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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

YANBIN YU and ZHONGXUAN ZHANG,

Plaintiffs,

v.

APPLE INC., a California Corporation,

Defendant.

Case No. 3:18-cv-06181-JD

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

DEMAND FOR JURY TRIAL

Judge: Hon. James Donato
Trial Date: July 13, 2020

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

Plaintiffs Yanbin Yu ("Yu") and Zhongxuan Zhang ("Zhang") (collectively "Plaintiffs") hereby file this First Amended Complaint ("FAC") against Apple Inc. ("Apple" or "Defendant") seeking damages for Apple's direct and indirect willful infringement of U.S. Patent No. 6,611,289 (the "'289 Patent"), and allege as follows:

THE PARTIES

1. Yu is an individual and a resident of the State of California who resides in Fremont, California.

2. Zhang is an individual and a resident of the State of California who resides in San Diego, California.

3. Apple is a California corporation having its headquarters and principal place of business located at One Apple Park Way, Cupertino, California, 95014.

JURISDICTION AND VENUE

4. This Court has original subject matter jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a) because this action arises under the patent laws of the United States, 35 U.S.C. §§ 1 et seq.

5. This Court can exercise personal jurisdiction over Apple because Apple's headquarters and principal place of business are located in this District, and therefore Apple's affiliations with this District are so substantial as to render it essentially at home in this District. Additionally, this Court can exercise personal jurisdiction over Apple in this action because Apple has committed acts of infringement and/or inducement of infringement in this District, because Plaintiffs' claims arise out of and relate to Apple's acts of infringement and/or inducement of infringement in this District, and because the exercise of jurisdiction by this Court over Apple in this action would be reasonable. Accordingly, Apple has minimum contacts with this District such that the maintenance of this action within this District would not offend traditional notions of fair play and substantial justice.

6. Venue is proper in this Court pursuant to 28 U.S.C. §§ 1391(b) and (c) and/or 1400(b) because Apple resides in this District and because a substantial part of Apple's acts of infringement and/or inducement of infringement occurred in this District.

INTRADISTRICT ASSIGNMENT

7. This action involves Intellectual Property Rights and, therefore, is subject to assignment on a district-wide basis pursuant to Local Rule 3-2(c).

THE '289 PATENT

8. The '289 Patent, entitled "Digital Cameras Using Multiple Sensors With Multiple Lenses," was filed on January 15, 1999 and was issued to Yu and Zhang by the United States Patent and Trademark Office ("USPTO") on August 26, 2003. A copy of the '289 Patent is attached hereto as Exhibit A.

9. Plaintiffs are the sole owners of the '289 Patent.

10. The claims of the '289 Patent focus on an improvement to the functionality of digital cameras that is achieved by utilizing a new camera architecture that includes multiple lenses and multiple image sensors – arranged in a specific configuration, and of a specific type – to produce digital images having improved quality compared with prior digital cameras. While digital cameras having multiple lenses and multiple image sensors existed prior to the filing date of the '289 Patent, the conventional approach at that time was to use image sensors that are responsive to only a portion of the visible color spectrum, such as a red sensor, a green sensor, and a blue sensor. The '289 Patent, however, departed from the conventional approach by utilizing at least one image sensor that is "sensitive to a full region of visible color spectrum." This unconventional approach enabled the improved digital camera of the '289 patent to produce images having improved qualities, such as higher resolutions and greater dynamic ranges, compared with prior digital cameras, including those that included multiple lenses and multiple image sensors. Moreover, many prior multiple lens and multiple image sensor digital cameras utilized complex lens arrangements that included a prism for separating light into its component colors and then directing those components onto the respective image sensors. Not only did this approach greatly increase the complexity of the system, but it also introduced the possibility of

large registration errors between the images generated by the multiple image sensors. The '289 Patent, on the other hand, avoided the need for such a complex lens arrangement by making the image sensors "closely positioned with respect to a common plane." In other words, the unconventional approach of the '289 Patent provided a digital camera architecture that was less complex than prior designs, while at the same time achieving improved image quality.

11. The '289 Patent covers only the specific configurations and types of image sensors recited in the claims. It does not cover camera architectures that utilize only a single lens or a single image sensor, camera architectures that do not include either at least one image sensor that is "sensitive to a full region of visible color spectrum" (claims 1 and 6) or at least four sensors that are "monochromatic and identical in resolution" (claim 26), or camera architectures that rely on complex lens arrangements to direct color components to the respective image sensors instead of utilizing image sensors that are "closely positioned with respect to [or in] a common plane." And, the '289 Patent covers only the specific types of image processing recited in the claims, specifically "producing a resultant digital image from said first digital image enhanced with said second digital image" (claim 1), "producing a color image of said imaging target from said four digital images" (claim 6), or "producing a color image from said three scalar digital images processed in conjunction with said gray digital image" (claim 26). None of the '289 Patent claims cover image enhancement that utilizes multiple images taken from the same image sensor, even on cameras that include multiple lenses and multiple sensors. For example, many digital cameras – including those that include multiple lenses and multiple sensors – capture high dynamic range ("HDR") photographs by taking multiple pictures at different exposures in rapid succession using the same image sensor. While this approach to capturing HDR photographs involves enhancing a first digital image with a second digital image, it is not covered by the '289 Patent claims because the images are not captured by first and second image sensors. Nor do any of the '289 Patent claims cover combining, side-by-side, images captured from multiple image sensors to create a single panoramic image, since that form of image processing does not involve enhancing one digital image with a second digital image.

Thus, the breadth of the '289 Patent claims is limited to very specific camera architectures, and to very specific forms of image processing that are performed using those architectures.

12. The problems described in the '289 Patent specification as being solved by the claimed invention make clear that the focus of the claims is on improving the functionality of digital cameras, and not merely on using a digital camera as a conduit for performing image processing in the abstract. A first problem identified in the specification was that digital cameras that existed at the time had limited resolutions compared with film cameras:

> Nevertheless, there are many cases in which digital cameras simply could not be used due to the limited resolutions from today's digital cameras. Film-based photographs have immeasurably higher resolutions than digital cameras. The comparison magnitude may be somewhere millions of pixels versus tens thousands of pixels in the digital cameras.

('289 Patent at 1:40-45). The specification also explains that simply using image sensors having a larger number of pixels was not, at that time, a viable solution to the problem of low image resolution because the costs would be prohibitive:

> Although, it is theoretically possible to design a photosensitive chip with multimillion of pixels, the cost of such chip would be a forbidden number and may consequently drag the digital cameras out of the consumer market.

('289 Patent at 1:46-49). The specification further explains that:

> To have color images with higher resolutions, the number of photocells in a sensor must be increased. The actual design and manufacturing cost for a higher resolution sensor, however, would be evaluated at many magnitudes of the lower resolution sensors.

('289 Patent at 1:66-2:3). Consequently, the specification concludes that "there is a great need for a generic solution that makes digital cameras capable of producing high resolution images without enormously incurring the cost of photosensitive chips with multimillion photocells." This is a first problem that was solved by the invention of the '289 Patent.

