

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Fatih M. Ozluturk
U.S. Patent No.: 9,860,450 Attorney Docket No.: 39843-0077IP1
Issue Date: January 2, 2018
Appl. Serial No.: 15/431,332
Filing Date: February 13, 2017
Title: METHOD AND APPARATUS TO CORRECT DIGITAL VIDEO
 TO COUNTERACT EFFECT OF CAMERA SHAKE

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PETITION FOR *INTER PARTES* REVIEW
OF UNITED STATES PATENT NO. 9,860,450
PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42

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EXHIBITS

SAMSUNG-1001	U.S. Patent No. 9,860,450 to Fatih M. Ozluturk (the “’450 Patent”)
SAMSUNG-1002	Prosecution History of the ’450 Patent (“the Prosecution History”)
SAMSUNG-1003	Declaration of Dr. Hany Farid
SAMSUNG-1004	U.S. Patent No. 4,717,958 to Eliyahu Gal et al. (“Gal”)
SAMSUNG-1005	U.S. Patent No. 5,430,480 to James Allen et al. (“Allen”)
SAMSUNG-1006	United States Patent 5,881,272 to Balmer (“Balmer”)
SAMSUNG-1007	Certified Translation of Japanese Patent Application No. 2000-023024 to Umeda Akifumi et al. (“Akifumi”)
SAMSUNG-1008	Article titled “Creative Camcorder,” included in Popular Magazine, March 1996 issue (“Creative Camcorder”)
SAMSUNG-1009	Unopposed Motion for Extension of Time to Move, Answer, or Otherwise Respond to Plaintiff’s Complaint (<i>Clear Imaging Research, LLC v. Samsung Electronics Co. Ltd.</i> , 2:19-cv-326-JRG (E.D. Tex. Oct. 15, 2019))
SAMSUNG-1010	U.S. Provisional App. No. 60/556,230
SAMSUNG-1011	Plaintiff’s Disclosure of Asserted Claims and Infringement Contentions Pursuant to Patent Local Rules (<i>Clear Imaging Research, LLC v. Samsung Electronics Co. Ltd.</i> , 2:19-cv-00326-JRG (E.D. Tex. June 24, 2020))
SAMSUNG-1012	U.S. Patent Pub. No. 2001/0041012 to Hsieh et al. (“Hsieh”)
SAMSUNG-1013	U.S. Patent No. 7,274,390 to Sevat et al. (“Sevat”)
SAMSUNG-1014	US Patent Pub. No. 2005/0207726 to Chen (“Chen”)

SAMSUNG-1015	US Patent No. 7,907,204 to Kudo (“Kudo”)
SAMSUNG-1016	U.S. Patent No. 7,619,656 to Ben-Ezra et al. (“Ben Ezra”)
SAMSUNG-1017	Joseph Guzman, “Fauci says second wave of coronavirus is ‘inevitable,’” TheHill.com (Apr. 29, 2020), available at: https://thehill.com/changing-america/resilience/natural-disasters/495211-fauci-says-second-wave-of-coronavirus-is
SAMSUNG-1018	Peter Wells, et al., “Texas puts reopening on hold in face of new Covid-19 outbreak,” Financial Times (June 25, 2020), available at https://www.ft.com/content/e35f3148-a797-4e6e-bf7a-1a7ce3181e97
SAMSUNG-1019	Order Granting Joint Motion to Amend the Docket Control Order and Time for Claim Construction Expert Disclosures (<i>Clear Imaging Research, LLC v. Samsung Electronics Co. Ltd.</i> , 2:19-cv-326-JRG (E.D. Tex. June 12, 2020))
SAMSUNG-1020	Email to Clear Imaging counsel dated February 10, 2020
SAMSUNG-1021	Email from Clear Imaging counsel dated July 3, 2020
SAMSUNG-1022	Stipulation by Samsung
SAMSUNG-1023	Declaration of Jacob R. Munford
SAMSUNG-1024	P.R. 4-3 Joint Claim Construction and Prehearing Statement (<i>Clear Imaging Research, LLC v. Samsung Electronics Co. Ltd.</i> , 2:19-cv-326-JRG (E.D. Tex. July 23, 2020))

LISTING OF CHALLENGED CLAIMS

Claim 1	
[1.P]	A method for use in an imaging device comprising an image sensor, a processor, a memory, and one or more motion sensors, ... comprising:
[1.1]	capturing a sequence of images with the image sensor, wherein the sequence of images comprise a video, and storing the images in the memory;
[1.2]	detecting, by the one or more motion sensors, motion information for one or more images of the sequence of images, wherein the motion information represents motion of the device during capturing of the one or more images of the sequence of images, and storing the motion information in the memory synchronously with the storing of the one or more images;
[1.3]	determining, by the processor, a vertical shift value and a horizontal shift value for one or more images of the sequence of images based at least in part on the motion information;
[1.4]	modifying, by the processor, one or more images of the sequence of images based at least in part on the vertical and the horizontal shift values;
[1.5]	combining, by the processor, the modified images to obtain a final video; and
[1.6]	storing the final video in the memory.
Claim 2	
2	... claim 1, wherein the processor determines the vertical and horizontal shift values for one or more images for which the motion information is detected.
Claim 3	
3	... claim 1, wherein the processor modifies one or more images for which the vertical and horizontal shift values are determined.

Claim 4	
4	... claim 1, wherein the processor modifies one or more images of the sequence of images such that effect of motion of the device during capturing of the one or more images of the sequence of images is reduced in the final video.
Claim 5	
5	... claim 1, wherein the processor determines a vertical shift value and a horizontal shift value for each image of the sequence of images.
Claim 6	
6	... claim 1, wherein the motion information represents motion of the device at time of capturing of one or more images of the sequence of images.
Claim 7	
7	... claim 1, wherein the one or more images of the sequence of images is at least two images, and wherein the motion information represents motion of the device between capturing of consecutive images.
Claim 8	
8	... claim 1, wherein the vertical and horizontal shift values for an image indicate how much the image is displaced due to motion of the device during capturing of the image.
Claim 9	
9	... claim 1, wherein the modifying by the processor of the one or more images of the sequence of images comprises shifting a reference point in each image according to the vertical shift value and the horizontal shift value for the image in a direction that reduces the effect of motion of the device in the final video.

Claim 10	
10	... claim 1, wherein the method further comprises displaying the final video in a user interface.
Claim 11	
11	... claim 1, wherein the method further comprises modifying the sequence of images using a video compression technique.
Claim 12	
12	... claim 1, wherein determining a vertical shift value and a horizontal shift value for one or more images of the sequence of images is based at least in part on the focal distance of a lens of the imaging device.
Claim 13	
13	... claim 1, wherein the method further comprises receiving user input in a user interface, and at least one of modifying one or more images of the sequential images or combining the modified images to obtain a final video is based at least in part on the user input.
Claim 14	
[14.P]	An imaging device, comprising:
[14.1]	an image sensor configured to capture a sequence of images, wherein the sequence of images comprise a video, and store the images in a memory;
[14.2]	one or more motion sensors configured to detect motion information for one or more images of the sequence of images, wherein the motion information represents motion of the imaging device during capturing of the one or more images of the sequence of images, and store the motion information in the memory synchronously with the storing of the one or more images; and
[14.3]	a processor configured to: determine a vertical shift value and a horizontal shift value for one or more images of the sequence of images based at least in part on the motion information;

[14.4]	processor configured to: ... modify one or more images of the sequence of images based at least in part on the vertical and the horizontal shift values; and
[14.5]	processor configured to: ... combine the modified images to obtain a final video; and
[14.6]	wherein the memory is further configured to store the final video.
Claim 15	
15	... claim 14, wherein the processor is configured to determine the vertical and horizontal shift values for one or more images of the sequence of images for which the motion information is detected.
Claim 16	
16	... claim 14, wherein the processor is configured to modify one or more images of the sequence of images for which the vertical and horizontal shift values are determined.
Claim 17	
17	... claim 14, wherein the processor is configured to modify one or more images of the sequence of images such that effect of motion of the device during capturing of the one or more images of the sequence of images is reduced in the final video.
Claim 18	
18	... claim 14, wherein the processor is configured to determine a vertical shift value and a horizontal shift value for each of the images of the sequence of images.
Claim 19	
19	... claim 14, wherein the motion information detected by the one or more motion sensors represents motion of the device at time of capturing of one or more images of the sequence of images.

Claim 20	
20	... claim 14, wherein the one or more images of the sequence of images is at least two images, and wherein the motion information detected by the one or more motion sensors represents motion of the device between capturing of consecutive images.
Claim 21	
21	... claim 14, wherein the processor is configured to determine a vertical shift value and a horizontal shift value for an image such that the vertical shift value and the horizontal shift value indicate how much the image is displaced due to motion of the device during capturing of the image.
Claim 22	
22	... claim 14, wherein the processor is configured to modify one or more images of the sequence of images by shifting a reference point in each image according to the vertical shift value and the horizontal shift value for the image in a direction that reduces the effect of motion of the device in the final video.
Claim 23	
23	... claim 14, wherein the device further comprises a display configured to display the final video.
Claim 24	
24	... claim 14, wherein the processor is further configured to modify the sequence of images using a video compression technique.
Claim 25	
25	... claim 14, wherein the processor is configured to determine a vertical shift value and a horizontal shift value for one or more images of the sequence of images based at least in part on the focal distance of a lens of the imaging device.

Claim 26	
26	... claim 14, wherein the device further comprises a display configured to receive user input, and the device is configured to modify one or more images of the sequential images and to obtain a final video based at least in part on the user input.
Claim 27	
27	... claim 14, wherein the processor is two or more processors.
Claim 28	
[28.P]	A method for use in an imaging device comprising an image sensor, a processor, a memory, and one or more motion sensors, ... comprising:
[28.1]	capturing a sequence of images with the image sensor, wherein the sequence of images comprise a video;
[28.2]	detecting, by the one or more motion sensors, motion information for one or more images of the sequence of images, wherein the motion information represents motion of the device during capturing of the one or more images of the sequence of images;
[28.3]	determining, by the processor, a vertical shift value and a horizontal shift value for one or more images of the sequence of images based at least in part on the motion information;
[28.4]	modifying, by the processor, one or more images of the sequence of images based at least in part on the vertical and the horizontal shift values;
[28.5]	combining, by the processor, the modified images, and applying a video compression technique to obtain a final video; and
[28.6]	storing the final video in the memory.
Claim 29	
[29.P]	An imaging device, comprising:

[29.1]	an image sensor configured to capture a sequence of images, wherein the sequence of images comprise a video;
[29.2]	one or more motion sensors configured to detect motion information for one or more images of the sequence of images, wherein the motion information represents motion of the imaging device during capturing of the one or more images of the sequence of images;
[29.3]	a processor configured to: determine a vertical shift value and a horizontal shift value for one or more images of the sequence of images based at least in part on the motion information;
[29.4]	a processor configured to: ... modify one or more images of the sequence of images based at least in part on the vertical and the horizontal shift values; and
[29.5]	a processor configured to: ... combine the modified images, and apply a video compression technique to obtain a final video; and
[29.6]	a memory configured to store the final video.
Claim 30	
30	... claim 29, wherein the one or more images of the sequence of images is at least two images, and wherein the motion information detected by the one or more motion sensors represents motion of the device between capturing of consecutive images.
Claim 31	
31	... claim 29, wherein the processor is configured to determine a vertical shift value and a horizontal shift value for one or more images of the sequence of images based at least in part on the focal distance of a lens of the imaging device.

Claim 32	
32	... claim 29, wherein the device further comprises a display configured to receive user input, and the device is configured to modify one or more images of the sequential images and to obtain a final video based at least in part on the user input.

Samsung petitions for *Inter Partes* Review (“IPR”) of claims 1-32 (the “Challenged Claims”) of U.S. Patent No. 9,860,450 (the “’450 Patent”).

I. IPR REQUIREMENTS

A. Standing

Samsung certifies that the ’450 Patent is available for IPR. This petition is being filed within one year of service of a complaint against Samsung. SAMSUNG-1009. Samsung is not barred/estopped from requesting this review.

B. Challenge and Relief Requested

Samsung requests cancellation of the Challenged Claims on these grounds.

Ground		Claims	§103(a) References
1	1(A)	1-12, 14-25, 27-31	Allen (or Allen and Akifumi)
	1(B)	13, 26, 32	Allen (or Allen and Akifumi) and Creative Camcorder
	1(C)	27	Allen (or Allen and Akifumi) and Balmer
2	2(A)	1-12, 14-25, 27-31	Gal (or Gal and Akifumi)
	2(B)	13, 26, 32	Gal (or Gal and Akifumi) and Creative Camcorder
	2(C)	27	Gal (or Gal and Akifumi) and Balmer

The following table summarizes the prior art basis for each reference relied upon in Grounds 1 and 2 with respect to an assumed Critical Date of March 25, 2004:¹

Reference	Date	Basis
Allen	Issued: 7/4/1995	§102(b)
Akifumi	Issued: 1/21/2000	§102(b)
Creative Camcorder	Published: 3/1996 or at least as of 11/4/1997 ²	§102(b)
Balmer	Issued: 3/9/1999	§102(b)
Gal	Issued: 1/5/1988	§102(b)

Additional explanation/support for each ground is in Dr. Hany Farid's declaration (SAMSUNG-1003).

¹ Although the '450 Patent's lists a March 25, 2004, provisional application, Patent Owner does not contend that the '450 Patent is entitled to the provisional date. SAMSUNG-1003, ¶¶25-30; SAMSUNG-1011, 13 (only contending that the '450 Patent is entitled to the March 24, 2005 date of the non-provisional application).

² SAMSUNG-1023, ¶¶5-11 (stating that Creative Camcorder was accessible and available to the public at the Chicago Public Library as of March 1996 or at least as of November 4, 1997).

II. THE '450 PATENT

A. Overview

The '450 Patent “correct[s] digital video to counteract effect of camera shake.” SAMSUNG-1001, Abstract, 11:66-12:41. An image “from camera optics is captured by an imager (step 41) and recorded in memory (step 42). Simultaneously, motion sensors detect and record camera motion (step 43).” *Id.*, 6:25-50, FIG. 4.

“A processor determines a correcting filter based on the motion information” and “modifies the sequence of images captured according to the correcting filter.” *Id.*, Abstract, 6:32-53. “Corrected video” is provided for display. *Id.*, Abstract.

B. Prosecution History

The examiner initially issued a restriction requirement because the claims related to “patentably distinct species of Figs. 4 and 5.” SAMSUNG-1002, 124-127. In response, Applicant “elect[ed] Figure 4.” *Id.*, 139-40.

The examiner then rejected certain claims while identifying other claims as “allowable if rewritten in independent form.” *Id.*, 145-52, 78-83. Patent Owner accepted the allowable matter and the application was allowed. *Id.*, 182-95, 202-08.

C. Level of Ordinary Skill in the Art

A person of ordinary skill in the art as of the Critical Date (“POSITA”) would have had at least a Bachelor’s Degree in an academic area emphasizing electrical

engineering, computer science, or a similar discipline, and at least two years of experience related to imaging technologies. SAMSUNG-1003, ¶¶31-32. Superior education could compensate for a deficiency in work experience, and vice-versa. *Id.*

D. Claim Construction

Unless otherwise noted, all terms should be given their plain meaning. Samsung reserves the right to respond to any constructions offered/adopted by Patent Owner/Board. Samsung is not waiving any indefiniteness or claim scope arguments.

1. “display configured to receive user input” (claims 26, 32) / “processor configured to ... combine the modified images to obtain a final video” (claim 14) / “processor configured to ... combine the modified images, and apply a video compression technique to obtain a final video (claim 29) / “processor is configured to determine a vertical shift value and a horizontal shift value ... based at least in part on the focal distance of a lens of the imaging device” (claims 25, 31)

Petitioner advances ordinary meaning of these phrases in this proceeding; however, a question exists regarding whether these phrases should be interpreted under 35 U.S.C. §112, ¶6 (“112/6”). *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1346 (Fed. Cir. 2015). The absence of the word “means” creates a rebuttable presumption that 112/6 does not apply. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1311 (Fed. Cir. 2005). In district court, the parties dispute whether the presumption should be rebutted. Although claim construction arguments are not yet final, Petitioner may argue in district court that 112/6 applies and these claims are indefinite.

SAMSUNG-1024, 35-36, 38-41. However, Patent Owner contends that 112/6 does not apply. *Id.*

Because the dispute in district court remains unresolved and because Petitioner cannot raise indefiniteness here, Petitioner relies on the presumption in this proceeding and applies prior art to these claims' ordinary meaning consistent with Patent Owner's litigation position. *Id.* Petitioner will promptly inform the Board of any developments in the district court related to these claims' definiteness.

Further, when determining validity, claim terms need to only be construed to "resolve the controversy." *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011). Because this proceeding lacks arguments and/or evidence rebutting the presumption, the presumption should stand and the Board should forego construction absent Patent Owner advocating for 112/6's application. If Patent Owner does not endorse a 112/6 construction, no controversy exists regarding 112/6's application. Indeed, the presumption holds when neither party presents argument and/or evidence to rebut it. *HTC America, Inc. v. Virginia Innovation Sciences, Inc.*, IPR2017-00872, Paper 11, 9; *Dick v. New York Life Ins. Co.*, 359 U.S. 437, 443 n.3 (1959); *Am. Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1358 (Fed. Cir. 1984).

Finally, any district court claim construction ruling is reviewable by the Federal Circuit, and yet, denial of institution is non-appealable. Thus, for this claim

construction theory, congressional intent is best served through institution, particularly considering that institution would involve prior art consideration under Patent Owner's claim construction.

Therefore, in this proceeding, these claim phrases should be given their ordinary meaning.

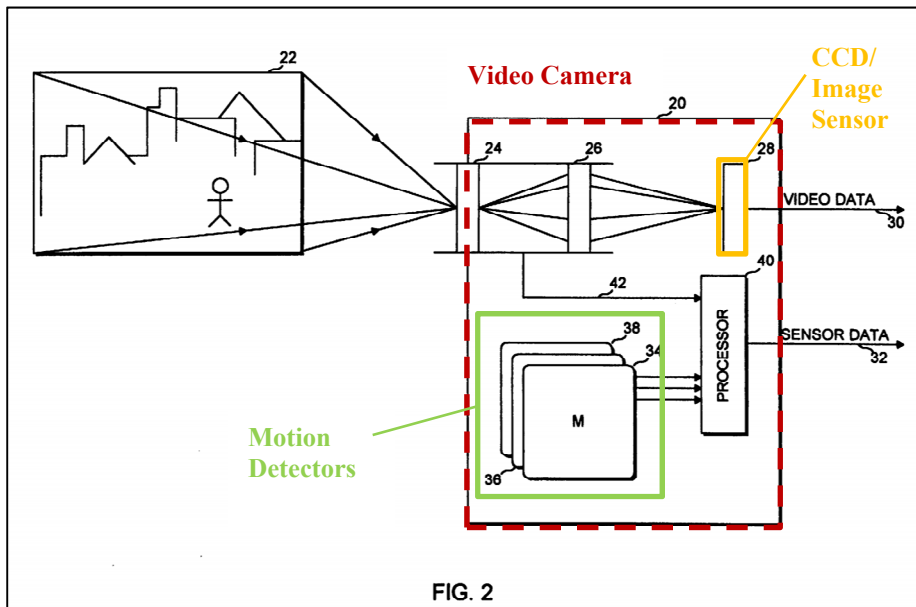
III. GROUND 1: ALLEN

A. 1(A): Allen or Allen and Akifumi Render Obvious Claims 1-12, 14-25, and 27-31

1. Allen

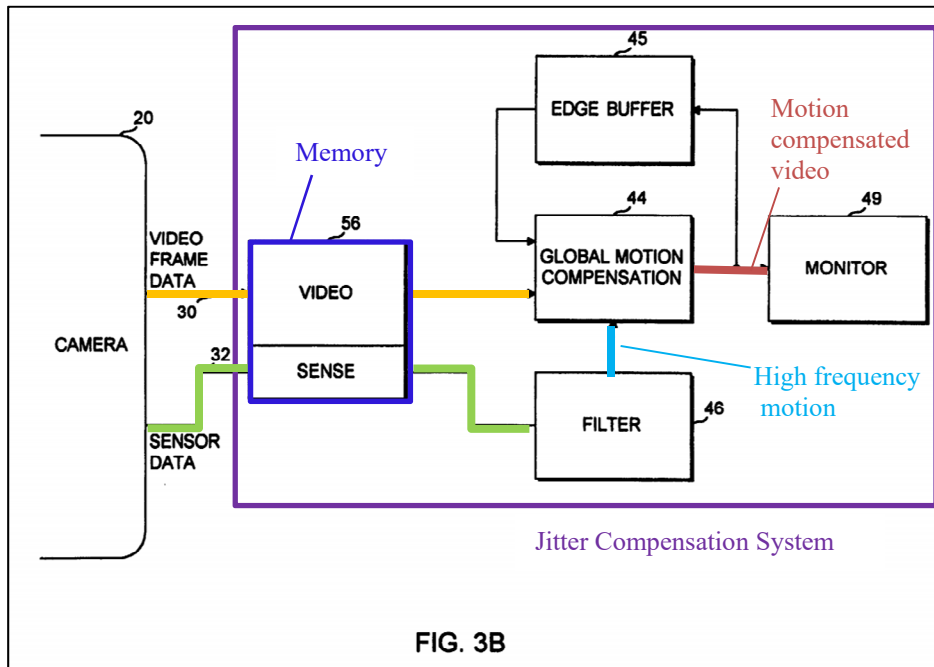
Allen discloses a system for removing jitter due to camera movement during video recording. SAMSUNG-1005, Abstract. Allen's system records camera movement along with image frames, and "us[es] the recorded motion ... to stabilize the recorded scene." *Id.*, 3:21-35.

