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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

LONGITUDE LICENSING LIMITED, Plaintiff, v. GOOGLE, LLC, Defendant.	Case No. 5:23-cv-03046 **COMPLAINT FOR PATENT INFRINGEMENT** **DEMAND FOR JURY TRIAL**

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Plaintiff Longitude Licensing Limited ("Plaintiff" or "Longitude") alleges patent infringement against Defendant Google, LLC ("Defendant" or "Google"):

INTRODUCTION

1. Longitude brings an action for patent infringement under the Patent Laws of the United States, 35 U.S.C. § 1 *et seq*. Longitude alleges that Google has infringed and continues to infringe seven patents: U.S. Patent Nos. 7,668,365 ("the '365 patent"), 8,355,574 ("the '574 patent"), 7,454,056 ("the '056 patent"), 7,428,082 ("the '082 patent"), 7,486,807 ("the '807 patent"), 7,945,109 ("the '109 patent"), and 8,482,638 ("the '638 patent") (collectively, the "Longitude Patents"). *See* Exs. 1-7.

2. The Longitude Patents are directed to foundational technologies for generating, processing, and enhancing digital images.

3. Google has infringed and continues to infringe the Longitude Patents by making, using, offering to sell, selling, and/or importing into the United States its Pixel smartphones, tablets, and accompanying software, and Google's photo-related applications, including Google Photos and Snapseed. Further, Google has induced and continues to induce third parties to make, use, offer to sell, sell, and/or import into the United States those products and applications.

4. Longitude seeks damages and other relief for Google's infringement of the Longitude Patents.

THE PARTIES

5. Plaintiff Longitude Licensing Limited is a private limited company registered in the Republic of Ireland, having a principal place of business at Plaza 255, Suite 2A, Blanchardstown Corporate Park 2, Dublin 15, D15 YH6H, Ireland.

6. Defendant Google, LLC, is a Delaware limited liability company having a principal place of business at 1600 Amphitheatre Parkway, Mountain View, CA 94043. Google maintains a substantial, permanent physical presence in the Northern District of California, including its global headquarters (1600 Amphitheatre Parkway, Mountain View, 94043). Google also maintains permanent offices in Redwood City, California (1600 Seaport Boulevard, 94063), San Bruno, California (901 Cherry Avenue, 94066), San Francisco, California (345 Spear Street,

94105), and Sunnyvale, California (803 11th Avenue, 94089), all of which are located in this District. Google is a subsidiary of Alphabet, Inc., and may be served through its registered agent for service of process at CSC—Lawyers Incorporating Service, 2710 Gateway Oaks Drive, Suite 150N, Sacramento, California, 95833.

JURISDICTION AND VENUE

7. Longitude brings this action for patent infringement under the Patent Laws of the United States, 35 U.S.C. § 1 *et seq*.

8. This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a).

9. This Court has personal jurisdiction over Google because Google has committed acts in the Northern District of California giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Google would not offend traditional notions of fair play and substantial justice.

10. Google regularly conducts business and/or solicits business in this District, including at and through its global headquarters and four additional permanent offices in this District. Google, directly and/or through subsidiaries (including distributors, customers, and end users), also has committed and continues to commit patent infringement in this District, including without limitation by making, using, offering to sell, selling, and/or importing into the United States the Accused Instrumentalities (defined *infra*) in this District, by purposefully directing activities at residents of this District, and by placing the Accused Instrumentalities into the stream of commerce with the knowledge and intent that they would be sold and used in California and in this District. These acts give rise to Longitude's claims.

11. Venue is proper in this District pursuant to 28 U.S.C. §§ 1391(b) and (c) and/or 1400(b). Google maintains multiple regular and established places of business in this District and has committed and continues to commit acts of patent infringement in this District.

DIVISIONAL ASSIGNMENT

12. This case is a district-wide case under General Order No. 44 (Assignment Plan). Venue is proper in any courthouse in this District.

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FACTUAL BACKGROUND

I. Longitude

13. Longitude is a privately owned intellectual property management company. Longitude manages and licenses the portfolio to which the Longitude Patents belong. That portfolio includes more than 1,000 active patents worldwide. Longitude is the exclusive worldwide licensee of the Longitude Patents with exclusive rights to sublicense, enforce, and obtain damages, including past damages, for infringement of the Longitude Patents.

14. Each of the Longitude Patents is valid and enforceable.

15. Google is not authorized to practice the Longitude Patents.

16. The claimed inventions of the Longitude Patents enable Google, its subsidiaries, and its customers to make, use, offer to sell, sell, and/or import smartphones, tablets, and similar devices that include camera hardware and software and related applications to provide improved digital image generating, processing, and enhancing technology and consumer-facing benefits. For example, the claimed inventions cover Google's "Real Tone," "Portrait Mode," and "Face Unblur" features.

II. The Inventors

17. The Longitude Patents describe and claim inventions developed by Seiko Epson Corporation ("Epson"). Epson is a Japanese electronics company, a pioneer in the development of digital imaging technologies, and a recognized innovator in the digital camera and printing spaces. The Longitude Patents cover digital image technologies that Epson developed.

III. Google

18. Google makes, uses, offers to sell, sells, and/or imports into the United States Pixel smartphones, tablets, and photo-related applications and software. On information and belief, Google's sales of Pixel smartphones in the United States generated approximately $3.3 billion in revenue in 2022. Google's Pixel smartphones and tablets infringe the Longitude Patents through specific camera and digital image processing features and applications, including Real Tone, Portrait Mode, Face Unblur, Google Photos, and the Snapseed application.

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19. Real Tone is a Pixel camera feature that Google introduced with its Pixel 6 smartphones. Real Tone is designed to automatically improve image quality and, in particular, improve the accuracy of how Pixel smartphones capture diverse skin tones in digital images. On information and belief, the same Real Tone functionality is also available through the "auto-enhancement" feature of the Google Photos app, which is included with Pixel smartphones and tablets, and can also be downloaded and used on any Android or iOS device to enhance images taken on non-Pixel devices. On information and belief, the Real Tone and auto-enhancement features function by detecting the subject of a digital image, like a human face, and then adjusting various properties of the subject's image data based on the characteristics of the subject to optimize color and lighting in any image, and in particular, to make digital images are more authentic and representative of the subject's skin tone.

20. Portrait Mode is a feature that Google first introduced with the launch of the Google Pixel 2 and Pixel 2 XL smartphones in October 2017.[1] On information and belief, Portrait Mode functions by detecting the subject of a digital image (a person in the portrait) and then sharpening the subject's contours and blurring the background to further enhance the subject in sharp detail. *Id.* In particular, on information and belief, when a user activates Portrait Mode on Google's Pixel smartphones and tablets, the depth sensors in the device measure the distance between the camera and various objects in the frame, creating a depth map that provides information about the scene's spatial dimensions.[2] On information and belief, this depth map allows Google's Pixel smartphones and tablets to differentiate between the subject and the background, understanding which areas should be in focus and which should be blurred. *Id.* On information and belief, Portrait Mode analyzes the subject's contours, identifies the areas that need to remain sharp and in focus, and blurs the background to create the desired shallow depth-

[1] https://ai.googleblog.com/2017/10/portrait-mode-on-pixel-2-and-pixel-2-xl.html.

[2] https://ai.googleblog.com/2019/12/improvements-to-portrait-mode-on-google.html; https://ai.googleblog.com/2022/01/accurate-alpha-matting-for-portrait.html; https://ai.googleblog.com/2020/12/portrait-light-enhancing-portrait.html.

of-field effect. Thus, on information and belief, Portrait Mode allows ordinary users to take professional-quality images.

21. Face Unblur is a feature that Google introduced with its Pixel 6 and 6 Pro smartphones that reduces or removes blur from faces in digital images. Face Unblur works by stitching together images captured using both the main and ultrawide-angle cameras. Specifically, the ultrawide-angle camera captures a darker but sharper image, and the main camera captures a brighter but blurrier image. Software running on the Pixel smartphone then automatically combines the two images to generate a composite image with a sharper, more in-focus face.

22. Google heavily promotes a face tagging feature in Google Photos that can be used to search on and organize photos of individual persons or pets. Google Photos is an application and service for "smart photo and video storage" that comes pre-installed on Google's Pixel smartphones and tablets. The app is available for devices running the Android or iOS operating systems, and Google offers its Google Photos service through a website for PC users (MacOS and Windows). Google describes Google Photos as "a smarter home for all your photos and videos, made for the way you take photos today." Google Photos passed one billion users in 2019 and presently stores more than four trillion photos.[3] Google describes face tagging as follows: "[t]o more easily search and manage your photos, you can apply a label to people or pets that appear in photos grouped by Google Photos."[4]

23. Google also promotes the ability to "[s]ave your personal looks and apply them to new photos later" in its Snapseed photo-editing application.[5] Google develops and markets its Snapseed app for Android and iOS. Google describes Snapseed as "a complete and professional photo editor." *Id.* On information and belief, Snapseed boasts 29 different tools and filters for editing both JPEG and RAW image files. *Id*. Google provides detailed instructions to Snapseed

[3] "Google Photos passes the 1 billion users mark," https://www.theverge.com/2019/7/24/20708328/google-photos-users-gallery-go-1-billion.

[4] https://support.google.com/photos/answer/6128838?co=GENIE.Platform%3DAndroid&hl=en#zippy=%2Clearn-about-face-models%2Cchange-or-remove-a-label%2Cremove-add-or-change-people-pet-labels-to-your-photos.

[5] https://play.google.com/store/apps/details?id=com.niksoftware.snapseed.

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users explaining how to create and save custom filters on its Snapseed support website.[6] The instructions explain that users can use "stacks," which store the filters that have been applied to edit an image, to use, modify, and apply "[f]ilters that have been previously applied to an image."[7]

IV. Google's Direct Infringement and Accused Instrumentalities

24. Google has directly infringed and continues to directly infringe, pursuant to 35 U.S.C. § 271(a), one or more claims of each of the Longitude Patents by making, using, offering to sell, selling, and/or importing into the United States at least:

- Google's Pixel smartphones, including at least the following models:
  - Pixel
  - Pixel XL
  - Pixel 2
  - Pixel 2 XL
  - Pixel 3
  - Pixel 3 XL
  - Pixel 3a
  - Pixel 3a XL
  - Pixel 4
  - Pixel 4 XL
  - Pixel 4a
  - Pixel 4a (5G)
  - Pixel 5
  - Pixel 5a
  - Pixel 6

[6] https://support.google.com/snapseed/answer/6155517?hl=en&ref_topic=6155507&sjid=10838383699742808373-NA.

[7] https://support.google.com/snapseed/answer/6155543?hl=en&ref_topic=6155507&sjid=10838383699742808373-NA.

- Pixel 6 Pro
- Pixel 6a
- Pixel 7
- Pixel 7 Pro
- Pixel 7a
- Pixel Fold

- Google's Pixel tablets, including at least the Pixel Slate and Pixel Tablet
- The Google Photos application and service, operating on compatible devices
- Google's Snapseed photo-editing application, operating on compatible devices

25. Longitude refers to these products, applications, and services that it accuses of infringing the Longitude Patents as the "Accused Instrumentalities."

26. On information and belief, Google—directly and/or through its subsidiaries, affiliates, or intermediaries—makes, uses, offers to sell, sells, and/or imports into the United States the Accused Instrumentalities.

27. Google's direct infringement has caused and will continue to cause injury and damage to Longitude.

V. Longitude Provided Actual Notice of Infringement to Google

28. Longitude provided actual notice, pursuant to 35 U.S.C. § 287(a), of the Longitude Patents.

29. Longitude provided to Google actual notice of Google's infringement of the '082, '807, and '109 patents on or around August 20, 2020, when Longitude's licensing representative sent a letter to Google explaining that specific Pixel smartphone models, applications, and services (Accused Instrumentalities here) infringed and continue to infringe specific claims of the '082, '807, and '109 patents and offering to engage in licensing negotiations.

30. Longitude provided to Google actual notice of Google's infringement of the '365, '574, '056, and '638 patents on or around June 7, 2023, when Longitude's licensing representative sent a letter to Google explaining that specific Pixel smartphone models, applications, and services (Accused Instrumentalities here) infringed and continue to infringe

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specific claims of the ’365, ’574, ’056, and ’638 patents and offering to engage in licensing negotiations.

31. Longitude’s actual notice provided Google enough time to have a meaningful opportunity to cease its infringement of, or negotiate a license to, the Longitude Patents. Longitude has offered to grant a license to the Longitude Patents to Google, and Google has refused Longitude’s offer. Since receiving actual notice of infringement of the Longitude Patents, Google has continued to make, use, offer to sell, sell within the United States, and/or import into the United States the Accused Instrumentalities.

VI. Google’s Indirect Infringement

32. Google has indirectly infringed and continues to indirectly infringe the Longitude Patents by inducing infringement by third parties under 35 U.S.C. § 271(b), including customers, resellers, and end users, in this District and elsewhere in the United States and the State of California.

33. Google has induced and continues to induce others’ direct infringement of the Longitude Patents by selling and/or providing Accused Instrumentalities to, for example, customers, retailers, and end users, who then directly infringe the Longitude Patents by using, offering to sell, and/or selling within the United States, and/or importing into the United States, the Accused Instrumentalities.

34. Google has induced and continues to induce others’ direct infringement of the Longitude Patents by selling and/or providing Pixel smartphones and tablets (the “Pixel Accused Instrumentalities”) to, for example, customers, retailers, and end users, who then directly infringe the Longitude Patents by using, offering to sell, and/or selling within the United States, and/or importing into the United States, those Pixel Accused Instrumentalities.

35. Google knew and specifically intended that its customers would offer to sell and sell and that its end users would use the Pixel Accused Instrumentalities in the United States, or deliberately avoided learning of the infringing circumstances so as to be willfully blind to the induced infringement. Google specifically intended that its customers offer to sell, sell, and/or use the Pixel Accused Instrumentalities in the United States, and/or import the Pixel Accused

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Instrumentalities into the United States. Google's direct and indirect customers and end users have directly infringed and continue to directly infringe the Longitude Patents by importing the Pixel Accused Instrumentalities into the United States, offering to sell and/or selling the Pixel Accused Instrumentalities in the United States, and/or using the Pixel Accused Instrumentalities in the United States.

36. Google has induced and continues to induce others' direct infringement of the Longitude Patents by selling and/or providing certain Accused Instrumentalities, including the Google Photos application and service and Google's Snapseed application (the "Application Accused Instrumentalities"), to end users, who then directly infringe the Longitude Patents by using within the United States those Application Accused Instrumentalities

37. Google knew and specifically intended that its end users would use the Application Accused Instrumentalities in the United States, or deliberately avoided learning of the infringing circumstances so as to be willfully blind to the induced infringement. Google specifically intended that its end users use the Application Accused Instrumentalities. Google's end users have directly infringed and continue to directly infringe the Longitude Patents by using the Application Accused Instrumentalities in the United States.

38. Google has induced others' direct infringement despite actual notice that the Accused Instrumentalities, including the Pixel Accused Instrumentalities and the Application Accused Instrumentalities, infringe the Longitude Patents. Google therefore has caused third parties to directly infringe the Longitude Patents with knowledge of those patents and specific intent that the third parties would directly infringe, or deliberately avoided learning of the infringing circumstances so as to be willfully blind to the induced infringement.

39. Google's indirect infringement has caused and will continue to cause injury and damage to Longitude.

THE LONGITUDE PATENTS

I. The '365 Patent

40. The '365 patent, titled "Determination of Main Object on Image and Improvement of Image Quality According to Main Object," issued on February 23, 2010, from a March 7, 2005

application, with Toshie Imai as the named inventor. The '365 patent claims priority to Japanese patent application 2004-063630, filed March 8, 2004.

Summary of the '365 Inventions

41. The '365 claims recite improvements in the computing field of processing digital image data to automatically improve the picture quality of the main object, or subject, characterizing an image. In particular, the '365 claims are directed to improvements to image processing devices and operations that automatically process digital image data corresponding to the subject of the image, for example, a human face, to more accurately display the subject's natural appearance. The '365 claimed inventions improve image processing devices and operations by determining the main object in an image, acquiring properties of the main object image data, acquiring correction conditions corresponding to the determined main object properties, and adjusting the picture quality of the main object image data using the acquired correction conditions.

42. Unlike prior systems that processed image data across the board, without taking into consideration subtle differences in the main object characterizing the digital image, the '365 claimed inventions identify, analyze, and process the image data corresponding to a main object characterizing the digital image. '365 patent at 1:30-38. The '365 claimed inventions analyze the *main object* image data to obtain statistical values describing its properties, acquire correction conditions corresponding to those properties, calculate correction levels based on those properties, and adjust the image quality of the main object using the acquired correction conditions and correction levels specific to the main object. *See, e.g.*, *id.* at 4:17-25.

43. The '365 claimed inventions improve upon prior image processing devices and operations that did not perform these operations and instead (1) used broad, generalized processes to identify the image data corresponding to the main object of the digital image without analyzing subtle variations, for example, in the color and position of the data representing different objects, and (2) adjusted image quality using the properties of the image data of the entire image across the board instead of using correction conditions corresponding to the properties of the main object. *See id.* at 1:20-40. Compared to those prior systems, the '365 claimed inventions process

image data to more accurately enhance the picture quality of the main object and thereby reproduce an attractive, natural visual appearance of the main object, without manual adjustment by the user.

Technical Problems Addressed by the '365 Inventions

44. The '365 patent addresses two technical problems relating to automatic image quality adjustment techniques. First, automatic image quality adjustment depends on accurately identifying the image's main object, or focus. *Id*. at 1:20-24. When the image processing device or technique misidentifies the main object, processing the image data based on that "main object" will produce poor image quality. *Id*. The '365 patent identifies an opportunity to improve automated image processing: "[i]t is therefore important to properly analyze the characteristics of the image data, such as determining what the main object characterizing the image is, in techniques for automatically adjusting picture quality of image data, and there is a need for a technique to accurately determine the main object." *Id*. at 1:24-29.

45. Second, existing techniques use generalized, across-the-board processes to determine the main object of an image that do not account for "subtle differences in the main object" of an image. *Id*. at 1:30-38; claim 32. Because existing techniques cannot account for these differences, "[i]t is therefore inherently impossible to carry out a picture quality adjusting process that takes advantage of the subtle characteristics of the main object," and edited images are no better than unedited images. *Id*. Thus, according to the '365 patent, a need existed "for a picture quality adjusting technique that is more responsive to variations in main objects." *Id*. at 1:39-40.