13. A second problem described in the '289 Patent specification as being solved by the claimed invention was the low dynamic range of images captured by digital cameras compared with film cameras:

> A second noticeable quality between digital cameras and film-based cameras is the dynamic range. Films have the necessary chemical

> pigments to make colors much more vivid and more adaptive to light conditions than current digital cameras can do. This is largely due to the limited pixel depth the current digital cameras could produce and the limited sensitivity of the photocells in the image sensor.

('289 Patent at 2:8-14). Consequently, "[t]here is thus a further need for digital cameras that produce better colors and details in a greater range." ('289 Patent at 2:15-16). The invention of the '289 Patent also solved this second problem associated with prior digital cameras.

14. Additionally, the '289 patent noted that it is always desirable to improve image quality in digital cameras, stating that:

> There are many other quality factors that limit the popularity of digital cameras although it is well understood that the digital cameras are the much preferred image acquisition means. Solutions that fundamentally improve the image qualities without incurring substantial cost are always welcome and being seriously and continuously sought.

('289 Patent at 2:17-22). The '289 Patent also addressed this broader issue by providing a camera architecture that can produce digital images having improved qualities. These problems that are described in the specification, and that were addressed by the '289 Patent, demonstrate that the focus of the claimed invention is an improvement in the functionality of digital cameras.

15. The '289 Patent specification explains that it solved these technological problems associated with prior digital cameras by providing a technological solution, specifically an improved digital camera architecture:

> The present invention has been made in consideration of the above described problems and needs and has particular applications to digital cameras that are demanded to produce digital images of high qualities. According to one aspect of the present invention, an improved digital camera uses four image sensors, each having its own lens, of which three image sensors are made responsive to the three primary colors and the fourth one made responsive to all intensity information.

('289 Patent at 2:36-44). The '289 Patent explains that the improved digital architecture of this embodiment can produce digital images having improved quality:

> Using a set of digital image processes embedded in a digital signal processing chip, images from the three color image sensors are processed with reference to the image from the black-and-white image sensor and subsequently produce high quality and film-like true color digital images.

('289 Patent at 2:44-49). The '289 Patent also describes additional benefits associated with the improved digital camera architecture of this embodiment:

> With the unique configuration, there are many obvious benefits and advantages. First, the resolutions of the image sensors are fully used. Second each of the image sensors is only responsible for one color; thereby the expensive process of coating a mosaic of selectively transmissive filters superimposed in pixel-based registration on one image sensor is eliminated and subsequently no micro-lenses process is needed. Third, the image from the black-and-white image sensor captures all information including details that the three color image sensors may have missed. Further, because the resolutions of the image sensors are fully used, for the same resolution of color images, the image sensors would relatively have smaller number of pixels, which typically leads to high yield, higher sensitivity, less cross-talking, and lower clocking rate. Besides, the size of the image sensors could be smaller, resulting in smaller optical lenses.

('289 Patent at 2:50-65). More benefits associated with various embodiments of the improved digital camera architecture of the '289 Patent are described in the specification:

> As will be appreciated below, there are many other features in the present invention including high sensitivities, high dynamic ranges, achievement of true colors and increased SNR (signal-to-noise ratio). ('289 Patent at 7:3-7).
>
> Further, with images of the same imaging target from the multiple sensors, it is possible to enhance images, such as noise removal and color correction at 820. More importantly, a true color image with true resolutions is derived from the enhanced images at 830. ('289 Patent at 10:13-16).

In other words, the '289 Patent solved the problems of low image resolution, low dynamic range, low signal-to-noise ratio ("SNR"), inaccurate color reproduction, and low image quality associated with prior digital cameras by providing an improved camera architecture that could produce high quality images while using both smaller image sensors (having higher yield, higher sensitivity, less cross-talking, and lower clocking rate) and smaller optical lenses.

16. The description of the invention in the '289 Patent specification also makes clear that the focus of the claims is on improving the functionality of digital cameras by providing a camera architecture employing a specific configuration and type of image sensors. The specification discloses several different embodiments of the claimed camera architecture, some

using four image sensors and others using two image sensors. For example, one embodiment, which is depicted in Fig. 3, is described as including four image sensors of a specific type:

> FIG. 3 shows a block diagram of an improved digital camera 300 employing multiple lens and sensors according to one embodiment of the present invention. Fundamentally and distinctly different from existing digital cameras, improved digital camera 300 uses four identical image sensors 302, 404, 306, and 308. ('289 Patent at 4:62-67).
>
> Each of image sensors 302, 304, 306, and 308 is integrated respectively with a uniform transmissive filter, not shown explicitly in the figure, referred to as a color filter herein. To be more specific, if output 318 of image sensor 302 is designated for a red signal, the color filter is basically a red filter only transmitting red portion of target 326. Similarly the color filters for image sensors 304 and 306 are a green filter and a blue filter, respectively. It should be pointed out that red, green and blue filters in the present example are preferable, but may be integrated into a lens. That means that lenses 310, 312 and 314 are colored accordingly according to another embodiment. Further other choices of three primary colors will work the same as more explained below. ('289 Patent at 5:14-27).
>
> The fourth image sensor 308 is not specifically coated with a color filter. According to one embodiment, fourth image sensor 308 is integrated with filter 316 that is full transparent, allowing all components of visible light to pass through. In other words, there may not need any filter in front of image sensor 208 according to one aspect of the present invention. Because some image sensors like CCD types tend to have high sensitivity in red portion or beyond in the light spectrum, potentially decreasing image quality. It is preferable to have a proper light (band) filter that obstructs anything beyond the visible light spectrum (430 nm˜680 nm). ('289 Patent at 4:28-40).

The '289 Patent specification also describes other embodiments using specific configurations and types of image sensors. For example, another embodiment employing four image sensors is described as follows:

> In the above description of FIG. 3, it is inherently implied that image sensors 302, 304, 306 and 308 are identical. It is true when the primary colors are red, green and blue. However, those skilled in the art will understand that image sensors 302, 304, 306 and 308 being identical is not the requirement to practice the present invention. For example, image sensors 302, 304 and 306 are integrated with filters that may cause the image sensors to produce images signals similar to YIQ signals used in NTSC television system. In other words, if one of the three images from image sensors 302, 304 and 306 produces a luminance signal representing the light intensity of a color target 326 and the two images are the chrominance images, the resolutions of the chrominance images can be only one half of the luminance image, hence two of image sensors 302, 304 and 306 need to have one half of the resolutions of the third one. This is taking the advantage of the color sensitivity in human color visions. ('289 Patent at 7:19-35).