FIG. 2 shows Allen's video camera 20:



Id., FIG. 2 (annotated), 4:59-68. Video camera 20 “records a physical scene 22, using a fixed lens 24 and a zoom lens 26 to focus light onto a charge coupled device 28, to produce a continuous stream of frames on video data bus 30.” *Id.*, 2:61-65.

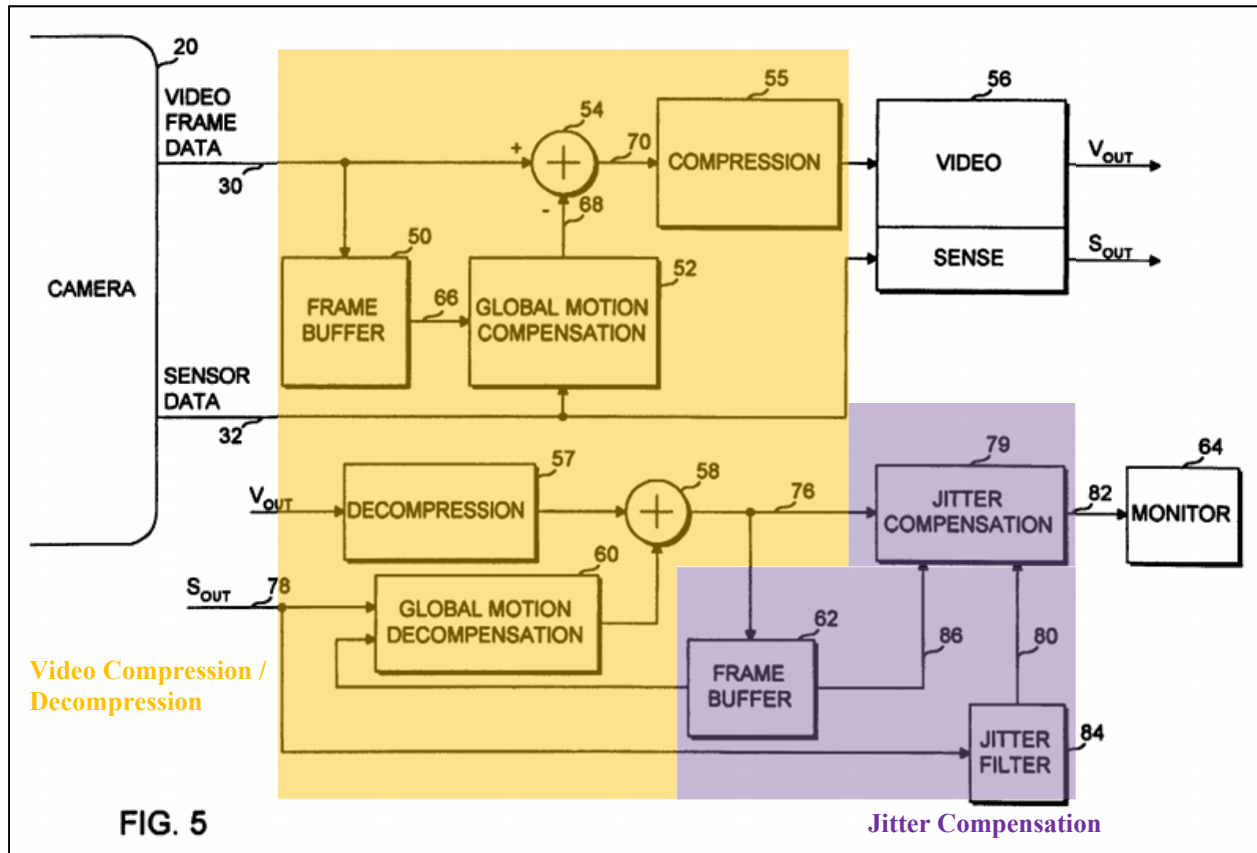
Video camera 20 also includes “[m]otion detectors 34, 36, and 38 [that] indicate to a processor 40 the movement of camera 20.” *Id.*, 4:66-68, 2:21-31. Processor 40 digitizes the sensor data and provides “it as a data stream on sensor data bus 32.” *Id.*, 5:8-11. “[V]ideo data on video data bus 30 is also digitized, and video data and its associated motion data are synchronized.” *Id.*, 5:11-14, 4:59-68. Synchronized video and sensor data are provided to a jitter compensation system:



Id., FIG. 3B (annotated), FIG. 3A. As shown, video and motion data are stored in channel 56, which “is a storage medium, such as a digital memory, a magnetic tape, or a disk.” *Id.*, 6:34-40.

Filter 46 obtains the motion sensor data and “high pass filter[s]” it “so that only high frequency camera movement” is provided to motion compensator 44. *Id.*, 5:53-6:12, claims 2-3. Motion compensator 44 “shifts” the video frames “to cancel out those high frequency movements of the camera, leaving only the low frequency movements of the camera, which are usually intentional panning movements.” *Id.* During jitter compensation, motion compensator 44 works with edge buffer 45 (e.g., a full frame buffer that stores the entire preceding frame) to reconstruct the currently-processed frame’s edges. *Id.*, 5:63-6:13.

“The compensated video data output of motion compensator 44 ... is viewed on monitor 49” and “appear[s] smoother than the raw video recorded by camera 20.” *Id.*, 6:14-19. Allen’s jitter compensation system in FIG. 3B operates together with a data compression system:



SAMSUNG-1005, FIG. 5 (annotated); 7:26-28. In the system, frame buffer 50, motion compensator 52, adder 54, and data compressor 55 compress image frames on video data bus 30 and store them in channel 56. *Id.*, 6:41-46. These image frames are then decompressed using motion decompressor 60, frame buffer 62, and data decompressor 57. *Id.*, 6:67-7:15.

that can be “a CCD ... or a MOS imaging element” and that generates an image signal. *Id.*, [0031]. Alternatively (in FIG. 10), “the image signal [for all pixels] outputted from the imaging portion 12 is digitized by the A/D converter 13, and written to the frame memory 20.” *Id.*, [0041]-[0043].

Akifumi’s device includes “shaking sensor 17,” which “detect[s] shaking of the user who is holding the image inputting device 10,” and includes acceleration sensors that detect acceleration in the vertical and horizontal directions. *Id.*, [0032]-[0033], FIG. 3.

“The shaking detection output from the shaking sensor 17 is inputted into the shaking correction value calculating portion 18,” which calculates the “shaking correction value.” *Id.*, [0032]. “[T]he accuracy of the shaking correction value can be improved” by using “the zoom lens setting (focal distance) if a zoom lens is used, the focus data ..., and the distance data” *Id.*, [0025], [0065], [0069], Figs. 6-9, 15, 17-21.

Based on the correction value, a shake correction is performed by changing the position “read out” from imaging element 12 or frame memory 20. *Id.*, [0034], [0041]-[0043]. Shake correction is performed by determining horizontal/vertical direction shift magnitudes, which are used to shift/change the position of one or more pixels in the image signal. *Id.*, [0072]-[0074].

The shake-corrected image is processed by signal processing portion 14 and

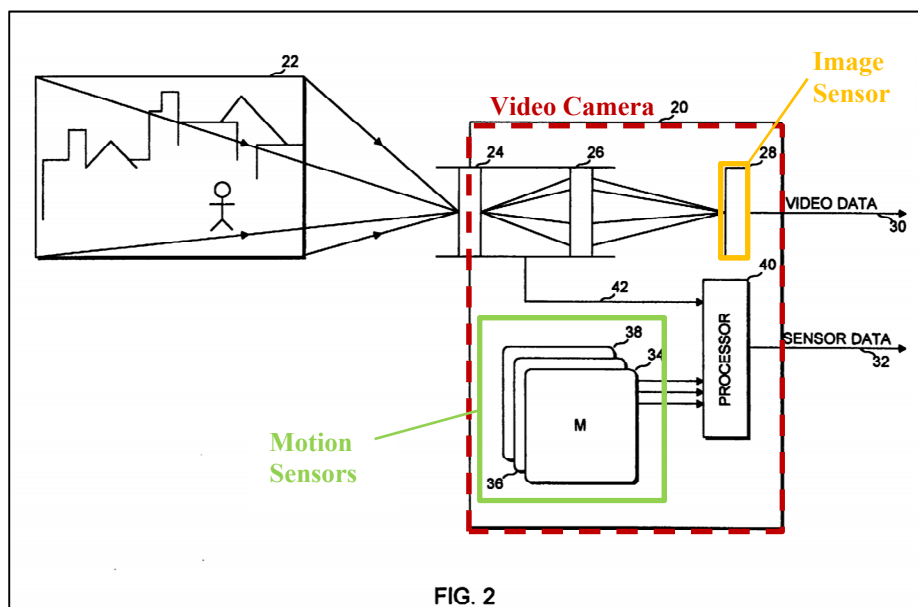
sent to video compressing portion 15, where it's compressed using "MPEG or another digital video compressing technique," and the compressed image data is stored in data recording portion 16" (e.g., a memory card or a memory "built into" the device). *Id.*, [0028]-[0029], FIGs. 1, 10.

3. Analysis

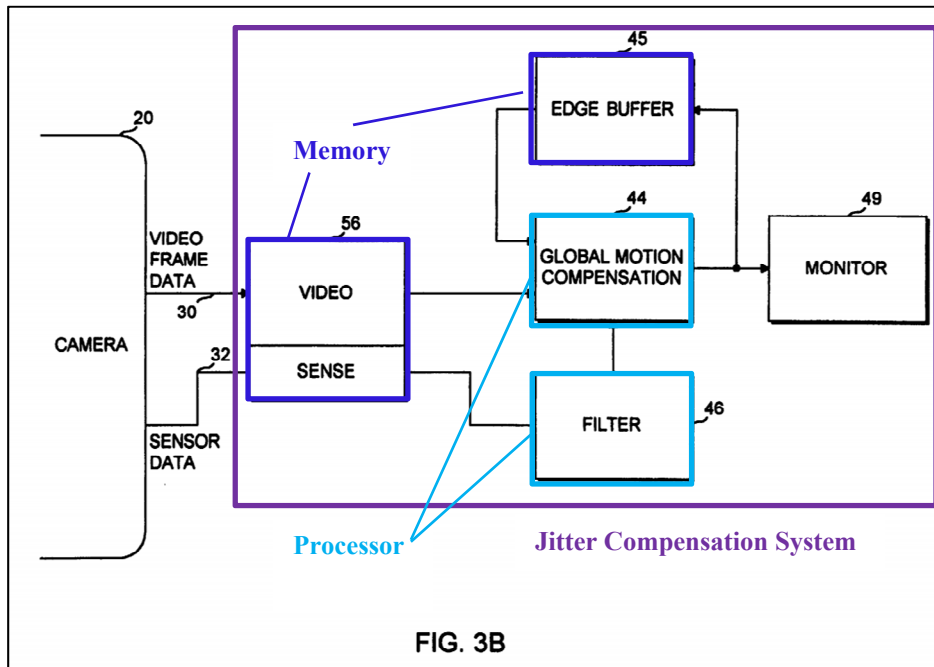
(a) Elements [1.P], [14.P], [28.P], [29.P]

Allen discloses an imaging device. As disclosed in the '450 Patent, an "imaging device" can be implemented using an image capture device (e.g., an image sensor, a camera, etc.) operating together with "a post-processing application, such as a photo editing software running on a computer." SAMSUNG-1001, 11:66-12:11, 12:35-41, 3:54-56. Similarly, Allen discloses an "imaging device" because its system includes video camera 20 operating together with a jitter compensation and/or data compression system, which a POSITA would have understood is/are implemented on a computer. SAMSUNG-1005, 4:59-65, FIG. 2 (showing Allen's video camera), FIGs. 3-5 (showing Allen's jitter compensation system and/or data compression system); SAMSUNG-1003, ¶¶56-62, 190, 214, 221.

As shown in FIG. 2, Allen's video camera 20 (part of "imaging device") includes CCD sensor 28, which is "an image sensor," as shown. *Id.*, 4:59-68, claims 1-6, FIG. 2 (below; annotated); SAMSUNG-1003, ¶63.



Allen's jitter compensation system (part of "imaging device") includes "global motion compensator 44" and "filter 46" (FIG. 3B; shown below) and frame buffer 50, motion compensator 52, adder 54, and data compressor 55 (FIG. 5) that map to the claimed "processor." *Id.*, 5:15-37, 6:20-66, 7:39-47, FIGs. 3A-3B, 4-5; SAMSUNG-1003, ¶64.



SAMSUNG-1005, FIG. 3B (annotated).

“Channel 56” and “edge buffer 45” in jitter compensation system constitute the “memory.” Channel 56 is “a *storage medium, such as a digital memory.*” SAMSUNG-1005, 6:20-40. Edge buffer 45 constitutes memory because it’s a “full frame buffer” that “stores the entire preceding [image] frame.” *Id.*, 5:63-6:13, 7:45-47; SAMSUNG-1003, ¶65.

Motion detectors 34, 36, and 38 (FIG. 2) in Allen’s video camera constitute “one or more motion sensors.” SAMSUNG-1005, Abstract, 4:66-5:7, 2:21-31; SAMSUNG-1003, ¶66.

As described further in [1.1]-[1.6], Allen discloses a method for use in the

imaging device that removes camera jitter/shake due to high frequency camera motion during video capture. SAMSUNG-1005, Abstract, 5:53-62, 1:13-16, 2:21-44, 3:62-69, 4:37-5:14, 6:20-44, 7:30-47, claims 2-3, FIGs. 1, 3B; SAMSUNG-1003, ¶67.

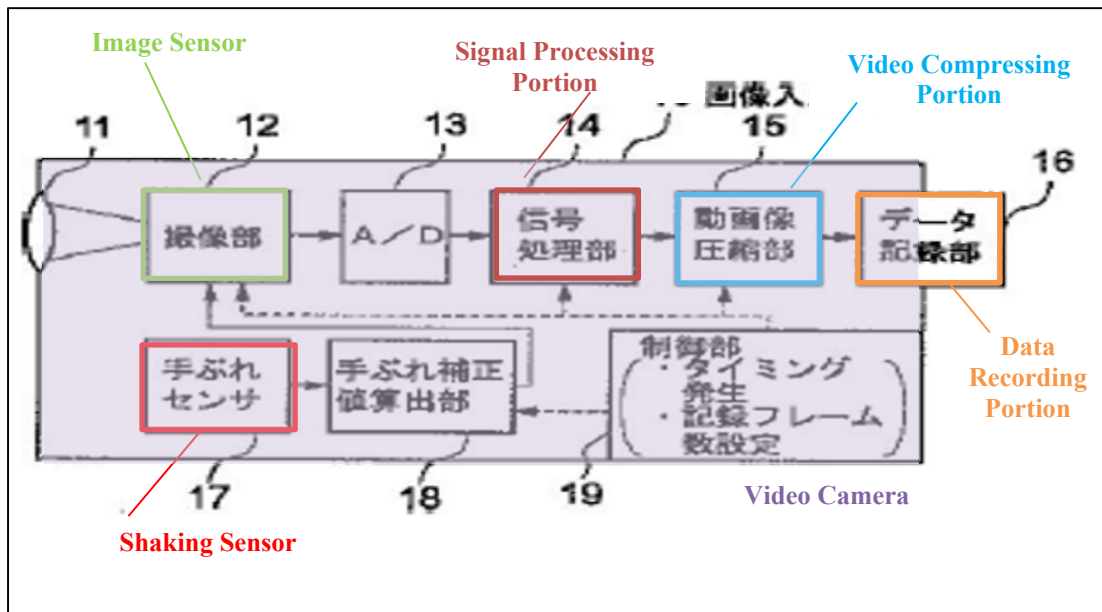
If Patent Owner argues that the “imaging device” must be a single device that includes the image sensor, the motion sensors, the memory, and the processor (instead of the combination of image capture device and post-processing system described in the ’450 patent), Allen does not explicitly disclose that its video camera and jitter compensation system (and/or data compression system) are part of the same device. However, implementing Allen’s video camera and jitter compensation system (and/or data compression system) in a single device would have been obvious based on Akifumi. SAMSUNG-1003, ¶68.

Akifumi’s imaging device/camera includes:

- (1) Imaging portion 12, e.g., CCD or CMOS sensor (“image sensor”). SAMSUNG-1007, [0031], [0043], [0044];
- (2) Shaking/acceleration sensor 17 (“motion sensor”). *Id.*, [0032]-[0033], FIG. 3;
- (3) Shaking correction value calculating portion 18, signal processing portion 14, and video compression portion 15 (collectively, “processor”). *Id.*, [0025]-[0029], [0032]-[0034], [0041]-[0046], [0065]-[0069], FIGs. 1, 5-10, 15, 17-

21, [0005];

- (4) Data recording portion 16, e.g., built-in memory or memory card (“memory”). *Id.*, [0028]-[0029], FIGs. 1, 10;



Id., FIG. 1 (annotated), [0002]; SAMSUNG-1003, ¶¶69-70. Because Akifumi’s video camera includes these components, detection of camera shake/motion, processing of captured images to compensate for camera shake/motion, and image storage, occurs within Akifumi’s camera. *Id.*; SAMSUNG-1003, ¶71.

Based on Akifumi’s disclosure, it would have been obvious to modify Allen’s video camera 20 to include (in addition to the image and motion sensors), the components of Allen’s jitter compensation system and/or data compression system, including global motion compensator 44, edge buffer 45, filter 46, frame buffer 50, motion compensator 52, adder 54, data compressor 55, and channel 56 (i.e.,

“memory” and “processor” components). SAMSUNG-1003, ¶¶72-75. As in Akifumi, such modification enables processing relating to camera jitter/shake compensation and image storage to occur entirely within Allen’s video camera 20. *Id.*

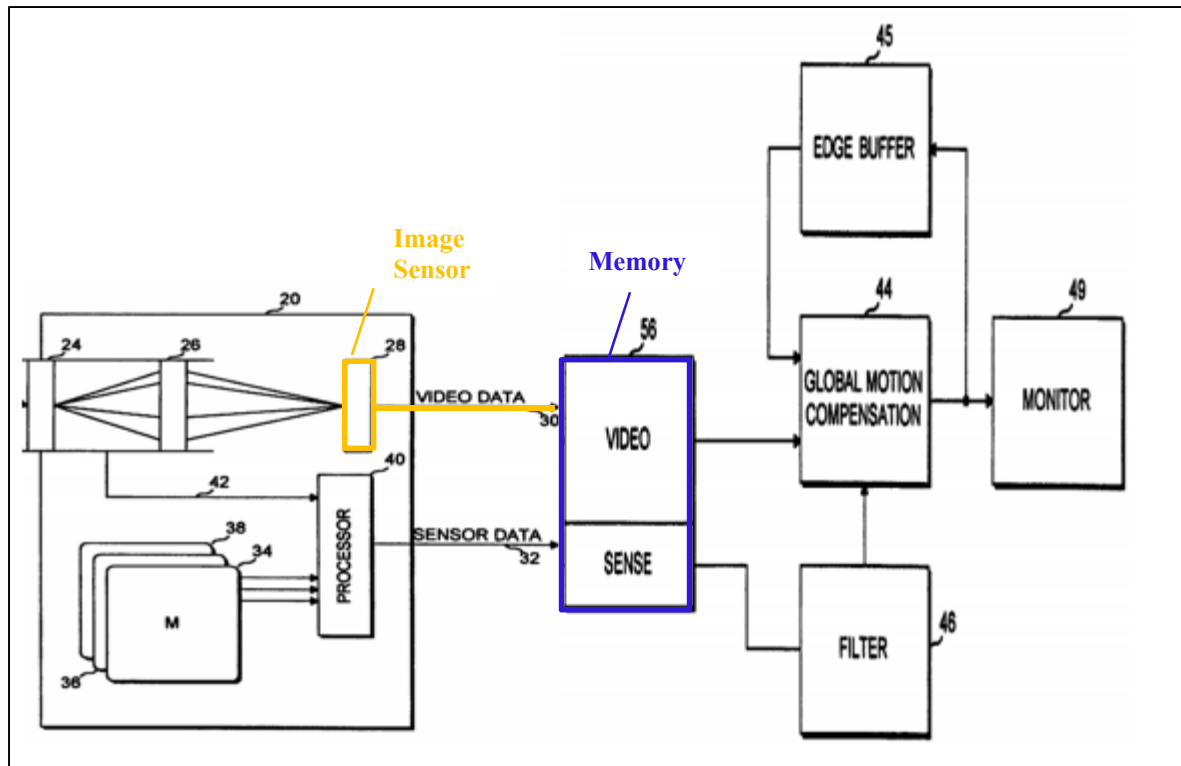
A POSITA would have been motivated to combine Allen and Akifumi for multiple reasons. **First**, each reference relates to video cameras and video processing, and each provides techniques for compensating for camera motion/shake during image capture. SAMSUNG-1003, ¶77; SAMSUNG-1007, [0025], [0034], [0041]-[0043], [0065]-[0069], FIGs. 6-9, 15-21; SAMSUNG-1005, 5:50-6:40, 7:30-44, 2:17-35, FIGs. 3B, 5. **Second**, this combination would have resulted in an enhanced camera with improved processing capabilities of capturing and recording videos without jitter (or reduced jitter) by Allen’s video camera, thus obviating/minimizing additional off-camera video processing for jitter removal/reduction. SAMSUNG-1003, ¶78. This in turn would have improved the recorded video’s quality (e.g., more stable videos). *Id.* **Third**, this modification would have been a simple design choice from a finite number of identified, predictable solutions (e.g., performing all shake-related image processing on the camera vs. performing all or part of such processing off-camera), with a reasonable expectation of success. SAMSUNG-1003, ¶¶73-75.