Technical Solutions and Benefits Provided by the '365 Inventions

46. The '365 patent claims specific solutions to these problems: new, improved image processing devices and techniques that (1) parse and analyze image data (e.g., pixel data) and use particular inputs (color information, position data and conditions) to identify the image's main object before editing; and (2) acquire main object image data properties, acquire correction conditions corresponding to those properties, and adjust image main object image data using the appropriate correction conditions. *See, e.g.*, *id.* at claim 1, claim 32. The claimed inventions

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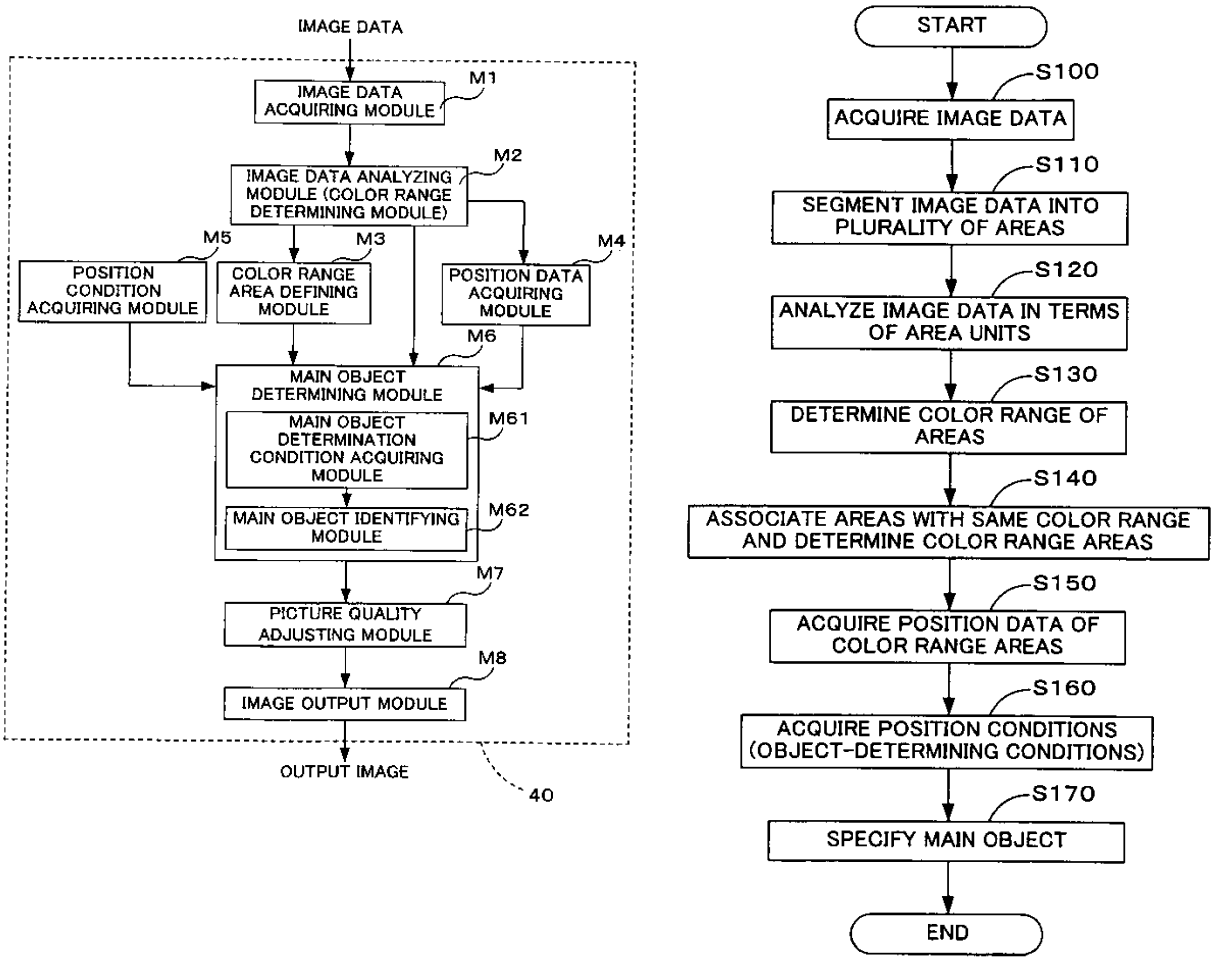
provide novel image processing devices and techniques that achieve improved image quality adjustments. The '365 patent describes and claims improved image processing devices and techniques that acquire, parse, analyze, and adjust/correct image data in improved ways, using particular data and steps to ensure improved accuracy and image quality.

47. The '365 patent describes and claims a first embodiment in which the improved image processing devices and techniques include specific modules to achieve more accurate main object determinations, before editing the image based on those determinations. *See id.* at 7:22-14:14. A module acquires image data (e.g., pixel data). Modules parse that data and segment it into pixel data groups, to determine the color range that the groups exhibit and position information. Finally, a main object determining module determines the main object corresponding to a color range area(s) using the color range information and position data and conditions. *See, e.g.*, *id.* at 7:22-8:5, 11:15-38, Fig. 3, Fig. 5. The claimed inventions systematically analyze image (pixel) data; determine color information; group like, adjacent pixels; use position data, "for example, to specify the boundaries between the color range areas to obtain position data on the color range areas"; use position conditions to determine whether the color range areas correspond to a certain object; and narrow main object candidates. *Id.* at 10:23-11:14. "It is thus possible to make more accurate determinations, that is, to reduce determination errors, compared to when the main object is determined using just color range data." *Id.* at 11:27-30. For example, if the device/technique used only color range information, it could misidentify color range areas in the middle of the image—for example, mistaking blue clothing for the sky. The inventions avoid this error "because the position conditions where the sky [is expected] to be located [e.g., the top of the image] are taken into consideration." *Id.*

48. The '365 patent describes and illustrates improved main object detection modules to perform the improved main object detection methods using these particular steps:



Id. at Figs. 3, 5.

49. The ’365 patent describes and claims a second embodiment in which the improved image processing devices and techniques achieve improved, higher-quality main object image data corrections. *See id.* at 14:38-15:38. The improved devices and techniques can, for example, (1) determine the main object image data corresponding to the main object characterizing the image, (2) analyze the main object image data to acquire properties of the main object image data, (3) acquire correction conditions corresponding to the acquired properties, (4) calculate the correction level based on those properties and associated correction conditions, and (4) adjust the quality of the main object image data using the acquired correction conditions. *See, e.g.*, *id.* at 3:54-61, 4:26-31. The inventions ensure that correction conditions are prepared for each type of main object, permitting more suitable adjusting of the picture quality according to the properties of the main object. The ’365 patent claims using properties and correction values to correct the

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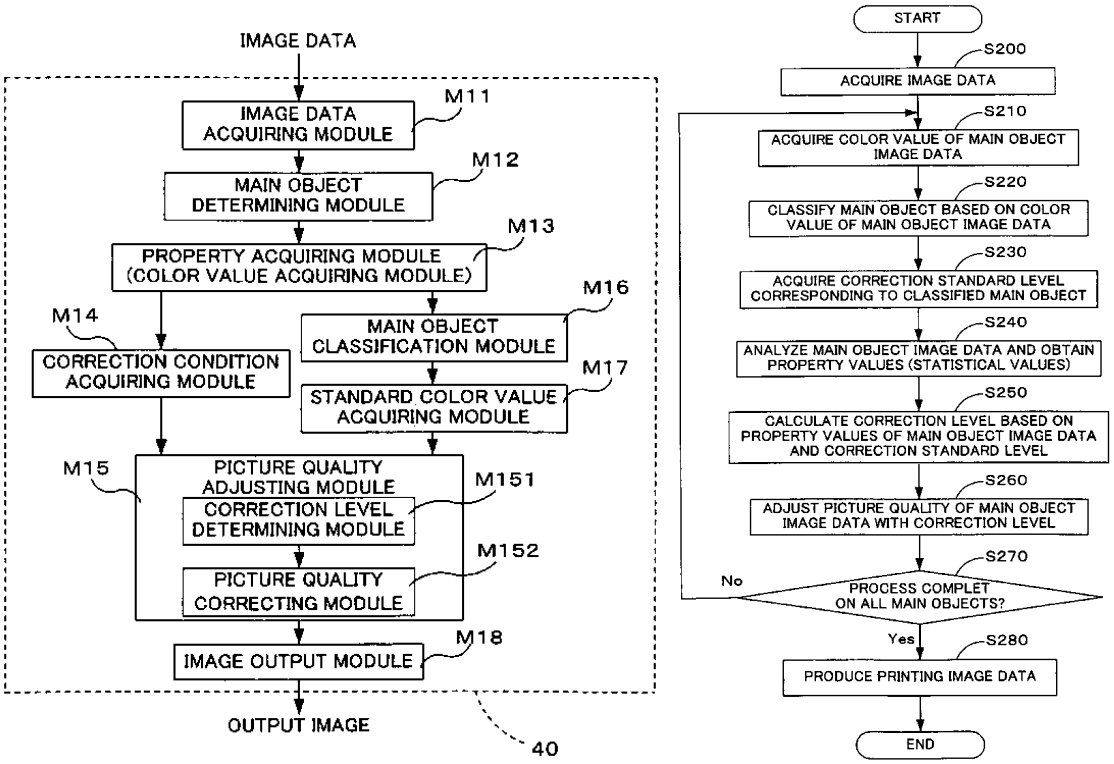
image. The improved devices and techniques use main object image data—for example, exposure/brightness/luminance data, tone information, or sharpness—to determine how to correct those same characteristics. *See, e.g.*, *id.* at 17:4-45.

50. The '365 patent describes and illustrates improved image processing modules to perform the improved processing methods using these particular steps:



Id. at Figs. 13, 14.

Claims Reciting the Technical Solutions of the '365 Inventions

51. Claim 5 of the '365 patent recites how to achieve the improvements described above by providing a new, improved digital image processing device and techniques that more accurately determine the main object characterizing a digital image. Claim 5 recites:

> 5. An image processing device that determines the main object which characterizes an image, the image processing device comprising:
>
> image data acquiring module that acquires image data which is data of the target image;

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image data analyzing module that segments the image data into a plurality of areas for analysis in terms of area units;

position data acquiring module that acquires position data of the areas of the image data; and

main object determining module that determines the main object using the acquired position data and the results of analysis;

wherein each of the modules of the image processing device is executed by an integrated circuit.

52. Claim 32 of the ’365 patent recites how to achieve the improvements described above by providing a new, improved digital image processing technique that achieves more accurate, higher-quality image correction by tailoring correction techniques to the main object image data. Claim 32 recites:

32. An image processing method comprising:

determining the main object image data corresponding to the main object characterizing the image:

acquiring the properties of the determined main object image data;

acquiring correction conditions corresponding to the properties that have been acquired; and

adjusting the picture quality of the main object image data using the acquired correction conditions;

wherein each of the operations of the image processing method is executed by an integrated circuit.

II. The ’574 Patent

53. The ’574 patent, titled “Determination of Main Object on Image and Improvement of Image Quality According to Main Object,” issued on January 15, 2013, from a November 10, 2009 application, with Toshie Imai as the named inventor. The ’574 patent is a continuation of the ’365 patent and claims priority to Japanese patent application 2004-063630, filed March 8, 2004.

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Summary of the '574 Inventions

54. The '574 claims recite improvements in the computing field of processing digital image data to automatically adjust and improve image quality. In particular, the '574 claims are directed to improvements to image processing devices and operations that process digital image data corresponding to the main object of the image, specifically, a human face, to more accurately display the main object's appearance. *See, e.g.,* '574 patent at claim 3. The '574 claimed inventions improve image processing operations by determining whether the image includes a human face, and if so, determining the main object in an image based on the object including the human face, acquiring properties of the main object, acquiring correction conditions corresponding to the determined main object, and adjusting at least one of following image qualities including highlight, shadow, brightness, contrast, color balance, or memory color image quality of the main object image data using the acquired correction conditions. *Id.*

55. Unlike prior systems that processed image data across the board, without taking into consideration subtle differences in main objects that include a human face, the '574 claimed inventions identify, analyze, and process the image data corresponding to a main object characterizing an image that includes a human face. *See id.* at 1:38-48. The '574 claimed inventions improve upon prior image processing devices that did not perform these operations and instead required manual user modification of the image data, or modified all of the data representing an image without modifying the main object image data to account for differences within the main object image data—for example, skin tone variations, e.g., "pale yellow flesh" versus "dark yellow flesh." *See id.* at 18:63-19:3. Compared to those prior systems, the '574 claimed inventions more accurately reproduce the visual appearance of the main object in a digital image, without manual adjustment by the user.

Technical Problems Addressed by the '574 Inventions

56. The '574 patent addresses two technical problems relating to automatic image quality adjustment techniques. First, automatic image quality adjustment depends on accurately identifying the image's main object, or focus. *Id.* at 1:28-37. When the image processing device or technique misidentifies the main object, editing the image based on that "main object" will

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produce poor image quality. *Id.* The ’574 patent identifies an opportunity to improve automated image processing: “[i]t is therefore important to properly analyze the characteristics of the image data, such as determining what the main object characterizing the image is, in techniques for automatically adjusting picture quality of image data, and there is a need for a technique to accurately determine the main object.” *Id.*

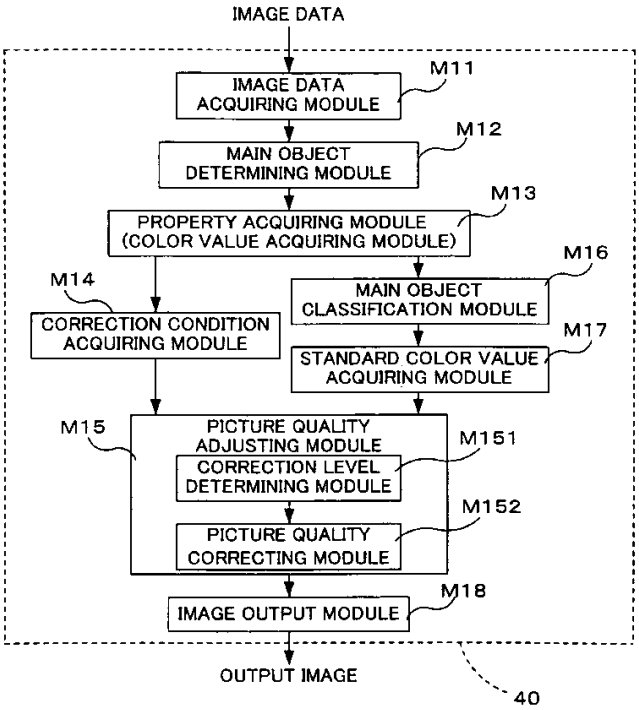
57. Second, existing techniques use generalized, across-the-board processes to determine the main object of an image that do not account for “subtle differences in the main object” of an image. *Id.* at 1:38-48. Because existing techniques cannot account for these differences, “[i]t is therefore inherently impossible to carry out a picture quality adjusting process that takes advantage of the subtle characteristics of the main object,” and edited images are no better than unedited images. *Id.* Thus, according to the ’574 patent, a need existed “for a picture quality adjusting technique that is more responsive to variations in main objects.” *Id.* at 1:46-47.

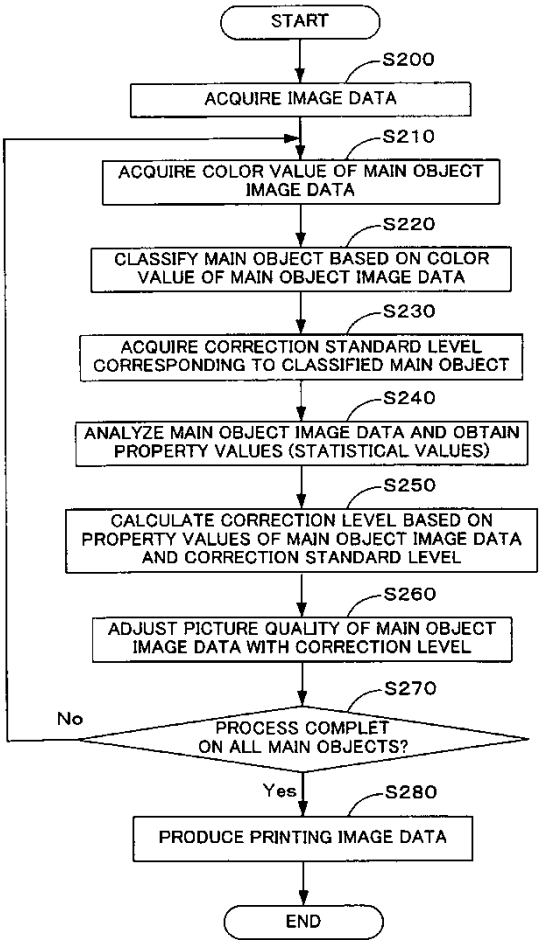
Technical Solutions and Benefits Provided by the ’574 Inventions

58. The ’574 patent addresses the foregoing problems by disclosing more accurate picture quality adjustment techniques that are more responsive to variations in main object types. The ’574 patent specifically claims improved image processing devices and methods to determine a main object in an image that includes at least a human face, and adjust the image quality of the main object using correction conditions that correspond to the properties of the main object by adjusting the highlight, shadow, brightness, contrast, color balance, or memory color of the main object. *See, e.g.*, *id.* at claims 3, 7.

59. Regarding image quality adjustment, the ’574 patent claims image quality adjustment methods and modules that improve automatic adjustment of the image quality of main objects that include a human face using specific operations to (1) determine a main object including a human face in an image, (2) analyze the main object image data to determine its properties, (3) determine correction conditions corresponding to the properties of the main object, and (4) adjust the picture quality of the main object image data using the correction conditions. *See id.* at 14:16-18:8.

60. The claimed inventions make modifications to main object image data that includes a human face more accurate by ensuring that correction conditions used to modify this data correspond to the properties of specific, detailed main objects that include human faces (e.g., variations within skin tone categories such as pale versus dark yellow skin), thus "permitting more suitable adjusting of the picture quality according to the properties of the main object." *Id.* at 14:58-67; 18:63-19:3. The '574 patent describes and illustrates the functional modules, procedures, and algorithms to achieve improved image quality adjustments based on the unique characteristics of the main object, as illustrated in the following block diagram (illustrating an embodiment of the invention's functional modules) and flow chart (illustrating an embodiment of the invention's process routine) to improve adjustments to the image quality of the main object:





Id. at Figs. 13, 14.

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61. The ’574 patent specifies that the main object image quality adjustment process is carried out “on picture quality parameters such as shadow, highlight, brightness, contrast, color balance, and memory color correction . . . using a tone curve (S curve) correlating the input and output levels of the RGB components” of the image data. *Id.* at 16:46-53. These parameters of the main object image data are adjusted to correspond to the correction conditions associated with the specific main object. *Id.* at 16:58-17:5.

Claims Reciting the Technical Solutions of the ’574 Inventions

62. Claim 3 of the ’574 patent recites how to achieve the improvements described above by providing a new, improved image processing operation for determining main objects that include a human face and adjusting the image quality of the main object using correction conditions corresponding to the highlight, shadow, brightness, contrast, color balance, or memory color of a human face by tailoring correction techniques to the main object image data (human face). The claimed invention adjusts the image quality using correction conditions specific to different skin tones. Claim 3 recites:

> 3. A method of image processing, the method comprising:
> determining a main object in an image generated by an image generating apparatus, wherein the main object includes at least a human face, and wherein the determining of the main object is implemented by determining whether the image includes the human face; and
> adjusting image quality of the main object using correction conditions corresponding to properties of the determined main object, wherein a parameter used in adjusting the image quality is a highlight, a shadow, brightness, contrast, color balance, or memory color, and
> wherein each operation of the method of image processing is executed by one of a personal computer, a printer, or a display device.

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63. Claim 4 of the ’574 patent depends from claim 3 and recites an additional aspect of the image adjustment process incorporating further unique characteristics of the main object that affect picture quality adjustment by applying different correction conditions for images where the main object is a nighttime scene that includes a human face, and where the main object is a human face. *Id*. at Claim 4.

64. Claim 7 of the ’574 patent recites how to achieve the improvements described above by providing a new, improved image processing device that improves the determination of main objects that include a human face and adjusts the image quality of the main object using correction conditions corresponding to the highlight, shadow, brightness, contrast, color balance, or memory color of a human face by tailoring correction techniques to the main object image data (human face). The claimed invention adjusts the image quality using correction conditions specific to the properties of the determined main object. Claim 7 recites:

> 7. An image processing apparatus comprising:
>
> one or more processors;
>
> memory;
>
> a determining module configured to determine a main object in an image generated by an image generating apparatus, wherein the main object includes at least a human face, and wherein the determining module determines whether the image includes the human face; and
>
> an image quality adjuster configured to adjust image quality of the main object using correction conditions corresponding to properties of the determined main object, wherein a parameter used by the image quality adjuster to adjust image quality is a highlight, a shadow, brightness, contrast, color balance, or memory color, and
>
> wherein the image processing apparatus is either a personal computer or a printer or a display device.

65. Claim 8 of the ’574 patent depends from claim 7 and recites an additional aspect of the image processing apparatus incorporating further unique characteristics of the main object that affect picture quality adjustment by applying different correction conditions for images when the main object is a nighttime scene that includes a human face, and when the main object is a human face. *Id*. at Claim 8.

III. The ’056 Patent

66. The ’056 patent, titled “Color Correction Device, Color Correction Method, and Color Correction Program,” issued on November 18, 2008, from a March 29, 2005 application, with Ikuo Hayaishi as the named inventor. The ’056 patent claims priority to Japanese patent application 2004-097537, filed March 30, 2004.