Again, the focus of this four image sensor embodiment is on the types of image sensors used. And, the '289 Patent also describes an embodiment employing two image sensors, again focusing on the types of image sensors used:

> Further it is also understood to those skilled in the art that the unique configuration of multiple sensors and multi lenses disclosed herein may be applied to black-and-white digital cameras in which there is only one monochromatic image sensor sensing only the intensity of an imaging target. Using an additional image sensor, such as image sensor 308 in FIG. 3 can help to modify image qualities of the original image from the monochromatic image sensor. The following description is based on the embodiment illustrated in FIG. 3, those skilled in the art can appreciate that the description is equally applied to the black-and-white digital cameras. ('289 Patent at 7:36-46).

Details of these embodiments described in the '289 Patent specification are incorporated into various claims. For example, claim 1 recites first and second image sensors that must be "closely positioned with respect to a common plane," and the second image sensor must be "sensitive to a full region of visible color spectrum." Claim 2, which depends from claim 1, specifies that the first image sensor must also be "sensitive to said full region of visible color spectrum." Claim 6 recites four image sensors that are "closely positioned with respect to a common plane," the first three being "sensitive to three different regions of visible color spectrum," and the fourth being "sensitive to a full region of said visible color spectrum." And, claim 26 similarly recites four image sensors that are "closely positioned in a common plane with reference to an image target," and that are each "monochromatic and identical in resolution." Thus, the description in the '289 Patent specification of the image sensors used in various embodiments of the invention, and the incorporation of those details into the claims, demonstrate that the focus of the invention claimed in the '289 Patent is a camera architecture having specific configurations and types of image sensors.

17. The prosecution history of the '289 Patent makes clear that the United States Patent and Trademark Office ("USPTO") considered the claimed invention to include an unconventional camera architecture. A copy of the '289 Patent file history is attached hereto as Exhibit B. In particular, the patent examiner cited several prior art patents disclosing digital cameras having multiple lenses and multiple image sensors against the '289 Patent. (1999-01-15

Detailed Action, pp. 2-4). Those prior art patents include U.S. Patent No. 4,506,294 ("Nagumo Patent"), U.S. Patent No. 5,414,465 ("Kodama Patent"), and U.S. Patent No. 5,436,661 ("Yamamoto Patent"). (1999-01-15 Detailed Action, pp. 2-4). With respect to the Nagumo Patent, the patent examiner stated:

> Nagumo discloses a digital camera (solid state camera) with three image sensors (1, 2, and 3) closely positioned with respect to a common plane with reference to an image target, with lenses mounted in front of all sensors. (See figure 7). The sensors are respectively responsive to three prima[r]y colors and are thus coated with the three respective primary color filters.

(1999-01-15 Detailed Action, pp. 2-3). Regarding the Kodama Patent, the examiner stated:

> Kodama discloses a digital camera with three image sensors sensitive to the three primary colors (red 3, green 4 and blue 5) closely positioned with reference to an image target. (See figure 1.) Kodama also discloses analog to digital circuitry (6, 7, 8) that digitizes the images produced by the sensors of different intensities. Kodama furthermore discloses image memory (frame memory 9, 10, 11) that stores the images in addition to digital image processing circuitry (interpolation circuits 12, 13, 14).

(1999-01-15 Detailed Action, pp. 3-4). And, regarding the Yamamoto Patent, the examiner stated:

> Yamamoto, however, teaches the use of a fourth sensor that outputs a green color image for use as a luminance signal. The examiner takes Official Notice that it is well known in the art to substitute green color images for gray intensity images with regards to obtaining luminance signals. Thus, it would have been obvious to incorporate the fourth image sensor of Yamamoto in the apparatus of Nagumo in order to produce a gray (green) intensity image in order to improve the resolution and dynamic range of a full color image signal.
>
> Yamamoto, however, teaches the use of a fourth sensor that outputs a second green color image sensor that is used to produce a luminance image. The image produced from the fourth Sensor is used to enhance the dynamic range of the mixed signal. (See column 10, lines 63-66.) Thus, it would have been obvious to incorporate the fourth image sensor of Yamamoto in the apparatus of Kodama in order to produce an additional intensity image that combined with the other three intensity images improves the resolution and dynamic range of a resulting full color image signal.

(1999-01-15 Detailed Action, pp. 3-4). Nonetheless, despite the fact that digital cameras having multiple lenses and multiple image sensors existed prior to the filing date of the '289 Patent, the patent examiner found all of the asserted claims allowable over the prior art in the first Office Action because of the types of sensors used. Specifically, the patent examiner stated that:

> Claims 1,2 and 4-25 are allowed. The following is a statement of reasons for the indication of allowable subject matter: Prior art discloses image pickup devices comprised of up to four image sensors, but is silent on the issue of one of said two or four image sensors being sensitive to a full visible color spectrum in combination with other limitations within claims 1 and 6.

(1999-01-15 Detailed Action, p. 4). In other words, the asserted claims of the '289 Patent were found allowable because they use different image sensors than those used in prior digital cameras having multiple lenses and multiple image sensors. Thus, the prosecution history of the '289 Patent demonstrates that the USPTO considered its claimed camera architecture to be unconventional.

APPLE'S DUAL-LENS CAMERA PRODUCTS

18. Apple makes, uses, sells, offers for sale, and/or imports into the United States and this District products that incorporate the multi-lens camera technology claimed in the '289 Patent. These products include Apple's iPhone 7 Plus, iPhone 8 Plus, iPhone X, iPhone Xs, iPhone Xs Max, and iPhone XR smartphones, and Apple's iPad Pro 11 and iPad Pro 12.9 (with the Apple A12X Bionic SoC) tablets (collectively "Apple Accused Products").

19. On information and belief, Apple released its first smartphone, the first-generation iPhone, on June 29, 2007. The first-generation iPhone included only a single-lens fixed-focus 2.0 megapixel camera on the back for taking digital photos.[1] Reviews of the first-generation iPhone indicated that the original camera performed poorly in low light conditions[2] and was just

[1] *See* https://gizmodo.com/276116/apple-iphone-review.

[2] *See* https://www.macworld.co.uk/review/iphone/iphone-uk-first-generation-review-2388/.

(continued...)

"decent" otherwise.[3] Moreover, the original camera provided no zoom or editing functionality.[4] One online publication called the camera "a glossed-over implementation,"[5] and another described it as a "sub-par camera."[6] One review specifically noted that "the lens appears to be of very poor quality and the photos we took weren't very sharp (even in good light). In a darkened room or at night, it's simply hopeless."[7]

20. At the time Apple released the original iPhone, the consumer mobile phone and digital camera markets were highly competitive, and in order to remain competitive, Apple began to aggressively seek ways to improve the performance of its digital cameras and address the shortcomings identified in the press with respect to the original iPhone. Accordingly, sometime around 2008 based upon Apple's patent filings, Apple began to pursue the development of a dual-lens camera which could improve image quality and support additional features desired by consumers. In particular, on February 20, 2008, Apple employees filed a patent application entitled "Electronic Device With Two Image Sensors," which eventually issued to Apple on February 14, 2012 as U.S. Patent No. 8,115,825 (the "Apple '825 Patent"). The Apple '825 Patent is generally directed to "an electronic device for producing [an] image of an object …" including "a black-and-white camera having a first sensor area to receive luma data pertaining to the object …" and "a color camera having a second sensor area configured to receive chroma data pertaining to the object." "The first sensor area may correspond to a first pixel array …," and "[t]he second sensor area may correspond to a second pixel array." The electronic device may also include "first logic configured to correlate pixels in the first pixel array with locations on the second sensor array …," "second logic configured to interpolate the chroma data to determine color data associated with the locations on the second sensor area …,"

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[3] *See* http://usatoday30.usatoday.com/tech/columnist/edwardbaig/2007-06-26-iphone-review_N.htm.