(b) Elements [1.1], [14.1], [28.1], [29.1]

The CCD sensor (“image sensor”) in video camera 20 captures “a continuous

stream of [image] frames” (“sequence of images”), which are output as video on video data bus 30. SAMSUNG-1005, 4:61-65, claims 1-6 (“*optical image sensor* ... for producing a *series of video frames*”); SAMSUNG-1003, ¶¶80, 191, 215, 222.

Allen’s CCD sensor provides (via video data bus 30) captured images for storage in the video subchannel of channel 56, which is “a storage medium, such as a digital memory” (“memory”):



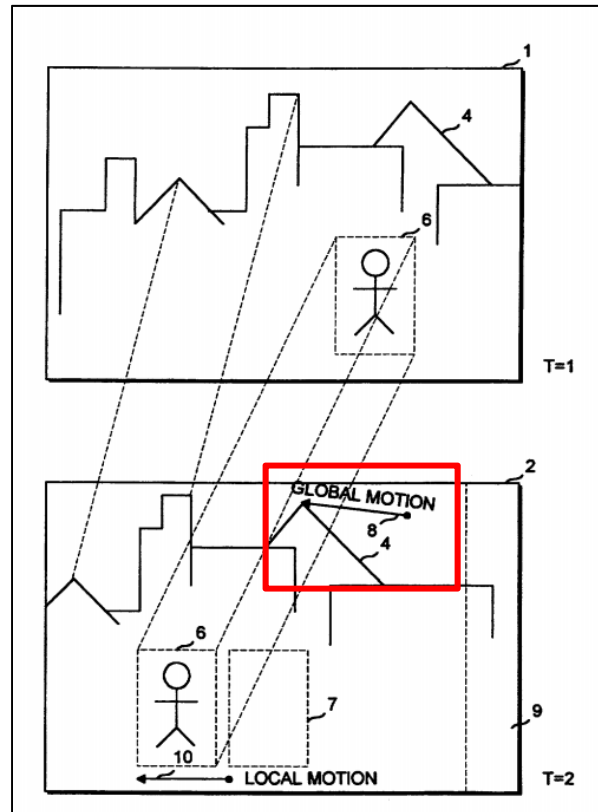
SAMSUNG-1005, FIGs. 2, 3B (combined and annotated FIGs. 2 and 3B), 6:20-40, 4:59-5:14; SAMSUNG-1003, ¶81.

(c) Elements [1.2], [14.2], [28.2], [29.2]

Allen’s motion detectors (“motion sensors”) detect movement of camera 20

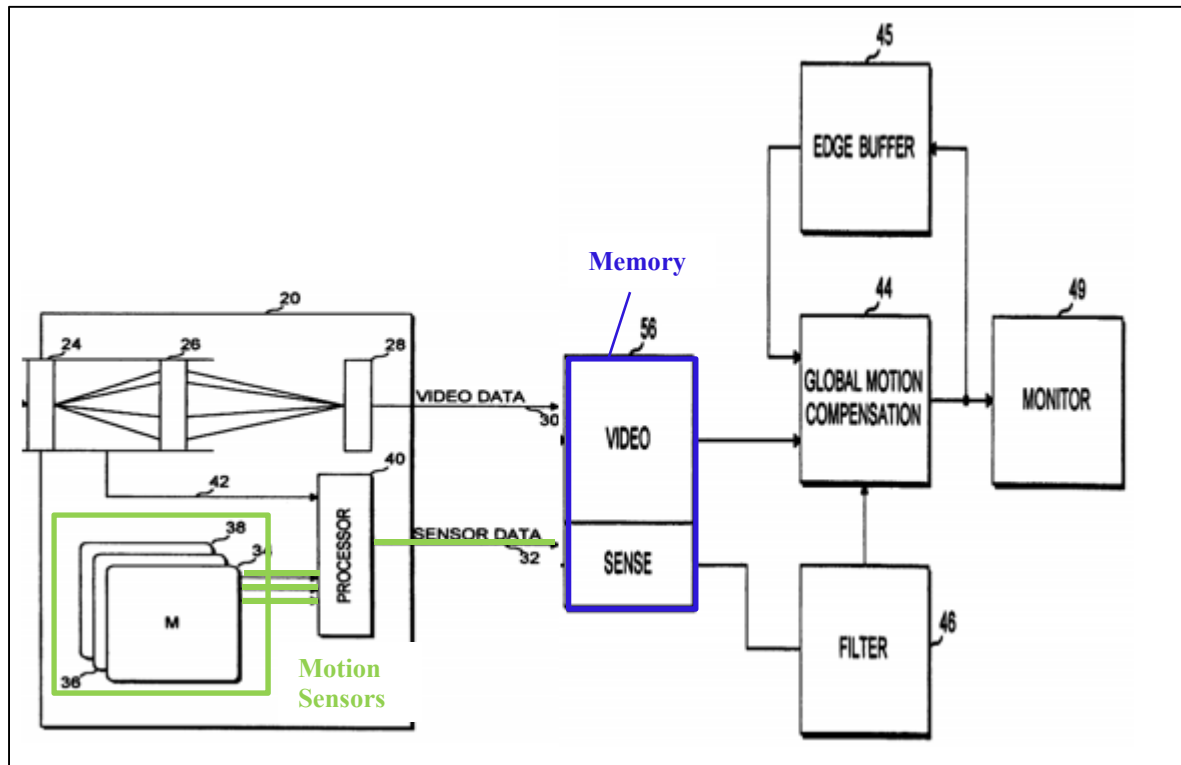
in horizontal and vertical directions for image frames in the video, and this motion information represents the camera's motion during image capture. SAMSUNG-1005, 4:66-5:14 (“Motion detectors ... indicate to a processor 40 the movement of camera 20.... [V]ideo data and its associated motion data are synchronized.”), 3:21-31, 2:19-31, Abstract; SAMSUNG-1003, ¶¶83, 192, 216, 223.

For example, in Allen, motion caused by camera movement is represented using a global motion vector (i.e., motion information).



SAMSUNG-1005, FIG. 1 (annotated), 3:62-68, 4:37-53; SAMSUNG-1003, ¶ 84.

Allen's motion detectors store “motion information” in the sensor data sub-channel of channel 56 (“memory”) via processor 40 and sensor data bus 32.



SAMSUNG-1005, Figs. 2, 3B, 5, 6:20-40, 4:59-5:14; SAMSUNG-1003, ¶85.

Allen stores motion information synchronously with storage of images captured by the CCD sensor. Specifically, “video data on video data bus 30 ... and its associated motion data [on sensor data bus 32] *are synchronized.*” SAMSUNG-1005, 5:8-14; Abstract (“motion data is then associated with the video frame data”). Synchronized video and motion data are stored in channel 56 (“memory”). *Id.*, 5:8-14, 6:20-40, FIG. 2, 3B, 5; SAMSUNG-1003, ¶86.

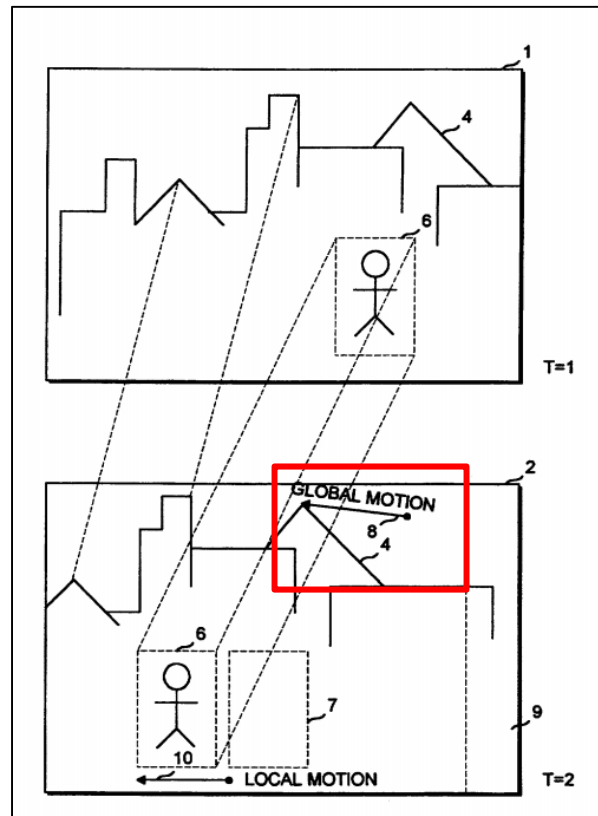
A POSITA would have understood (or found obvious) that Allen stores motion information synchronously with image data because motion compensation component 44 compensates for camera motion during capture of an image frame based

on the image frame and its corresponding motion data stored in channel 56. SAMSUNG-1005, 5:54-61, 7:30-47; elements [1.3]-[1.4] *infra*; SAMSUNG-1003, ¶87.

(d) Elements [1.3], [14.3], [28.3], [29.3]

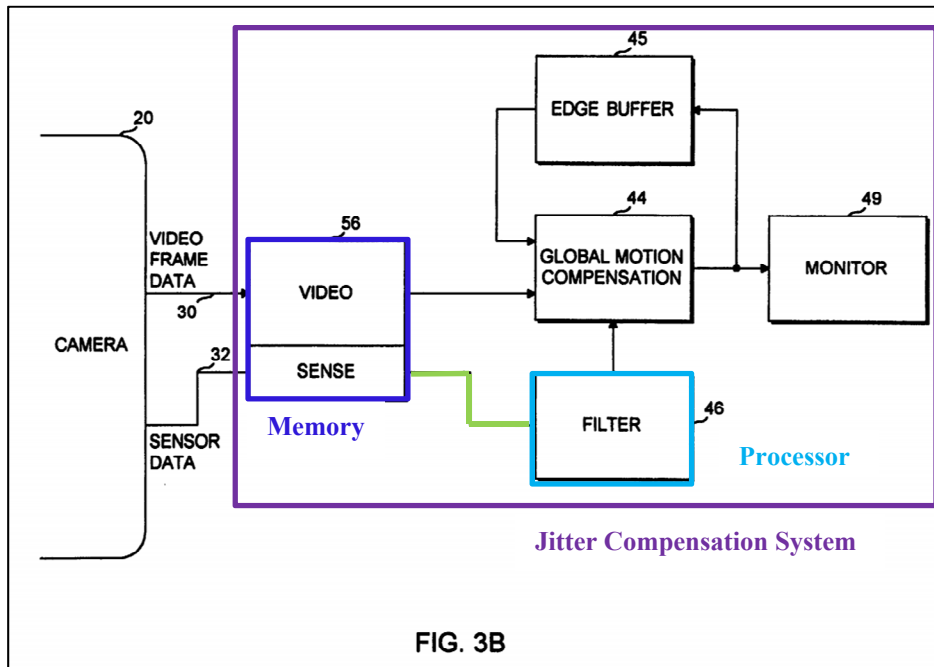
For each captured image in the sequence of images, filter 46 (“processor”) determines horizontal and vertical shift values based on the detected motion information. SAMSUNG-1003, ¶¶89-95, 193, 217, 224.

In Allen, the detected motion information for an image includes camera movement data in the horizontal and vertical directions, which includes high frequency camera movement (e.g., jitter/shake) and intentional camera movements. *See* element [1.2]; SAMSUNG-1005, 2:40-44, 5:53-62, 7:30-47, claims 2-3, Abstract; SAMSUNG-1003, ¶¶89-90. Such camera movements indicate global motion in the image and are represented using Allen’s global motion vector:



SAMSUNG-1005, FIG. 1 (annotated), 3:65-69, 4:37-52; SAMSUNG-1003, ¶91.

Allen’s camera movement data is “high pass filtered” by filter 46 “so that only *high frequency camera movement data* is passed to motion compensator 44.” *Id.*, 5:53-6:12 (stating that “[z]oom is not compensated for” as part of motion compensation by motion compensator 44), 2:40-44, 3:21-31, 7:30-47, claims 2-3 (stating high-pass filter filters the motion data and uses the filtered motion data in “shifting ... frames in response” to the filter’s output); SAMSUNG-1003, ¶92.



Id., FIG. 3B (annotated; motion data provided from channel 56 to filter 46).

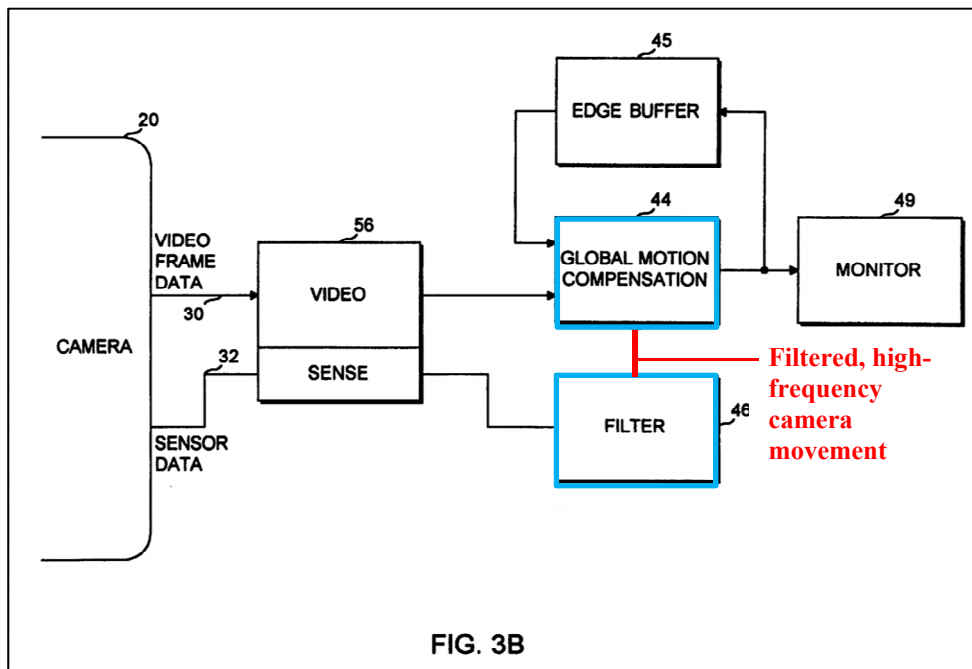
From these disclosures, a POSITA would have understood that, as part of Allen's high pass filtering, filter 46 determines a global motion vector (or another data structure) that identifies the amount of camera "shift" in the horizontal and vertical directions caused by high frequency motion/jitter. SAMSUNG-1005, claims 2-3 (*"filter means ... for filtering said motion data; and means, coupled to said video output means and said filter means, for shifting ... data in frames of said series of frames in response to an output of said filter means"*), 5:53-6:13, 7:30-47, 3:21-31, 3:65-68; 4:37-52; SAMSUNG-1003, ¶¶93-95. Indeed, global motion vector 8 "describes how to *translate* the background of frame 1 to frame 2," indicating that this

vector includes horizontal/vertical shift values for discretely shifting images horizontally/vertically. SAMSUNG-1005, 4:37-52, 3:27-29 (“motion data for camera rotation in two dimensions”); SAMSUNG-1003, ¶¶93-95.

Thus, for each video frame, filter 46 determines horizontal value and vertical shift values based on the motion information. SAMSUNG-1005, 4:37-52, 3:27-29, 5:53-6:13, 7:30-47; SAMSUNG-1003, ¶¶92-95.

(e) Elements [1.4], [14.4], [28.4], [29.4]

Allen’s motion compensator 44 (“processor”) modifies image frame data received from channel 56 based on the filtered motion data (which, as explained at [1.3], includes horizontal and vertical shift values). For example, Allen’s “high frequency camera movement data” is used by global motion compensator 44 to “*adjust[] the frames of the video data to cancel out those high frequency movements of the camera.*” SAMSUNG-1005, 5:53-62, claim 2-3 (“shifting ... data in frames of said series of frames in response to” output of the filter); 1:34-38, 2:32-33, 7:30-47; SAMSUNG-1003, ¶¶97-98, 194, 218, 225. Indeed, motion compensator 44 removes “frame-to-frame jitter by *moving a frame into alignment with the preceding frame* to correct for camera movement,” indicating that Allen horizontally/vertically shifts images based on horizontal/vertical shift values. SAMSUNG-1005, 5:63-6:34, 7:30-47; SAMSUNG-1003, ¶98.



SAMSUNG-1005, FIG. 3B (annotated).

(f) Elements [1.5], [14.5], [28.5], [29.5]³

Allen discloses this limitation for two independent reasons.

First, motion compensator 44 (“processor”) operates together with edge

³ In litigation, Petitioner asserts that the phrases “a processor configured to ... combine the modified images to obtain a final video” ([14.5]) and “a processor configured to ... combine the modified images, and apply a video compression technique to obtain a final video” ([29.5]) are indefinite. SAMSUNG-1024, 38-40. Because indefiniteness is ineligible for consideration in IPR, Samsung has applied prior art against Patent Owner’s interpretation as reflected in its District Court infringement contentions for purposes of this proceeding. *Id.*

buffer 45 (e.g., full frame buffer) to combine the modified images by using edge data from the preceding frame, stored in the buffer, in reconstructing the frame currently being processed by motion compensator 44, to obtain the final video. SAMSUNG-1005, 5:63-6:13 (*“Edge buffer 45 stores pixels along the edge of a scene for one frame period. Then, as a frame is moved by motion compensator 44, the exposed edges are filled with corresponding pixels from the preceding frame.”*), 7:30-47; SAMSUNG-1003, ¶¶100-103, 195, 219, 226.

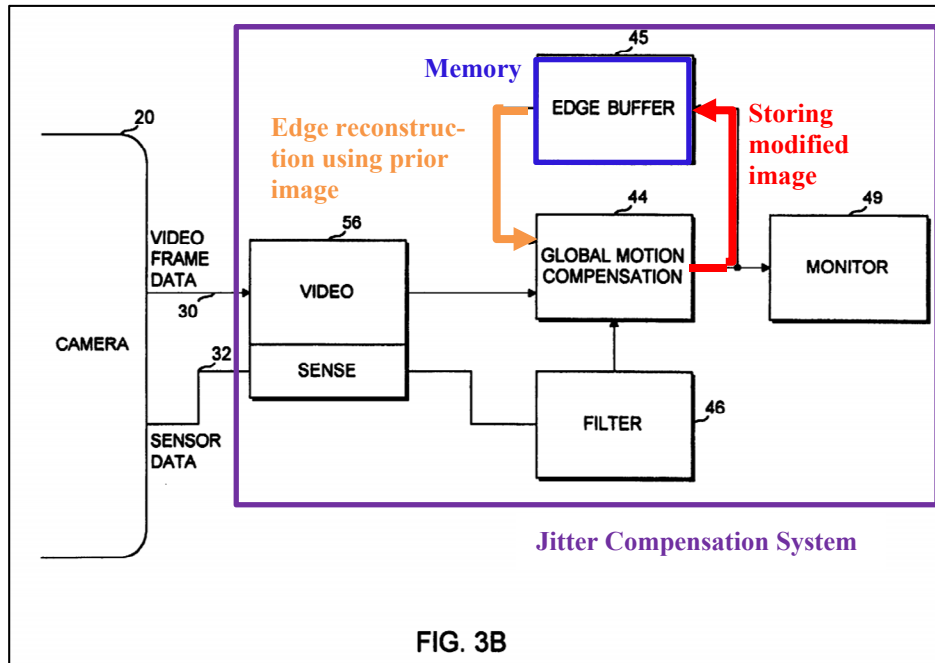
Second, Allen discloses that the “compensated video data output of motion compensator 44 is either stored or transmitted ... for the type of channel 48 used, and is viewed on monitor 49.” SAMSUNG-1005, 6:15-19 (“The video viewed on monitor 49 will appear smoother than the raw video recorded by camera 20”), 5:48-50, 7:39-44, FIG. 3B. For the motion-compensated video to be stored and viewed, a POSITA would have understood that the modified, the video’s motion-compensated image frames are combined/grouped (physically or logically) in the sequence in which the video is to be played. *Id.*; SAMSUNG-1003, ¶¶104-105.

