the distortion based on capture of the visual content through a wide field of view optical element.”**

Claim 15 mirrors claim 5. (EX1002, ¶246.)

8. **Claim 16: “The method of claim 13, wherein the visual content includes the distortion based on application of the distortion to non-distorted visual content, the distortion applied to the non-distorted visual content based on the visual content including the non-distorted visual content.”**

Claim 16 mirrors claim 6. (EX1002, ¶247.)

VI. THE BOARD SHOULD NOT DENY INSTITUTION UNDER *FINTIV*

As the USPTO Interim Procedure for Discretionary Denials stated, “[t]he plain language of the *Fintiv* factors is directed to district court litigation and does not apply to parallel U.S. International Trade Commission (ITC) proceedings, as the ITC lacks authority to invalidate a patent and the ITC’s invalidity rulings are not binding on the Office or on the district courts.” (USPTO Interim Procedure for Discretionary Denials, at 2-3.) Accordingly, the Board should not exercise its discretion to deny institution.

VII. THE BOARD SHOULD NOT DENY INSTITUTION UNDER § 325(d)

The Board should not deny institution under 35 U.S.C. § 325(d) on the basis

of the prosecution of the '832 patent. Section 325(d) is inapplicable to this proceeding, because the Petition does not raise substantially the same art or arguments in the same way as the examination of the '832 patent; and, to the extent the Petition does, the Office erred in a material manner. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (Feb. 13, 2020) (precedential).

The Board applies a two-part framework for determining whether to deny institution under § 325(d) in view of prosecution of the original patent application and any subsequent reexamination: “(1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.” *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (P.T.A.B. Feb. 13, 2020) (precedential).

Here, the Board need not reach the second part of the test, because the first part fails: neither the same (or substantially the same) art or arguments were previously presented to the Office. None of the references presented in this Petition—Thomason, Pacurariu, Watanabe, Voss, or Derbanne—were considered during prosecution of the '832 patent. While a related application of Voss, U.S.

Patent Pub. No. 2016/0283097 was disclosed during prosecution of the '832 patent⁴, this related application was not substantively discussed or applied against the claims. *See Amazon Inc. v. M2M Sols. LLC*, IPR2019-01204, Paper 14 at 16 (P.T.A.B. Jan. 23, 2020) (“reference that ‘was neither applied against the claims nor discussed by the Examiner’” weighs against denying institution under section 325(d) (citation omitted)). Furthermore, the Examiner also never considered the combination of the related application of Voss together with Derbanne. That “one piece of art” in a combination “was previously presented and/or argued” (which is not even the case here because Voss itself was never presented and/or argued) is “insufficient to satisfy the first prong of *Advanced Bionics*.” *Thorne Research, Inc. v. Trustees of Dartmouth Coll.*, No. IPR2021-00491, Paper 18 at 8 (P.T.A.B. Aug. 12, 2021) (no denial where other reference in combination was not before the examiner); *Samsung Elecs. Co. v. Headwater Rsch. LLC*, No. IPR2023-01226, Paper 9 at 6-7 (P.T.A.B. Feb. 8, 2024) (same); *BMW of N. Am., Inc. v. Mich. Motor Techs., LLC*, No. IPR2023-01031, Paper 12 at 13 (P.T.A.B. Jan. 23, 2024) (same). Thus, the inquiry should end there.

⁴ U.S. Patent Pub. No. 2016/0283097 was listed in a Notice of References Cited dated February 9, 2022, provided by the Examiner, and listed in the Notice of Allowance and Fee(s) Due dated February 9, 2022. (EX1003, p. 40; p. 38.)

Even if the Board were to conclude otherwise, the second step of the *Advanced Bionics* inquiry—whether the examiner erred in a manner material to patentability—would still preclude discretionary denial. The Examiner allowed the claims directly without raising any rejections. Where the examination record is not well developed, as here, it may indicate that the Examiner erred by “overlooking something persuasive.” *Advanced Bionics*, IPR2019-01469, Paper 6 at 10. The Office erred to the extent it failed to fully consider the significance of the art or arguments as set forth in this Petition. Accordingly, even if the first part of the test is satisfied, the Board further should not deny institution based on the second part of the test.

Thus, the Board should not exercise its discretion to deny institution under § 325(d).

VIII. NOTICES AND STATEMENTS

Pursuant to 37 C.F.R. § 42.8(b)(1), Arashi Vision Inc. (d/b/a Insta360) is the real party-in-interest for Petitioner.

Pursuant to 37 C.F.R. § 42.8(b)(2), Petitioner identifies the following related matters:

- *In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith*, Inv. No. 337-TA-1400 (USITC)
- *GoPro, Inc. v. Arashi Vision Inc. et al.*, No. 8:24-cv-00681-HDE-JCV

(C.D. Cal.).

Pursuant to 37 C.F.R. § 42.8(b)(3), Petitioner identifies the following counsel (and a power of attorney accompanies this Petition).

Lead Counsel	First Backup Counsel
Alex S. Yap Registration No.: 60,609 MORRISON & FOERSTER LLP 707 Wilshire Blvd., Suite 6000 Los Angeles, CA 90017 Email: AYap@mofo.com Tel: 213-892-5200 Fax: 213-892-5454	Mehran Arjomand Registration No.: 48,231 MORRISON & FOERSTER LLP 707 Wilshire Blvd., Suite 6000 Los Angeles, CA 90017 Email: MArjomand@mofo.com Tel: 213-892-5200 Fax: 213-892-5454
	Second Backup Counsel
	Yunan Yuan Registration No.: 73,637 MORRISON & FOERSTER LLP 755 Page Mill Road Palo Alto, CA 94304 Email: AYuan@mofo.com Tel: 415-268-7000 Fax: 415-268-7522

Pursuant to 37 C.F.R. § 42.8(b)(4), service information for lead and back-up counsel is provided above. Petitioner consents to electronic service by email to MoFo_Insta360-IPRs@mofo.com.

Pursuant to 37 C.F.R. § 42.104(a), Petitioner certify that the '832 patent is available for *inter partes* review and that Petitioner are not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds

identified in this Petition.

The USPTO is authorized to charge any required fees, including the fee as set forth in 37 C.F.R. § 42.15(a) and any excess claim fees, to Deposit Account No. **03-1952** referencing Docket No. **33316-00000.02.**

Dated: June 20, 2024

Respectfully submitted,

By /s/ Alex S. Yap

Alex S. Yap

Reg. No.: 60,609

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Counsel for Petitioner

Certification of Word Count (37 C.F.R. § 42.24)

I hereby certify that this Petition for *Inter Partes* Review has 13,976 words (as counted by the “Word Count” feature of the Microsoft Word™ word-processing system), exclusive of “a table of contents, a table of authorities, mandatory notices under § 42.8, a certificate of service or word count, or appendix of exhibits or claim listing.”

Dated: June 20, 2024

By /s/ Alex S. Yap
Alex S. Yap

Certificate of Service (37 C.F.R. § 42.6(e)(4) and 42.205(a))

I hereby certify that the attached Petition for *Inter Partes* Review and supporting materials were served as of the below date by UPS, which is a means at least as fast and reliable as U.S. Express Mail, on the Patent Owner at the correspondence addresses indicated for U.S. Patent No. 11,336,832:

GoPro Issuance
3025 Clearview Way
San Mateo, CA 94402

Esplin & Associates (GoPro)
6225 Buckhorn Ridge Place
San Miguel, CA 93451

Dated: June 20, 2024

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