[4] See https://gizmodo.com/276116/apple-iphone-review.

[5] *See* https://gizmodo.com/276116/apple-iphone-review.

[6] *See* https://www.macworld.co.uk/review/iphone/iphone-uk-first-generation-review-2388/.

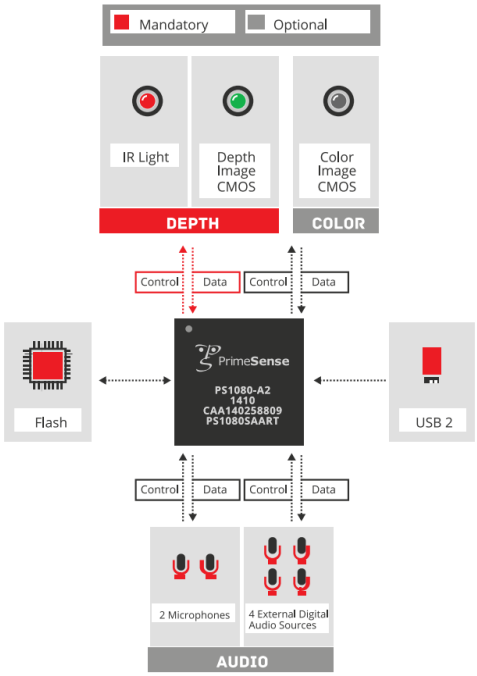
[7] *See* https://www.macworld.co.uk/review/iphone/iphone-uk-first-generation-review-2388/.

and "third logic configured to adjust the color data utilizing the luma data based on the correlation between the locations on the second sensor area and the pixels in the first pixel array to produce image data for the image of the object. The same group of Apple employees also filed a continuation application on December 20, 2011 claiming priority to the original application from which the Apple '825 Patent issued. The continuation application ultimately issued to Apple on March 25, 2014, as U.S. Patent No. 8,681,250 (the "Apple '250 Patent").

21. On information and belief, on November 24, 2013, Apple significantly expanded its in-house camera and imaging technology expertise, particularly with respect to dual-lens designs, by purchasing Israel-based 3D imaging technology company PrimeSense for approximately $360 million.[8] PrimeSense was founded in 2005, more than five years after Plaintiffs filed their application for the '289 Patent, and had gained notoriety for providing dual-lens camera technology for use in 3D imaging that used a first "depth image CMOS" image sensor to detect coded IR light reflected off a surface, a second "color image CMOS" image sensor to detect a color image, and a custom system-on-a-chip ("SoC") to control the operation of the CMOS image sensors and to execute the algorithms for performing the 3D imaging.[9] PrimeSense's dual-camera system is shown in the following image:

[8] *See* http://allthingsd.com/20131124/apple-confirms-acquisition-of-3d-sensor-startup-primesense/.

[9] *See* http://www.i3du.gr/pdf/primesense.pdf.



PrimeSense claimed that their "3D sensing technology gives digital devices the ability to observe a scene in three dimensions. It translates these observations into a synchronized image stream (depth and color) – just like humans do."[10] PrimeSense further claimed that their Light Coding technology enabled 3D depth sensing by "coding the scene with near-IR light, which is invisible to the human eye. The solution then uses a standard off-the-shelf CMOS image sensor to read the coded light back from the scene. This is the process that enables depth acquisition and what makes PrimeSense solutions so accurate."[11] The SoC is used to "execute sophisticated parallel computational algorithms to decipher the received light coding infrared patterns, in order to produce a VGA size depth image of a scene. With a USB interface used to pass all data to the host, the SoC has minimal CPU requirements as all depth acquisition algorithms run on the SoC itself."[12] Thus, PrimeSense provided Apple with the CMOS sensor technology, integrated circuit

[10] *See* http://www.i3du.gr/pdf/primesense.pdf.

[11] *See* http://www.i3du.gr/pdf/primesense.pdf.

[12] *See* http://www.i3du.gr/pdf/primesense.pdf.

technology, and imaging algorithms to greatly enhance the performance of the digital cameras in its smartphones and other products.

22. About a year after Apple's acquisition of PrimeSense, an online article dated November 18, 2014 stated it was rumored at the time that Apple was "working on major camera improvements" involving "some kind of weird two-lens system where the back camera uses two lenses and it somehow takes it up to DSLR quality imagery."[13] The article suggested that this rumored improvement "might be the biggest camera jump ever."[14]

23. On information and belief, on April 14, 2015, Apple further expanded its camera and imaging capabilities by purchasing yet another Israel-based dual-lens camera technology company, LinX, for a reported $25 million.[15] Online publications described LinX as "a leader and a pioneer in the development of multi-aperture imaging technologies ...,"[16] such as the multi-aperture cameras shown in the following figures:[17]

[13] *See* https://www.macrumors.com/2014/11/18/apple-biggest-camera-jump-ever/.

[14] *See* https://www.macrumors.com/2014/11/18/apple-biggest-camera-jump-ever/.

[15] *See* https://www.timesofisrael.com/apple-buys-photo-tech-firm-linx-for-its-third-israel-acquisition/.

[16] *See* https://www.businesswire.com/news/home/20140605005713/en/LinX-Imaging-Takes-Mobile-Photography-New-Dimension.

[17] *See* https://www.macrumors.com/2015/04/14/apple-acquires-linx-imaging/.

(continued...)

By June 2014, the company reported that it had "successfully developed miniature multi-aperture cameras designed for mobile devices."[18] According to reports, "[t]he camera modules are nearly half the height of a standard mobile camera and are capable of creating stunning color images and high accuracy depth maps."[19] Moreover, LinX claimed to have "solved all problems associated with combining multiple images captured from different points in space such as registration errors and occlusion related artifacts which are seen on competing technologies …," thus providing images that "are artifact-free, even when objects appear at very short range."[20] Specifically, LinX claimed that "[d]uring the registration process between the images, the LinX software extracts very accurate depth information for each pixel and creates a depth map. The software creates true depth information on high contrast objects and on near flat surfaces, such as walls, which are traditionally considered difficult for passive stereo systems. The accuracy and resolution of details in distance maps created the opportunity to use the suggested algorithms for 3D reconstruction."[21] The purported improvements provided by LinX technology over traditional smartphone photography include reduced height (achieved by replacing one large sensor with two smaller ones), improved sensitivity to light by using a monochrome sensor, dramatically lower noise levels, improved effective camera resolution, improved low-light performance and image quality, fast exposure to assure crisp images without motion blur, and high-quality distance mapping.[22] Moreover, applications can use LinX technology to provide functionalities such as automatic background removal, refocusing, improved autofocus,

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[18] *See* https://www.businesswire.com/news/home/20140605005713/en/LinX-Imaging-Takes-Mobile-Photography-New-Dimension.