For the [28.5]/[29.5] limitation of the processor applying a video compression technique to obtain a final video, see claim 11, *infra*. SAMSUNG-1003, ¶¶169-76.

(g) Elements [1.6], [14.6], [28.6], [29.6]

Allen discloses storing the final video in edge buffer 45 (“memory”). As described at [1.5], edge buffer 45 stores an entire preceding frame in the video, which

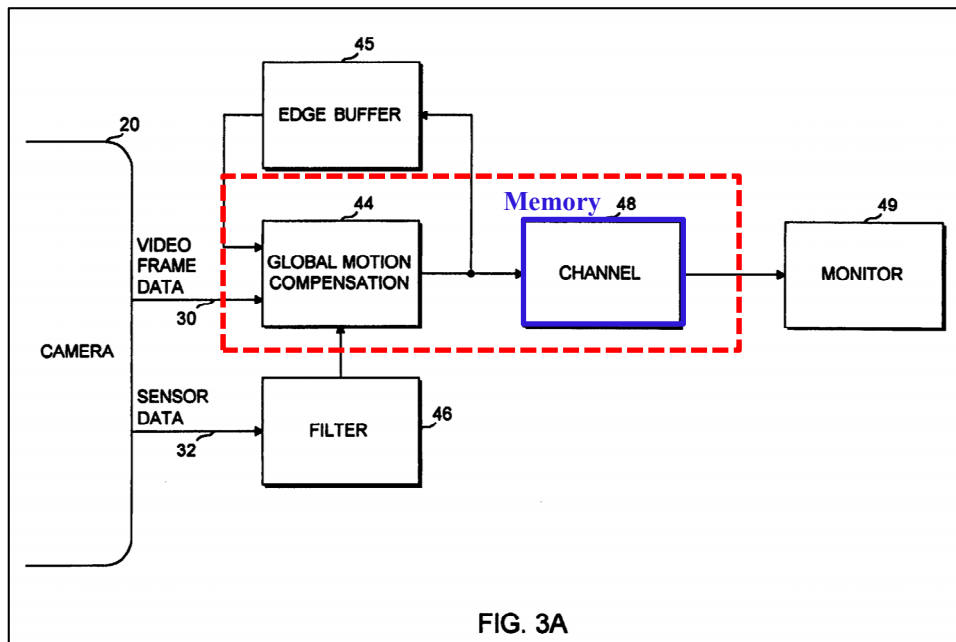
is used by motion compensator 44 in reconstructing the image frame currently being processed. SAMSUNG-1005, 5:64-6:13, 7:30-47, FIG. 3B, 5; SAMSUNG-1003, ¶¶100-08. The reconstructed/combined image frame is stored in edge buffer 45 and is used in reconstructing the subsequent image frame processed by motion compensator 44. SAMSUNG-1005, 5:64-6:13, 7:30-47, FIG. 3B, 5; SAMSUNG-103, ¶¶107-108, 196, 220, 227.



SAMSUNG-1005, FIG. 3B, 5 (annotated). From these disclosures, a POSITA would have understood that this procedure repeats for each successive image frame in the video and that each combined/motion-compensated image frame of the final video is stored in edge buffer 45. SAMSUNG-1003, ¶109.

If Patent Owner argues that this limitation requires simultaneous storage of all

frames processed by motion compensator 44, Allen's FIG. 3B does not explicitly disclose storage in that level of detail. However, Allen's FIG. 3A renders obvious simultaneous storage of these images in device memory. SAMSUNG-1003, ¶110. In FIG. 3A's jitter compensation system, the "compensated video data output of motion compensator 44" ("final video") is "stored" in "channel 48," which is a ***"storage medium, such as a digital memory."*** SAMSUNG-1005, 5:38-47, FIG. 3A (annotated); SAMSUNG-1003, ¶¶111-113.



From this disclosure, a POSITA would have found it obvious to either include additional memory (e.g., channel 48) in Allen's FIG. 3B or configure existing memory (e.g., channel 56) to store the final video. SAMSUNG-1003, ¶114, 220. Making either of these modifications to Allen's (or Allen-Akifumi's) imaging device would have been an application of known/straightforward techniques that

would have yielded the predictable result of enabling the final video's storage. SAMSUNG-1003, ¶¶115, 121-22.

A POSITA would have been motivated to combine embodiments from Allen's FIG. 3A and FIG. 3B for multiple reasons. *First*, both embodiments are directed to jitter compensation in captured images. SAMSUNG-1003, ¶116; SAMSUNG-1005, 5:15:6:24, 7:30-47. *Second*, a POSITA would have been motivated to make this modification because Allen's FIG. 3A expressly contemplates storing the final compensated video. SAMSUNG-1003, ¶116. *Third*, this modification would have resulted in a system that enables storage and later playback of videos in Allen's (or Allen-Akifumi's) imaging device, thus improving the device's overall operation and increasing accessibility of its captured/recorded videos. SAMSUNG-1003, ¶116.

Alternatively, it would have been obvious to simultaneously store the final video in Allen's memory in view of Akifumi's storage of final motion/shake compensated video. SAMSUNG-1007, [0028]-[0029], [0059], FIGs. 1, 10 (shake/compensated video stored in data recording portion 16 which includes a "memory that is built into the [camera], or a recordable digital disk.")). Accordingly, it would have been obvious to store Allen's final video either by modifying existing "memory" (e.g., channel 56) to store the final video or by adding extra device memory to store the video. SAMSUNG-1003, ¶¶117-119, 121-22.

A POSITA would have been motivated to combine Allen and Akifumi for reasons described at element [1.P] and because this combination would have resulted in a system that enables storage and later playback of videos, which would have improved overall operation of Allen's (or Allen-Akifumi's) imaging device by increasing accessibility of videos captured and recorded. SAMSUNG-1003, ¶¶120, 196, 220, 227; SAMSUNG-1007, [0028]-[0029] (storing video enables “*playback of video*”).

Alternatively, it would have been obvious to a POSITA to simultaneously store images processed by motion compensator 44 in Allen's memory in view of the knowledge of a POSITA. SAMSUNG-1003, ¶121. It was well known as of the Critical Date to store videos in memory to enable their playback (including the ability to rewind/fast-forward videos and/or playback videos one or more times). *Id.* Moreover, adding an extra memory device to Allen's (or the Allen-Akifumi) “imaging device” or configuring an existing memory of this device to store data, such as a digitally processed final video, was a straightforward technique as of the Critical Date. *Id.*, ¶ 122. Accordingly, it would have been obvious to a POSITA to store Allen's final video either by modifying the existing “memory” (e.g., channel 56) or by adding an extra memory component to the system (as described above). *Id.*

(h) Claims 2, 15

As described at [1.2] and [1.3], for image frames for which motion information is detected, Allen’s filter 46 (“processor”) determines horizontal and vertical shift values based on the motion information. SAMSUNG-1005, Abstract, 2:21-44, 3:62-69, 4:37-55, 4:59-5:14, 5:53-6:44, claims 2-3, FIGs. 1-3B; SAMSUNG-1003, ¶¶82-95, 123-124, 197.

(i) Claims 3, 16

As described at [1.4], Allen’s motion compensator 44 (“processor”) modifies images in the video/sequence of images for which vertical and horizontal shift values were determined. SAMSUNG-1005, 5:53-6:12, claim 2, 1:34-38, 2:30-35, 7:30-47, FIG. 3B; SAMSUNG-1003, ¶¶125-126, 198.

(j) Claims 4, 17⁴

As described at element [1.4] and claim 3, Allen’s global motion compensator 44 (“processor”) modifies images in the video/sequence of images to reduce effect

⁴ In litigation, Petitioner asserts that the phrase “effect of motion ... reduced in the final video” renders these claims indefinite. SAMSUNG-1024, 36-37. Because indefiniteness is ineligible for consideration in IPR, Samsung has applied prior art against Patent Owner’s interpretation as reflected in its District Court infringement contentions for purposes of this proceeding. *Id.*

of motion of the camera. SAMSUNG-1005, 5:53-6:12, 1:34-38, 2:32-33, 7:30-47, claim 2, FIG. 3B; SAMSUNG-1003, ¶¶97-98, 127. Allen's modification removes the effect of jitter/high frequency camera movements and results in stable/smooth video. *Id.*, Abstract, 2:63-65, 4:14-19; SAMSUNG-1003, ¶129, 199.

(k) **Claims 5, 18**

As described at [1.3], Allen's filter 45 ("processor") determines horizontal and vertical shift values for each image of the video/sequence of images. SAMSUNG-1005, Abstract, 2:21-44, 3:62-69, 4:37-5:14, 5:53-6:12, 6:20-44, 7:30-47, claims 2-3, FIGs. 1, 3B; SAMSUNG-1003, ¶¶88-95, 130-31, 200.

(l) **Claims 6, 19**

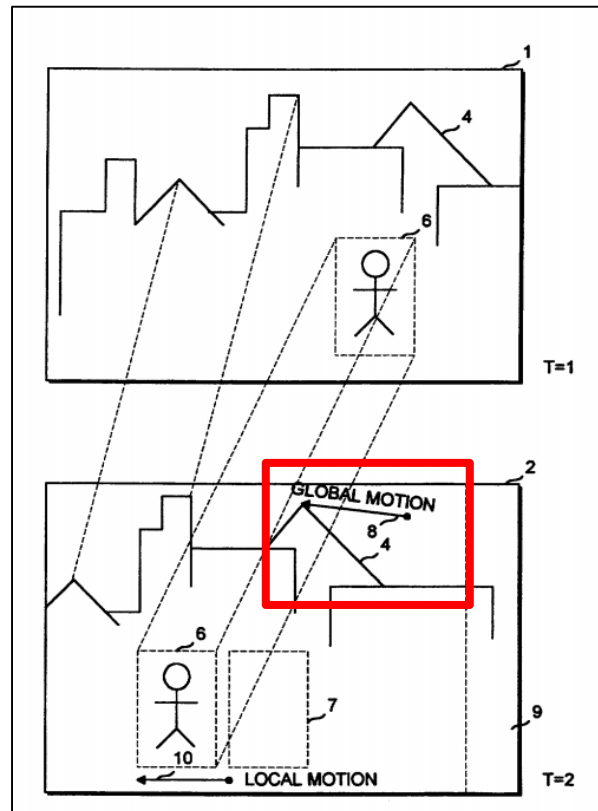
As described at [1.2], Allen's motion information detected by the one or more motion sensors represents the device's motion at the time of/during capture of one or more images of the sequence of images. SAMSUNG-1005, Abstract, 2:21-31, 3:62-68, 4:37-5:14, 5:53-6:44; SAMSUNG-1003, ¶¶82-87, 132-33, 201.

(m) **Claims 7, 20, 30**

As described at [1.1], Allen's image sensor captures a "*continuous stream of frames*," which includes at least two images. SAMSUNG-1005 4:61-67, Abstract, claim 1, 5:53-6:34, FIGs. 2, 3B; SAMSUNG-1003, ¶¶80-81, 135.

As described at [1.2]-[1.4], Allen compensates for global motion caused by high frequency camera movements during image capture. Specifically, in Allen, by

having the “*motion sensor measure the camera’s movement* in space ... along with the [video] frames,” “*apparent motion from frame to frame* ... can be determined.” SAMSUNG-1005, 3:24-27, claim 1; SAMSUNG-1003, ¶¶82-98, 136. Allen’s frame-to-frame motion is referred to as “global motion,” and “global motion *between two frames* is represented by ... global motion vector 8.” SAMSUNG-1005, 4:37-52; SAMSUNG-1003, ¶¶136-37. Indeed, Figure 1 shows global motion vector 8 *between* an image captured at t=1 and another image captured at t=2 (i.e., “consecutive images”).



SAMSUNG-1005, FIG. 1 (annotated); SAMSUNG-1003, ¶¶136-37. Accordingly,

a POSITA would have understood that Allen's motion information represents motion "between" capturing of consecutive images. SAMSUNG-1003, ¶¶136-38, 202, 228.

(n) **Claims 8, 21**

As described at [1.3], Allen's filter 46 ("processor") determines horizontal and vertical shift values for image frames in the video/sequence of images. SAMSUNG-1005, Abstract, 2:21-44, 3:62-69, 4:37-5:14, 5:53-6:44, 7:30-47, claims 2-3, FIGs. 1 and 3B; SAMSUNG-1003, ¶¶88-95, 140.

Allen's horizontal and vertical shift values indicate how much an image is displaced due to motion during capturing of the image. As described at [1.3]-[1.4], the horizontal and vertical shift values determined by filter 46 are used by global motion compensator 44 to "*shift*" the image frame to "*cancel out*" the "high frequency movements of the camera." SAMSUNG-1005, claims 2-3, 5:53-6:12, 7:30-47, Abstract; SAMSUNG-1003, ¶¶88-98, 141-42, 203. Because the horizontal and vertical shift values are used to "shift" the image frame to "cancel out" the "high frequency movements of the camera," these values indicate how much the image is displaced/shifted due to device motion during image capture. *Id.*

(o) **Claims 9, 22**⁵

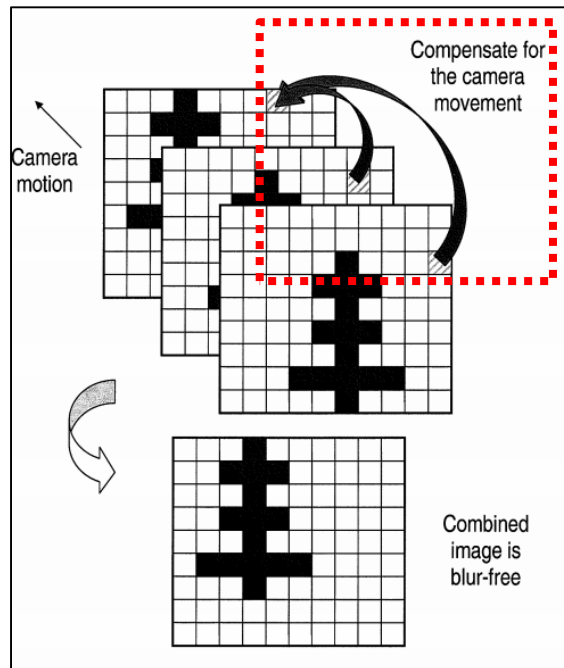
As described at [1.4] and [4], motion compensator 44 (“processor”) modifies image frames in the video/sequence of images based on the horizontal and vertical shift values, to reduce the effect of high frequency motion. SAMSUNG-1005, Abstract, 2:32-33, 2:63-65, 4:14-19, 5:53-6:12, claims 2-3, 1:34-38, 7:39-44, FIG. 3B; SAMSUNG-1003, ¶¶97-98, 128-29, 144.

When viewed in the context of the ’450 Patent, Allen discloses this limitation. As described in §II.B, the ’450 Patent’s claims are directed to FIG. 4’s embodiment. SAMSUNG-1002, 124-27, 140. However, FIG. 4 and its disclosure do not shift a reference point in each image according to the vertical and horizontal shift values determined based on device motion. SAMSUNG-1001, 6:31-7:47; SAMSUNG-1003, ¶146.

The ’450 Patent uses a “reference point” in a separate embodiment relating to prevention of blur as the image is “being captured.” *Id.*, 9:49-11:6, FIGs. 10-11;

⁵ In litigation, Petitioner asserts that the phrase “reduces the effect of motion of the device in the final video” renders claim 9 indefinite. SAMSUNG-1024, 37-38. Because indefiniteness is ineligible for consideration in IPR, Samsung has applied prior art against Patent Owner’s interpretation as reflected in its District Court infringement contentions for purposes of this proceeding. *Id.*

SAMSUNG-1003, ¶147. In this embodiment, multiple versions of the same image are captured and combined in a single image that removes/reduces blur. *Id.* The '450 Patent accomplishes this by using a reference point based on the imaging device's location or the image's subject. *Id.*, 10:55-57, 9:49-11:6; SAMSUNG-1003, ¶¶148-50. When the reference point is based on the imaging device's location, the imaging device records device motion during image capture (using a motion sensor) and “*moves each of the images in the series by an amount which is preferably measured in pixels, in the direction opposite the motion of the imager that occurred during the capture of each of the images.*” *Id.*, 9:66-10:54; SAMSUNG-1003, ¶¶150-51. Thus, the image shift is compensated for, and the “*correct pixels are aligned* in each of the images.” *Id.*



SAMSUNG-1005, FIG. 11 (annotated).

Thus, a POSITA would have understood that shifting a reference point in each image according to the vertical and horizontal shift values for the image includes shifting the image's one or more pixels in horizontal/vertical directions that are opposite to the imaging device's horizontal/vertical movements/shifts. SAMSUNG-1003, ¶¶150-51.

Based on the '450 Patent's disclosure, Allen shifts a reference point in each image according to the vertical and horizontal shift values. SAMSUNG-1003, ¶152. As described at [1.4] and [8], Allen modifies an image by shifting the image based on the determined horizontal and vertical shift values to cancel out high frequency camera motion. SAMSUNG-1005, Abstract, 2:32-65, 4:14-19, 5:53-6:12, claims 2-3, 1:34-38, 7:30-47, FIG. 3B, 5; SAMSUNG-1003, ¶¶88-98, 140-142, 152. A POSITA would have understood that, as part of such image modification, a set of image pixels are shifted in horizontal/vertical directions that are opposite to the horizontal/vertical movements of Allen's (or Allen-Akifumi's) imaging device. SAMSUNG-1005, Abstract, claims 2-3, 5:54-6:12, 1:33-39, 7:30-47; SAMSUNG-1003, ¶¶152-53, 204.

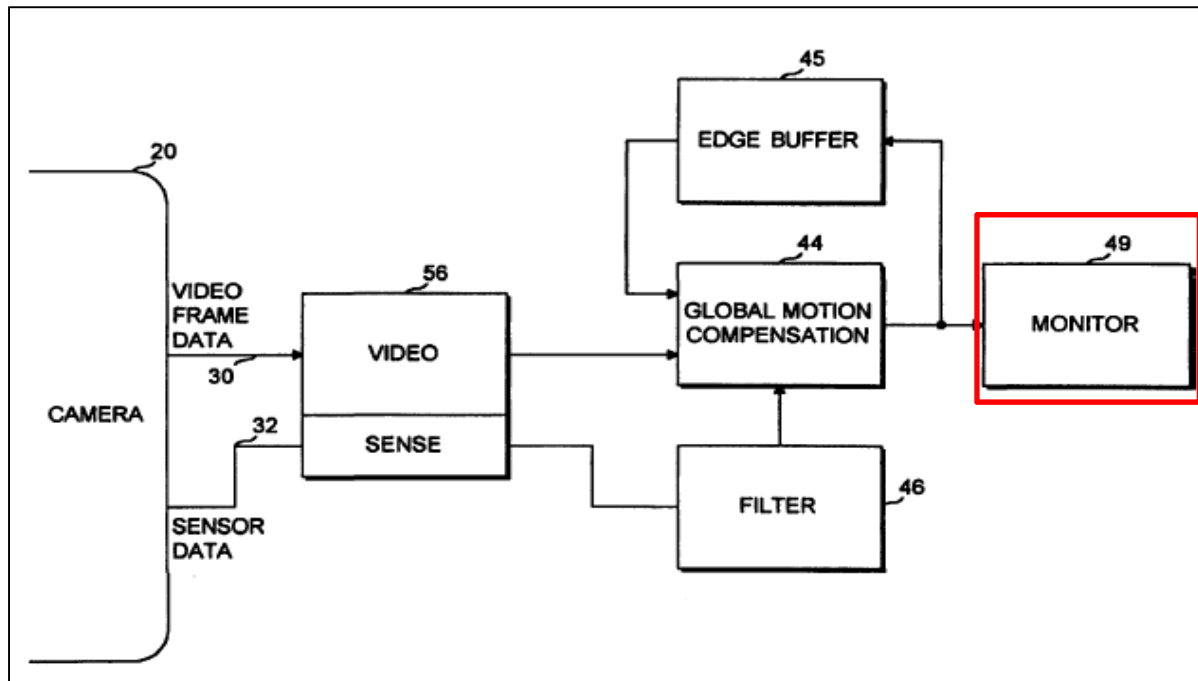
If Patent Owner argues that Allen does not disclose "shifting a reference point ... according to the vertical shift value and the horizontal shift value for the image,"

Allen renders this limitation obvious in view of Akifumi, which discloses this limitation in the context of the '450 Patent. SAMSUNG-1003, ¶154. Akifumi applies horizontal and vertical direction shift magnitudes (i.e., horizontal and vertical shift values) to shift image pixels to correct for motion in the image due to camera shake. SAMSUNG-1007, [0072]-[0074]; SAMSUNG-1003, ¶¶155-56, 204. It would have been obvious to configure motion compensator 44 (“processor”) to perform the motion compensation by shifting a reference point according to the horizontal and vertical shift values, as disclosed in Akifumi. *Id.*

A POSITA would have been motivated to combine Allen and Akifumi for reasons described in claim 1. SAMSUNG-1003, ¶¶76-78, 120. A POSITA would have also combined these references because they provides techniques for correcting/compensating for camera motion/shake during video capture based on horizontal and vertical shift values. SAMSUNG-1003, ¶159. Given similarity in these system’ motion/shake compensation techniques, a POSITA would have consulted Akifumi to provide additional details/specificity regarding how the determined horizontal and vertical shift values in Allen’s system correct for the camera motion in the captured image—i.e., based on shifting a reference point. SAMSUNG-1003, ¶160. Moreover, this combination would have resulted in a higher quality video due to precise motion compensation in the portion of the image where motion was detected. SAMSUNG-1003, ¶161.