Summary of the ’056 Inventions

67. The ’056 claims recite improvements in the computing field of processing digital image data to capture desired, more accurate visual characteristics. ’056 patent at 1:8-10. In particular, the ’056 claims are directed to improvements to image processing devices and operations that modify digital image data by automatically adjusting the color data to correct for the type of light source used during imaging and more closely capture the subject’s natural color. *Id.* at 1:8-41. The ’056 claimed inventions improve these devices and operations by introducing a new image processing device and operation that “execute[s] color balance correction according to the subject” and “improve[s] the appearance of the subject in an image,” including determining a subject area in the digital image data in which a subject appears based on analyzing the pixel values of the digital image data in a target area and the position of the target area in the image, further processing the data corresponding to the subject area to calculate a characteristic of that data (for example, hue or color), and modifying that data using the calculated characteristic value and a reference value to perform color balance correction on only the subject image data. *Id.* at 1:37-41, 1:61-2:3.

68. The ’056 claimed inventions improve upon prior computing systems and operations that did not identify, analyze, and modify the data corresponding to the subject of a digital image, and instead considered and modified all data in an image. *Id.* at 1:15-33. Compared

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to those prior systems and operations, the ’056 claimed inventions more accurately reproduce the color tone of the subject in a digital image and reduce the likelihood of modifying the subject image data in a way that deviates from the subject’s natural appearance. *Id.* at 1:67-2:3 (“Therefore, it is possible correct the color balance according to the specific subject characteristic and to improve the appearance of the subject in the image.”).

Technical Problems Addressed by the ’056 Inventions

69. The ’056 patent addresses a technical problem. The ’056 patent describes known systems and operations for processing digital images and videos to correct color balance. The ’056 patent describes known color balance correction techniques “for which the basic idea is to correct *each* color component so that the average color of the overall image becomes colorless (white or gray).” *Id.* at 1:15-19 (emphasis added). But known systems and techniques did not provide efficient or accurate ways to specifically correct the image’s *subject’s* real color tone (e.g., “flesh color”). Instead, known systems and techniques correct color across the *entire* image. *Id.* The ’056 patent explains that this technique of correcting by aggregating each color component of an image leads to “undesirable change to the color tone of a specific subject” within an image or a video. *Id.* at 1:25-33. For example, the “aforementioned color balance correction performed on a portrait (human subject image) for which the overall background is a blue-tinged white, suppresses blue tints and emphasizes the red tints for the overall image, so the flesh color of the human subject which is the main subject becomes red-tinged, significantly distancing it from the desired color.” *Id.* Thus, the ’056 patent identifies a need for new, improved image processing devices and operations that achieve improved color balance correction according to the image’s subject, for example, a person, and processes the subject’s image data in a way that achieves an accurate, “natural” color tone. *Id.* at 1:8-41.

Technical Solutions and Benefits Provided by the ’056 Inventions

70. The ’056 patent claims specific technical solutions to this problem: new, improved image processing devices and operations that correct color balance based on the specific subject characteristics of the image data representing the image’s subject and a characteristic target value representing the target color tone of the subject, without correcting each color component of an

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image. *Id.* at 1:37-41. The improved processing devices and operations thus "improve the appearance of the subject" and avoid undesirably altering the color of the subject's image data away from its natural color.

71. The '056 patent describes and claims novel structures and ordered steps to improve image processing devices and operations that correct color balance.

Fig.2

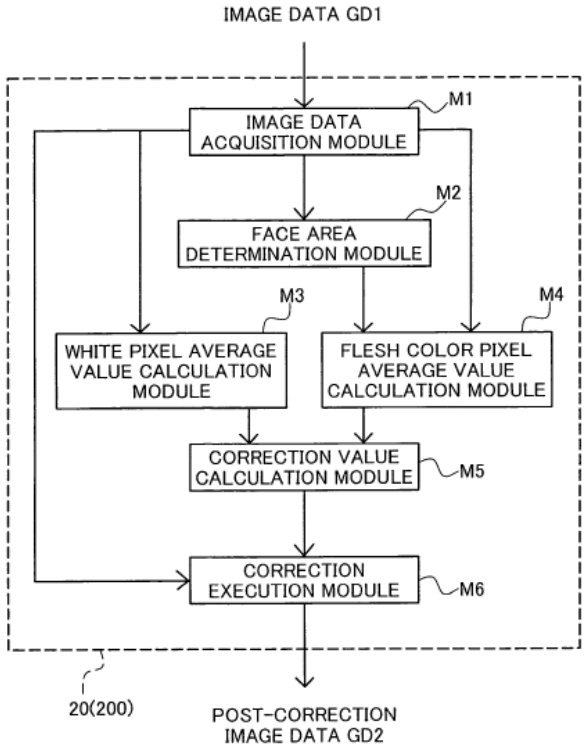
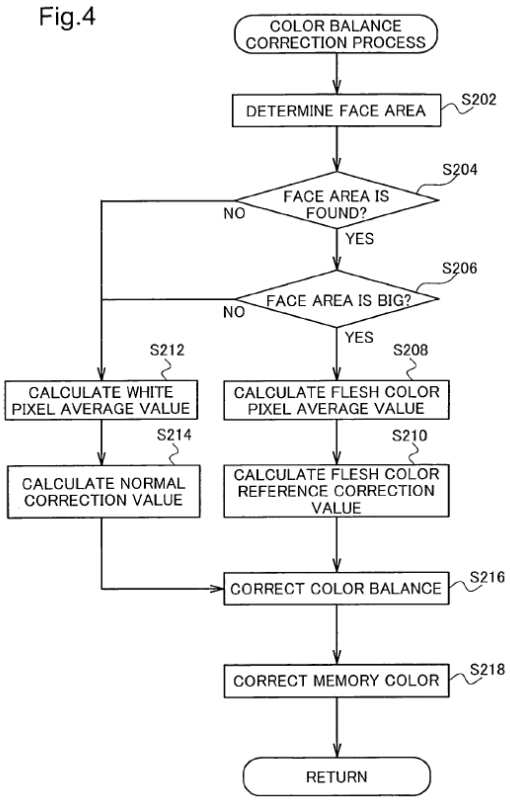


Fig.4



The '056 claims recite particular modules and operations to achieve the improved color balance. According to the '056 inventions, the new, improved "color balance correction process . . . first determines the specific subject area processing for determining an image area containing the specific subject on the image." *Id.* at 6:38-45, Fig. 4. The improved systems and operations use, for example, pixel data and position information to identify the subject area. *Id.* at 3:24-34, 16:32-56. And the specific subject area could include, for example, a person's face. *Id.* at 5:24-38, 6:4-9, 6:43-45, Figs. 2, 4. Next, the improved systems and operations calculate a characteristic value of the subject image data. For example, the system "analyzes the image data corresponding to the face [i.e., subject] area . . . and calculates the flesh color pixel average value." *Id.* at 8:4-7. The

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calculated characteristic value—or "statistical pixel value"—may represent, for example, hue or color. *Id.* at 2:29-41. Then the improved systems and operations use the calculated characteristic value and a preset "target" value for that characteristic to calculate a correction value for the subject image data. "By calculating a correction value for color balance correction for eliminating or reducing the difference between the statistical value of pixel values of the pixel data belonging to the specific color range and the pixel target value, it is possible to correct the overall color balance so that the specific color of the subject approaches a desirable color." *Id.* at 2:50-56. The improved image processing systems and operations achieve color balance correction tailored to the image's subject, thus enhancing the subject's appearance in the image. *See id.* 1:40-51.

72. The claimed inventions provide specific improvements over prior systems and operations, creating new, improved color balance correction image processing devices and operations that identify the image's subject and achieves improved, more accurate color balance correction of only that image data. By correcting based on the image's subject instead of the aggregation of each color component of the entire image like prior systems, the '056 inventions improve the appearance of image subjects without the image data that is not the subject negatively affecting the quality adjustment of the subject.

73. In addition, the '056 patent describes and claims additional improvements to its novel color balance correction operations, including "weighting" pixel values towards the center of the subject area, *see, e.g.*, *id.* at 2:4-13, 14:44-15:3; accounting for multiple subject areas, *see, e.g.*, *id.* at 2:14-28, 15:46-16:7; or calculating and accounting for an area ratio of the subject area to the whole image, *see, e.g.*, *id.* at 2:66-3:10, 16:8-31.

Claims Reciting the Technical Solutions of the '056 Inventions

74. Claim 10 of the '056 patent recites how to achieve the improvements described above by providing a new image data processing device and operation that includes analyzing digital image data to determine an area in the digital image data in which a subject appears, further processing the data corresponding to the subject area to calculate a characteristic of that data, and modifying the data corresponding to the subject area using the calculated characteristic

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value and a reference value to perform color balance correction on the image data. Claim 10 recites:

> 10. An image processing device for executing color balance correction on image data of a photographed image, said image processing device comprising:
> an image data acquisition module that acquires said image data;
> a specific subject area determination module that determines a specific subject area in said photographed image, wherein said specific subject area contains a specific subject in said photographed image, and wherein said specific subject area determination module determines said specific subject area using pixel values of pixel data included in a target area for determination, and a position of said target area in said photographed image;
> a specific subject characteristic value calculation module that calculates a specific subject characteristic value, wherein said specific subject characteristic value represents a characteristic of image data corresponding to said determined specific subject area;
> a correction value calculation module that calculates a correction value for color balance correction using said calculated specific subject characteristic value and a preset characteristic target value; and
> a correction execution module that executes said color balance correction on said image data using said calculated correction value.

IV. The ’082 Patent

75. The ’082 patent, titled “Update Control of Image Processing Control Data,” issued on September 23, 2008, from a May 2, 2003 application, with Yasumasa Nakajima as the named

inventor. The ’082 patent claims priority to Japanese patent application 2002-131207, filed May 7, 2002.

Summary of the ’082 Inventions

76. The ’082 claims recite improvements in the computing field of generating digital image data and processing that digital image data to achieve desired visual characteristics. In particular, the ’082 claimed inventions improve the way that image generators (1) generate and store digital image-related data that includes image data and image processing control data (for example, a set of parameters used to control an image processing mode, e.g., “sunset” (’082 patent at 8:66-9:2, Fig. 7), and specification data identifying the image processing mode and control data (*id*. at 5:58-65, 6:28-30)); and (2) update the control data in the system, for example, to implement new image processing modes that modify the image data in different ways. *Id*. at 1:44-2:9.

77. The ’082 claimed inventions improve upon the way that prior image generators operate and handle the control data in the system. Specifically, instead of attaching the control data to the image as in prior image generators (*id*. at 1:24-30), the improved image generator includes a control data storage module that stores image processing control data, including specification data and control data, separate from the image data. The ’082 claimed inventions improve upon prior image generators, enabling relating the image data to detached control data and updating the control data with new data corresponding to selected specification data. Compared to those prior systems, the ’082 claimed inventions reduce the resources required to perform digital image data processing to achieve the user’s desired visual characteristics, and increase the functionality of image generators by providing new or improved image processing modes.

Technical Problems Addressed by the ’082 Inventions

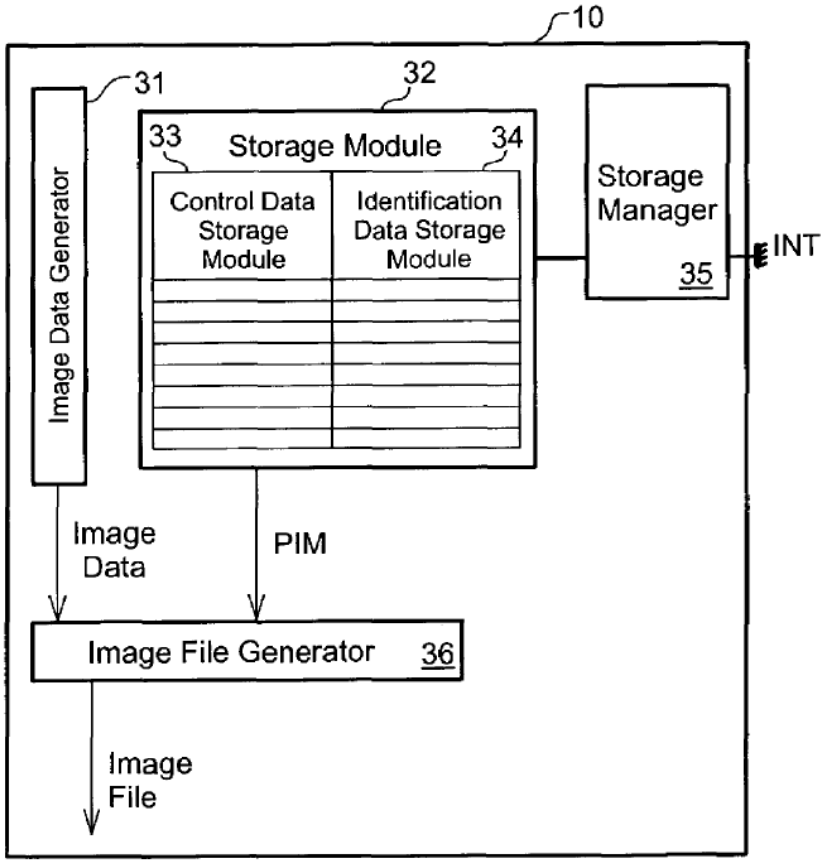
78. The ’082 patent addresses the technical problem of updating control data used by an image generator to process image data. The ’082 patent describes various “image generators,” including “digital still cameras, digital video cameras, and scanners.” *Id*. at 1:12-14. The ’082 patent also describes a known technique intended to “make image processing easier”: “to attach

image processing control data to image data when the image data is generated, thereby controlling image processing based on the image processing control data." *Id*. at 1:27-30. But known systems and techniques did not provide efficient ways to *update* that control data. Users would have to manually "check whether the image processing control data should be updated" and "acquire the correct update data for the image processing control data." *Id*. at 31-35. Thus, the '082 patent identifies a need for new, improved systems and techniques for updating control data used by an image generator.

Technical Solutions and Benefits Provided by the '082 Inventions

79. The '082 patent claims specific technical solutions to this problem: new, improved image generators and techniques that update image processing control data (filters, e.g.) and relate control data to image data (digital photos, e.g.) through a new control data structure stored separately from the image data. The inventions update control data in a control data storage module, for example, to implement new image processing modes that modify the image data in different ways. The novel data structure and techniques improve on prior image generators through a particular, novel claimed structure that adds a relating module, which relates image data and control data, and a storage manager, which updates control data by using specification data in the control data to specify the control data to be updated. These novel, claimed structures improve image generators by separating the control data from the captured image data, which allows for relating control data to multiple sets of image data and facilitates updating of control data.

80. Figure 3 illustrates the novel structure of the image-related-data generator (the digital camera, e.g.):



81. According to the '082 inventions, the "control data storage module 33" stores the image processing control data, which the patent calls "PIMs." *Id*. at 7:27. Because PIMs are "pre-stored in the DSC," *id*. at 5:64, the image generating system need not attach the control data to the image data (unlike prior systems). Instead, the "image file generator" acts as a relating module, relating image data and control data. *Id*. at 7:29-32.

82. More specifically, the illustrated "storage manager" "manages the PIMs stored in the control data storage module 33 by storing update data." *Id*. at 7:34-35. The storage manager is responsible for retrieving update data when requested. *Id*. at 7:37-39. The storage manager therefore improves upon how a conventional image generator operates and handles image data and control data by updating specific control data in the control data storage module based on specification data that references that control data. The claimed modules provide specific improvements over prior image generators by creating a novel image-related-data generator having a unique structure including a control data storage module, a relating module, and a

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storage manager that improves the manner by which image generators store and retrieve image data and control data.

Claims Reciting the Technical Solutions of the '082 Inventions

83. Claim 1 of the '082 patent recites how to achieve the improvements described above by providing a new, unconventional storage structure that separates the image processing control data from the image data, distributes control data updates to a storage module, and relates the image data to the image processing control data in a separate image file generator or "relating module." Claim 1 recites:

> 1. An image related data generator, connectable to a server, comprising:
> an image data generator configured to generate image data;
> a control data storage module pre-storing image processing control data to control image processing of the image data;
> a relating module configured to relate the image data to the image processing control data; and
> a storage manager configured to update at least a part of the image processing control data stored in the control data storage, based on specification data, which specifies the image processing control data to be updated,
> wherein the image processing control data is to be used in processing of the image data by an image processing device that receives the image data and the image processing control data that are transferred from the image related data generator.

V. The '807 Patent

84. The '807 patent, titled "Image Retrieving Device, Method for Adding Keywords in Image Retrieving Device, and Computer Program Therefor," issued on February 3, 2009, from a January 23, 2004 application, with Toshinori Nagahashi as the named inventor. The '807 patent claims priority to Japanese patent application 2003-020805, filed January 29, 2003.

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Summary of the '807 Inventions

85. The '807 claims recite improvements in the computing field of classifying and retrieving digital image files to facilitate adding and retrieving images using keywords. In particular, the '807 claims improve the way that image retrieving devices associate and store manipulable keyword data characterizing digital image files. The '807 claimed inventions improve the way that prior image retrieving devices operate and handle keywords. Specifically, the inventive image retrieving device stores data representing objects in digital images with associated keywords in a database, detects data representing objects in new, incoming image data, proposes keywords for the new, incoming image data to the user based on the detected data representing objects in the incoming image data, and updates the keyword metadata for stored images based on the user's response. The '807 claimed inventions' implementation of the improved data structure—particularly the way in which the inventions detect objects in new, incoming image data and propose associated keywords based on the detection and the user update operations—improve the '807 computing systems compared to other approaches. The '807 claimed inventions improve upon, for example, prior computing systems that did not perform these operations and instead required users to provide their own keywords to associate with, or describe, digital image data, which could result in inconsistent keywords being associated with images containing the same objects.

Technical Problems Addressed by the '807 Inventions

86. The '807 patent addresses several technical problems known in the field of classifying and retrieving digital image files with characterizing data. The '807 patent describes five known devices and techniques for manipulating characterization-based metadata in a database for storing digital images, but notes the limitations of each of these prior art systems. *Id.* at 3:1-48. The '807 patent identifies a need for new, improved devices and techniques for computing systems that associate and store manipulable keyword metadata with digital image files.

Technical Solutions and Benefits Provided by the '807 Inventions

87. The '807 patent claims a technical solution to these problems: a new, improved database system and related techniques for associating and storing manipulable keyword metadata with digital image files. The improved device stores, in a database, digital images and associated keywords describing objects in the images, detects objects (such as people) in the image when the image is classified, and efficiently proposes keywords for a newly inputted image by detecting and matching an object in the newly inputted image with an object in the database. *Id*. at 3:51-4:4.

88. According to the '807 patent, "images which are supposed to be classified and detected are saved in [a] database together with the[ir] keywords by the image storing section." *Id*. at 4:5-7. The system can acknowledge "a new predetermined object which is inputted" as part of a new image, for example, a human or an automobile. *Id*. at 4:7-10. Upon detection of a predetermined object, "the keywords which relate to the object are proposed to the user" by the system. *Id*. at 4:10-14. The user can confirm, add, or correct the keywords proposed by the improved system. *Id*. at 4:13-16.

89. The '807 inventions further improve prior computing systems for associating and storing manipulable keyword metadata with digital image files by applying particular rules for prioritizing the keywords that the system proposes to the user. In one embodiment, for instance, if a user adds an image containing a human face to the system and the system does not find a matching face in the database, the system recognizes a substantial likelihood that the face in the image is the same as that in the last-entered image. Applying predefined rules, the system retrieves from the database and proposes the last keyword metadata that was input to the system. *Id*. at 5:14-19. The '807 patent describes a particular embodiment of the improved computing system, emphasizing the novel arrangement of individual components that comprise the system.

90. After receiving and reading an image, the system's human detecting condition inputting section "sets up a condition for determining whether or not a human is contained in an image." *Id*. at 8:15-17. For example, the system detects a human face either by detecting a face image or face color. *Id*. at 8:17-20. The face image detecting section "detects . . . whether or not a face image is contained in the image by analyzing the image." *Id*. at 8:23-25. The '807 patent

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describes particular rules for carrying out the face detection, including through frequency analysis or matching with pre-stored patterns. *Id*. at 8:25-31.

91. If the system detects a face, it applies further rules to "check whether or not a similar face image to the detected face image is contained" in the database; for instance, the system may match images using image density information. *Id*. at 8:60-67. If the system detects a similar face in a stored image, the system retrieves associated keyword metadata from the database to present to the user for confirmation or modification. *Id*. at 9:2-6. The '807 patent discloses specific priority rules for proposing keywords. In one embodiment, recognizing that "images for the same human tend to be input continuously for a case in which family photographs are taken," the system can retrieve and propose keywords associated with the previously input image. *Id*. at 9:14-29. When prompted with specific proposed keywords retrieved from the database, the user can select or correct an existing keyword or add a new one associated with the input image. *Id*. at 12:5-10.