[19] *See* https://www.businesswire.com/news/home/20140605005713/en/LinX-Imaging-Takes-Mobile-Photography-New-Dimension.

[20] *See* https://www.businesswire.com/news/home/20140605005713/en/LinX-Imaging-Takes-Mobile-Photography-New-Dimension.

[21] *See* https://www.businesswire.com/news/home/20140605005713/en/LinX-Imaging-Takes-Mobile-Photography-New-Dimension.

[22] *See* https://www.businesswire.com/news/home/20140605005713/en/LinX-Imaging-Takes-Mobile-Photography-New-Dimension.

(continued...)

augmented reality, 3D object modeling, distance and sizing of objects, and biometric 3D face recognition.[23]

24. About two years after publication of that article, on September 7, 2016, Apple introduced the iPhone 7 Plus, its first smartphone incorporating a dual-lens camera.[24] Pre-orders for the iPhone 7 Plus began on September 9, 2016, and general availability in the United States began on September 16, 2016.[25] According to Apple's website, the iPhone 7 Plus includes rear-facing "Dual 12 MP wide-angle and telephoto cameras …," with the wide-angle lens having a f/1.8 aperture and the telephoto lens having a f/2.8 aperture.[26] The rear-facing dual-lens camera of the iPhone 7 Plus appears to closely resemble the camera technology it acquired through its purchase of LinX in 2014.

25. The rear-facing dual-lens camera configuration of the iPhone 7 Plus provides "2x optical zoom" as well as "digital zoom up to 10x."[27] The standard iPhone 7, in contrast, which includes only a single camera, provides no optical zoom capabilities, and supports digital zoom only up to 5x.[28] Furthermore, the iPhone 7 Plus introduced two new features unique to dual-lens cameras. The first is improved digital zoom that smoothly and transparently transitions between the wide and telephoto lenses by fusing images from both lenses, thereby improving image quality.[29] The second new feature is a "portrait mode" that creates a bokeh effect by capturing separate images of the same scene using the wide and telephoto lenses, determining the depth of the objects in the scene using a technique called disparity mapping, and blurring the distant

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[23] *See* https://www.businesswire.com/news/home/20140605005713/en/LinX-Imaging-Takes-Mobile-Photography-New-Dimension.

[24] *See* http://www.iphonehacks.com/2016/09/iphone-7-release-date-availability.html.

[25] *See* http://www.iphonehacks.com/2016/09/iphone-7-release-date-availability.html.

[26] *See* https://support.apple.com/kb/SP744?locale=en_US.

[27] *See* https://support.apple.com/kb/SP744?locale=en_US.

[28] *See* https://support.apple.com/kb/SP744?locale=en_US.

[29] *See* https://forums.developer.apple.com/thread/63347.

(continued...)

object while keeping the close objects in focus.[30] Portrait mode requires use of both the wide and telephoto lenses to create the disparity mapping, and therefore portrait mode is not available on Apple's single-lens camera phones.[31]

26. In order to enable the iPhone 7 Plus to perform the complex computations necessary to take advantage of the dual-lens camera introduced on the iPhone 7 Plus, Apple designed and incorporated into the phone a powerful new 64-bit ARM-based system on a chip (SoC) called the A10 Fusion.[32] The A10 Fusion SoC includes an image signal processor ("ISP") that was described by an Apple executive as providing twice the throughput of the ISP in Apple's prior-generation SoC, the A9, and capable of performing 100 billion operations in 25 milliseconds.[33] This Apple executive referred to the ISP in the A10 Fusion SoC as a "supercomputer for photos."[34] The ISP in the A10 Fusion SoC performs the processing for implementing the new "portrait mode" that was introduced with the iPhone 7 Plus.

27. On September 12, 2017, Apple introduced the successor to the iPhone 7 Plus, the iPhone 8 Plus, which became generally available in the United States on September 22, 2017.[35] The iPhone 8 Plus retains the rear-facing dual-lens camera of the iPhone 7 Plus, and is capable of performing the improved digital zoom and the "portrait mode" functionality of the iPhone 7 Plus, but it also introduced a new feature called "portrait lighting."[36] This new feature utilizes the same depth measurements obtained from the disparity mapping generated from the wide and telephoto lenses and is used in "portrait mode" to apply professional lighting effects to

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[30] *See* https://appleinsider.com/articles/16/09/23/apples-iphone-7-camera-delivers-nice-slice-of-enhancements-but-iphone-7-plus-takes-the-cake.

[31] *See* https://developer.apple.com/videos/play/wwdc2017/507/.

[32] *See* https://www.apple.com/iphone-7/specs/.

[33] *See* https://www.eetimes.com/document.asp?doc_id=1330418.

[34] *See* https://www.eetimes.com/document.asp?doc_id=1330418.

[35] *See* http://www.iphonehacks.com/2017/09/iphone-8-release-date-price-availability.html.

[36] *See* https://www.apple.com/iphone-8/specs/.

(continued...)

photographs.[37] Specifically, using machine learning, software uses the depth mapping to separate the subject from background objects, identifies features in the subject such as people's faces, and applies lighting effects such as glow or shadows.[38] The iPhone 8 Plus included five different effects for "portrait lighting," which it called "natural light," "studio light," "contour light," "stage light," and "stage light mono."[39] To implement these features, the iPhone 8 Plus incorporated an even more powerful 64-bit ARM-based SoC than the one found in the iPhone 7 Plus.[40] This new SoC, called the A11 Bionic, includes a new ISP that supports computational photography functions such as the lighting estimation, wide color capture, and advanced pixel processing used to implement the new "portrait lighting" feature.[41]

28. On September 12, 2017, alongside the iPhone 8 Plus, Apple also introduced the iPhone X, which became generally available in the United States on November 3, 2017.[42] The iPhone X includes the rear-facing dual-lens camera of the iPhone 8 Plus, and is capable of performing all of the dual-lens camera functions available on that phone such as improved digital zoom, "portrait mode," and "portrait lighting."[43] Additionally, the iPhone X also incorporates an additional dual-lens camera, called the TrueDepth camera, on the front of the phone.[44] The front-facing TrueDepth camera includes a first 7MP camera having a f/2.2 aperture, and a second

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[37] *See* https://www.macrumors.com/2018/02/22/apple-portrait-lighting-behind-the-scenes/.

[38] *See* https://www.macrumors.com/2018/02/22/apple-portrait-lighting-behind-the-scenes/.