(p) **Claims 10, 23**

Allen's jitter compensation system (part of "imaging device") includes monitor 49 with a "user interface"/"display" on which the motion compensated video ("final video") is "viewed"/displayed. SAMSUNG-1005, 6:14-19, 3:32-35, 7:39-47; SAMSUNG-1003, ¶¶163-64, 205.



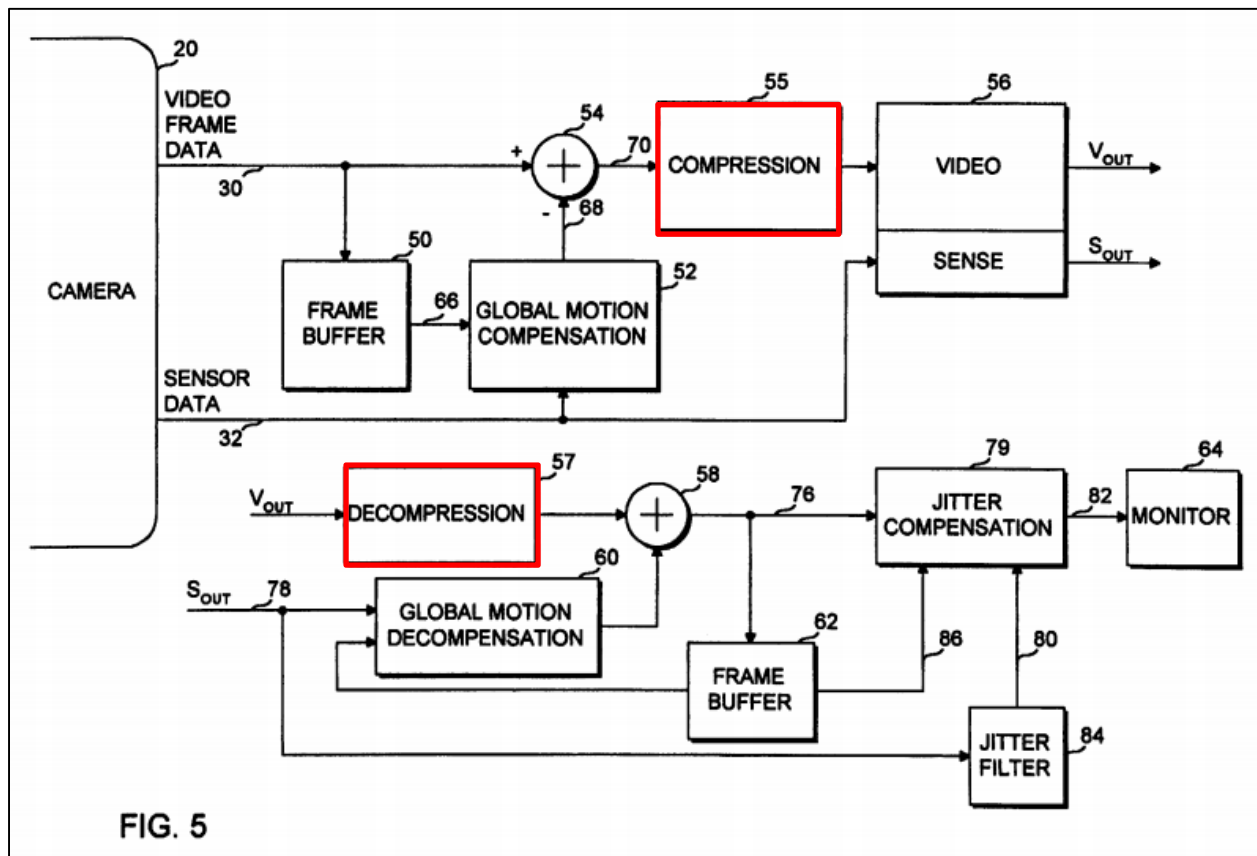
SAMSUNG-1005, FIG. 3B (annotated).

If Patent Owner argues Allen's (or Allen-Akifumi's) "imaging device" must include the interface/display in the same device that includes the image and motion sensors, memory, and processor, Allen does not explicitly disclose that monitor 49 is included in the same device. However, implementing a monitor/display within

the same imaging device would have been obvious in view of Akifumi, which discloses a video camera (“imaging device”) that includes “monitoring portion 22” for displaying videos recorded by the camera. SAMSUNG-1007, [0059], FIG. 11; SAMSUNG-1003, ¶¶165-67. A POSITA would have been motivated to combine these references for reasons described in claims 1 and 9, and because adding a display to the imaging device results in an enhanced imaging device that enables viewing/replaying videos recorded by the imaging device (in real-time and without needing to connect to a separate monitor/computer). SAMSUNG-1003, ¶¶76-78, 120, 159-61, 205; SAMSUNG-1007, [0059].

(q) Claims 11, 24

Allen’s jitter compensation is implemented with a data compression system:



SAMSUNG-1005, FIG. 5 (annotated), 7:26-34; *see* §IV.A.1; SAMSUNG-1003, ¶171, 206.

The components of the system—frame buffer 50, motion compensator 52, adder 54, and data compressor 55 (part of “processor”)—modify video frames using video compression by processing them (using frame buffer 50, motion compensator 52, and adder 54) and compressing them (using data compressor 55). *Id.*, 6:27-7:43; SAMSUNG-1003, ¶¶172-75, 206. Prior to providing the video for display, the video frames are reconstructed by data decompressor 57, motion decompensator 60, and frame buffer 62. *See id.*, 6:67-7:14; SAMSUNG-1003, ¶174. The components of

the jitter compensation system remove camera jitter from the reconstructed frames and provide “stabilized video scenes ... to monitor 64.” *See id.*, 7:30-48; SAMSUNG-1003, ¶¶174-175.

If Patent Owner argues that Allen’s “imaging device” must be a single device that includes the image sensor, motion sensors, memory, and processor, Allen does not explicitly disclose that the “processor” components that perform video compression are part of the same device. However, this would have been obvious in view of Akifumi, for reasons described in claims 1 and 9-10. SAMSUNG-1003, ¶¶68-78, 370-73, 120, 154-61, 166-68, 206; SAMSUNG-1007, [0028]-[0029], [0005], [0046], [0059], Figs. 1, 6, 10 FIG. 1, 11 (including video compression portion for compressing images after performing shaking correction on them).

(r) **Claims 12, 25, 31**⁶

⁶ In litigation, Petitioner asserts that the phrase “processor is configured to determine a vertical shift value and a horizontal shift value for one or more images of the sequence of images based at least in part on the focal distance of a lens of the imaging device” renders claims 25/31 indefinite. SAMSUNG-1024, 40-41. Because indefiniteness is ineligible for consideration in IPR, Samsung has applied prior art against Patent Owner’s interpretation as reflected in its District Court infringement contentions for purposes of this proceeding. *Id.*

As described at [1.3], filter 46 (“processor”) determines horizontal and vertical shift values for each image frame in the sequence of images/video. SAMSUNG-1005, Abstract, 2:21-44, 3:62-69, 4:37-5:14, 5:53-61, 6:20-44, 7:30-47, claims 2-3, FIGs. 1, 3B, 5; SAMSUNG-1003, ¶¶88-95. Moreover, the motion sensors measure the “zoom factor” of zoom lens 26. SAMSUNG-1005, 4:61-5:5, 3:21-35; SAMSUNG-1003, ¶¶179, 207.

Although Allen compensates for camera motion (as described at [1.2]-[1.4]), Allen does not explicitly disclose determining vertical and horizontal shift values based on lens zoom factor, which informs “the focal distance of the lens.” *See id.*, 5:53-62, 3:21-35; SAMSUNG-1003, ¶180. However, this would have been obvious in view of Akifumi.

As described at [9], Akifumi determines a “camera shake correction amount/value” that specifies horizontal and vertical direction shift magnitudes (“horizontal shift” and “vertical shift”). SAMSUNG-1007, [0072]-[0074]; SAMSUNG-1003, ¶¶155-56, 181-82. Akifumi’s “camera shake correction amount/value” is based on the camera motion/shake information, and the lens’s focal distance/length. SAMSUNG-1007, [0025], [0069], [0065]; Figs. 1, 6-10, 15, 17-21; SAMSUNG-1003, ¶¶155-56, 207.

A POSITA would have modified Allen’s system to determine the horizontal and vertical shift values based not only on camera movements, but also on the focal

distance of the zoom lens, as taught in Akifumi. SAMSUNG-1003, ¶156. Such a modification would have been an application of a known technique (e.g., using focal distance in determining shift values) that would have yielded predictable results (determining image shift due to camera motion based on focal distance). *Id.*

A POSITA would have been motivated to combine Allen with Akifumi as described in claims 1 and 9-11, and these additional reasons. SAMSUNG-1003, ¶¶68-78, 120, 154-61, 166-68, 176, 185. **First**, Allen compensates for motion and determines lens zoom factor (which informs lens focal distance) and a POSITA would have been motivated to implement a solution, such as the one disclosed in Akifumi, that determines horizontal and vertical shift values based also on the lens focal distance. SAMSUNG-1003, ¶186. **Second**, this combination would improve the accuracy of the computations of the horizontal and vertical shift values in Allen's system, which in turn would refine the required motion correction/compensation and result in more stable final video. SAMSUNG-1007, [0025] (disclosing "improve[ment] in the accuracy of the camera-shake correction value when using "the setting (focal length) of the zoom lens" in "combination with the [correction value's] calculation"); SAMSUNG-1003, ¶¶187-89.

(s) **Claim 27**

As described at [1.P], Allen's "imaging device" includes "a processor" in the form of motion compensator 44, filter 46, frame buffer 50, motion compensator 52,

adder 54, and data compressor 55. SAMSUNG-1005, 5:27-37. In some implementations, each of these components would have been implemented as a separate processor and Allen's "imaging device" includes at least two processors. SAMSUNG-1003, ¶¶64, 209-211.

Alternatively, Allen would have rendered this limitation obvious in view of the knowledge of a POSITA. ¶¶212-13. It was well known as of the Critical Date that image/video processing is computationally intensive and that adding multiple processors to an image/video processing system enables it to efficiently perform such computationally-intensive tasks. *Id.* Accordingly, it would have been obvious to implement Allen's motion compensation and/or data compression techniques using multiple processors. *Id.*

**B. 1(B) – Allen (or Allen and Akifumi) and Creative Camcorder
Render Obvious Claims 13, 26, and 32**

1. Creative Camcorder

Creative Camcorder describes Canon's ES2000 video camera.



SAMSUNG-1008, 8.

“ES2000 offers an image-stabilization system” that “compensate[s] for different kinds of motion.” *Id.*, 8. To achieve image stabilization, “[m]otion sensors detect horizontal or vertical movement and relay information to a microprocessor that controls prism actuators.” *Id.* “The motion of the prism compensates for camera shake by keeping the image centered on the CCD.” *Id.*

ES2000 includes “a 0.55-inch color LCD” viewfinder, which “provides several important pieces of information and includes a zoom meter as well as icons to indicate the exposure and focusing modes, and whether ... image-stabilization [is] on and off.” *Id.*

ES2000 includes FlexiZone auto-focus and auto-exposure features. *Id.* “With the FlexiZone feature turned on, the viewfinder shows a small frame that indicates the desired area of focus. The default area is the center of the frame. However, the frame can be moved using a joystick-like thumb controller on the back panel of the camcorder.” *Id.* “With the push of a button, the exposure can also be determined by the area inside the frame. The exposure settings remain locked until the button is pushed again, or until the FlexiZone mode is turned off.” *Id.*

2. Analysis

(a) Claims 13, 26, and 32⁷

Canon's ES2000 video camera ("imaging device") includes a viewfinder ("user interface"/"display"), that receives user input. SAMSUNG-1008, 8-9. For example, ES2000's viewfinder receives user input regarding focus and exposure settings. *Id.*, 8. Thus, ES2000 modifies images of the video, e.g., by modifying exposure/focus settings based on the user-provided focus and exposure settings. SAMSUNG-1003, ¶¶235-40, 248-49.

ES2000's viewfinder also receives user input turning on/off the image stabilization feature. SAMSUNG-1008, 8 (explaining that viewfinder provides "*icons to indicate*" whether "*image-stabilization [is] on and off*"). Thus, ES2000 modifies one or more images of the video to compensate for camera motion in captured images when the image stabilization feature is turned on. SAMSUNG-1003, ¶241, 248-49.

⁷ In litigation, Petitioner asserts that the phrase "a display configured to receive user input" renders claims 26 and 32 indefinite. SAMSUNG-1024, 35-36. Because indefiniteness is ineligible for consideration in IPR, Samsung has applied prior art against Patent Owner's interpretation as reflected in its District Court infringement contentions for purposes of this proceeding. *Id.*

A POSITA would have combined Allen (or Allen-Akifumi) and Creative Camcorder. A POSITA would have included ES2000's "display"/"user interface" (i.e., viewfinder), touch controls, and auto-focus/exposure functionality within Allen's (or Allen-Akifumi's) camera. SAMSUNG-1003, ¶¶242, 248-49. These features were well known as of the Critical Date and thus, the combination would require applying known techniques/features (e.g., viewfinder, touch control, autofocus/exposure functionality) to Allen's (or Allen-Akifumi's) camera, which would have yielded predictable results (enabling the user to turn on/off image stabilization (including Allen's stabilization) and modify focus/exposure settings). *Id.*

A POSITA would have been motivated to combine Allen (or Allen-Akifumi) and Creative Camcorder for multiple reasons. **First**, these systems relate to video cameras and are directed to correcting/compensating for camera motion/shake during image capture. SAMSUNG-1008, 8; SAMSUNG-1003, ¶244. **Second**, the combination would have enabled viewing image/video to be captured on a viewfinder and provided the user with control over how image/video is recorded. Thus, an improved imaging device would be achieved that provides a convenient way for the user to control (e.g., by specifying focus/exposure settings or controlling whether to use image stabilization) quality of the recorded video. SAMSUNG-1003, ¶245. **Third**, this combination would have improved focus/exposure settings of captured video, which in turn improves quality of the recorded video. SAMSUNG-1003,

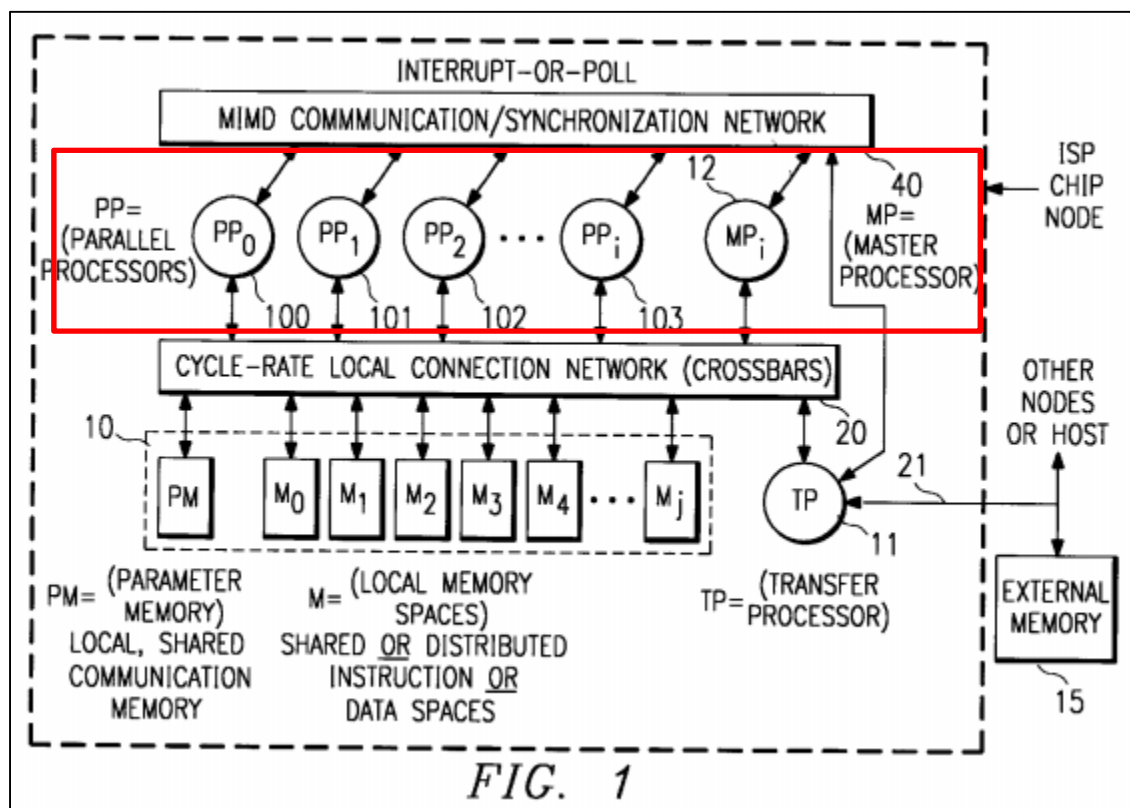
¶246. **Fourth**, enabling turning on/off of image stabilization would have allowed user control over a user to control power consumption (and thus, manage battery usage) or capture unstabilized video if desired. SAMSUNG-1003, ¶247.

C. 1(C) – Allen (or Allen and Akifumi) and Balmer Render Obvious Claim 27

1. Balmer

Balmer's multi-processing system handles image processing and allows any number of processors to run synchronously. SAMSUNG-1006, 3:36-42, 60:49-52.

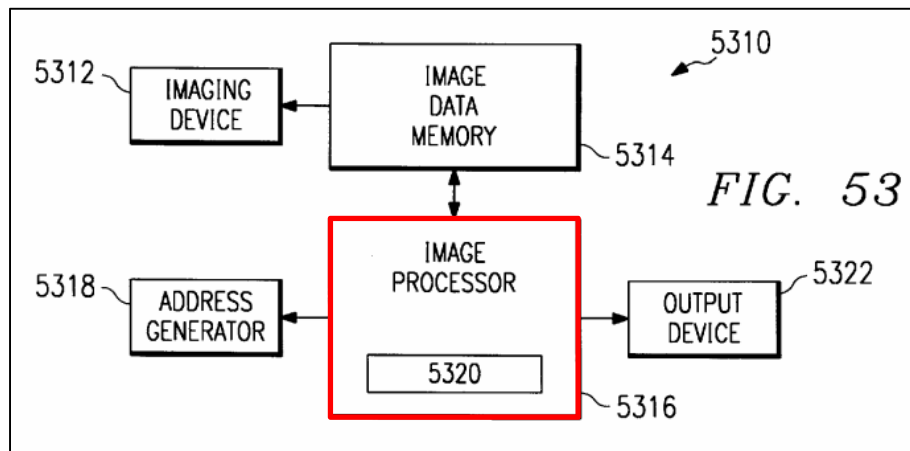
Balmer's FIG. 1 shows the system:



SAMSUNG-1006, FIG. 1 (annotated); FIGs. 2-3.

Balmer's FIG. 53 shows imaging system 5310, which processes image data

using FIG. 1's processor.



SAMSUNG-1006, FIG. 53 (annotated), 30:2-14. Imaging system 5310 includes imaging device 5312, “such as a video camera” that “capture[s] images” and then image processor 5320 “performs signal processing functions including statistical processes on the” captured images. *Id.*, 30:2-14; FIG. 58, 58:17-42.

2. Analysis

If Patent Owner argues that Allen (or Allen-Akifumi) does not disclose/render obvious claim 27, it would have been obvious over Allen (or Allen-Akifumi) and Balmer.

Balmer's multiple processor environment processes video data. SAMSUNG-1006, 3:36-42, 30:2-14, 58:17-42, 60:49-52, 62:22-27; Figs. 1-2, 10, 53, 58; SAMSUNG-1003, 250-56.

In view of Balmer, a POSITA would have implemented “processor” components of Allen's (or Allen-Akifumi's) jitter compensation/data compression system

using multiple processors. SAMSUNG-1003, ¶257. Using multiple processors to process image data was well known and conventional as of the Critical Date. SAMSUNG-1003, ¶¶210-12, 257.

A POSITA would have been motivated to make this combination for multiple reasons. *First*, Balmer, like Allen and Akifumi, analyzes and processes video data. SAMSUNG-1003, ¶258; §III.C.1. *Second*, a POSITA would have looked to Balmer to implement a multi-processor architecture in Allen’s (or Allen-Akifumi) imaging device because implementing multiple processors would enable more efficient and faster video processing. SAMSUNG-1003, ¶260; SAMSUNG-1006, 2:30-37 (“imaging systems are prime candidates for multi-processing”). *Third*, because using multiple processors would have resulted in a more powerful/robust imaging device, a POSITA would have been motivated to combine these references as a design choice to achieve improved performance. SAMSUNG-1003, ¶261.