92. The '807 patent therefore recites a new, improved computing system and related techniques to associate and store manipulable keyword metadata with digital image files. In particular, the novel structure of the image input and retrieval system provides a specific, technical solution to recognized shortcomings in prior computing systems that required users to provide their own keywords to associate with digital image data. The system improves on these prior computing systems through a particular arrangement of components that detect objects in images when they are first input to the system, retrieve and propose associated keywords from a database based on similarities with stored objects, and update and correct the keywords according to user input as more images containing the same objects are input to the system.

Claims Reciting the Technical Solutions of the '807 Inventions

93. Claim 1 of the '807 patent recites how to achieve the improvements described above by providing a new data processing system and operation that includes an image storing section that stores data representing objects in digital images with associated keywords in a database, a detecting section that detects objects in newly input images, an object acknowledging section that matches the detected object with an object in the database, a keyword proposing

section that proposes a keyword from the database that relates to the detected object, and an object information inputting section that allows a user to update the proposed keyword. Claim 1 recites:

> 1. An image retrieving device for classifying and retrieving an image by detecting an object in the image and adding a keyword, the image retrieving device comprising:
> an image storing section for storing the image which is supposed to be classified and retrieved together with a keyword in a database and an object of the image being previously contained in the database;
> an image inputting detecting section that detects an inputted image that is newly inputted to the image retrieving device;
> an object acknowledging section for acknowledging an inputted object in the inputted image that has been detected by the image inputting detecting section;
> a keyword proposing section for proposing the keyword on a display, the keyword which relates to the inputted object which is acknowledged by the object acknowledging section; and
> an object information inputting section for confirming by the user, adding, and correcting the keyword which is proposed by the keyword proposing section when the inputted object acknowledged by the object acknowledging section is similar to the object of the image previously contained in the database.

VI. The ’109 Patent

94. The ’109 patent, titled “Image Processing Based On Object Information,” issued on May 17, 2011, from a June 16, 2009 application, with Yoshihiro Nakami as the named inventor. The ’109 patent claims priority to Japanese patent application 2001-275153, filed September 11, 2001.

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Summary of the '109 Inventions

95. The '109 claims recite improvements in the computing field of processing digital image data to display desired visual characteristics. In particular, the '109 claims are directed to improvements to image processing devices and operations that modify digital image data based on its subject, for example, a person, and according to the scene that the image captured. The '109 claims improve these image processing devices and operations by introducing a new image data processing system and operation that specifically includes acquiring an image file and image data and particular information about that image file, including shooting scene information and location information of a person in the image file, using that information to more accurately identify the image's subject and how to best edit the image, and, when the shooting scene information indicates a portrait scene, sharpening the portions of the image in which the person appears and softening the remaining portions of the image.

96. The '109 claimed inventions improve prior image data processing systems and operations by using a specific data structure that associates the image data with shooting scene information to determine that the image is a portrait scene and location information to identify the location of a person in the image. The '109 claimed inventions improve upon, for example, prior image data processing systems and operations that did not use specific data to determine the subject of the image (e.g., a person) or its location in the image and instead assumed that the image's subject appeared in the center of the image. Compared to those prior systems, the '109 claimed inventions produce higher-quality, more focused images that emphasize the people they capture.

Technical Problems Addressed by the '109 Inventions

97. The '109 patent addresses a technical problem. The '109 patent describes known image data processing (i.e., photo editing) devices and techniques and, importantly, their limitations. The '109 patent explains that an image's emphasis region—its focus—"contains the major object of the image." *Id*. at 1:23-25. But rather than analyze images to accurately identify the emphasis region, known image processing devices and techniques simply use the image's central region as a proxy. *Id*. at 1:25-26.

98. But the image's "major object" may not appear in its central region, and thus, prior devices and operations could not process the image as intended. *Id*. at 1:27-36. Thus, the '109 patent identifies a need for new, improved image data processing systems and operations that more accurately identify the image's emphasis region—its subject, for example, a person—and process the image based on that determination.

Technical Solutions and Benefits Provided by the '109 Inventions

99. The '109 patent claims specific technical solutions to this problem: new, improved image data processing systems and operations that use a particular image data structure including image data, shooting scene information, and location information of a person in the image to process the image and, when the shooting scene information indicates a portrait, emphasize its subject by sharpening the area containing the person and decreasing sharpness (blurring) the background. The '109 inventions "improve the accuracy of image processing by setting and using an appropriate emphasis region [e.g., the area in which a person is located] for every image data." *Id*. at 1:40-43; *see also id*. at 1:44-62.

100. First, the '109 claims recite acquiring particular data including image data, shooting scene information, and location information of a person in the image data. *See, e.g.*, *id*. at 14:63-16:13. The image file may include shooting scene information, for example, "a normal mode that indicates a normal shot scene; a portrait mode that is appropriate for shots that include primarily person(s); and a macro mode that is effective for close-up shooting." *Id*. at 8:15-28. The image file may also include location, or focus location, information. "The focus location information indicates the location to which the focus is on within a shooting frame at the time of shooting," and the image file stores the information in the file's control information storage region. *Id*. at 8:30-53. Acquiring particular image data (for example, information indicating portrait mode, or location information) facilitates new, more accurate editing, for example, sharpness adjustments in portrait mode.

101. Second, the '109 patent claims particular steps to achieve improved image processing using the image file data and information. The '109 patent specifically describes using the image file information—for example, shooting scene information—to adjust the image. "As

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described previously, the image processing control information CI may be a piece of information that is comprised of plural parameter groups each corresponding to a shooting mode at the time of shooting. With this structure, it is possible to achieve the image adjustment processing in a way suitable for the shooting mode." *Id*. at 10:19-25. Figures 7 and 8 show the '109 patent's new, improved image processing operation using control information, such as location information and shooting scene information (e.g., indicating a portrait mode), to adjust image data:

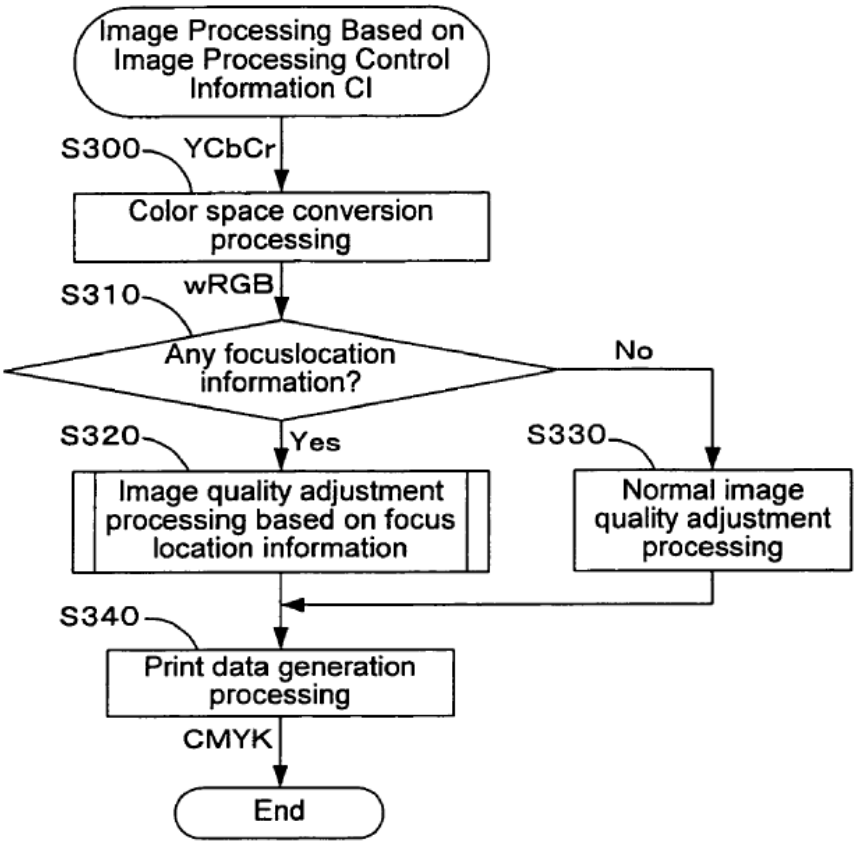

Fig.8

102. The '109 patent discloses that "[a]lthough an image quality adjustment using focus location information is described with respect to a brightness value adjustment in the above embodiments, it is also possible to use the focus location information for other types of adjustments such as, for example, a sharpness adjustment," as claimed. *Id*. at 13:1-7, 14:63-15:5. "In such a case, it is possible to strengthen the sharpness of an image at a focus location or in an emphasis region, or weaken the sharpness of an image in the other regions by using a Gaussian distribution method, so as to blur away the backgrounds of the image in a suitable way." *Id*. at

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13:7-12. The '109 patent notes that the new, improved "processing is particularly effective when a portrait mode is selected as the photo mode." *Id*. at 13:12-13.

Claims Reciting the Technical Solutions of the '109 Inventions

103. Claim 1 of the '109 patent recites how to achieve the improvements described above by providing a new image data processing system and operation that includes acquiring particular information about an image file—shooting scene information and location information of a person in the image file—using that information to more accurately identify the image's subject and edit the image, and sharpening the portions of the image in which the person appears and softening the remaining portions of the image. The '109 patent claims new, improved image processing systems and techniques, in particular, a novel technique for using particular image information to adjust sharpness for portrait-mode images. Claim 1 recites:

> 1. An image processing apparatus comprising:
> a CPU, the CPU executing functions including
> acquiring an image file, the image file including image data,
> shooting scene information, and location information of a person in
> the image data, and
> increasing sharpness of an area in which the person is located and
> decreasing sharpness of an area in which the person is not located
> based on the acquired location information when the acquired
> shooting scene information indicates a portrait scene.

VII. The '638 Patent

104. The '638 patent, titled "Digital Camera Generating Composite Image from Main Image and Sub-Image, and Method for Manufacturing Same," issued on July 9, 2013, from a December 22, 2010 application with Ryuichi Shiohara as the named inventor. The '638 patent claims priority to Japanese patent application 2009-295202, filed December 22, 2010.

Summary of the '638 Inventions

105. The '638 claims recite improvements in the computing field of generating and displaying digital images. In particular, the '638 claims are directed to improvements to

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generating and displaying images in digital cameras with multiple lenses. The ’638 claimed inventions improve these digital cameras by providing an innovative digital camera that is capable of generating a composite image by superimposing an image from a main lens and an image from a sub-lens using a level of magnification set to substantially match a size of a main image from the main lens and a size of a sub-image from the sub-lens based on the focal lengths of the main lens and sub-lens. The ’638 claimed inventions improve upon prior digital camera computing systems that required a user to manually rotate an imaging lens to focus the image. Compared to those prior systems, the ’638 claimed inventions produce focused digital images more reliably using uncomplicated digital camera hardware that does not require complex manual operation by the user.

Technical Problems Addressed by the ’638 Inventions

106. The ’638 patent addresses technical and practical problems relating to capturing sharp, in-focus images with digital cameras. *See id.* at 1:18-36. The ’638 patent explains that obtaining sharp, in-focus images with existing digital camera configurations required a camera with a complex mechanism of mirrors and lenses (“a double-image matching range finder” wherein “the image used as the viewfinder” is an image from a range finder superimposed via complex mirrors on to the image from the viewfinder). *Id.* at 1:24-46. This “double-image matching range finder” system also relied on a manual operation to obtain sharp, in-focus images that involved precisely aligning the image from the range finder with the image from the viewfinder using the camera’s controls. *Id.*

107. The ’638 patent discloses and claims a greatly simplified solution for achieving sharp, in-focus digital images that addresses these shortcomings by providing “a digital camera for generating a composite image in which two images are superimposed by a simple mechanism.” *Id.* at 1:47-50.

Technical Solutions and Benefits Provided by the ’638 Inventions

108. The improved imaging system claimed by the ’638 patent includes two separate imaging devices within a digital camera: “a main electronic imaging unit” “for performing a photoelectric conversion to an image of a subject and outputting a digital signal,” and a second,

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"sub-electronic imaging unit" "for performing a photoelectric conversion to the subject and outputting a digital signal." *Id.* at 2:35-39. The '638 discloses and claims an improved imaging system to produce sharp, in-focus images using two specific rules to match the images from both imaging units in terms of size and combine them to improve overall focus: a cutout rule, and a magnification rule.

109. The cutout rule is "a rule for setting the cutout position K at which a partial image is cut out from the sub-image GS in accordance with a focusing operation in order to generate the viewfinder image GF." *Id.* at 5:6-11. The cutout rule relates "the operation amount S_o and the cutout position K," where the "operation amount" is the focus position of the imaging lens in the main electronic imaging unit. *Id.* at 6:2-4, 3:21-24.

110. "The magnification rule Rb is a rule for setting the magnification with respect to the sub-image GS so that the subject appears as the same size in the sub-image GS and the main image GM." *Id.* at 6:18-21. The main image and sub-image are generated by different lenses having different focal lengths. The magnification rule is generated "based on the difference in size between the main image GM and the sub-image GS, and the relationship between the focal lengths f1, f2, f3 of the imaging lens 21 and the focal length of the sub-lens 41." *Id.* at 6:37-45. The magnification rule disclosed by the '638 patent aligns "the size of the subject image in the sub-image GS with the size of the subject image in the main image GM." *Id.* at 6:38-40.

111. The cutout rule and magnification rule, as applied to the main image and sub-image in the imaging system, transform the images generated by each imaging system to create a single, composite image with improved focus on a particular feature such as a human face. This improved system provides a novel, elegant solution to the existing technical and practical problem of overly complex focal mechanisms that significantly improves the focusing performance and usability of digital cameras.

Claims Reciting the Technical Solutions of the '638 Inventions

112. Claim 1 of the '638 patent recites how to achieve the improvements described above by providing a digital camera that contains a processing system capable of carrying out particular processing steps that transform a main image and a sub-image into a sharper, in-focus

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composite image using magnification settings based on the focal length of the main lens and calculated to match the sizes of the main and sub-images. Claim 1 recites:

> 1. A digital camera having a focusing function and a focal length varying function of a main lens, the digital camera comprising:
> a main imaging unit configured to generate a main image by performing a photoelectric conversion from a subject obtained via the main lens;
> a sub-imaging unit configured to generate a sub-image by performing a photoelectric conversion from the subject obtained via a sub-lens;
> a focal length acquiring unit configured to acquire the focal length of the main lens;
> a magnification setting unit configured to set a level of magnification on the basis of the focal length;
> a composite image generating unit configured to generate a composite image by combining the main image and the sub-image, after at least one of the main image and the sub-image is magnified at the level of magnification;
> an image display unit configured to display the composite image; and
> wherein the magnification setting unit is configured to set the level of the magnification in order to match substantially a size of the main image and a size of the sub-image.

COUNT I: INFRINGEMENT OF U.S. PATENT NO. 7,668,365

113. The allegations of paragraphs 1-112 of this Complaint are incorporated by reference here.

114. Pursuant to 35 U.S.C. § 282, the ’365 patent is presumed valid.

115. Google has directly infringed and continues to directly infringe one or more claims of the ’365 patent, in violation of 35 U.S.C. § 271(a), by making, using, offering to sell, selling, and/or importing into the United States the ’365 Accused Instrumentalities, which include Google’s Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality.

116. Google has infringed and continues to infringe, for example, at least claim 32 of the ’365 patent. Longitude’s allegations of infringement are not limited to claim 32, and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

117. Paragraphs 119-134 describe how Google has infringed and continues to infringe claim 32 of the ’365 patent, at least when performing the claimed method to test its products and features (the ’365 Accused Instrumentalities) in the United States, as shown here using the exemplary Pixel 7 Pro smartphone.

118. On information and belief, the ’365 Accused Instrumentalities are in relevant part substantially similar to the exemplary Pixel 7 Pro, in particular with regard to the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality. Paragraphs 119-134 are thus illustrative of how the ’365 Accused Instrumentalities infringe.

119. Google has practiced and continues to practice claim 32’s method of image processing at least when testing the ’365 Accused Instrumentalities in the United States. The Pixel 7 Pro camera and/or the Google Photos application that runs on the Pixel 7 Pro include Real Tone and auto-enhancement image processing that “tune up” digital images by optimizing various color and lighting parameters.

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Give it a shot: Check out these 10 new camera upgrades on Pixel 7 and 7 Pro

Oct 06, 2022
6 min read

Here's a look at how camera upgrades to the Pixel 7 and Pixel 7 Pro pushes computational photography to new heights.

1. Take great shots of everyone — no matter their skin tone.

Real Tone makes our camera work more equitably for people of every skin tone. With the help of partners around the world, we've created over 10,000 new portraits on Pixel 7 to improve Real Tone, and we've worked with Diversify Photo to evaluate our progress. Thanks to them, Pixel 7 and Pixel 7 Pro have the most inclusive smartphone camera. [1]

https://blog.google/products/pixel/pixel-7-camera/ (annotation added).

- **More ways to tune up any photo.** The auto-enhancement feature in Google Photos works with uploaded photos that were taken any time and with any camera, not just Pixel. It optimizes color and lighting in any picture, across all skin tones.

https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/.

120. At least in testing the '365 Accused Instrumentalities, including, for example, the Pixel 7 Pro smartphone and the Google Photos app, Google has practiced and continues to practice an image processing method comprising determining the main object image data

corresponding to the main object characterizing the image. On information and belief, the Pixel 7 Pro's Real Tone and/or auto-enhancement camera features and/or Google Photos functionality determine the main object image data corresponding to the main object, or subject, characterizing an image by analyzing the image data that corresponds to, for example, skin tone characteristics in different lighting conditions to determine that the main object of an image is, for example, a human face.

Recognize a broader set of faces

To make a great portrait, your phone first has to see a face in the picture. So, we trained our face detector models to "see" more diverse faces in more lighting conditions.

https://store.google.com/intl/en/ideas/real-tone/ (annotations added) (showing skin tone and lighting condition characteristics of the main object image data used to determine the main object).

The result of that collaboration isn't an app or a single technology, but a framework that we're committing to over many years, across all of our imaging products. Real Tone is a collection of improvements that are part of Google's Image Equity Initiative, which is focused on building camera and imaging products that work equitably for people of color, so that everyone feels seen, no matter their skin tone. Here are some of the things we're doing to help make pictures more authentic:

- **Recognize a broader set of faces.** Detecting a person's face is a key part of getting a great photo that's in focus. We've diversified the images we use to train our models to find faces more successfully, regardless of skin tone and in a variety of lighting conditions.

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https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/ (annotations added).

121. At least in testing the '365 Accused Instrumentalities, including, for example, the Pixel 7 Pro smartphone and the Google Photos app, Google has practiced and continues to practice an image processing method comprising acquiring the properties of the determined main object image data. On information and belief, the Pixel 7 Pro's Real Tone and/or auto-enhancement camera features and/or Google Photos functionality acquires the properties of the main object image data relating to the color tone and lighting of the main object image data, e.g., color balance and lighting.

> • Real Tone. Historically, people of color have appeared washed out or lost in shadows in photos. Real Tone relies on AI software to adjust color balance and lighting to represent everyone more accurately, making the camera more inclusive and equitable.

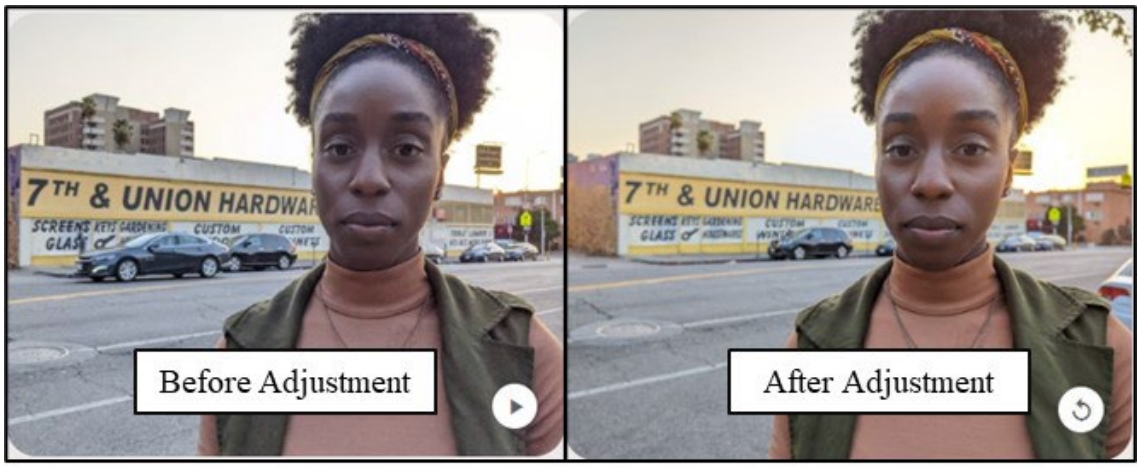
http://store.google.com/intl/en/ideas/articles/what-is-an-ai-camera/ (annotation added).