[39] *See* https://support.apple.com/en-us/HT208118.

[40] *See* https://appleinsider.com/articles/17/09/23/inside-iphone-8-apples-a11-bionic-introduces-5-new-custom-silicon-engines.

[41] *See* https://www.apple.com/newsroom/2017/09/iphone-8-and-iphone-8-plus-a-new-generation-of-iphone/.

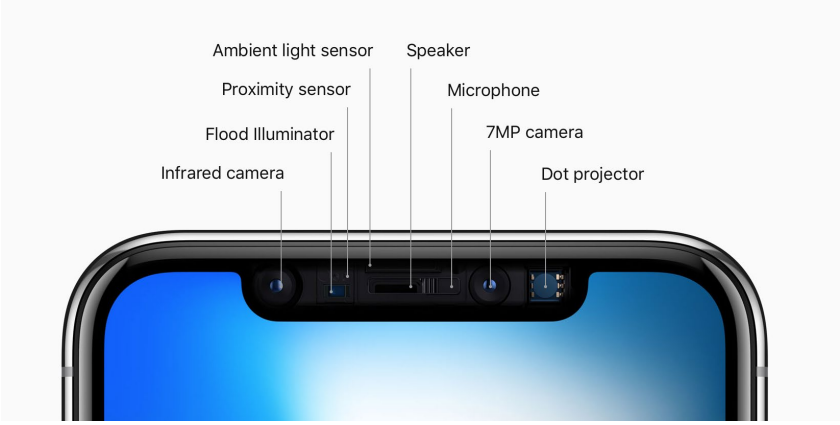
[42] *See* http://www.iphonehacks.com/2017/09/iphone-x-release-date-price-availability.html.

[43] *See* https://support.apple.com/kb/SP770?locale=en_US.

[44] *See* https://support.apple.com/kb/SP770?locale=en_US.

(continued...)

infrared camera that can sense light emitted from a flood illuminator and/or dot projector and reflected back from the subject, as shown in the following image:[45]



The TrueDepth camera, which appears to be an implementation of the technology Apple purchased from PrimeSense, projects an array of infrared dots (reported to be an array of 30,000 dots) from the dot projector onto the subject (such as a user's face).[46] The infrared camera reads the dots as they are reflected back from the subject, and deformities are analyzed to generate a highly accurate depth map of the subject.[47] The flood illuminator can be used to generate additional infrared light when needed to ensure the system works in low light conditions.[48] The image information from the infrared camera is combined with the image from the 7MP camera to power features such as Apple's Face ID biometric authentication technology, which uses machine learning and sophisticated algorithms to generate a 3D model of a user's face that can be used to unlock the phone or provide other security features.[49] The depth mapping capabilities

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[45] *See* https://www.theverge.com/circuitbreaker/2017/9/17/16315510/iphone-x-notch-kinect-apple-primesense-microsoft.

[46] *See* https://www.extremetech.com/mobile/255771-apple-iphone-x-truedepth-camera-works.

[47] *See* https://www.extremetech.com/mobile/255771-apple-iphone-x-truedepth-camera-works.

[48] *See* https://www.apple.com/iphone-xs/face-id/.

[49] *See* https://www.apple.com/iphone-xs/face-id/.

(continued...)

of the TrueDepth camera also power additional features, such as the "portrait mode" and "portrait lighting" features available on the iPhone 8, as well as other applications such as augmented reality and machine vision.[50] To perform the processing required to implement these features, the iPhone X retains the A11 Bionic SoC that powers the iPhone 8 Plus.[51]

29. On September 12, 2018, Apple introduced the iPhone Xs and the iPhone Xs Max, both of which became generally available in the United States on September 21, 2018.[52] The iPhone Xs and iPhone Xs Max retain the same rear-facing dual camera and front-facing TrueDepth camera from the iPhone X, as well as all of the associated functionality such as improved digital zoom, "portrait mode," "portrait lighting," and Face ID,[53] but the iPhone Xs and iPhone Xs Max incorporate a more powerful processor, the A12 Bionic 64-bit ARM-based SoC.[54] This new processor, as with its A10 Fusion and A11 Bionic predecessors, incorporates an ISP to process the data generated by the front- and rear-facing dual-lens cameras on the iPhone Xs and iPhone Xs Max, and to implement the associated features.[55]

30. Also on September 12, 2018, Apple introduced the iPhone XR, which became generally available in the United States on September 21, 2018.[56] The iPhone XR uses the same front-facing TrueDepth camera from the iPhone X, iPhone Xs, and iPhone Xs Max, and provides all of the associated functionality, including improved "portrait mode," "portrait lighting," and

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[50] *See* https://www.theverge.com/circuitbreaker/2017/9/17/16315510/iphone-x-notch-kinect-apple-primesense-microsoft.

[51] *See* https://support.apple.com/kb/SP770?locale=en_US.

[52] *See* http://www.iphonehacks.com/2018/09/iphone-xs-max-release-date-price-availability.html.

[53] *See* https://www.apple.com/iphone-xs/specs/.

[54] *See* https://en.wikichip.org/wiki/apple/ax/a12.

[55] *See* https://www.apple.com/iphone-xs/a12-bionic/.

[56] *See* http://www.iphonehacks.com/iphone-xr.

(continued...)

Face ID.[57] The iPhone XR incorporates the A12 Bionic 64-bit ARM-based SoC from the iPhone Xs and iPhone Xs Max.[58]

31. On October 30, 2018, Apple introduced the iPad Pro 11 and iPad Pro 12.9 (with the Apple A12X Bionic SoC) ("Accused iPad Products"), which became generally available in the United States on November 7, 2018.[59] The Accused iPad Products use the same front-facing TrueDepth camera from the iPhone X, iPhone Xs, and iPhone Xs Max, and provide all of the associated functionality, including improved "portrait mode," "portrait lighting," and Face ID.[60] The Accused iPad Products incorporate the A12 Bionic 64-bit ARM-based SoC from the iPhone Xs, iPhone Xs Max, and iPhone XR.[61]

32. As detailed above, the Apple Accused Products all infringe at least claims 1, 2, and 4 of the '289 Patent:

Claim Element	Apple Accused Products
1. An improved digital camera comprising:	The Apple Accused Products are all digital cameras.
1[a] a first and a second image sensor closely positioned with respect to a common plane, said second image sensor sensitive to a full region of visible color spectrum;	The iPhone 7 Plus, iPhone 8 Plus, iPhone X, iPhone Xs, and iPhone Xs Max ("Apple Accused Rear Dual-Camera Products") all include first and second image sensors closely positioned with respect to a common plane, the first sensor being located behind a wide-angle f/1.8 aperture lens, and the second sensor being located behind a telephoto f/2.8 aperture lens, both lenses being on the rear-side of the device. Both of the first and second image sensors behind the lenses on the rear-side of the device are sensitive to a full region of visible color spectrum. Additionally, the iPhone X, iPhone Xs, iPhone Xs Max, iPhone XR, and Accused iPad Products ("Apple Accused TrueDepth

[57] *See* https://www.apple.com/iphone-xr/specs/.