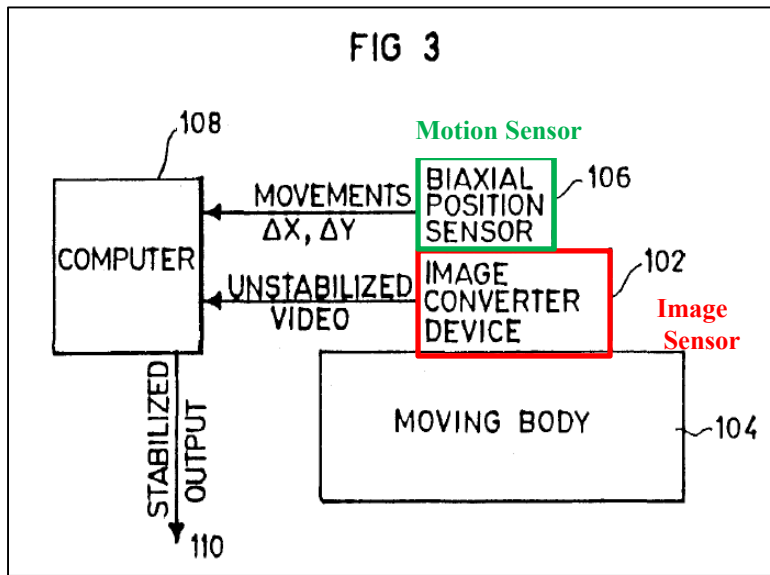
IV. GROUND 2: GAL

A. 2(A): Gal or Gal and Akifumi Render Obvious Claims 1-12, 14-25, and 27-31

1. Gal

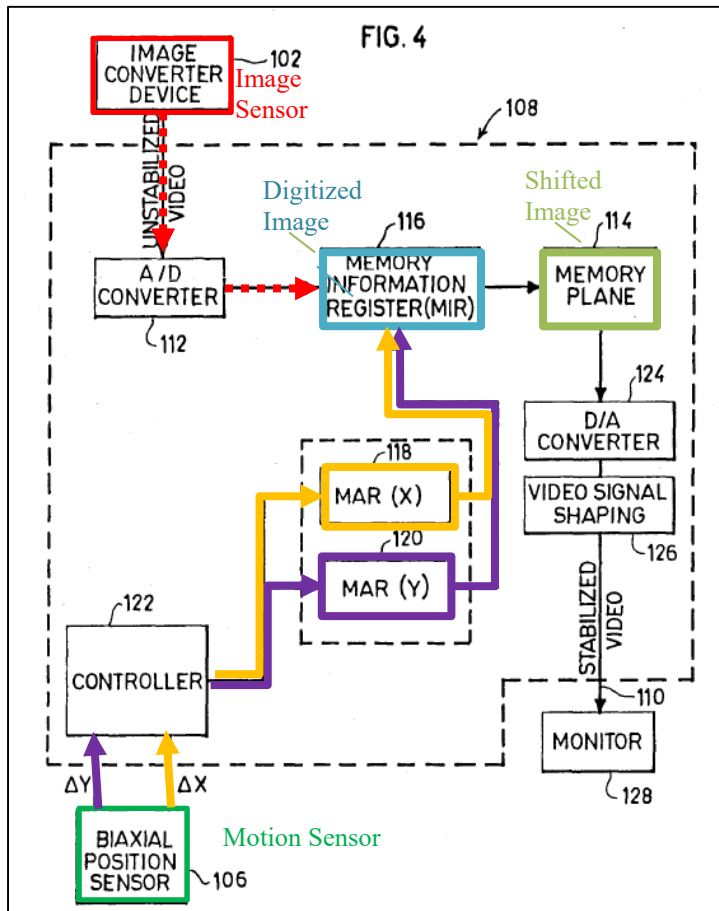
Gal’s “image converter system” “electronically stabiliz[es]” video by detecting movement during image capture and compensating for the movement. SAMSUNG-1004, 1:21-42, Abstract. Gal discloses two embodiments: one where the image sensor performs image/video stabilization (FIGs. 1-2, 2:61-4:26) and another

where a computer performs image/video stabilization on images captured by the image sensor (FIGs. 3-4). *Id.*, 2:64-4:26, 4:27-5:8. The second embodiment is shown below:



Id., FIG. 3 (annotated); *see also id.*, FIG. 1.

Gal's system includes "image converter device 102," which is an "area image sensor" that captures and outputs an unstabilized video. *Id.*, 4:40-49, 3:16-40. Image converter device 102 is "coupled to a bi-axial position sensor 106 producing output signals corresponding to the changes in position of device 102 in both the horizontal and vertical directions." *Id.*, 4:29-34, FIG. 3. "The outputs of both the image converter device 102 and the position sensor 106 are inputted into a computer 108 which compensates the unstabilized electrical signals received from the image converter device 102 for positional changes, the computer producing the stabilized output at 110." *Id.*, 4:34-39. Computer 108 is shown below:



SAMSUNG-1004, FIG. 4 (annotated).

Image converter device 102 provides unstabilized video to analog-to-digital (A/D) converter 112, which converts images from analog to digital form and stores digitized images in memory instruction register (MIR) 116. *Id.*, 2:27-29, 4:40-57, claim 17, FIG. 4.

Controller 122 receives horizontal and vertical position change signals from the biaxial position sensor and provides them for storage in MAR-X and MAR-Y. *Id.*, 4:50-66, claim 17, FIG. 4. Values in these registers are used to shift the digitized images “to compensate for changes-in-position of the area image sensor in both the

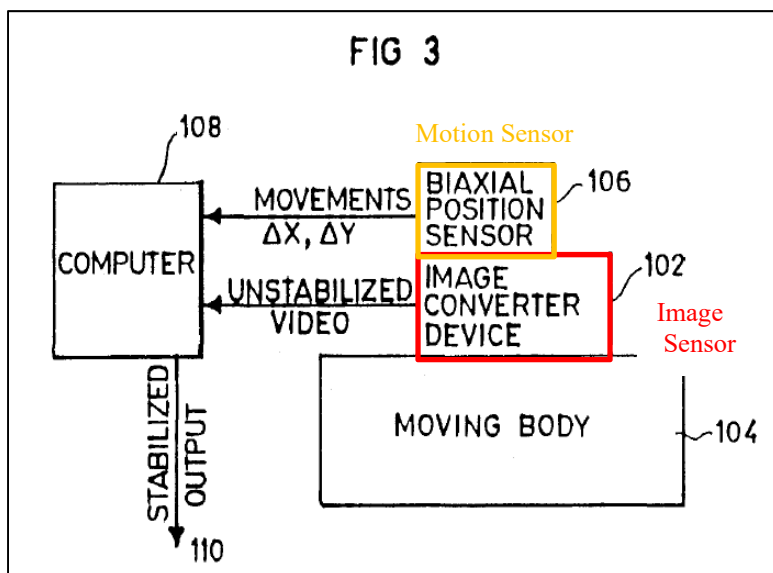
vertical and horizontal directions.” *Id.*, 2:30-41, Abstract, 4:50-67, claim 17.

Shifted/position-compensated digital images are stored in memory plane 114. *Id.* The images are read out of “memory plane 114 into a digital-to-analog converter 124,” “shaped by a video-signal shaping circuit 126,” and outputted as “position-stabilized video information.” *Id.*, 4:67-5:8, 2:22-41. The stabilized video is displayed on monitor 128 or stored. *Id.*, 5:4-8, FIG. 4.

2. Analysis

(a) Elements [1.P], [14.P], [28.P], [29.P]

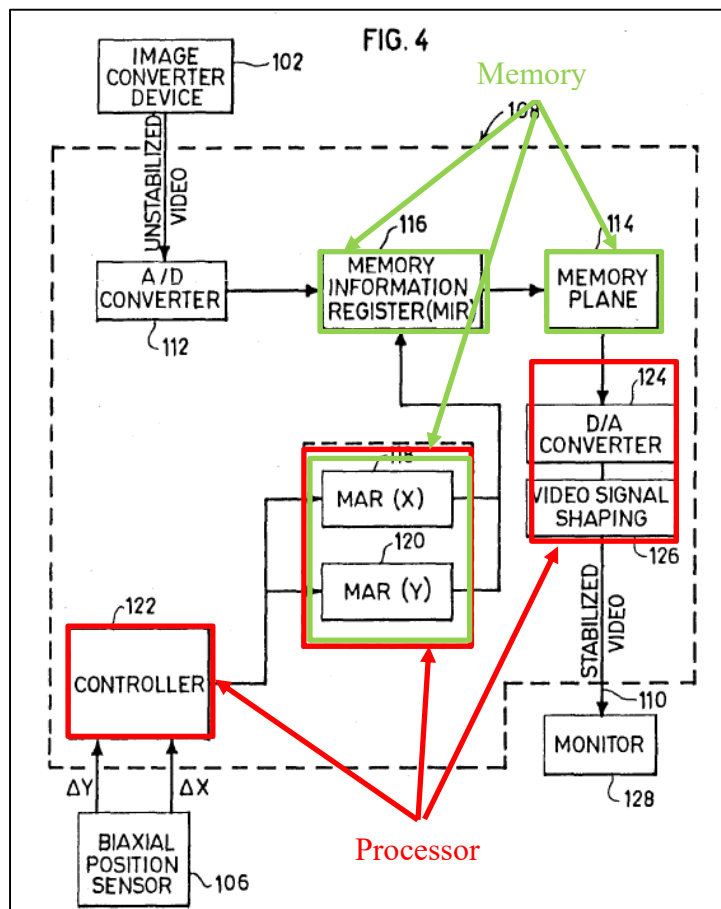
Gal’s “image converter system” (FIG. 3) is an “imaging device” because it includes “image converter device 102” and computer 108 that “generates a stabilized video output.” SAMSUNG-1004, 3:16-40, 4:27-45, 5:11-20; SAMSUNG-1003, ¶¶272-74, 387, 409, 416. As discussed in Ground 1 (§III.A.3.(a), *supra*), this aligns with the ’450 Patent. SAMSUNG-1001, 11:66-12:14, 3:54-56.



SAMSUNG-1004, FIG. 3 (annotated).

Image converter device 102 is an area image sensor, such as a CCD (“image sensor”). SAMSUNG-1004, 4:40-49, 3:16-40; 5:11-21, claims 1, 8; SAMSUNG-1003, ¶275.

The “control circuit” in Gal’s computer includes controller 122, MAR-X and MAR-Y registers, D/A converter 124, and video signal shaping 126, which collectively map to the claimed “processor.” SAMSUNG-1004, Abstract, 1:37-42, 2:30-41, 4:40-5:8, claims 1-2, 7-8, 17; SAMSUNG-1003, ¶276.



SAMSUNG-1004, FIG. 4 (annotated).

MAR-X and MAR-Y, memory instruction register 116⁸, and memory plane 114 in computer 108 constitute “memory.” *Id.*, 2:23-41, 4:50-66, 5:22-23, claims 7-8, 17; SAMSUNG-1003, ¶277.

“Biaxial position sensor”⁹ constitutes “one or more motion sensors.” SAMSUNG-1004, Abstract, 3:41-45, 5:34-37; 1:24-50, 2:65-3:8, 4:27-34, claims 9-10; SAMSUNG-1003, ¶278.

Gal disclose/s a “method for use” in its “imaging device” that compensates for the image sensor’s position changes during image capture to stabilize the sensor’s output. SAMSUNG-1004, Abstract, 1:6-63, 2:65-5:8, claims 7-8, FIGs. 3-4; SAMSUNG-1003, ¶279; [1.1]-[1.6] *infra*.

If Patent Owner argues that the “imaging device” must be a single device that includes the image sensor, the motion sensors, the memory, and the processor, Gal does not explicitly disclose that the image converter system (FIGs. 3-4) is implemented as a single device. However, implementing Gal’s system in a single device would have been obvious in view of Akifumi. SAMSUNG-1003, ¶280.

As described in [1.P] in Ground 1(A), Akifumi’s camera includes an image sensor, a motion sensor, a processor, and a memory. SAMSUNG-1007, [0002],

⁸ Gal also refers to this component as memory information register 116 in FIG. 4.

⁹ Gal also refers to this sensor as a change-in-position or two-axes position sensor.

[00025], [0028]-[0034], [0041]-[0044], [0065], [0069], FIGs. 1, 3, 5, 6-10, 15, 17-21; SAMSUNG-1003, ¶¶281-82. Because Akifumi's camera includes these components, camera shake/motion detection, motion/position-change compensation in captured images, and image storage, occurs within Akifumi's camera. *Id.*; SAMSUNG-1003, ¶283.

Based on Akifumi's disclosure, it would have been obvious to modify Gal's image converter system to include its "image sensor," "motion sensor," "processor" and "memory" in a single device. SAMSUNG-1003, ¶¶284-86. As in Akifumi, this modification would have enabled processing relating to position compensation and image storage to occur within a single device. *Id.*

A POSITA would have been motivated to combine Gal and Akifumi for multiple reasons. **First**, both references relate to video processing and correct/compensate for camera motion/shake. SAMSUNG-1003, ¶288; SAMSUNG-1007, [0025], [0034], [0041]-[0043], [0065]-[0069], FIGs. 6-9, 15-21; SAMSUNG-1004, 2:64-3:41, 4:30-5:8, FIGs. 3 and 4. **Second**, this combination would have resulted in an enhanced camera/imaging device with improved processing capabilities of directly capturing and recording videos with reduced (or without) device motion/shake, thus obviating/minimizing off-camera video processing for shake/motion removal/reduction. SAMSUNG-1003, ¶289. This would have improved the quality of the video recorded (e.g., more stable videos) by the camera/imaging device. *Id.* **Third**, this

modification would have been a simple design choice from a finite number of identified/predictable solutions (e.g., performing all motion-related image processing on the camera vs. performing all or part of such processing off-camera), with a reasonable expectation of success. SAMSUNG-1003, ¶¶284-86.

(b) Elements [1.1], [14.1], [28.1], [29.1]

Image converter device 102 (“image sensor”) captures a “light image” and converts it into “electrical signals” used for “reproducing the image.” SAMSUNG-1004, 1:6-63, 4:50-67, 2:22-41, claims 1, 11, FIG. 3; SAMSUNG-1003, ¶¶291, 388, 410, 417.

Gal’s “image sensor” captures a sequence of images comprising a video. FIG. 3 shows image converter device 102 outputting “unstabilized video.” *Id.* Because Gal’s image sensor captures images and outputs an unstabilized video, Gal’s image sensor captures a sequence of images that comprise video. *Id.*; *see* SAMSUNG-1003, ¶¶292.

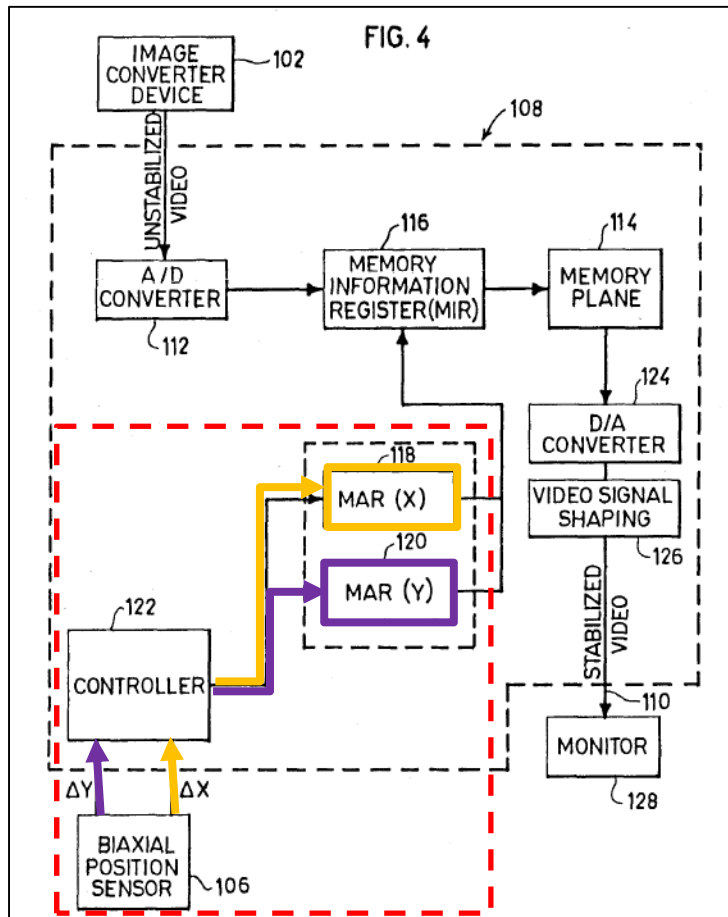
Gal’s “image sensor” provides the captured images for storage in MIR 116 (“memory”) via A/D converter 112. SAMSUNG-1004, 4:40-43 (“[C]omputer 108 includes an analog-to-digital converter 112 converting the *analog information from the light sensing elements of the image converter device 102 to digital form.*”), claim 17 (“*a Memory-Instruction-Register (MIR) temporarily storing the output from said analog-to-digital converter*”), 2:22-41, 3:15-40, 4:11-26, 4:54-57, claims

1, 11, FIG. 4; SAMSUNG-1003, ¶293.

(c) **Elements [1.2], [14.2], [28.2], [29.2]**

For images captured by Gal's "image sensor," biaxial position sensor ("motion sensor"), which is coupled to the image sensor, detects "electrical outputs (ΔX , ΔY) corresponding to the changes in position in the horizontal and vertical directions" of the image sensor ("motion information"). SAMSUNG-1004, 4:27-39 ("This embodiment ... includes an image converter device 102 mounted on a moving body 104 and coupled to *a bi-axial position sensor 106 producing output signals corresponding to the changes in position of device 102 in both the horizontal and vertical directions.*"), 3:41-45, 1:43-50 ("[T]wo-axes position sensor 6 ... produces the *ΔX and ΔY output signals representing the changes in position ... of the image converter device 2.*"), claims 1, 11, Abstract; SAMSUNG-1003, ¶¶295, 389, 410, 417.

This motion information represents motion of the image sensor during image capture. *Id.*, Abstract, 1:24-42, 2:65-3:50, 4:27-67; SAMSUNG-1003, ¶¶296-97. As shown, the biaxial position sensor provides this "motion information" for storage in MAR-X and MAR-Y ("memory"), via controller 122. SAMSUNG-1004, claim 7-8, 17, 4:11-66; SAMSUNG-1003, ¶¶296-97, 389, 411, 418.



SAMSUNG-1005, FIG. 4 (annotated).

If Patent Owner argues that values in MAR-X and MAR-Y (“memory”) are not the same as the actual change-in-position signals (motion information) detected by the biaxial position sensor, those stored values still represent the motion information captured by this sensor. SAMSUNG-1004, 4:27-67, 3:41-45, 1:43-50, 2:22-41, claims 1, 7-8, 11, 17; SAMSUNG-1003, ¶¶298-99. It would have been obvious to modify Gal to store the actual motion information values/signals detected by the biaxial position sensor in MAR-X and MAR-Y (or another memory within computer 108). *Id.* The values in MAR-X and MAR-Y are derived by controller 122 using

the actual position signals and thus, these values are representations of the change in position signals detected by the biaxial position sensor. SAMSUNG-1004, 4:50-66, 2:22-41; FIG. 4; SAMSUNG-1003, ¶¶298-99.

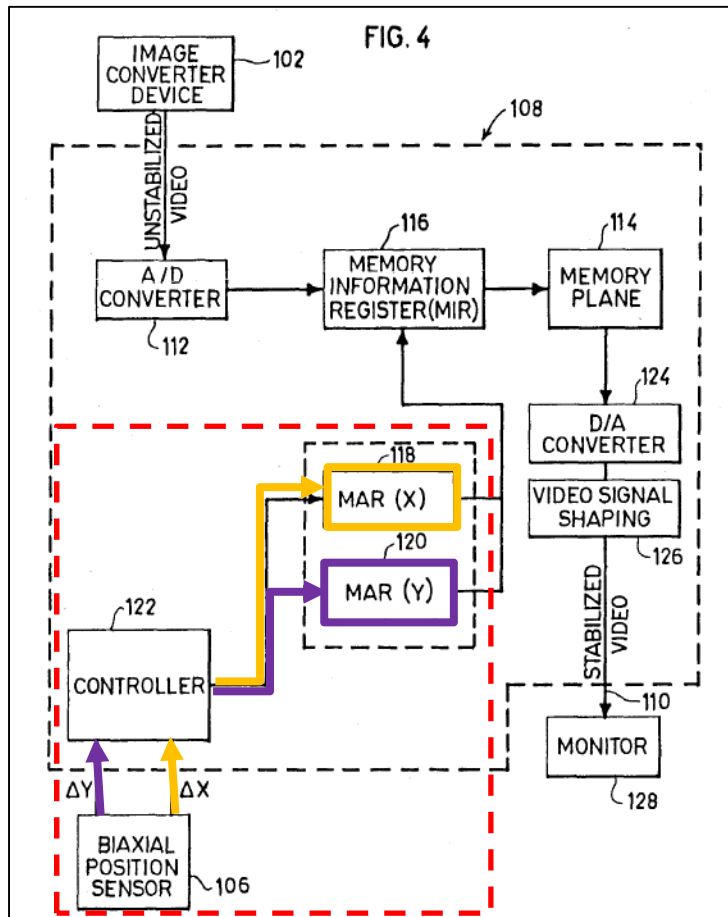
A POSITA would have modified Gal's system to substitute/add to the data stored in MAR-X and MAR-Y registers with the actual position change data (i.e., motion information) detected by the biaxial position sensor (assuming *arguendo* these values are different). SAMSUNG-1003, ¶300.