122. At least in testing the '365 Accused Instrumentalities, including, for example, the Pixel 7 Pro smartphone and the Google Photos app, Google has practiced and continues to practice an image processing method comprising acquiring correction conditions corresponding to the properties that have been acquired. On information and belief, the Pixel 7 Pro's Real Tone and/or auto-enhancement camera features and/or Google Photos functionality acquires correction conditions corresponding to the color and lighting properties of the main object image data. The acquired correction conditions correspond to properties of the main object image data that include at least color balance, brightness and/or exposure, shadow, and highlights.

- **Correctly represent skin color in pictures.** Automatic white balance is a standard camera feature that helps set the way colors appear in an image. We worked with various partners to improve the way white balance works to better reflect a variety of skin tones.
- **Make skin brightness appear more natural.** Similarly, automatic exposure is used to determine how bright a photograph appears. Our goal with Real Tone was to ensure that people of color do not appear unnaturally darker or brighter, but rather exactly as they really are.
- **Reduce washed-out images.** Stray light in a photo setting can wash out any image – such as when you are taking a picture with a sunlit window directly behind the subject. This effect is even greater for people with darker skin tones, often leaving their faces in complete shadow. A new algorithm Google developed aims to reduce the impact of stray light on finished images.
- **Sharpen blurry images even in low light.** We discovered that photos of people with darker skin tones tend to be more blurry than normal in low light conditions. We leveraged the AI features in the Google Tensor chip to sharpen photos, even when the photographer's hand isn't steady and when there isn't a lot of light available.

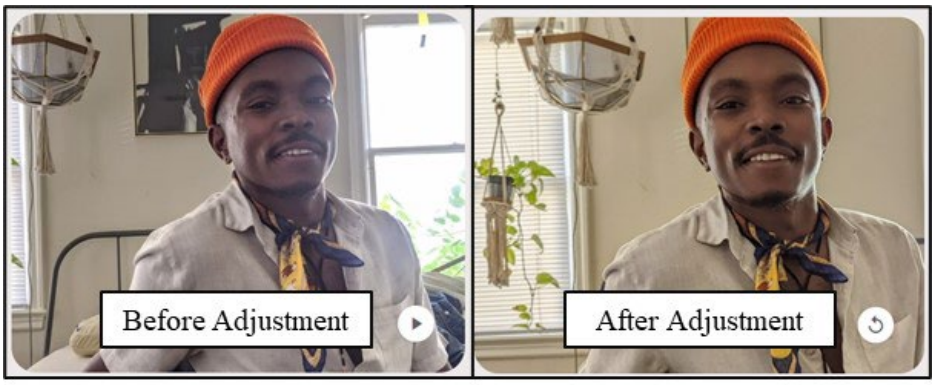
https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/ (annotations added).

123. At least in testing the '365 Accused Instrumentalities, including, for example, the Pixel 7 Pro smartphone and the Google Photos app, Google has practiced and continues to practice an image processing method comprising adjusting the picture quality of the main object image data using the acquired correction conditions. On information and belief, the Pixel 7 Pro's Real Tone and/or auto-enhancement camera features and/or Google Photos functionality adjust the picture quality of the main object image data using the correction conditions corresponding to the color and lighting properties of the main object image data. Real Tone adjusts the main object image data using correction conditions to adjust properties including at least color balance, brightness and/or exposure, white balance, shadow, and highlights.



Auto-white balance models help determine color in a picture. Our partners helped us hone these models to better reflect a variety of skin tones.

https://store.google.com/intl/en/discover/realtone/ (annotations added showing correction conditions used to adjust the image quality of the main object, including conditions for at least the color balance properties of the main object).



Reduce washed-out images

Stray light shining in an image can make darker skin tones look washed out, so we developed an algorithm to reduce its negative effects in your pictures.

https://store.google.com/intl/en/discover/realtone/ (annotations added showing correction conditions used to adjust the image quality of the main object, including conditions for at least the highlight, shadow, and brightness properties of the main object).

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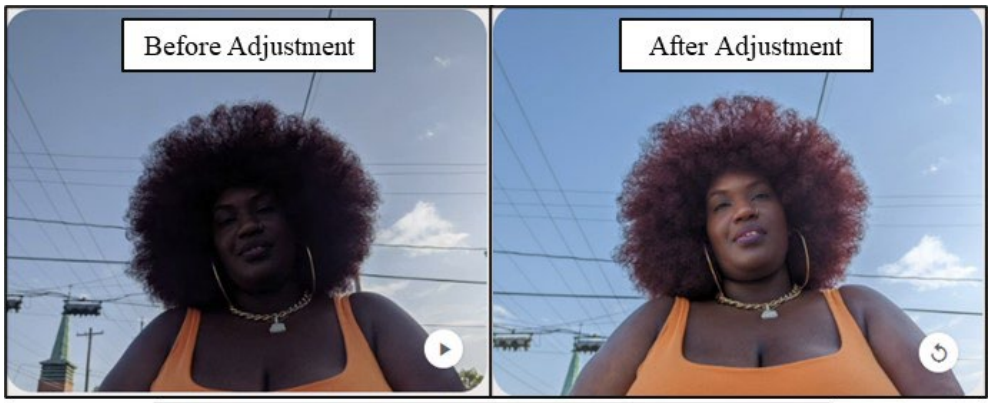
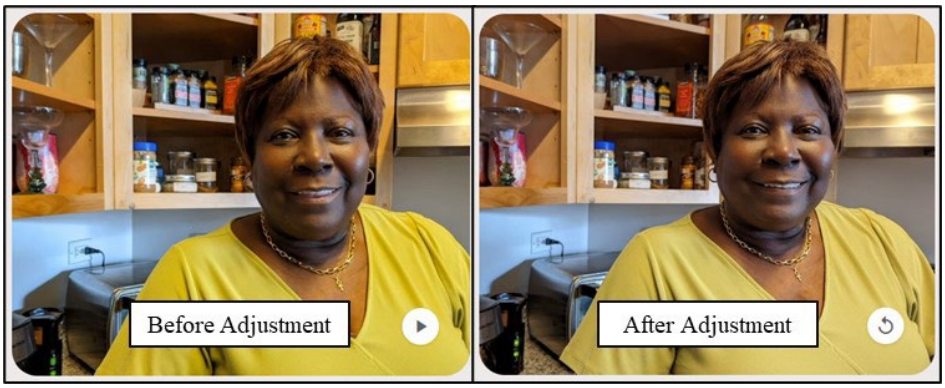


Make skin brightness appear more natural

Similarly, we made changes to our auto-exposure tuning to balance brightness and ensure your skin looks like you – not unnaturally brighter or darker.

https://store.google.com/intl/en/discover/realtone/ (annotations added showing correction conditions used to adjust the image quality of the main object, including conditions for at least the highlight, shadow, and brightness or exposure properties of the main object).



Sharpen images even in low light

Getting a sharp portrait in dim light shouldn't depend on how you look, so we significantly cut down image blur for people with darker skin tones in Night Sight portraits.

https://store.google.com/intl/en/discover/realtone/ (annotations added showing correction conditions used to adjust the image quality of the main object, including conditions for at least the highlight, shadow, and brightness or exposure properties of the main object).

124. On information and belief, the Pixel 7 Pro's Real Tone and/or auto-enhancement camera features and/or Google Photos functionality adjusts the image quality of main object

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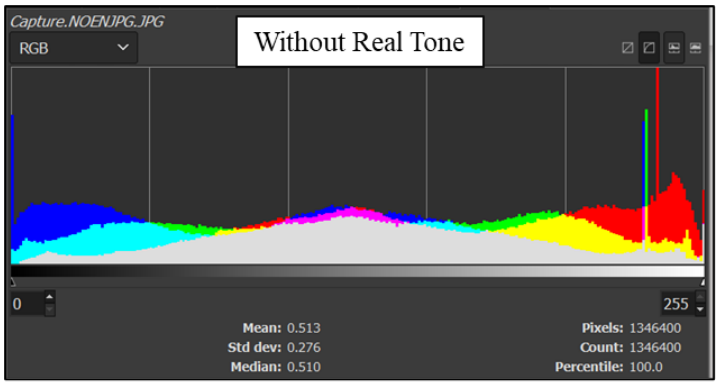
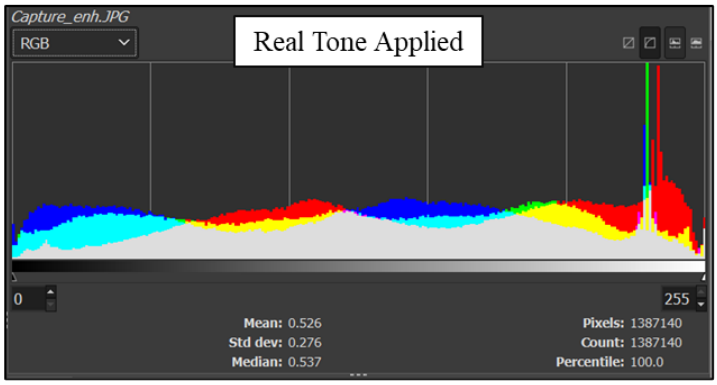
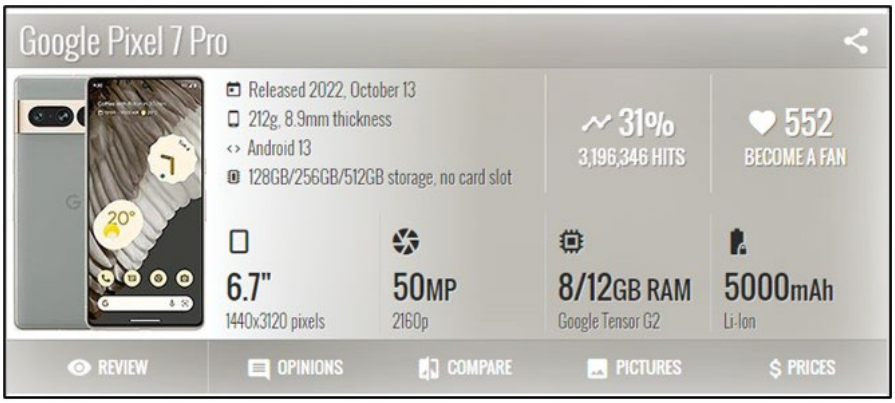
image data using at least correction conditions for the color balance properties of main object that, for example, include a human face. RGB histograms show adjustments to color balance in an image using Real Tone (versus without Real Tone).





Images used in testing available at https://store.google.com/intl/en/discover/realtone/ (RGB histograms showing the adjustments to color balance comparing an image without Real Tone and the same image with Real Tone applied).

125. At least in testing the ’365 Accused Instrumentalities, including, for example, the Pixel 7 Pro smartphone and the Google Photos app, Google has practiced and continues to practice an image processing method wherein each of the operations of the image processing method is executed by an integrated circuit. On information and belief, the Pixel 7 Pro’s Real Tone and/or auto-enhancement camera features and/or Google Photos functionality are executed by the Pixel 7 Pro’s Google Tensor G2 system-on-a-chip chipset, which is an integrated circuit.



DISPLAY	Type	LTPO AMOLED, 120Hz, HDR10+, 1000 nits (HBM), 1500 nits (peak)
	Size	6.7 inches, 110.6 cm^2 (~88.7% screen-to-body ratio)
	Resolution	1440 x 3120 pixels, 19.5:9 ratio (~512 ppi density)
	Protection	Corning Gorilla Glass Victus
		Always-on display
PLATFORM	OS	Android 13
	Chipset	Google Tensor G2 (5 nm)
	CPU	Octa-core (2x2.85 GHz Cortex-X1 & 2x2.35 GHz Cortex-A78 & 4x1.80 GHz Cortex-A55)
	GPU	Mali-G710 MP7
MEMORY	Card slot	No
	Internal	128GB 8GB RAM, 256GB 8GB RAM, 128GB 12GB RAM, 256GB 12GB RAM, 512GB 12GB RAM
		UFS 3.1

https://www.gsmarena.com/google_pixel_7_pro-11908.php (annotation added).

126. On information and belief, Google has directed infringed and continues to directly infringe one or more claims of the ’365 patent by making, using, offering to sell, selling, and/or importing into the United States Pixel smartphones and tablets that include Real Tone and/or auto-enhancement camera features and/or Google Photos functionality.

127. On information and belief, Google has directed infringed and continues to directly infringe at least claim 32 of the ’365 patent when it tests Pixel smartphones and tablets that include Real Tone and/or auto-enhancement camera features and/or Google Photos functionality.

128. Google had actual notice pursuant to 35 U.S.C. § 287(a) of the ’365 patent and the infringement alleged herein as of on or around June 7, 2023, when Longitude provided notice to Google.

129. Google has indirectly infringed and continues to indirectly infringe the ’365 patent by actively inducing, in violation of 35 U.S.C. § 271(b), the direct infringement of the ’365 patent by others in the United States.

130. Google has induced, and continues to induce, through affirmative acts, its customers and other third parties to directly infringe the '365 patent by using the '365 Accused Instrumentalities.

131. On information and belief, Google knows that it provides, markets, and actively promotes the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality of its Pixel smartphones and tablets.

132. On information and belief, Google designed, marketed, and continues to market the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality of its Pixel smartphones and tablets to third parties with knowledge and the specific intent to cause third parties to use, offer to sell, or sell in the United States, and/or import into the United States, Pixel smartphones and tablets capable of detecting the main object of a digital image and adjusting the image quality of the main object image data based on the characteristics of the main object. For example, Google encourages its customers to use Google Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality to take photos that are adjusted to "make every picture more authentic and more representative of the subject of the photo – regardless of their skin tone," and to "tune up any photo" using the "auto-enhancement feature in Google Photos" "to optimize[] color and lighting in any picture, across all skin tones."[8]

133. Google knew that its customers would use, offer to sell, and/or sell accused Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality in the United States, and Google specifically intended its customers to purchase and use the accused Pixel smartphones and tablets.

134. Google has induced others' direct infringement despite actual notice that Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality infringe the '365 patent. As of at least June 7, 2023, Google knew that the induced conduct would constitute infringement—and intended that infringement at the time of

[8] https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/.

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committing the aforementioned affirmative acts, such that the acts and conduct have been and continue to be committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

135. The above-described acts of infringement have caused injury and damage to Longitude.

136. Longitude is entitled to recover damages sustained as a result of Google's infringement in an amount subject to proof at trial, but in no event less than a reasonable royalty.

COUNT II: INFRINGEMENT OF U.S. PATENT NO. 8,355,574

137. The allegations of paragraphs 1-112 of this Complaint are incorporated by reference here.

138. Pursuant to 35 U.S.C. § 282, the '574 patent is presumed valid.

139. Google has directly infringed and continues to directly infringe one or more claims of the '574 patent, in violation of 35 U.S.C. § 271(a), by making, using, offering to sell, selling, and/or importing into the United States the '574 Accused Instrumentalities, which include Google's Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality.

140. Google has infringed and continues to infringe at least, for example, claims 3 and 4 of the '574 patent. Longitude's allegations of infringement are not limited to claims 3 and 4, and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

141. Paragraphs 143-160 describe how Google has infringed and continues to infringe claims 3 and 4 of the '574 patent, at least when performing the claimed methods to test its products and features (the '574 Accused Instrumentalities) in the United States, as shown here using the exemplary Pixel 7 Pro smartphone.

142. On information and belief, the '574 Accused Instrumentalities are in relevant part substantially similar to the exemplary Pixel 7 Pro, in particular with regard to the Real Tone

and/or auto-enhancement camera features and/or Google Photos functionality. Paragraphs 143-160 are thus illustrative of how the ’574 Accused Instrumentalities infringe.

143. Google has practiced and continues to practice claim 3’s method of image processing at least when testing the ’574 Accused Instrumentalities in the United States. The Pixel 7 Pro’s camera and/or Google Photos app include Real Tone and auto-enhancement image processing features and functionality.

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Give it a shot: Check out these 10 new camera upgrades on Pixel 7 and 7 Pro

Oct 06, 2022
6 min read

Here’s a look at how camera upgrades to the Pixel 7 and Pixel 7 Pro pushes computational photography to new heights.

1. Take great shots of everyone — no matter their skin tone.

Real Tone makes our camera work more equitably for people of every skin tone. With the help of partners around the world, we’ve created over 10,000 new portraits on Pixel 7 to improve Real Tone, and we’ve worked with Diversify Photo to evaluate our progress. Thanks to them, Pixel 7 and Pixel 7 Pro have the most inclusive smartphone camera. [1]

https://blog.google/products/pixel/pixel-7-camera/ (annotation added).

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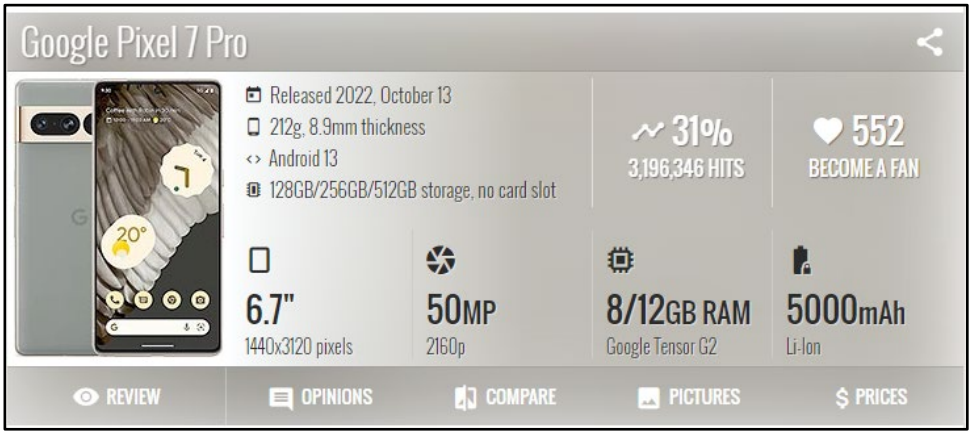
> • **More ways to tune up any photo.** The auto-enhancement feature in Google Photos works with uploaded photos that were taken any time and with any camera, not just Pixel. It optimizes color and lighting in any picture, across all skin tones.

https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/.

144. At least in testing the ’574 Accused Instrumentalities, including, for example, the Pixel 7 Pro’s camera and the Google Photos app, Google determines a main object in an image generated by an image generating apparatus, wherein the main object includes at least a human face, and wherein the determining of the main object is implemented by determining whether the image includes the human face. The Pixel 7 Pro cameras are image generating apparatuses that capture digital images.



MAIN CAMERA	Triple	50 MP, f/1.9, 25mm (wide), 1/1.31", 1.2µm, multi-directional PDAF, Laser AF, OIS 48 MP, f/3.5, 120mm (telephoto), 1/2.55", 0.7µm, multi-directional PDAF, OIS, 5x optical zoom 12 MP, f/2.2, 126˚ (ultrawide), 1/2.9", 1.25µm, AF
	Features	Dual-LED flash, Pixel Shift, Auto-HDR, panorama
	Video	4K@30/60fps, 1080p@30/60/120/240fps; gyro-EIS, OIS, 10-bit HDR
SELFIE CAMERA	Single	10.8 MP, f/2.2, 21mm (ultrawide), 1/3.1", 1.22µm
	Features	Auto-HDR, panorama
	Video	4K@30/60fps, 1080p@30/60fps

https://www.gsmarena.com/google_pixel_7_pro-11908.php (annotation added).