[58] *See* https://www.apple.com/iphone-xr/a12-bionic/.

[59] *See* https://www.apple.com/newsroom/2018/10/new-ipad-pro-with-all-screen-design-is-most-advanced-powerful-ipad-ever/.

[60] *See* https://www.apple.com/ipad-pro/specs/.

[61] *See* https://www.apple.com/ipad-pro/why-ipad/.

Claim Element	Apple Accused Products
	Camera Products") include first and second image sensors closely positioned with respect to a common plane, the first sensor being located behind an infrared lens, and the second sensor being located behind an f/2.2 aperture lens, both lenses being on the front-side of the device. Both of the first and second image sensors behind the lenses on the front-side of the device are sensitive to a full region of visible color spectrum.
1[b] two lenses, each being mounted in front of one of said two image sensors;	The Apple Accused Rear Dual-Camera Products all include a wide-angle f/1.8 aperture lens and a telephoto f/2.8 aperture lens on the rear-side of the device, each lens being mounted in front of an image sensor. Additionally, the Apple Accused TrueDepth Camera Products include an infrared lens and an f/2.2 aperture lens on the front-side of the device, each lens being mounted in front of an image sensor.
1[c] said first image sensor producing a first image and said second image sensor producing a second image;	The first and second image sensors located behind the wide-angle f/1.8 aperture lens and the telephoto f/2.8 aperture lens on the rear-side of the Apple Accused Rear Dual-Camera Products create first and second images, respectively. Additionally, the first and second image sensors located behind the infrared lens and the f/2.2 aperture lens on the front-side of the Apple Accused TrueDepth Camera Products create first and second images, respectively.
1[d] an analog-to-digital converting circuitry coupled to said first and said second image sensor and digitizing said first and said second intensity images to produce correspondingly a first digital image and a second digital image;	The first and second image sensors located behind the wide-angle f/1.8 aperture lens and the telephoto f/2.8 aperture lens on the rear-side of the Apple Accused Rear Dual-Camera Products each are coupled to analog-to-digital converting circuitry that digitizes the first and second images to produce first and second digital images, respectively. Additionally, the first and second image sensors located behind the infrared lens and the f/2.2 aperture lens on the front-side of the Apple Accused TrueDepth Camera Products each are coupled to analog-to-digital converting circuitry that digitizes the first and second images to produce first and second digital images, respectively.
1[e] an image memory, coupled to said analog-to-digital converting circuitry, for	An image memory coupled to the analog-to-digital converting circuitry in the Apple Accused Products stores the digital images.

Claim Element	Apple Accused Products
storing said first digital image and said second digital image; and	
1[f] a digital image processor, coupled to said image memory and receiving said first digital image and said second digital image, producing a resultant digital image from said first digital image enhanced with said second digital image.	A digital image processor coupled to the image memory in the Apple Accused Products receives the first and second digital images, produces a resultant digital image from the first and second digital images, and produced a resultant digital image from the first digital image enhanced with the second digital image. In the iPhone 7 Plus, the digital image processor is located in the A10 Fusion SoC, and a resultant digital image is produced from the first digital image enhanced with the second digital image when using the improved digital zoom and portrait mode features. In the iPhone 8 Plus, the digital image processor is located in the A11 Bionic SoC, and a resultant digital image is produced from the first digital image enhanced with the second digital image when using the improved digital zoom, portrait mode, and portrait lighting features. In the iPhone X, the digital image processor is located in the A11 Bionic SoC, and a resultant digital image is produced from the first digital image enhanced with the second digital image when performing the improved digital zoom, portrait mode, portrait lighting, selfie portrait mode, selfie portrait lighting, and Face ID features. In the iPhone Xs, iPhone Xs Max, iPhone XR, and Accused iPad Products, the digital image processor is located in the A12 Bionic SoC, and a resultant digital image is produced from the first digital image enhanced with the second digital image when performing the improved digital zoom, portrait mode, portrait lighting, selfie portrait mode, selfie portrait lighting, and Face ID features.
2. The improved digital camera as recited in claim 1, wherein said first image sensor sensitive to said full region of visible color spectrum.	Both of the first and second image sensors behind the wide-angle f/1.8 aperture lens and the telephoto f/2.8 aperture lens on the rear-side of the Apple Accused Rear Dual-Camera Products are sensitive to a full region of visible color spectrum. Additionally, both of the first and second image sensors behind the infrared lens and the f/2.2 aperture lens on the front-side of the

Claim Element	Apple Accused Products
	Apple Accused TrueDepth Camera Products are sensitive to a full region of visible color spectrum.
4. The improved digital camera as recited in claim 1, wherein said analog-to-digital converting circuitry comprises two individual analog-to-digital converters, each integrated with one of said first and second image sensors so that said first and second digital images are digitized independently and in parallel to increase signal throughput rate.	The analog-to-digital circuitry coupled to the first image sensor located behind the wide-angle f/1.8 aperture lens on the rear-side of the Apple Accused Rear Dual-Camera Products comprises an individual analog-to-digital converter, and the analog-to-digital circuitry coupled to the second image sensor located behind the telephoto f/2.8 aperture lens on the rear-side of the Apple Accused Rear Dual-Camera Products comprises another individual analog-to-digital converter. The individual analog-to-digital converters digitize the first and second digital images independently and in parallel to increase signal throughput rate. Additionally, the analog-to-digital circuitry coupled to the first image sensor located behind the infrared lens on the front-side of the Apple Accused TrueDepth Camera Products comprises an individual analog-to-digital converter, and the analog-to-digital circuitry coupled to the second image sensor located behind the f/2.2 aperture lens on the front-side of the Apple Accused TrueDepth Camera Products comprises another individual analog-to-digital converter. The individual analog-to-digital converters digitize the first and second digital images independently and in parallel to increase signal throughput rate.

APPLE'S KNOWLEDGE OF THE '289 PATENT

33. The Apple '825 Patent was filed in 2008, five years after the '289 Patent issued, and sought to claim many of the same features claimed in the '289 Patent. On March 22, 2011, the patent examiner issued an office action rejecting then-pending claims 1-3, 7, 10-14, 16, and 17 of the Apple '825 Patent as being anticipated under 35 U.S.C. § 102 by the '289 Patent, and rejecting the remaining pending claims as being obvious under 35 U.S.C. § 103(a) in view of the '289 Patent either by itself or in combination with other prior art references. Thus, Apple was made aware of the '289 Patent at that time. On June 20, 2011, Apple's patent attorney participated in a telephonic interview with the patent examiner during which "the cited

references and a proposed amendment were discussed." Then, on June 21, 2011, Apple filed a response to the office action that amended the claims by adding limitations to the independent claims and making various additional amendments to several dependent claims, and that argued the additional claim limitations are not disclosed in the '289 Patent. On September 21, 2011, in view of these additional claim limitations to overcome the '289 Patent, the examiner issued a notice of allowance for the Apple '825 Patent.