A POSITA would have been motivated to make such modification(s) to preserve the actual positional change data at a high resolution, which could enhance the precision of Gal's position compensation and, with more data available, aid in assessing image correction problems. SAMSUNG-1003, ¶301. Moreover, such modification(s) would have been a design choice (e.g., storing the actual positional-change data, the data that is representative of the actual positional-change position data, or both) readily available to a system designer. SAMSUNG-1003, ¶302. Additionally, such modification(s) would not hamper Gal's operation because Gal already generates the representation of the positional-change data from the actual positional-change data, which would be used to generate the position-compensated image (as described at [1.4]). SAMSUNG-1003, ¶304; SAMSUNG-1004, 1:25-42, 2:22-41, 4:40-66, claim 1, 7-8, 17, Abstract.

Gal's motion information is stored synchronously with the storing of the captured images. MAR-X and MAR-Y "control the input of the information stream from MIR 116" (storing the captured image) "into the proper places in the memory plane 114" so as "to compensate for the positional displacements sensed by [biaxial] sensor 106." SAMSUNG-1004, 4:50-66, 1:25-42, 2:22-41, claims 1, 11, 17. A POSITA would have understood and found obvious that such position/motion compensation for an image is achieved when that image is stored in memory synchronously with the image's corresponding motion information. SAMSUNG-1003, ¶304.

(d) **Elements [1.3], [14.3], [28.3], [29.3]**

For the captured image, controller 122 ("processor") receives the ΔX and ΔY change in position signals "in the horizontal and vertical axes, respectively" ("motion information") for the image (*see* §IV.A.2.(c), *supra*) and uses this motion information to preset the MAR-X and MAR-Y registers. SAMSUNG-1004, 4:50-66 (MAR-X and MAR-Y "are preset ... by the outputs of the position sensor 106 via controller 122 ... to control the input of the information stream from MIR 116 into the proper places in the memory plane 114"), claim 7-8, 17, 1:25-53, 2:21-42, FIG. 4 (below annotated); SAMSUNG-1003, ¶¶306-08, 390, 412, 419.



Thus, controller 122 (“processor”) determines the values stored in MAR-X and MAR-Y based on ΔX and ΔY values (horizontal and vertical position changes, respectively) detected by Gal’s sensor. *Id.*; SAMSUNG-1003, ¶¶309-10. Moreover, as described at [1.4] (§IV.A.2.(e)), MAR-X and MAR-Y (“processor”) use the values in these registers to compensate for the horizontal and vertical shifts in the image. SAMSUNG-1004, 1:37-42, 2:22-41, 4:50-66, claim 7-8, 17, Abstract; SAMSUNG-1003, ¶¶309-14. Thus, Gal’s processor determines horizontal and vertical shift values. *Id.*

(e) Elements [1.4], [14.4], [28.4], [29.4]

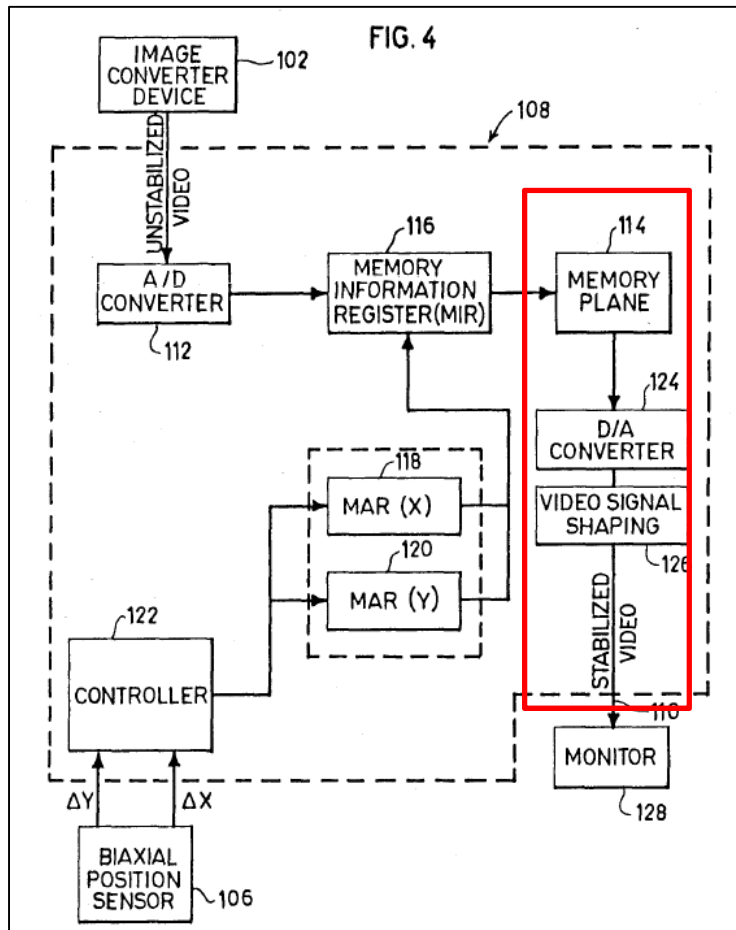
MAR-X and MAR-Y (“processor”) modify the captured image (stored in MIR 116) based on the horizontal and vertical shift values (§IV.A.2.(d)) stored in these registers to shift/compensate for positional displacements during image capture. SAMSUNG-1004, claim 17 (“*said MIR being controlled by said MAR-X and MAR-Y to read into the memory plane the digital electrical signals ... in the shifted positions of the memory plane*”), 4:40-66 (MAR-X and MAR-Y “*control the input of the information stream from MIR 116 ... to compensate for the positional displacements sensed by sensor 106*”), Abstract, 2:22-41, claims 1, 7-8, 11; SAMSUNG-1003, ¶¶305-14, 391, 413, 420. The resulting, modified image is stored in the memory plane portion of Gal’s memory. *Id.*

(f) Elements [1.5], [14.5], [28.5], [29.5]¹⁰

¹⁰ In litigation, Petitioner asserts that the phrase “a processor configured to ... combine the modified images to obtain a final video” in claim 14 (element [14.5]) and the phrase “a processor configured to ... combine the modified images, and apply a video compression technique to obtain a final video” in claim 29 (element [29.5]), are indefinite. SAMSUNG-1024, 38-40. Because indefiniteness is ineligible for

D/A converter 124 and video shaping signal 126 (“processor”) combine the modified images to obtain a final video. SAMSUNG-1004, 2:35-41, 4:67-5:8, claim 11, FIG. 4; SAMSUNG-1003, ¶¶315-19, 414, 421. Specifically, modified images (see [1.4]—§IV.A.2.(e)) are “read out” from “memory plane 114 into digital-to-analog converter 124 which converts the information back to analog form,” “shaped by video-signal shaping circuit 126,” and outputted via output 110 as “*position-stabilized video information*” (*final video*). SAMSUNG-1004, 4:67-5:8, FIGs. 3-4; SAMSUNG-1003, ¶¶315-18, 392.

consideration in IPR, Samsung has applied prior art against Patent Owner’s interpretation as reflected in its District Court infringement contentions for purposes of this proceeding. *Id.*



SAMSUNG-1004, FIG. 4 (annotated). This video is displayed on monitor 128.

SAMSUNG-1004, 5:4-8, FIG. 4. For this video to be displayed on the monitor, a POSITA would have understood that the modified images are combined/grouped (physically or logically) in the sequence in which the video is played. *Id.*; SAMSUNG-1003, ¶¶318-19.

Although Gal does not disclose “applying a video compression technique to obtain a final video” ([28.5]/[29.5]), Gal and Akifumi render this limitation obvious

through Akifumi's disclosure of video compression (*see* [11]--§IV.A.2.(q)). SAMSUNG-1004, 5:4-8; SAMSUNG-1007, [0028]-[0029], [0005], [0046], FIGs. 1, 6, 10; SAMSUNG-1003, ¶¶367-76.

(g) Elements [1.6], [14.6], [28.6], [29.6]

As described at [1.5] (§IV.A.2.(f)), each modified image of the stabilized video is stored in memory plane 114 ("memory"). SAMSUNG-1004, 2:35-41, claim 11, 4:60-5:6, FIG. 4; SAMSUNG-1003, ¶¶321, 393, 415, 422. A POSITA would have understood that the process of compensation for position displacements is repeated for each image in the video and each position-compensated frame of the final video is stored in memory plane 114. *Id.*

If Patent Owner argues that this limitation requires simultaneous storage of all modified images of the final video in memory, this would have been obvious over Gal and Akifumi. SAMSUNG-1003, ¶¶322, 393, 415, 422. Gal's position-stabilized video information 110 ("final video"), which may be compressed (as described based on Gal and Akifumi in [1.5]) "may be stored." SAMSUNG-1004, 5:4-8, SAMSUNG-1003, ¶¶367-76. Although Gal doesn't disclose storing the final video is Gal's "memory," this would have been obvious in view of Akifumi. SAMSUNG-1003, ¶322.

Specifically, Akifumi stores final motion/shake compensated video in data recording portion 16 (memory) of its camera. SAMSUNG-1007, [0028]-[0029],

[0059], FIGs. 1, 10; SAMSUNG-1003, ¶323. Because Gal's final video "may be stored," it would have been obvious, in view of Akifumi, to store this video in memory, e.g., by modifying existing "memory" (e.g., memory plane 114) or by adding memory (built-in memory, memory card, as in Akifumi). SAMSUNG-1003, ¶¶324, 328; SAMSUNG-1004, 5:4-9.

A POSITA would have been motivated to combine Gal and Akifumi for reasons described at element [1.P] (§IV.A.2(a)) and because the combination would have enabled storage and playback of videos, thus improving overall operation of Gal's (or Gal-Akifumi's) imaging device and increasing the accessibility of recorded videos. SAMSUNG-1003, ¶¶287-89, 325-28; SAMSUNG-1007, [0029], [0059].

Alternatively, it would have been obvious to a POSITA to simultaneously store images of the final video in Gal's memory in view of the knowledge of a POSITA. It was well known as of the Critical Date to store videos in memory to enable their playback (including the ability to rewind/fast-forward videos and/or playback videos one or more times). SAMSUNG-1003, ¶327. Thus, adding an extra memory device to Gal's (or the Gal-Akifumi) imaging device or modifying an existing memory of this device to store data, such as the final video, was a straightforward technique as of the Critical Date and would have been an obvious way to implement Gal's disclosure that the stabilized video may be stored. *Id.*, ¶¶327-28; SAMSUNG-1004, 5:4-8. Accordingly, it would have been obvious to a POSITA to

store Gal's final video either by modifying the existing "memory" or by adding an extra memory component to the imaging device. *Id.*

(h) Claims 2, 15

As described at [1.2] and [1.3] (§§IV.A.2.(c)-(d)), for image frames for which motion information is detected, Gal's "processor" determines horizontal and vertical shift values. SAMSUNG-1004, 4:11-39, Abstract, 1:24-53, 2:21-3:13, 3:41-50, 4:50-66, claim 1, 7-8, 17, FIGs. 3-4; SAMSUNG-1003, ¶¶290-304, 329-30, 394.

(i) Claims 3, 16

As described at [1.4] (§IV.A.2.(e)), Gal's "processor" modifies an image in the unstabilized video ("for one or more images") for which vertical and horizontal shift values were determined. SAMSUNG-1004, 2:22-41, 4:40-66, claims 1, 7-8, 11, 17, Abstract; SAMSUNG-1003, ¶¶311-14, 331-32, 395.

(j) Claims 4, 17¹¹

¹¹ In litigation, Petitioner asserts that the phrase "effect of motion ... reduced in the final video" renders these claims indefinite. SAMSUNG-1024, 36-37. Because indefiniteness is ineligible for consideration in IPR, Samsung has applied prior art against Patent Owner's interpretation as reflected in its District Court infringement contentions for purposes of this proceeding. *Id.*

As described at [1.4] and [3] (§IV.A.2.(e), IV.A.2.(i)), Gal's "processor" modifies an image in the video/sequence of images. SAMSUNG-1004, 2:22-41, 4:40-66, claims 1, 7-8, 11, 17, Abstract; SAMSUNG-1003, ¶¶311-14, 331-34.

Such modification "reduce[s] the effect of motion of the device during capturing of the one or more images ... in the final video" because this modification "compensates for the position changes" in the image sensor during image capture, thereby resulting in a "position-stabilized video." SAMSUNG-1004, Abstract, 4:27-5:6, Abstract, 1:24-43, FIGs. 3-4; SAMSUNG-1003, ¶¶335, 396.

(k) Claims 5, 18

As described at [1.3] (§IV.A.2.(d)), Gal's "processor" determines horizontal and vertical shift values for captured images in the video/sequence of images. SAMSUNG-1004, 4:40-66, 7-8, 17, 1:25-53, 2:21-42, FIG. 4; SAMSUNG-1003, ¶¶305-10, 338.

As described at [1.3]-[1.5] (§IV.A.2.(d)-(f)), Gal generates a "position-stabilized video output" by determining vertical and horizontal shift values for captured images that are used in compensating for the image sensor's positional displacement/motion. SAMSUNG-1004, 4:11-39, Abstract, 1:24-53, 2:21-42, 2:65-3:13, 3:41-50, 4:50-66, claim 1, 11, 7-8, 17, FIGs. 3-4; SAMSUNG-1003, ¶¶305-19, 339. From this disclosure, a POSITA would have understood that the image sensor's po-

sitional shifts are compensated in each image captured and processed by Gal's control circuit ("processor"). *Id.*; SAMSUNG-1003, ¶¶340, 397. Thus, Gal's processor determines vertical and horizontal shift values for each image of the video/sequence of images. *Id.*

(l) **Claims 6, 19**

As described at [1.2] (§IV.A.2.(c)), Gal's "motion information" detected by the "one or more motion sensors" represents motion of the device at the time of/during capture of one or more images of the sequence of images. SAMSUNG-1004, 4:27-66, Abstract, 1:24-50, 2:22-41, 2:65-3:8, 3:41-50, claims 1, 7-8, 11, 17, FIGs. 3-4; SAMSUNG-1003, ¶¶341-42, 398.

(m) **Claims 7, 20, 30**

As described at [1.1] (§IV.A.2.(b)), Gal's image sensor captures a *sequence* of images, which includes at least two images. SAMSUNG-1004, 1:6-63, 4:40-67, 2:22-41, 4:40-67, claims 1, 11, 17, FIG. 3; SAMSUNG-1003, ¶¶290-93, 344, 399, 423.

As described at element [1.2] (§IV.A.2.(c)), Gal's position sensor detects motion/position change(s) in the image sensor during image capture. SAMSUNG-1004, 4:27-66, Abstract, 1:24-50, 2:22-41, 2:65-3:8, 3:41-50, claims 1, 7-8, 11, 17, FIGs. 3-4; SAMSUNG-1003, ¶¶294-304, 345.

When viewing this limitation in the context of the '450 Patent, Gal's "motion

information” represents “motion of the device between capturing of consecutive images.”

The '450 Patent does not explicitly disclose that the motion sensors detect motion information “represent[ing] motion of the device between capturing of consecutive images.” Rather, the '450 Patent discloses detecting motion “while the image is being captured.” *See* SAMSUNG-1001, 6:26-31. Thus, a POSITA would have understood that, in the '450 Patent, device motion detected while capturing a particular image/sequence of images includes the device’s motion between the capturing of the preceding image and the particular image. *Id.*; SAMSUNG-1003, ¶347.

In the context of the '450 Patent, a POSITA would have understood that, when Gal’s biaxial position sensor detects motion information during image capture (as described above), that motion information includes device motion between the capture of the particular image and the preceding image in the video/sequence of images. SAMSUNG-1004, 4:27-66, Abstract, 1:24-50, 2:22-41, 2:65-3:8, 3:41-50, claims 1, 7-8, 11, 17, FIGs. 3-4; SAMSUNG-1003, ¶348, 399, 423.

(n) Claims 8, 21

As described at [1.3] (§IV.A.2.(d)), Gal’s “processor” determines vertical and horizontal shift values (stored in MAR-Y and MAR-X). SAMSUNG-1004, 4:40-66, 7-8, 17, 1:25-53, 2:21-42, FIG. 4; SAMSUNG-1003, ¶¶305-10, 350.

Gal’s horizontal and vertical shift values indicate how much the image has

shifted/displaced due to the motion/changes in position of Gal's image sensor during image capture. SAMSUNG-1004, Abstract, 1:24-43, 2:21-42, 3:3-7, 4:27-66, claim 17, FIGs. 3-4; SAMSUNG-1003, ¶¶351, 400.

(o) **Claims 9, 22**¹²

Gal's "processor" modifies one or more images in the video/sequence of images based on the horizontal and vertical shift values, to compensate for/reduce the effect of device/image sensor motion during image capture (as described at [1.4] and [4] (§IV.A.2.(e), (j))). SAMSUNG-1004, 2:22-41, 4:40-66, claims 1, 7-8, 11, 17, Abstract; SAMSUNG-1003, ¶¶352-53, 401.

Gal discloses "shifting a reference point in each image according to the vertical shift value and the horizontal shift value for the image" within the context of the '450 Patent. As described in Ground 1 (§III.A.3.(o)), a POSITA would have understood that this limitation includes shifting one or more pixels of the image in horizontal and vertical directions that are opposite to the imaging device's horizontal

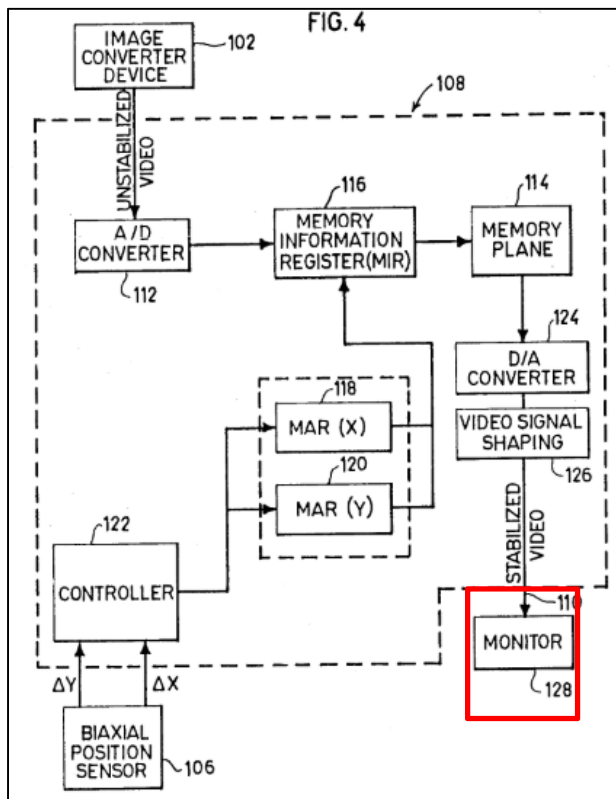
¹² In litigation, Petitioner asserts that the phrase "reduces the effect of motion of the device in the final video" renders claim 9 indefinite. SAMSUNG-1024, 37-38. Because indefiniteness is ineligible for consideration in IPR, Samsung has applied prior art against Patent Owner's interpretation as reflected in its District Court infringement contentions for purposes of this proceeding. *Id.*

and vertical movements/shifts. SAMSUNG-1001, 6:31-7:49, 9:49-11:6, FIGs. 10-11; SAMSUNG-1003, ¶¶146-51.

In view of the '450 Patent, Gal discloses this limitation. Specifically, when an image is captured by Gal's image sensor, electrical signals from the matrix of light sensing elements (pixels) in the image sensor are obtained and then digitized using an analog-to-digital converter. SAMSUNG-1004, 2:27-41, 4:29-31, 3:16-40; SAMSUNG-1003, ¶¶354-59, 401. Then, a set of pixels in the digital image is shifted based on the device movement/shift (as specified/represented by the MAR-X and MAR-Y values), to generate a new position-shifted image output in the memory plane (which includes a matrix of memory elements corresponding to the matrix of light sensing elements in the image sensor). *Id.*, 1:23-42, 2:23-41, 4:40-66, claims 1, 7-8, 11, 17; SAMSUNG-1003, ¶¶354-59, 401. A POSITA would have understood that Gal's processor shifts a set of pixels of the image in a direction opposite to the device's horizontal and vertical movements/shifts represented/indicated by values in MAR-X and MAR-Y (horizontal and vertical shift values). *Id.*

(p) **Claims 10, 23**

Gal's image converter system includes monitor 128.



SAMSUNG-1004, FIG. 4 (annotated).