145. On information and belief, the Pixel 7 Pro’s Real Tone and/or auto-enhancement camera features and/or Google Photos functionality perform a method that determines when the subject, or main object, of an image generated by an image generating apparatus is a human face.

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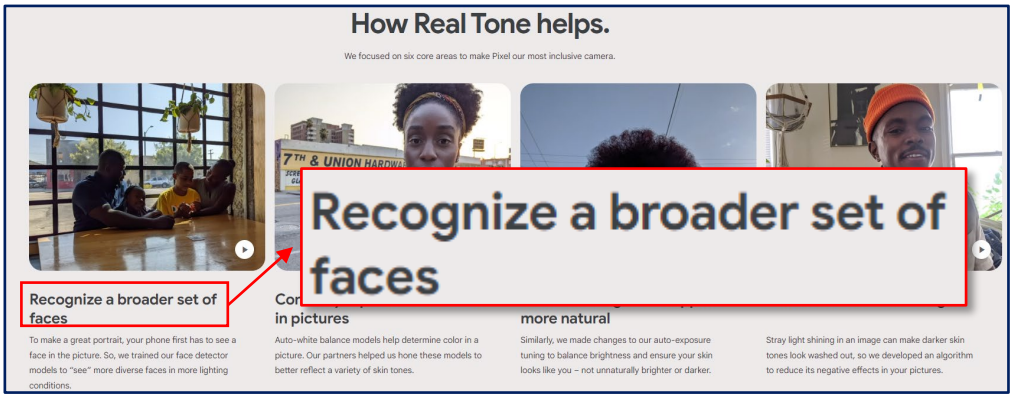
> The result of that collaboration isn't an app or a single technology, but a framework that we're committing to over many years, across all of our imaging products. Real Tone is a collection of improvements that are part of Google's Image Equity Initiative, which is focused on building camera and imaging products that work equitably for people of color, so that everyone feels seen, no matter their skin tone. Here are some of the things we're doing to help make pictures more authentic:
>
> - **Recognize a broader set of faces.** Detecting a person's face is a key part of getting a great photo that's in focus. We've diversified the images we use to train our models to find faces more successfully, regardless of skin tone and in a variety of lighting conditions.

https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/ (annotations added).



https://store.google.com/intl/en/discover/realtone/ (annotation added).

146. At least in testing the '574 Accused Instrumentalities, including, for example, the Pixel 7 Pro smartphone's camera and the Google Photos app, Google adjusts the image quality of the main object using correction conditions corresponding to properties of the determined main object, wherein a parameter used in adjusting the image quality is a highlight, a shadow, brightness, contrast, color balance, or memory color.

147. On information and belief, the Pixel 7 Pro's Real Tone and/or auto-enhancement camera features and/or Google Photos functionality perform a method of adjusting the image quality of the main object using correction conditions corresponding to properties of the determined main object, wherein a parameter used in adjusting the image quality is a highlight, a shadow, brightness, contrast, color balance, or memory color. On information and belief, Real Tone adjusts the image quality of the image data corresponding to the unique properties of human faces in digital images by adjusting at least the white balance (color balance), exposure

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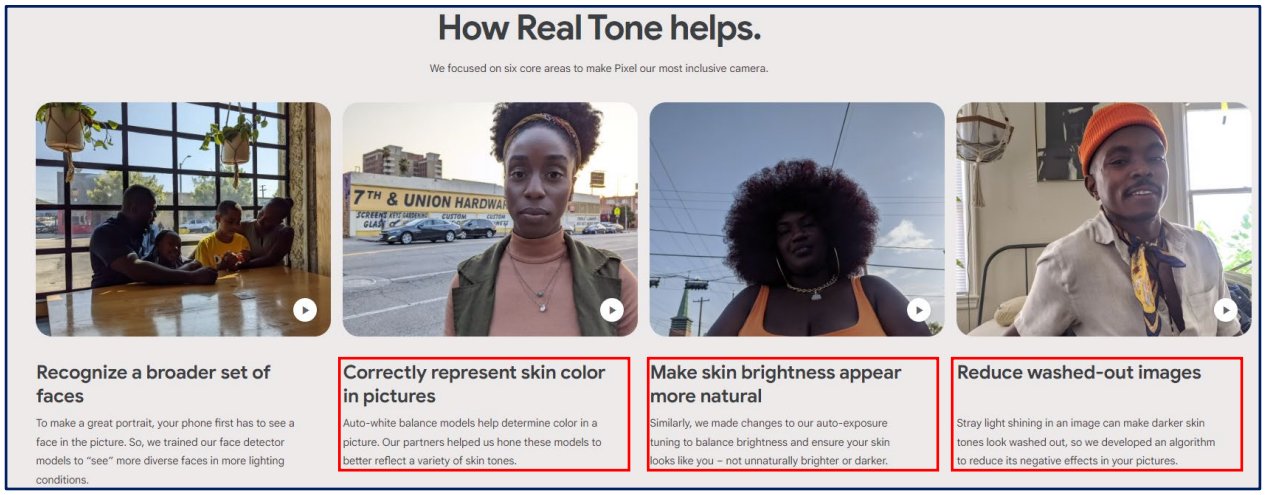
(brightness), and highlight or shadow parameters of the image data corresponding to a human face.

- **Correctly represent skin color in pictures.** Automatic white balance is a standard camera feature that helps set the way colors appear in an image. We worked with various partners to improve the way white balance works to better reflect a variety of skin tones.
- **Make skin brightness appear more natural.** Similarly, automatic exposure is used to determine how bright a photograph appears. Our goal with Real Tone was to ensure that people of color do not appear unnaturally darker or brighter, but rather exactly as they really are.
- **Reduce washed-out images.** Stray light in a photo setting can wash out any image – such as when you are taking a picture with a sunlit window directly behind the subject. This effect is even greater for people with darker skin tones, often leaving their faces in complete shadow. A new algorithm Google developed aims to reduce the impact of stray light on finished images.
- **Sharpen blurry images even in low light.** We discovered that photos of people with darker skin tones tend to be more blurry than normal in low light conditions. We leveraged the AI features in the Google Tensor chip to sharpen photos, even when the photographer's hand isn't steady and when there isn't a lot of light available.

https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/ (annotations added).



https://store.google.com/intl/en/discover/realtone/ (annotations added).

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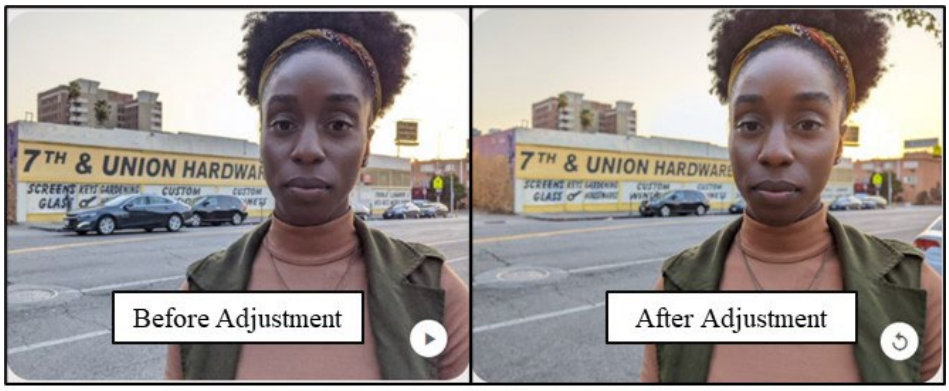
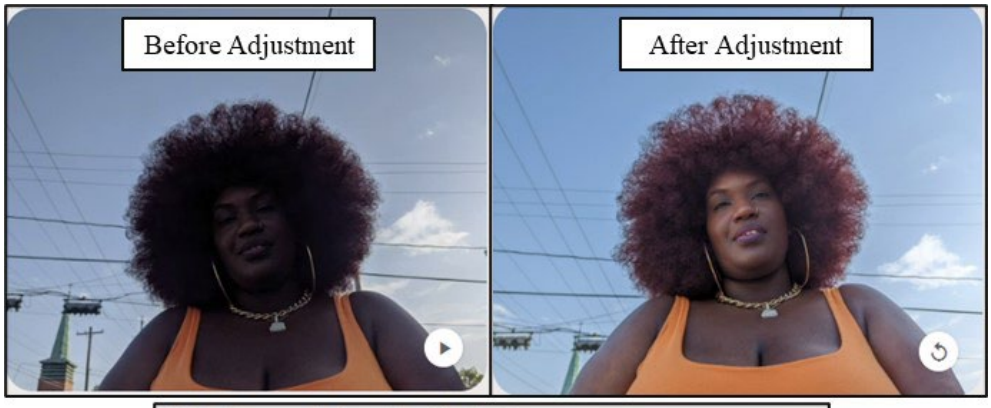


Auto-white balance models help determine color in a picture. Our partners helped us hone these models to better reflect a variety of skin tones.

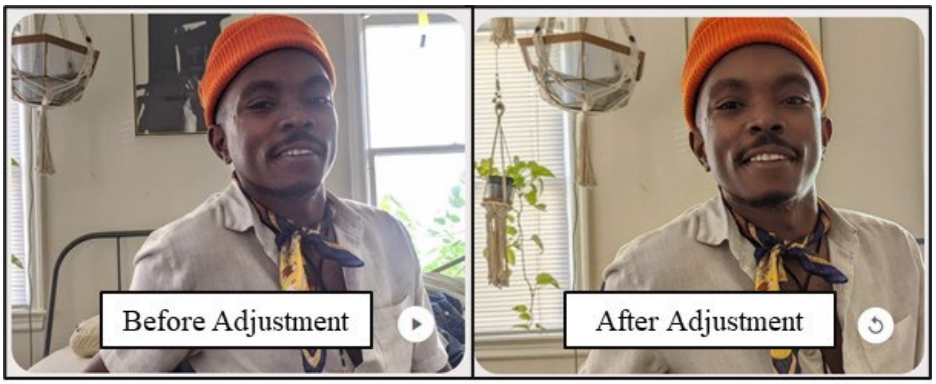
https://store.google.com/intl/en/discover/realtone/ (annotations added showing correction condition parameters used to adjust the image quality of the main object, including at least the color balance parameter (underlined in red) that correspond to the properties of the main object, a human face (underlined in green)).



Make skin brightness appear more natural

Similarly, we made changes to our auto-exposure tuning to balance brightness and ensure your skin looks like you – not unnaturally brighter or darker.

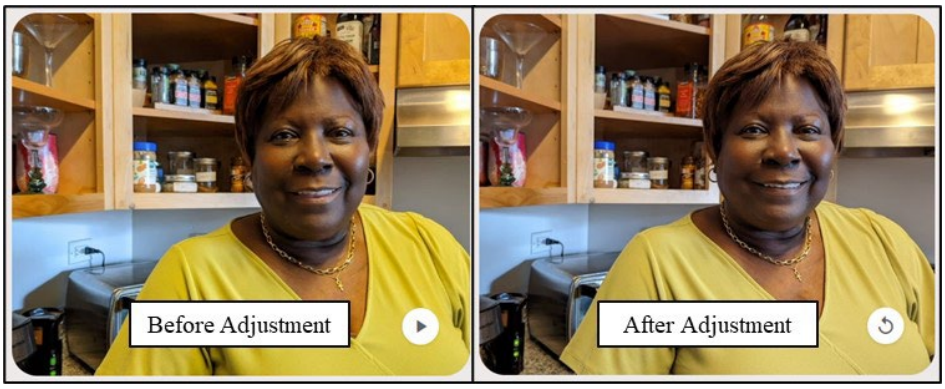
https://store.google.com/intl/en/discover/realtone/ (annotations added showing correction condition parameters used to adjust the image quality of the main object, including at least the highlight, shadow, and/or brightness parameters (underlined in red) that correspond to the properties of the main object, a human face (underlined in green)).



Reduce washed-out images

Stray light shining in an image can make darker skin tones look washed out, so we developed an algorithm to reduce its negative effects in your pictures.

https://store.google.com/intl/en/discover/realtone/ (annotations added showing correction condition parameters used to adjust the image quality of the main object, including at least the highlight, shadow, and/or brightness parameters (underlined in red) that correspond to the properties of the main object, a human face (underlined in green)).



Sharpen images even in low light

Getting a sharp portrait in dim light shouldn't depend on how you look, so we significantly cut down image blur for people with darker skin tones in Night Sight portraits.

https://store.google.com/intl/en/discover/realtone/ (annotations added showing correction condition parameters used to adjust the image quality of the main object, including at least the highlight, shadow, contrast, and/or brightness parameters (underlined in red) that correspond to the properties of the main object, a human face (underlined in green)).

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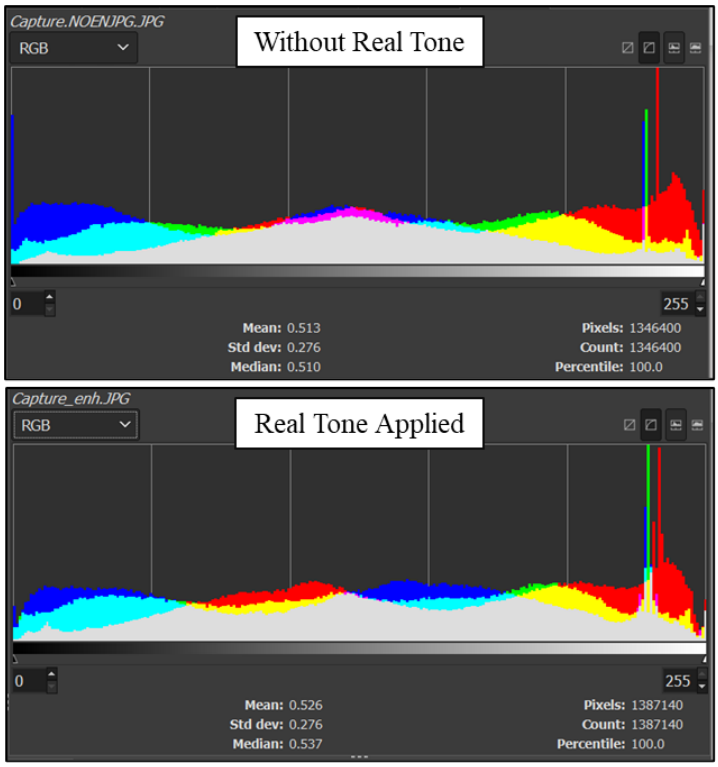
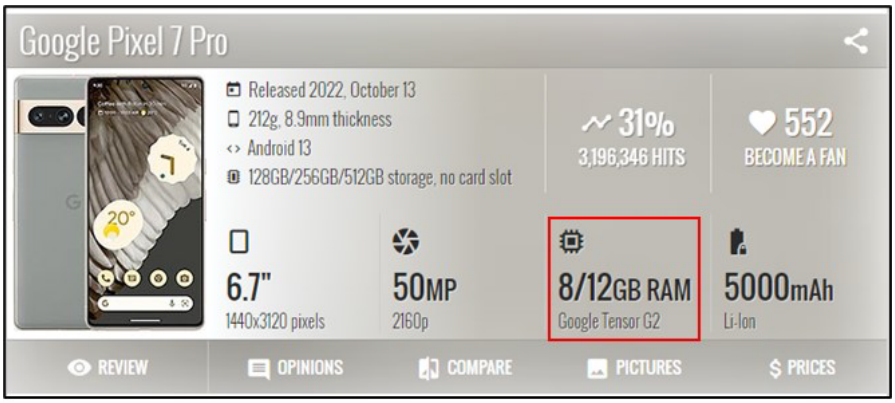
148. On information and belief, the Pixel 7 Pro's Real Tone and/or auto-enhancement camera features and/or Google Photos functionality adjust color balance parameter using correction conditions corresponding to the properties of a main object that includes a human face.



Images used in testing available at https://store.google.com/intl/en/discover/realtone/ (RGB histograms showing the adjustments to color balance comparing an image without Real Tone and the same image with Real Tone applied).

149. At least in testing the '574 Accused Instrumentalities, including, for example, the Pixel 7 Pro's Real Tone and/or auto-enhancement camera features and/or Google Photos functionality, Google practices a method of image processing wherein each operation of the method of image processing is executed by one of a personal computer, a printer, or a display device. The Pixel 7 Pro is a personal computer with a Google Tensor G2 system-on-a-chip chipset, memory, and storage that includes a 6.7" AMOLED display.

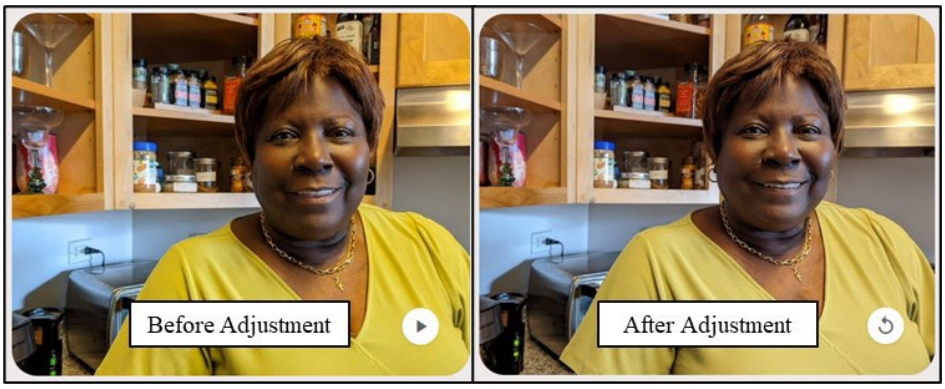


DISPLAY	Type	LTPO AMOLED, 120Hz, HDR10+, 1000 nits (HBM), 1500 nits (peak)
	Size	6.7 inches, 110.6 cm^2 (~88.7% screen-to-body ratio)
	Resolution	1440 x 3120 pixels, 19.5:9 ratio (~512 ppi density)
	Protection	Corning Gorilla Glass Victus
		Always-on display
PLATFORM	OS	Android 13
	Chipset	Google Tensor G2 (5 nm)
	CPU	Octa-core (2x2.85 GHz Cortex-X1 & 2x2.35 GHz Cortex-A78 & 4x1.80 GHz Cortex-A55)
	GPU	Mali-G710 MP7
MEMORY	Card slot	No
	Internal	128GB 8GB RAM, 256GB 8GB RAM, 128GB 12GB RAM, 256GB 12GB RAM, 512GB 12GB RAM
		UFS 3.1

https://www.gsmarena.com/google_pixel_7_pro-11908.php (annotations added).

150. Google has practiced and continues to practice claim 4's method of image processing at least when testing the '574 Accused Instrumentalities in the United States.

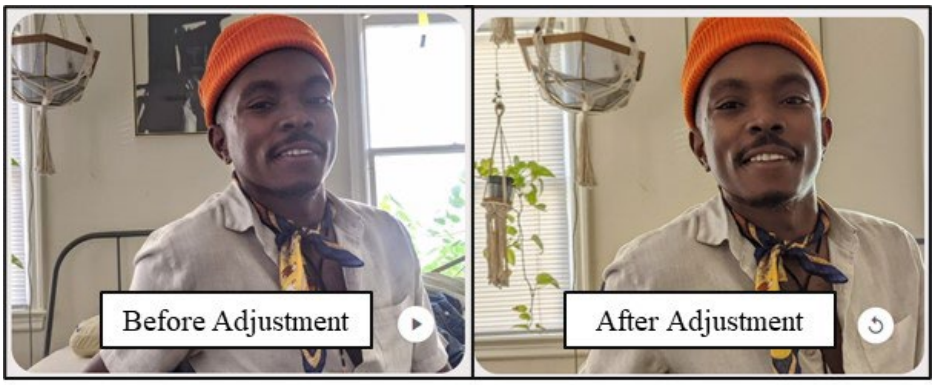
151. At least in testing the '574 Accused Instrumentalities, including, for example, the Pixel 7 Pro's Real Tone and/or auto-enhancement camera features and/or Google Photos functionality, Google practices a method in accordance with claim 3, wherein the correction conditions are different when the main object is determined as a nighttime scene and a human face and when the main object is determined as a human face. On information and belief, the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality adjust the image quality of human faces using correction conditions that are different when the main object is a human face in a night and/or dark environment compared to when the main object is a human face in, for example, a bright, sunlit environment, as depicted in the following examples showing correction conditions for at least the highlight, shadow, contrast, and/or brightness parameters that are different when the a face is in a dark compared to a bright environment.