34. Apple further demonstrated its awareness of the '289 Patent during prosecution of U.S. Patent No. 8,681,250 (the "Apple '250 Patent"), a continuation of the same application from which the Apple '825 Patent issued. The Apple '250 Patent was filed on December 20, 2011 and issued to Apple on March 25, 2014. When Apple filed the application that ultimately issued as the Apple '250 Patent, Apple simultaneously filed an information disclosure statement listing the '289 Patent as a reference "that may be material to examination of the above-identified patent application …."

35. Having had its '825 Patent initially rejected by the USPTO in light of the '289 Patent, and then having cited the '289 Patent in the continuation application that ultimately issued as the '250 Patent, Apple was both aware of the claims of the '289 Patent no later than June 21, 2011, was aware of the significance of the '289 Patent to products incorporating dual-lens cameras and their uses, and was aware that the dual-lens technology it purchased at great expense from PrimeSense and LinX was based on the technology found in the '289 Patent. Despite this awareness, Apple made no attempt to contact Plaintiffs or obtain a license for the '289 technology up to and including the filing of this lawsuit.

36. Apple's conduct was deliberate and willful and subjects it to exemplary damages under the patent laws. *Halo Electronics, Inc. v. Pulse Electronics, Inc., et al.*, 136 S. Ct. 1923, 1935-36 (2016).

COUNT I

(Direct Infringement of the '289 Patent pursuant to 35 U.S.C. § 271(a))

37. Plaintiffs incorporate Paragraphs 1 through 29 herein as set forth in full.

38. Apple has infringed and continues to infringe at least Claims 1, 2, and 4 of the '289 Patent in violation of 35 U.S.C. § 271(a).

39. Apple's infringement is based upon literal infringement or infringement under the doctrine of equivalents, or both.

40. Apple's acts of making, using, importing, selling, and/or offering for sale infringing products and services have been without the permission, consent, authorization, or license of Plaintiffs.

41. Apple's infringement includes the manufacture, use, sale, importation and/or offer for sale of Apple's products, including Apple's iPhone 7 Plus, iPhone 8 Plus, iPhone X, iPhone Xs, and iPhone Xs Max. The Apple Accused Products embody the patented invention of the '289 Patent.

42. Apple's infringement of the '289 Patent has injured and continues to injure Plaintiffs in an amount to be proven at trial.

43. Apple has been well aware of Plaintiffs' patents, including the '289 Patent, and has continued its infringing activity despite this knowledge.

44. Apple knew of the '289 Patent at least as early as March 2011 when the '289 patent was cited by the examiner during prosecution of Apple's '825 and '250 patents.

45. Despite the foregoing knowledge of the '289 Patent and the technology covered by this patent, and despite a high likelihood that its actions constituted infringement of this patent, Apple proceeded to and continued to infringe the '289 Patent. Apple made the deliberate decision to acquire and to continue to sell products and services that it knew infringed the '289 Patent.

46. Apple's infringement of the '289 Patent is egregious.

47. On information and belief, Apple has undertaken no efforts to design these products or services around the '289 Patent to avoid infringement despite Apple's knowledge

and understanding that its products and services infringe the '289 Patent. Thus, Apple's infringement of the '289 Patent is willful and egregious, warranting enhancement of damages under 35 U.S.C. § 284, and attorneys' fees and costs incurred under 35 U.S.C. § 285.

COUNT II

(Indirect Infringement of the '289 Patent pursuant to 35 U.S.C. § 271(b))

48. Plaintiffs incorporate Paragraphs 1 through 40 herein as set forth in full.

49. Apple has induced and continues to induce infringement of at least claims 1, 2, and 4 of the '289 Patent under 35 U.S.C. § 271(b) by instructing, directing and/or requiring others, including its customers, purchasers, users, and developers, to perform one or more of the limitations of the claims, either literally or under the doctrine of equivalents, of the '289 Patent, where all the limitations of the claims are performed by either Apple, its customers, purchasers, users or developers, or some combination thereof. Apple knew or was willfully blind to the fact that it was inducing others, including customers, purchasers, users or developers, to infringe by practicing, either themselves or in conjunction with Apple, one or more claims of the '289 Patent, including at least Claims 1, 2, and 4.

50. Apple knowingly and actively aided and abetted the direct infringement of the '289 Patent by instructing and encouraging its customers, purchasers, users and developers to use the Apple Accused Products. Such instructions and encouragement include, but are not limited to, advising third parties to use the Apple Accused Products in an infringing manner, providing a mechanism through which third parties may infringe the '289 Patent, specifically through the use of multiple lens cameras and multiple image sensors, and by advertising and promoting the use of the Apple Accused Products in an infringing manner, and distributing guidelines and instructions to third parties on how to use the Apple Accused Products in an infringing manner.

51. On information and belief, Apple has had knowledge and notice of the '289 Patent as early as March 2011, when the patent was cited in the prosecution history of Apple's patent application in patent examiner's rejection noting that the '289 Patent read on Apple's proposed patent claims. Apple's infringement is willful, egregious, deliberate and done in bad faith entitling Plaintiffs to exemplary damages.

52. Plaintiffs have suffered damages because of Apple's indirect infringement of the '289 Patent.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs pray for judgment and relief as follows:

A. An entry of judgment holding that Apple has infringed and is infringing the '289 Patent, and has induced infringement and is inducing infringement of the '289 Patent;

B. An award to Plaintiffs of such damages as it shall prove at trial against Apple that is adequate to fully compensate Plaintiffs for Apple's infringement of the '289 Patent, said damages to be no less than a reasonable royalty;

C. A determination that Apple's infringement has been willful, wanton, deliberate and egregious and that the damages against it be increased up to treble on this basis or for any other basis within the Court's discretion;

D. A finding that this case is "exceptional" and an award to Plaintiffs of their costs and reasonable attorneys' fees, as provided by 35 U.S.C. § 285;

E. An accounting of all infringing sales and revenues, together with post judgment interest and prejudgment interest from the first date of infringement of the '289 Patent; and

F. Such further and other relief as the Court may deem proper and just.

Respectfully submitted,

DATED: July 22, 2019

By /s/ Daniel Johnson, Jr.

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DEMAND FOR JURY TRIAL

Plaintiffs demand a jury trial on all issues so triable.

Respectfully submitted,

DATED: July 22, 2019

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CERTIFICATE OF SERVICE

I, Robert G. Litts, hereby certify that on July 22, 2019, the foregoing document was filed with the Clerk of the U.S. District Court for the Northern District of California, using the court's electronic filing system ("ECF"), in compliance with Civil L.R. 5-1. The ECF system serves a "Notice of Electronic Filing" to all parties and counsel who have appeared in this action, who have consented under Civil L.R. 5-1 to accept that Notice as service of this document.

/s/ Robert G. Litts
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