Gal's monitor includes a "display"/"user interface" that displays the final video. For example, in Gal, information is "read out of memory plane 114 into a digital-to-analog converter 124 which converts the information back to analog form," which is "then shaped by a video-signal shaping circuit 126 and **outputted via output 110 in the form of position-stabilized video** information" and "transmitted to a monitor 128 for **reproducing**" (i.e., displaying) the video. SAMSUNG-1004, 4:67-5:6, 2:22-41, 1:23-42; SAMSUNG-1003, ¶¶361-62, 402.

If Patent Owner argues Gal's (or Gal-Akifumi's) "imaging device" must include the interface/display in the same device that includes the image and motion

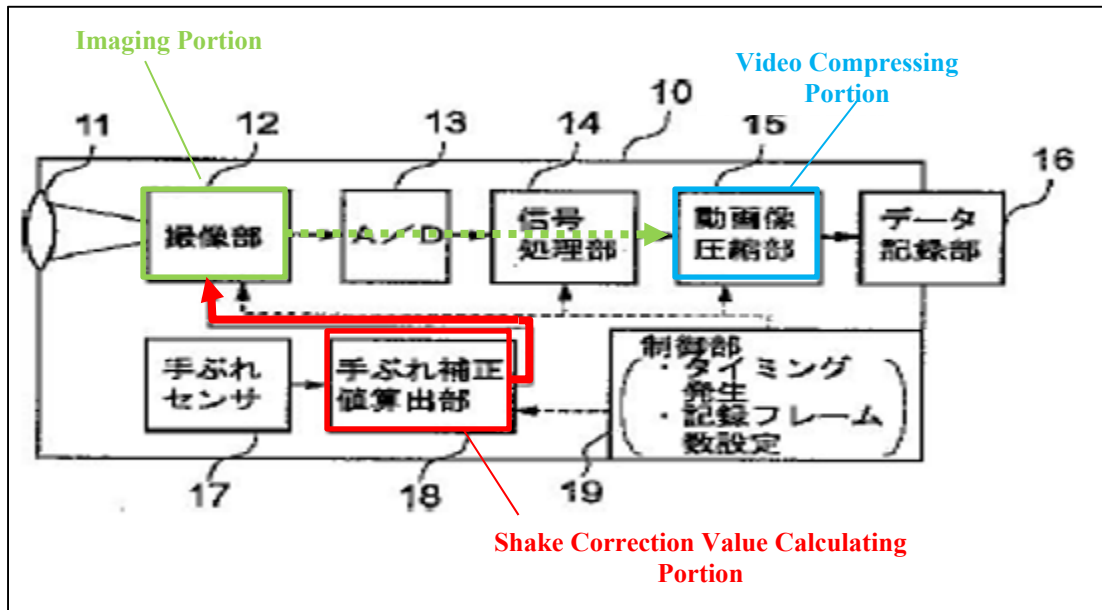
sensors, memory, and processor, Gal does not explicitly disclose monitor 128 is included in the same device. However, implementing a monitor/display within the same imaging device would have been obvious in view of Akifumi, which discloses a video camera (“imaging device”) that includes “monitoring portion 22” for displaying videos recorded by the camera. SAMSUNG-1007, [0059], FIG. 11; SAMSUNG-1003, ¶¶363-65, 402. Based on Akifumi, a POSITA would have included a display in the resulting imaging device. *Id.* A POSITA would have been motivated to make this combination for reasons described in claim 1, and because adding a display to the device results in an enhanced imaging device that enables viewing/replaying videos recorded by the imaging device (in real-time and without needing to connect to a separate monitor/computer). SAMSUNG-1003, ¶¶287-89, 323-28, 366; SAMSUNG-1007, [0059].

(q) Claims 11, 24

Although Gal’s “final video” is stored, Gal does not explicitly disclose applying a video compression technique before storing this video. SAMSUNG-1004, 5:4-8; SAMSUNG-1003, ¶¶368-69. However, this would have been obvious in view of Akifumi.

After shaking correction is performed on the captured image, Akifumi’s corrected image is sent to “video compressing portion 15” for compression using MPEG or another “video compressing technique.” SAMSUNG-1007, [0028]-[0029];

[0005], [0046], [0059], Figs. 1, 6, 10; SAMSUNG-1003, ¶¶370-71.



SAMSUNG-1007, FIG. 1 (annotated).

A POSITA would have implemented Akifumi's video compression, in Gal's (or Gal-Akifumi's) imaging device to enable storing a compressed version of the final video in Gal's memory. SAMSUNG-1003, ¶372. Since Gal already stores the final video, a POSITA would have sought to reduce the size of the video to be stored in memory using well-known video compression techniques (as in Akifumi). *Id.* The combination would have required applying known video compression techniques to Gal's (or Gal-Akifumi's) imaging device, which would have yielded the predictable result of generating a compressed final video. SAMSUNG-1003, ¶¶373, 403. And, as described at [1.P], it would have been obvious for video compression

to be performed on the same device (if Patent Owner argues that the “imaging device” must be a single device). SAMSUNG-1003, ¶¶280-89, 403; SAMSUNG-1007, [0028]-[0029], FIG. 1, 10.

A POSITA would have been motivated to combine Gal with Akifumi for reasons described in claims 1 and 10 (Ground 2(A)) and because this combination would have resulted in an improved imaging device that enables storage of the final video data more efficiently in Gal’s (or Gal-Akifumi’s) memory (e.g., due to the reduction in video size from the compression), which in turn would have enabled storage of more videos recorded by Gal’s (or Gal-Akifumi’s) imaging device. SAMSUNG-1003, ¶¶87-89, 323-28, 366, 374.

(r) **Claims 12, 25, 31**¹³

Gal and Akifumi rendered this limitation obvious because Akifumi discloses

¹³ In litigation, Petitioner asserts that the phrase “processor is configured to determine a vertical shift value and a horizontal shift value for one or more images of the sequence of images based at least in part on the focal distance of a lens of the imaging device” renders claims 25 and 31 indefinite. SAMSUNG-1024, 40-41. Because indefiniteness is ineligible for consideration in IPR, Samsung has applied prior art against Patent Owner’s interpretation as reflected in its District Court infringement contentions for purposes of this proceeding. *Id.*

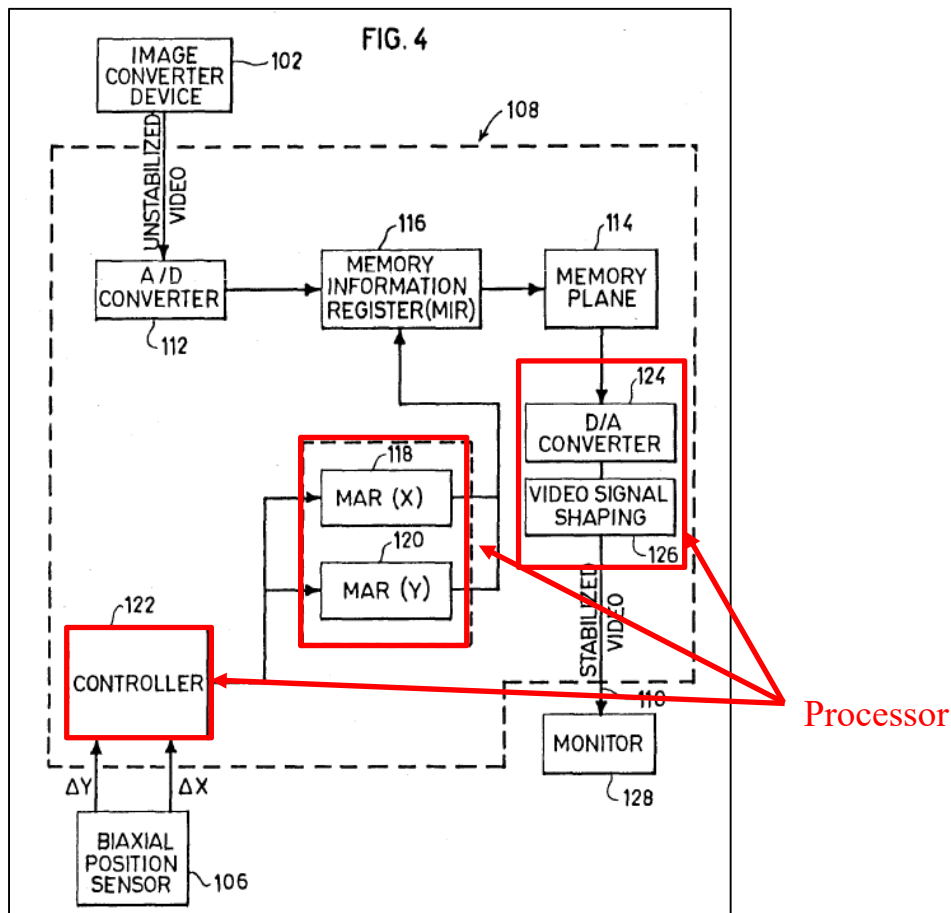
it (as described at claim 12 in Ground 1(A)). SAMSUNG-1007, [0072]-[0074], [0025], [0069], [0065], FIGs. 1, 6-10, 15, 17-21; SAMSUNG-1003, ¶¶178-83, 378-80, 404, 424.

A POSITA would have modified Gal's system to determine horizontal and vertical shift values based on camera movements as well as lens focal distance, as in Akifumi. SAMSUNG-1003, ¶381. This modification would have involved applying a known technique (using focal distance in determining shift values) that would have yielded predictable results (determining image shift due to device motion based on focal distance). *Id.*

A POSITA would have been motivated to combine Gal and Akifumi for reasons described at claims 1 and 10-11 (Ground 2(A)) and because this combination would have improved the accuracy of the computation of horizontal and vertical shift values, which in turn would have refined the motion correction/compensation and resulted in a more stable final video. SAMSUNG-1007, [0025]; SAMSUNG-1003, ¶¶87-89, 323-28, 366, 374, 383-86.

(s) **Claim 27**

Gal's control circuit ("processor") includes controller 122, MAR-X and MAR-Y registers, D/A converter 124, and video signal shaping circuit 126, each of which is implemented using a separate processor. SAMSUNG-1003, ¶¶210-12, 305-10, 405-08; *see* §IV.A.2.(a), (d), *infra*.



SAMSUNG-1004, FIG. 4 (annotated), claim 1, 7-8, 11, 17, 4:40-5:7, 1:23-42, 2:21-42; SAMSUNG-1003, ¶¶405-407.

Alternatively, Gal would have rendered this limitation obvious in view of the knowledge of a POSITA. ¶408. It was well known as of the Critical Date that image/video processing is computationally intensive and that adding multiple processors to an image/video processing system enables it to efficiently perform such computationally-intensive tasks. *Id.* Accordingly, it would have been obvious to a POSITA to implement Gal's "processor" components (described above) using multiple (i.e., two or more) processors. *Id.*

B. 2(B) – Gal (or Gal and Akifumi) and Creative Camcorder Render Obvious Claims 13, 26, and 32¹⁴

Although Gal/Akifumi do not disclose the substantively same limitation in these claims, it would have been obvious over Gal (or Gal and Akifumi) and Creative Camcorder. As described in Ground 1(B), Creative Camcorder discloses this limitation. SAMSUNG-1008, 8-9; SAMSUNG-1003, ¶¶230-41, 426, 433-34.

A POSITA would have combined Gal (or Gal-Akifumi) and Creative Camcorder. Specifically, a POSITA would have included ES2000's display/user interface (viewfinder), touch controls, and auto-focus/exposure functionality within Gal's (or Gal-Akifumi's) imaging device. SAMSUNG-1003, ¶427, 433-34. These features was well known as of the Critical Date and thus, the combination applies known techniques/features (viewfinder, touch controls, and autofocus/exposure functionality) to Gal's (or Gal-Akifumi's) imaging device, which would have yielded predictable results (e.g., enabling users to modify focus/exposure settings

¹⁴ In litigation, Petitioner asserts that the phrase “a display configured to receive user input” renders claims 26 and 32 indefinite. SAMSUNG-1024, 35-36. Because indefiniteness is ineligible for consideration in IPR, Samsung has applied prior art against Patent Owner's interpretation as reflected in its District Court infringement contentions for purposes of this proceeding. *Id.*

and to turn on/off image stabilization (including Gal's stabilization)). *Id.*

A POSITA would have been motivated to combine Gal's (or Gal-Akifumi's) system with Creative Camcorder for multiple reasons. ***First***, these references relate to video processing and describe techniques for correcting/compensating for camera motion/shake during image capture. SAMSUNG-1008, 8; SAMSUNG-1003, ¶429. ***Second***, this combination would have enabled viewing the image/video to be captured on a viewfinder and providing the user with control over how image/video is recorded. SAMSUNG-1003, ¶430. Thus, an improved imaging device would be achieved that provides a convenient way to control (e.g., by specifying focus/exposure settings or controlling whether to use image stabilization) the quality of the recorded video. *Id.* ***Third***, this combination would have improved the focus and exposure settings of the captured video, which in turn improves the recorded video's quality. *Id.*, ¶431. ***Fourth***, enabling the user to turn on/off image stabilization allows control over power consumption (thus, management of battery usage) or capture unstabilized video if desired. *Id.*, ¶432.

C. 2(C) – Gal (or Gal and Akifumi) and Balmer Render Obvious Claim 27

If Patent Owner argues that Gal does not disclose/render obvious claim 27, it would have been obvious over Gal (or Gal and Akifumi) and Balmer. As described in Ground 1(C), Balmer discloses this limitation. SAMSUNG-1006, 3:36-42, 30:2-

14, 58:17-42, 60:49-52, 62:22-27; Figs. 1-2, 10, 53, 58; SAMSUNG-1003, ¶¶435-37, 250-56.

Based on Balmer, a POSITA would have known to implement Gal's (or Gal-Akifumi's) "processor" components using multiple processors. SAMSUNG-1003, ¶¶435. Use of multiple processors for the known purpose of processing data was well known and conventional as of the Critical Date. SAMSUNG-1003, ¶438.

A POSITA would have been motivated to make this combination for multiple reasons. **First**, Balmer, like Gal and Akifumi, analyzes/processes video data. SAMSUNG-1003, ¶440; SAMSUNG-1006, 3:36-42, 30:2-14, 58:17-42, 60:49-52, 62:22-27. **Second**, a POSITA would have looked to Balmer to implement such a multi-processor architecture in Gal's (or Gal-Akifumi's) system. SAMSUNG-1003, ¶441; SAMSUNG-1006, 2:30-37. **Third**, because using multiple processors would have resulted in a more powerful/robust imaging device, a POSITA would have been motivated to combine these references as a design choice for improved performance. SAMSUNG-1003, ¶442.

V. PTAB DISCRETION SHOULD NOT PRECLUDE INSTITUTION

Consistent with Congressional intent and goals of *NHK/Fintiv*, Samsung asks the Board alone to consider challenges raised in this Petition. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11, 6 (PTAB 2020). Thus, *Fintiv* favors institution.

Factor 1: Institution Will Enable Stay

Institution will enable the Board to resolve the issue of validity, and a finding of invalidity will relieve the Eastern District of Texas (“District Court”) of the need to continue with the companion litigation. Samsung will move to stay the District Court case, and the opportunity for such simplification increases the likelihood that the court will grant a stay in view of IPR institution. *Uniloc USA, Inc. v. Samsung Elecs. Am., Inc.*, Case No. 2:16-cv-642-JRG, 2-3 (E.D. Tex. 2017); *NFC Techs. LLC v. HTC Am., Inc.*, Case No. 13-CV-1058, 2015 WL 1069111 (E.D. Tex. 2015).

Factor 2: District Court Schedule

As in *NHK*, district court trial dates shift, even in normal times. *Mylan Pharma. Inc. v. Sanofi-Aventis Deutschland GMBH*, IPR2018-01680, Pap. 22, 17 (PTAB 2019). The District Court is one of the country’s busiest patent courts. Scheduling issues cannot be ruled out, as experts have professed that COVID-19 outbreaks are likely to arise and Texas is facing new outbreaks. SAMSUNG-1017, 1 (“Fauci says second wave of coronavirus is ‘inevitable’”); SAMSUNG-1018, 1 (“Texas puts reopening on hold in face of new Covid-19 outbreak”).

Also, due to the fast District Court schedule, time did not permit Petitioner to file a petition in time for the Final Written Decision (“FWD”) to be rendered before the scheduled trial date. Indeed, based on the 18-month IPR schedule, even if a petition had been filed within three days of service of the complaint (October 3,

2019), the FWD date *still* would have followed the currently-scheduled district court trial date (April 5, 2021). The FWD's issuance after the scheduled trial date, therefore, is due to Patent Owner's forum selection.

Factor 3: Samsung's Investment in IPR Outweighs Forced Investment in Litigation to Date

District court proceedings are still at an early phase. Neither party has filed claim construction briefs (and no claim construction orders have issued). SAMSUNG-1019, 5. The *Markman* hearing is not scheduled until September 29, and discovery is not scheduled to close until December 23. *Id.*, 4. Also, Patent Owner has asserted a large number of claims in District Court and has resisted Samsung's efforts to focus claims. Indeed, Patent Owner's infringement contentions alleged infringement of 163 claims across six patents. *See* SAMSUNG-1011. In February, Samsung proposed "an Order Focusing Patent Claims." SAMSUNG-1020, 1. Instead of responding, Patent Owner stalled, did not offer a counter-proposal until July, and proposed waiting until *after* claim construction (and Samsung's IPR bar date) to narrow the case. SAMSUNG-1021, 1, 7. By asserting a large number claims and then refusing to narrow the case until after Samsung's IPR bar date, Patent Owner's conduct has left the litigation more complex than necessary and disrupted Samsung's ability to file focused IPR challenges. And, yet, despite Patent

Owner's tactics, Samsung diligently worked to prepare nine Petitions and is filing them over two months prior to the bar date.

Samsung's substantial investment in these petitions should counterbalance—and outweigh—the resources invested in the co-pending litigation given the speed with which Samsung filed on 163 claims across six patents. It would be unjust to consider resources expended in District Court (equally by both parties), without considering Samsung resources expended to prepare nine petitions that would be irretrievably lost without consideration on the merits, in addition to the extensive expenses that may be foregone through institution of Samsung's petitions and that will otherwise certainly follow in co-pending litigation for which significant milestones exist.

Factor 4: The Petition Raises Unique Issues

Consistent with *Fintiv*, Samsung asks the Board to consider the unique challenges raised in the Petition. Samsung has eliminated any risk of duplicated effort by voluntarily stipulating to counsel for Patent Owner that, if the Board institutes the pending Petition, Samsung will not pursue district court invalidity challenges based on the pending Petition's asserted grounds. SAMSUNG-1022, 1. Also, the Petition addresses claims that will not be addressed in District Court. Although Patent Owner has not narrowed the asserted claims, its own proposal requires a limit of “no more than eight (8) asserted claims per patent” by trial. SAMSUNG-1021, 7. Thus, the

District Court will necessarily address less than half of the claims challenged in this Petition and less than 30% of the 163 claims presently asserted, even assuming the District Court addresses validity at all, which is presently unknowable.

In short, grounds in this Petition are unique, and will not be addressed in District Court.

Factor 5: The Petition Enables Invalidity of Claims that Might be Reasserted

Samsung's Petition is potentially helpful to future defendants. For at least this reason, Samsung's status as both Petitioner and defendant is, at worst, a neutral factor. Taking relevant circumstances into account, institution would serve overall efficiency and integrity, enabling the Board to determine invalidity of claims that Patent Owner might otherwise later assert against others.

Factor 6: Other Circumstances Support Institution

As *Fintiv* noted, "the factors ... are part of a balanced assessment of all the relevant circumstances in the case," and, "if the merits of a ground raised in the petition seem particularly strong ... the institution of a trial may serve the interest of overall system efficiency and integrity" *Fintiv*, 14-15. As explained in the Petition (and Dr. Farid's testimony), institution would result in invalidation of the Challenged Claims.

VI. FEES

Please charge any fees to Deposit Account No. 06-1050.

VII. CONCLUSION

Samsung requests cancellation of all Challenged Claims.

VIII. MANDATORY NOTICES UNDER 37 C.F.R § 42.8(a)(1)

A. Real Party-In-Interest

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. are the real parties-in-interest.

B. Related Matters

Samsung is unaware of any disclaimers or reexamination certificates for the '450 Patent. The '450 Patent is at issue in: *Clear Imaging Research, LLC v. Samsung Electronics Co. Ltd.*, Case No. 2:19-CV-326 (E.D.Tex. 2019).

C. Lead And Back-Up Counsel

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D. Service Information

Please address correspondence/service to the above-listed address. Samsung

consents to email service at IPR39843-0077IP1@fr.com (referencing No. 39843-0077IP1 and cc'ing PTABInbound@fr.com, axf-ptab@fr.com, monaldo@fr.com, and jhurani@fr.com).

Respectfully submitted,

Dated: July 31, 2020

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CERTIFICATION UNDER 37 CFR § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter partes* Review totals 13,975 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated: July 31, 2020

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on July 31, 2020, a complete and entire copy of this Petition for *Inter partes* Review and all supporting exhibits were provided via Federal Express, to the Patent Owner by serving the correspondence address of record as follows:

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