Sharpen images even in low light

Getting a sharp portrait in dim light shouldn't depend on how you look, so we significantly cut down image blur for people with darker skin tones in Night Sight portraits.

https://store.google.com/intl/en/discover/realtone/ (annotations added) (showing correction condition parameters, including at least shadow, highlight, contrast, and/or brightness that are adjusted to improve the image quality in a dim environment based on the skin tone of the main object).



Reduce washed-out images

Stray light shining in an image can make darker skin tones look washed out, so we developed an algorithm to reduce its negative effects in your pictures.

https://store.google.com/intl/en/discover/realtone/ (annotations added) (showing correction condition parameters, including at least shadow, highlight, contrast, and/or brightness that are adjusted to improve the image quality in a bright environment based on the skin tone of the main object).

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152. On information and belief, Google directly infringes at least claims 7 and 8 of the ’574 patent by making, using, offering to sell, selling, and/or importing into the United States Google’s Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality.

153. On information and belief, Google directly infringes at least claims 3 and 4 of the ’574 patent when it tests Google’s Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality.

154. Google had actual notice pursuant to 35 U.S.C. § 287(a) of the ’574 patent and the infringement alleged herein as of on or around June 7, 2023, when Longitude provided notice to Google.

155. Google has indirectly infringed and continues to indirectly infringe the ’574 patent by actively inducing, in violation of 35 U.S.C. § 271(b), the direct infringement of the ’574 patent by others in the United States.

156. Google has induced, and continues to induce, through affirmative acts, its customers and other third parties to directly infringe the ’574 patent by using the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality of Google’s Pixel smartphones and tablets.

157. On information and belief, Google knows that it provides, markets, and actively promotes the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality of its Pixel smartphones and tablets.

158. On information and belief, Google designed, marketed, and continues to market the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality of its Pixel smartphones and tablets to third parties with knowledge and the specific intent to cause third parties to use, offer to sell, or sell in the United States, and/or import into the United States, Pixel smartphones and tablets capable of detecting the main object of a digital image and adjusting the image quality of the main object image data based on the characteristics of the main object. For example, Google encourages its customers to use Google Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos

functionality to take photos that are adjusted to "make every picture more authentic and more representative of the subject of the photo – regardless of their skin tone," and to "tune up any photo" using the "auto-enhancement feature in Google Photos" "to optimize[] color and lighting in any picture, across all skin tones."[9]

159. Google knew that its customers would use, offer to sell, and/or sell accused Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality in the United States, and Google specifically intended its customers to purchase and use the accused Pixel smartphones and tablets.

160. Google has induced others' direct infringement despite actual notice that Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality infringe the '574 patent. As of at least June 7, 2023, Google knew that the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been and continue to be committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

161. The above-described acts of infringement have caused injury and damage to Longitude.

162. Longitude is entitled to recover damages sustained as a result of Google's infringement in an amount subject to proof at trial, but in no event less than a reasonable royalty.

COUNT III: INFRINGEMENT OF U.S. PATENT NO. 7,454,056

163. The allegations of paragraphs 1-112 of this Complaint are incorporated by reference here.

164. Pursuant to 35 U.S.C. § 282, the '056 patent is presumed valid.

165. Google has directly infringed and continues to directly infringe one or more claims of the '056 patent, in violation of 35 U.S.C. § 271(a), by making, using, offering to sell, selling,

[9] https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/.

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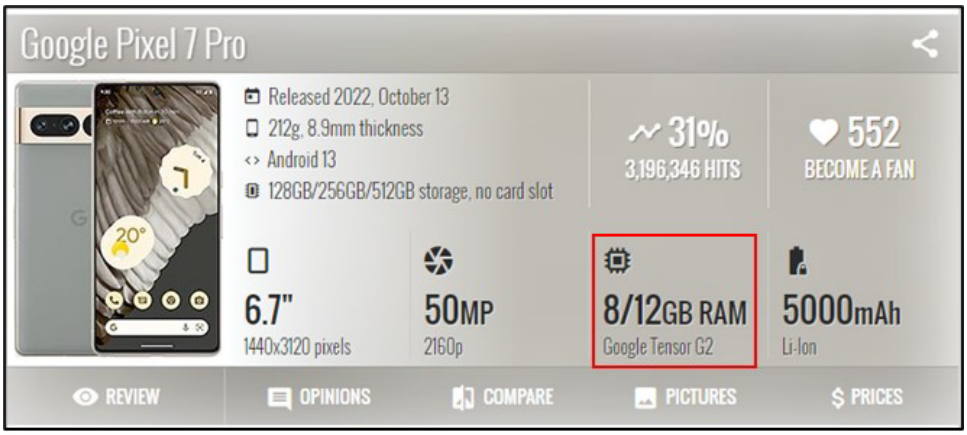
and/or importing into the United States the ’056 Accused Instrumentalities, which include Google’s Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality.

166. Google has infringed and continues to infringe at least, for example, claim 10 of the ’056 patent. Longitude’s allegations of infringement are not limited to claim 10, and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

167. Paragraphs 169-182 describe how the ’056 Accused Instrumentalities practice claim 10 of the ’056 patent, by way of the exemplary Pixel 7 Pro.

168. On information and belief, the ’056 Accused Instrumentalities are in relevant part substantially similar to the exemplary Pixel 7 Pro, in particular with regard to the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality. Paragraphs 169-182 are thus illustrative of how the ’056 Accused Instrumentalities infringe.

169. Google’s Pixel smartphones and tablets, including, for example, the Pixel 7 Pro, comprise an image processing device for executing color balance correction on image data of a photographed image. The Pixel 7 Pro is an image processing device, including multiple cameras and a Google Tensor G2 system-on-a-chip chipset with memory and storage components that are capable of processing images. The Pixel 7 Pro includes Real Tone and the Google Photos application and, thus, processes images and executes color balance correction as claimed.



DISPLAY	Type	LTPO AMOLED, 120Hz, HDR10+, 1000 nits (HBM), 1500 nits (peak)
	Size	6.7 inches, 110.6 cm^2 (~88.7% screen-to-body ratio)
	Resolution	1440 x 3120 pixels, 19.5:9 ratio (~512 ppi density)
	Protection	Corning Gorilla Glass Victus
		Always-on display
PLATFORM	OS	Android 13
	Chipset	Google Tensor G2 (5 nm)
	CPU	Octa-core (2x2.85 GHz Cortex-X1 & 2x2.35 GHz Cortex-A78 & 4x1.80 GHz Cortex-A55)
	GPU	Mali-G710 MP7
MEMORY	Card slot	No
	Internal	128GB 8GB RAM, 256GB 8GB RAM, 128GB 12GB RAM, 256GB 12GB RAM, 512GB 12GB RAM
		UFS 3.1

MAIN CAMERA	Triple	50 MP, f/1.9, 25mm (wide), 1/1.31", 1.2µm, multi-directional PDAF, Laser AF, OIS
		48 MP, f/3.5, 120mm (telephoto), 1/2.55", 0.7µm, multi-directional PDAF, OIS, 5x optical zoom
		12 MP, f/2.2, 126° (ultrawide), 1/2.9", 1.25µm, AF
	Features	Dual-LED flash, Pixel Shift, Auto-HDR, panorama
	Video	4K@30/60fps, 1080p@30/60/120/240fps; gyro-EIS, OIS, 10-bit HDR
SELFIE CAMERA	Single	10.8 MP, f/2.2, 21mm (ultrawide), 1/3.1", 1.22µm
	Features	Auto-HDR, panorama
	Video	4K@30/60fps, 1080p@30/60fps

https://www.gsmarena.com/google_pixel_7_pro-11908.php (annotations added).

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PIXEL

Give it a shot: Check out these 10 new camera upgrades on Pixel 7 and 7 Pro

Oct 06, 2022
6 min read

Here's a look at how camera upgrades to the Pixel 7 and Pixel 7 Pro pushes computational photography to new heights.

1. Take great shots of everyone — no matter their skin tone.

Real Tone makes our camera work more equitably for people of every skin tone. With the help of partners around the world, we've created over 10,000 new portraits on Pixel 7 to improve Real Tone, and we've worked with Diversify Photo to evaluate our progress. Thanks to them, Pixel 7 and Pixel 7 Pro have the most inclusive smartphone camera. [1]

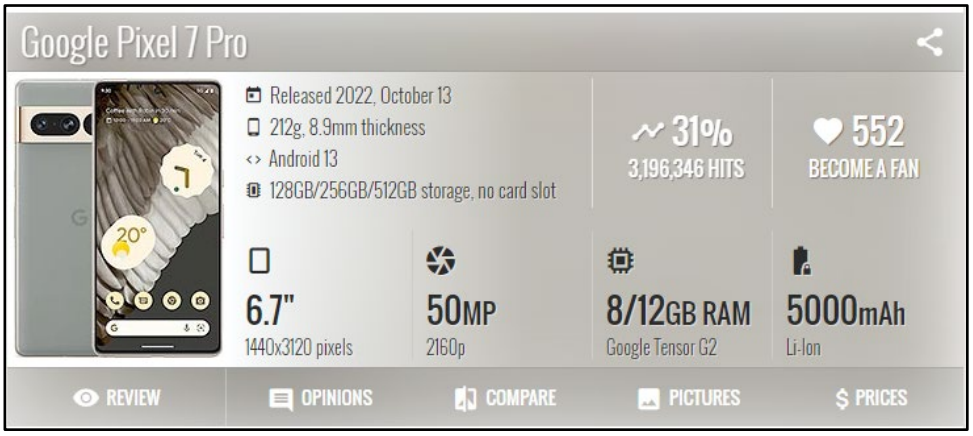
https://blog.google/products/pixel/pixel-7-camera/ (annotation added).

- **More ways to tune up any photo.** The auto-enhancement feature in Google Photos works with uploaded photos that were taken any time and with any camera, not just Pixel. It optimizes color and lighting in any picture, across all skin tones.

https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/.

170. Google's Pixel smartphones and tablets, including, for example, the Pixel 7 Pro, comprise an image processing device comprising an image data acquisition module that acquires

the image data. The Pixel 7 Pro acquires image data, including images that it captures with its cameras.



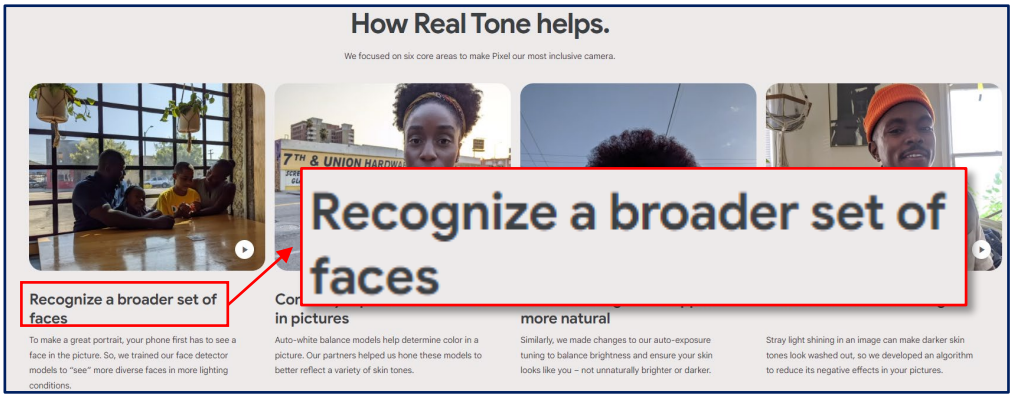
MAIN CAMERA	Triple	50 MP, f/1.9, 25mm (wide), 1/1.31", 1.2µm, multi-directional PDAF, Laser AF, OIS
		48 MP, f/3.5, 120mm (telephoto), 1/2.55", 0.7µm, multi-directional PDAF, OIS, 5x optical zoom
		12 MP, f/2.2, 126° (ultrawide), 1/2.9", 1.25µm, AF
	Features	Dual-LED flash, Pixel Shift, Auto-HDR, panorama
	Video	4K@30/60fps, 1080p@30/60/120/240fps; gyro-EIS, OIS, 10-bit HDR
SELFIE CAMERA	Single	10.8 MP, f/2.2, 21mm (ultrawide), 1/3.1", 1.22µm
	Features	Auto-HDR, panorama
	Video	4K@30/60fps, 1080p@30/60fps

https://www.gsmarena.com/google_pixel_7_pro-11908.php.

171. Google's Pixel smartphones and tablets, including, for example, the Pixel 7 Pro, comprise an image processing device comprising a specific subject area determination module that determines a specific subject area in the photographed image, wherein the specific subject area contains a specific subject in the photographed image, and wherein the specific subject area determination module determines the specific subject area using pixel values of pixel data included in a target area for determination, and a position of the target area in the photographed image. For example, the Pixel 7 Pro includes Real Tone and/or auto-enhancement camera features and/or Google Photos functionality. On information and belief, these features and functions determine a specific subject area of an image, and the specific subject area contains a specific subject—a human face (e.g., face detection capabilities). On information and belief, the Pixel 7 Pro's face detection capabilities use pixel data in a target area (e.g., the colors that typify the human face) and position information to detect faces (for example, detecting a face when it appears in the center of an image).

> The result of that collaboration isn't an app or a single technology, but a framework that we're committing to over many years, across all of our imaging products. Real Tone is a collection of improvements that are part of Google's Image Equity Initiative, which is focused on building camera and imaging products that work equitably for people of color, so that everyone feels seen, no matter their skin tone. Here are some of the things we're doing to help make pictures more authentic:
>
> - **Recognize a broader set of faces.** Detecting a person's face is a key part of getting a great photo that's in focus. We've diversified the images we use to train our models to find faces more successfully, regardless of skin tone and in a variety of lighting conditions.

https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/ (annotations added).



https://store.google.com/intl/en/discover/realtone/ (annotations added).

172. Google's Pixel smartphones and tablets, including, for example, the Pixel 7 Pro, comprise an image processing device that includes a specific subject characteristic value calculation module that calculates a specific subject characteristic value, wherein the specific subject characteristic value represents a characteristic of image data corresponding to the determined specific subject area; a correction value calculation module that calculates a correction value for color balance correction using the calculated specific subject characteristic value and a preset characteristic target value; and a correction execution module that executes the color balance correction on the image data using the calculated correction value. For example, the Pixel 7 Pro includes Real Tone and/or auto-enhancement camera features and/or Google Photos functionality. The Real Tone feature adjusts image data of a specific subject area—e.g., the face area. On information and belief, the Real Tone feature adjusts the image quality of the image data

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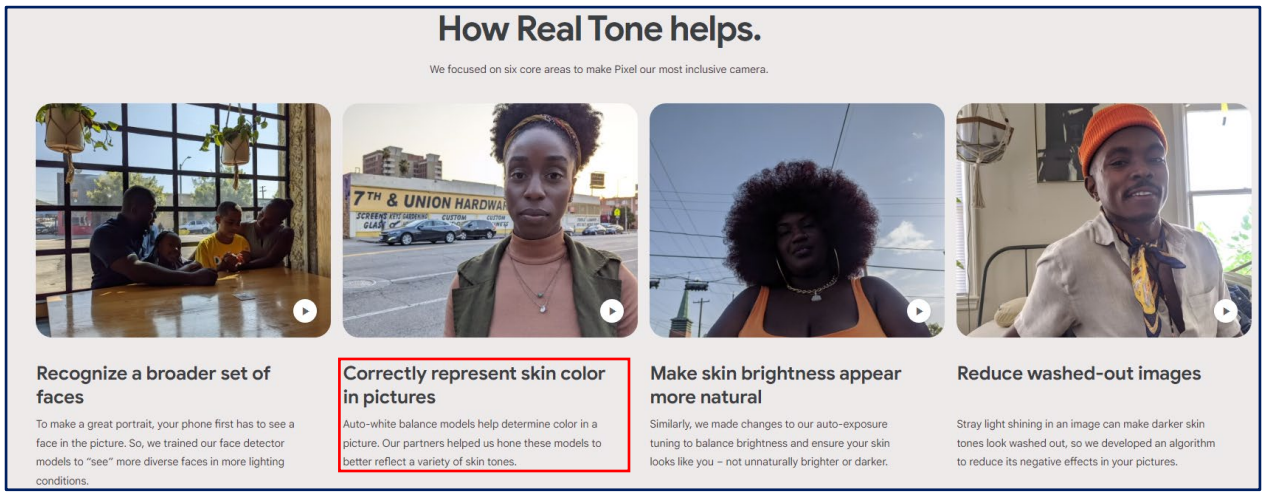
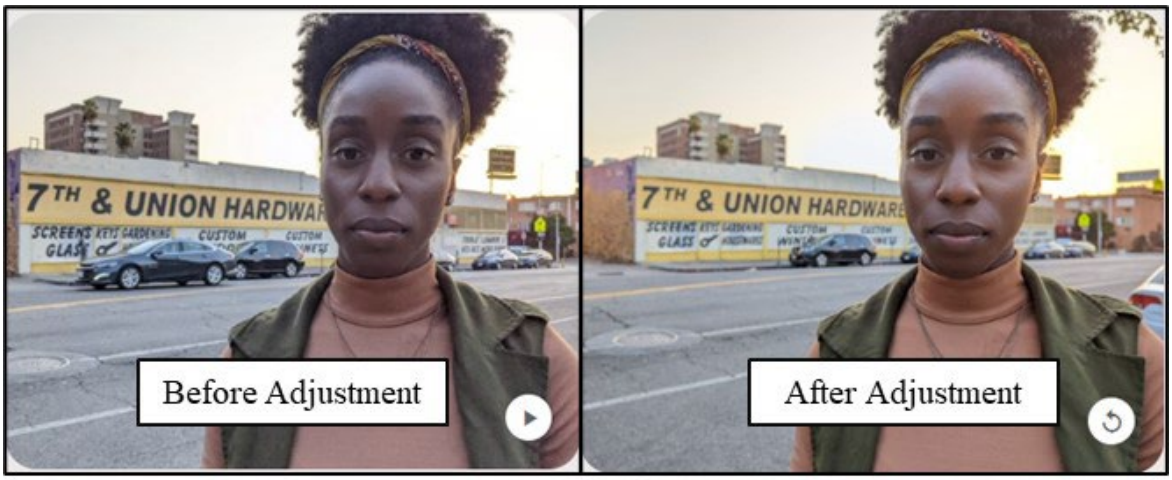
corresponding to the properties of a human face in a digital image by correcting at least the color balance of the image data corresponding to a human face. Thus, on information and belief, the Pixel 7 Pro calculates a subject characteristic value, calculates a correction value for color balance correction based on that characteristic value and a target value, and corrects the image data accordingly.

- **Correctly represent skin color in pictures.** Automatic white balance is a standard camera feature that helps set the way colors appear in an image. We worked with various partners to improve the way white balance works to better reflect a variety of skin tones.
- **Make skin brightness appear more natural.** Similarly, automatic exposure is used to determine how bright a photograph appears. Our goal with Real Tone was to ensure that people of color do not appear unnaturally darker or brighter, but rather exactly as they really are.
- **Reduce washed-out images.** Stray light in a photo setting can wash out any image – such as when you are taking a picture with a sunlit window directly behind the subject. This effect is even greater for people with darker skin tones, often leaving their faces in complete shadow. A new algorithm Google developed aims to reduce the impact of stray light on finished images.
- **Sharpen blurry images even in low light.** We discovered that photos of people with darker skin tones tend to be more blurry than normal in low light conditions. We leveraged the AI features in the Google Tensor chip to sharpen photos, even when the photographer's hand isn't steady and when there isn't a lot of light available.

https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/ (annotations added).



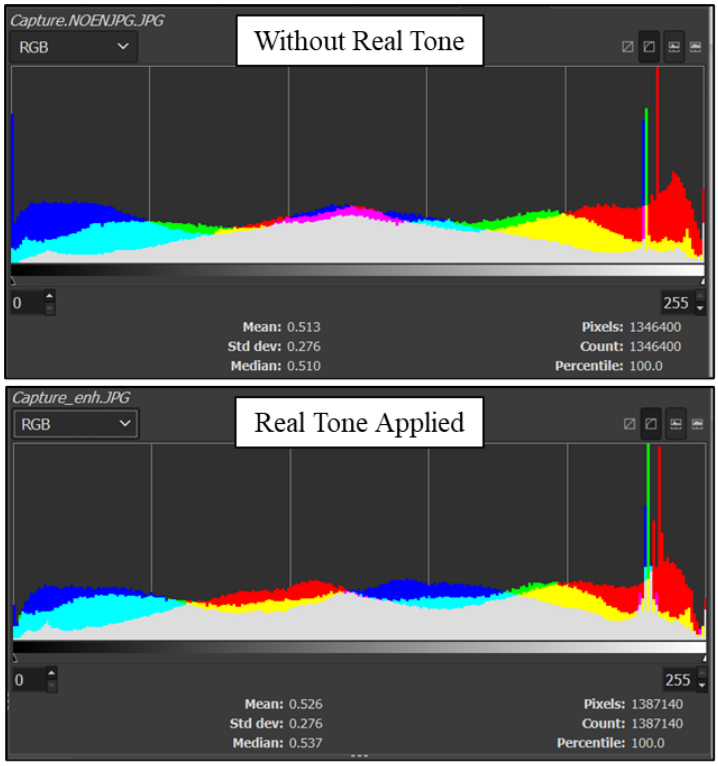
https://store.google.com/intl/en/discover/realtone/ (annotations added).



Auto-white balance models help determine color in a picture. Our partners helped us hone these models to better reflect a variety of skin tones.

https://store.google.com/intl/en/discover/realtone/ (annotations added).

173. RGB histograms confirm the adjustments to color balance in an image without Real Tone and the same image with Real Tone applied.



Images used in testing available at https://store.google.com/intl/en/discover/realtone/.

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174. On information and belief, Google directly infringes at least claim 10 of the ’056 patent by making, using, offering to sell, selling, and/or importing into the United States Google’s Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality.

175. On information and belief, Google directly infringes one or more claims of the ’056 patent when it tests Google’s Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality.

176. Google had actual notice pursuant to 35 U.S.C. § 287(a) of the ’056 patent and the infringement alleged herein as of on or around June 7, 2023, when Longitude provided notice to Google.

177. Google has indirectly infringed and continues to indirectly infringe the ’056 patent by actively inducing, in violation of 35 U.S.C. § 271(b), the direct infringement of the ’056 patent by others in the United States.

178. Google has induced, and continues to induce, through affirmative acts, its customers and other third parties to directly infringe the ’056 patent by using the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality of Google’s Pixel smartphones and tablets.

179. On information and belief, Google knows that it provides, markets, and actively promotes the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality of its Pixel smartphones and tablets.

180. On information and belief, Google designed, marketed, and continues to market the Real Tone and/or auto-enhancement camera features and/or Google Photos functionality of its Pixel smartphones and tablets to third parties with knowledge and the specific intent to cause third parties to use, offer to sell, or sell in the United States, and/or import into the United States, Pixel smartphones and tablets capable of executing color balance on a specific subject area in an image. For example, Google encourages its customers to use Google Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality to take photos that are adjusted to “make every picture more authentic and more

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representative of the subject of the photo – regardless of their skin tone," and to "tune up any photo" using the "auto-enhancement feature in Google Photos" "to optimize[] color and lighting in any picture, across all skin tones."[10]

181. Google knew that its customers would use, offer to sell, and/or sell accused Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality in the United States, and Google specifically intended its customers to purchase and use the accused Pixel smartphones and tablets.

182. Google has induced others' direct infringement despite actual notice that Pixel smartphones and tablets with Real Tone and/or auto-enhancement camera features and/or Google Photos functionality infringe the '056 patent. As of at least June 7, 2023, Google knew that the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been and continue to be committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

183. The above-described acts of infringement have caused injury and damage to Longitude.

184. Longitude is entitled to recover damages sustained as a result of Google's infringement in an amount subject to proof at trial, but in no event less than a reasonable royalty.

COUNT IV: INFRINGEMENT OF U.S. PATENT NO. 7,428,082

185. The allegations of paragraphs 1-112 of this Complaint are incorporated by reference here.

186. Pursuant to 35 U.S.C. § 282, the '082 patent is presumed valid.

187. Google has directly infringed and continues to directly infringe one or more claims of the '082 patent, in violation of 35 U.S.C. § 271(a), by making, using offering to sell, selling, and/or importing into the United States the '082 Accused Instrumentalities, which include

[10] https://store.google.com/intl/en/ideas/articles/inclusive-photography-real-tone/.

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Google's Snapseed application operating on any compatible device, including smartphones and tablets running the Android or iOS operating systems and laptop computers running ChromeOS.

188. Paragraphs 190-212 describe how the '082 Accused Instrumentalities practice claim 1 of the '082 patent, by way of the Snapseed app running on the exemplary Pixel 4 XL smartphone. Longitude's allegations of infringement are not limited to claim 1 or to the exemplary product, and additional infringement will be identified and disclosed through discovery and in infringement contentions.

189. On information and belief, the '082 Accused Instrumentalities are in relevant part substantially similar to the Snapseed app running on the exemplary Pixel 4 XL smartphone, in particular with regard to how the '082 Accused Instrumentalities include an image data generator (digital camera system, e.g.), control data storage for pre-storing image processing control data (filters, e.g.), a relating module for relating the image data and image processing control data (for previewing the effects of filters applied to digital images, e.g.), a storage manager for updating part of the image processing control data based on specification data (a processor and software for creating custom filters), and where the image processing control data is used to process the image data (by applying filters to the digital images, e.g.). Paragraphs 190-212 are thus illustrative of how the '082 Accused Instrumentalities infringe.

190. Google's Pixel smartphones, including, for example, the Pixel 4 XL smartphone, running the Snapseed app comprise an image related data generator, connectable to a server. The Pixel 4 XL smartphone includes a multi-camera system, in which the cameras, including lens systems and detectors associated with the "Main Camera" and "Selfie Camera," are used to generate image data.

MAIN CAMERA	Dual	12.2 MP, f/1.7, 27mm (wide), 1/2.55", 1.4µm, dual pixel PDAF, OIS 16 MP, f/2.4, 50mm (telephoto), 1/3.6", 1.0µm, PDAF, OIS, 2x optical zoom
	Features	Dual-LED flash, Auto-HDR, panorama
	Video	4K@30fps, 1080p@30/60/120fps, 1080p@30fps (gyro-EIS)
SELFIE CAMERA	Dual	8 MP, f/2.0, 22mm (wide), 1.22µm, no AF TOF 3D, (depth/biometrics sensor)
	Features	Auto-HDR
	Video	1080p@30fps
SOUND	Loudspeaker	Yes, with stereo speakers
	3.5mm jack	No
COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac, dual-band, Wi-Fi Direct, DLNA, hotspot
	Bluetooth	5.0, A2DP, LE, aptX HD
	GPS	Yes, with A-GPS, GLONASS, BDS, GALILEO
	NFC	Yes
	Radio	No
	USB	3.1, Type-C 1.0 reversible connector
FEATURES	Sensors	Face ID, accelerometer, gyro, proximity, compass, barometer
BATTERY		Non-removable Li-Po 3700 mAh battery
	Charging	Fast charging 18W USB Power Delivery 2.0 QI wireless charging

https://www.gsmarena.com/google_pixel_4_xl-9895.php (annotation added).

191. The Pixel 4 XL also includes storage (6 GB of RAM and 64 or 128 GB of storage) that stores image filters for applying to the image data generated by the cameras.

MEMORY	Card slot	No
	Internal	64GB 6GB RAM, 128GB 6GB RAM UFS 2.1

https://www.gsmarena.com/google_pixel_4_xl-9895.php.

192. The Pixel 4 XL is also connectable to a server, for instance, the user's Google Drive via the Internet.

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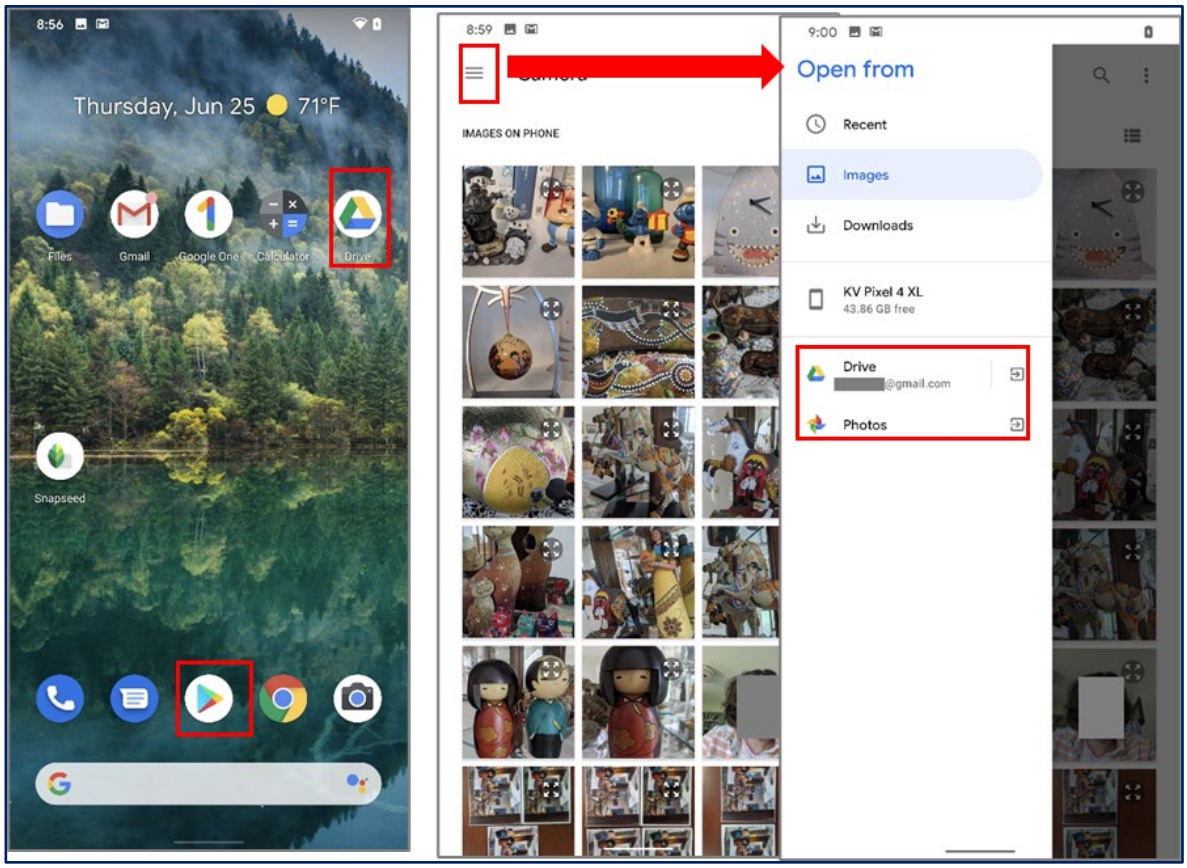
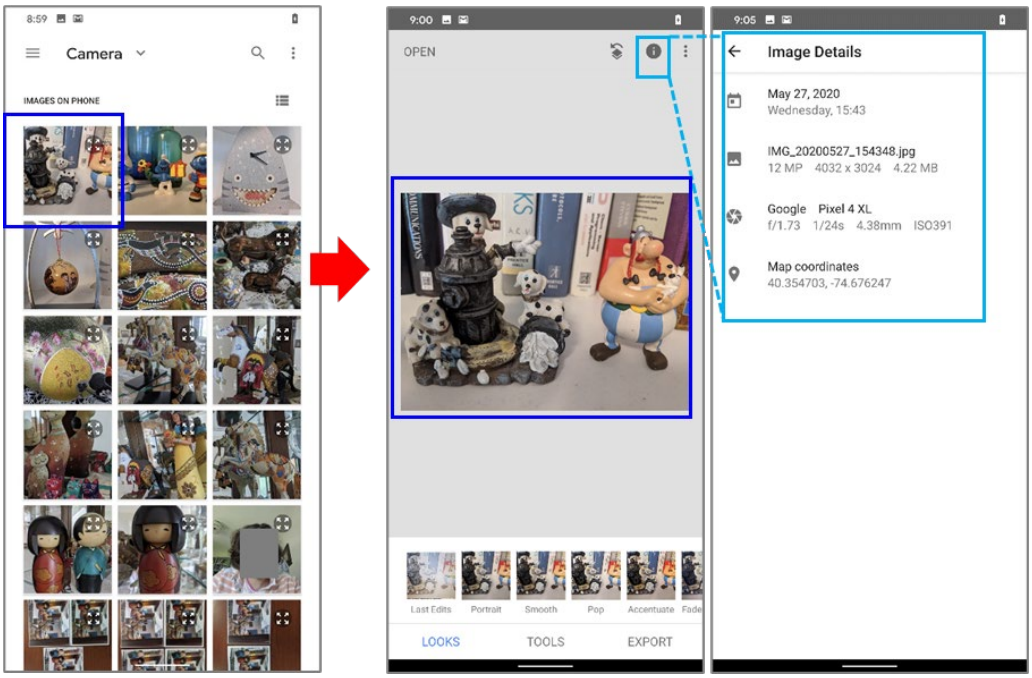


193. Google's Pixel smartphones, including, for example, the Pixel 4 XL smartphone, running the Snapseed app comprise an image data generator configured to generate image data. The Pixel 4 XL smartphone includes a multi-camera system, in which the cameras, including lens systems and detectors associated with the "Main Camera" and "Selfie Camera," are used to generate image data.

MAIN CAMERA	Dual	12.2 MP, f/1.7, 27mm (wide), 1/2.55", 1.4µm, dual pixel PDAF, OIS 16 MP, f/2.4, 50mm (telephoto), 1/3.6", 1.0µm, PDAF, OIS, 2x optical zoom
	Features	Dual-LED flash, Auto-HDR, panorama
	Video	4K@30fps, 1080p@30/60/120fps, 1080p@30fps (gyro-EIS)
SELFIE CAMERA	Dual	8 MP, f/2.0, 22mm (wide), 1.22µm, no AF TOF 3D, (depth/biometrics sensor)
	Features	Auto-HDR
	Video	1080p@30fps
SOUND	Loudspeaker	Yes, with stereo speakers
	3.5mm jack	No
COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac, dual-band, Wi-Fi Direct, DLNA, hotspot
	Bluetooth	5.0, A2DP, LE, aptX HD
	GPS	Yes, with A-GPS, GLONASS, BDS, GALILEO
	NFC	Yes
	Radio	No
	USB	3.1, Type-C 1.0 reversible connector
FEATURES	Sensors	Face ID, accelerometer, gyro, proximity, compass, barometer
BATTERY		Non-removable Li-Po 3700 mAh battery
	Charging	Fast charging 18W USB Power Delivery 2.0 QI wireless charging

https://www.gsmarena.com/google_pixel_4_xl-9895.php (annotation added).

194. The CMOS image sensor in the camera is configured to generate image data of an image captured by the optical assembly.



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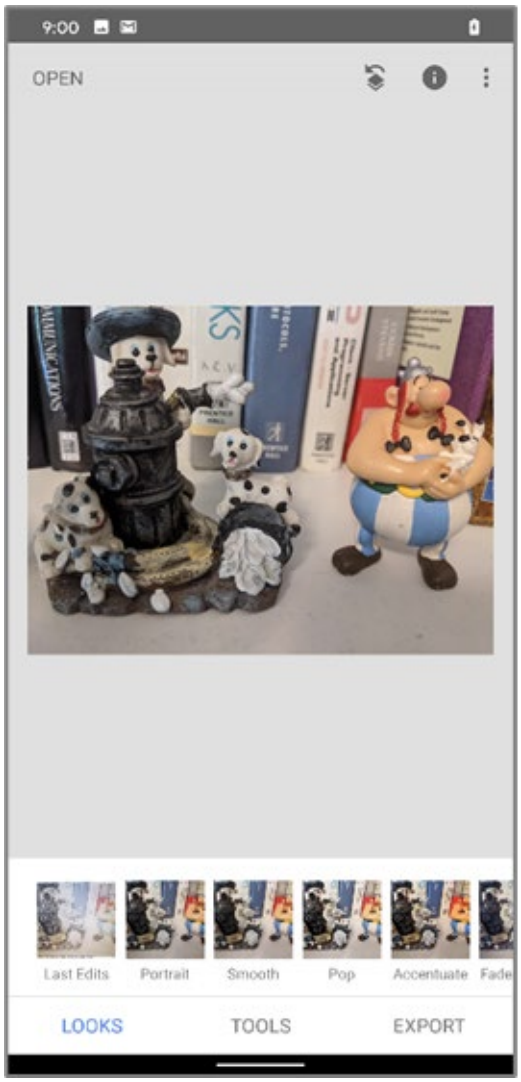
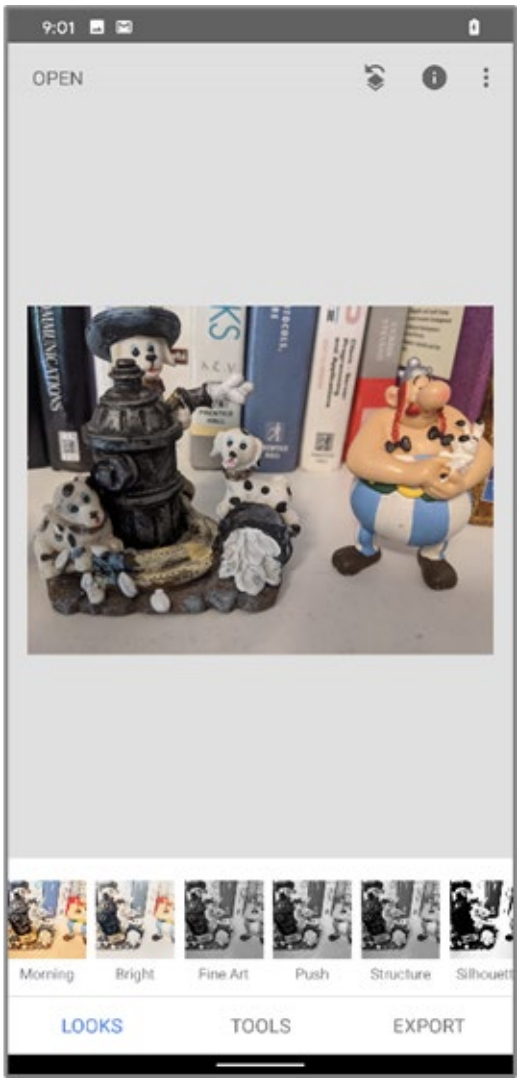
195. Google's Pixel smartphones, including, for example, the Pixel 4 XL smartphone, running the Snapseed app comprise a control data storage module pre-storing image processing control data to control image processing of the image data. For instance, the Pixel 4 XL smartphone contains memory (e.g., RAM and flash storage) that stores pre-loaded image processing control data associated with the Snapseed app. The image processing control data comprises "Looks" such as "Smooth," "Pop," "Morning," or "Bright."





196. The graphical user interface (GUI) in the Snapseed app generates and applies different color effects and specific image processing according to the selected Look. For example, the "Smooth", "Morning", and "Bright" Looks are used in processing the image as shown.

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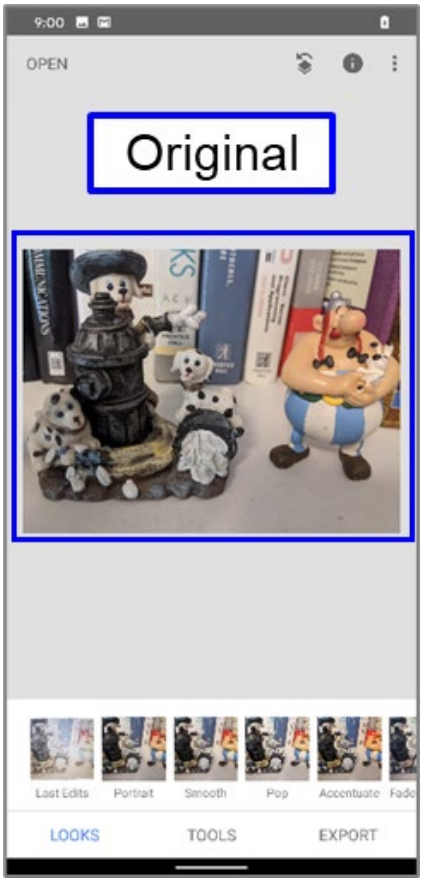

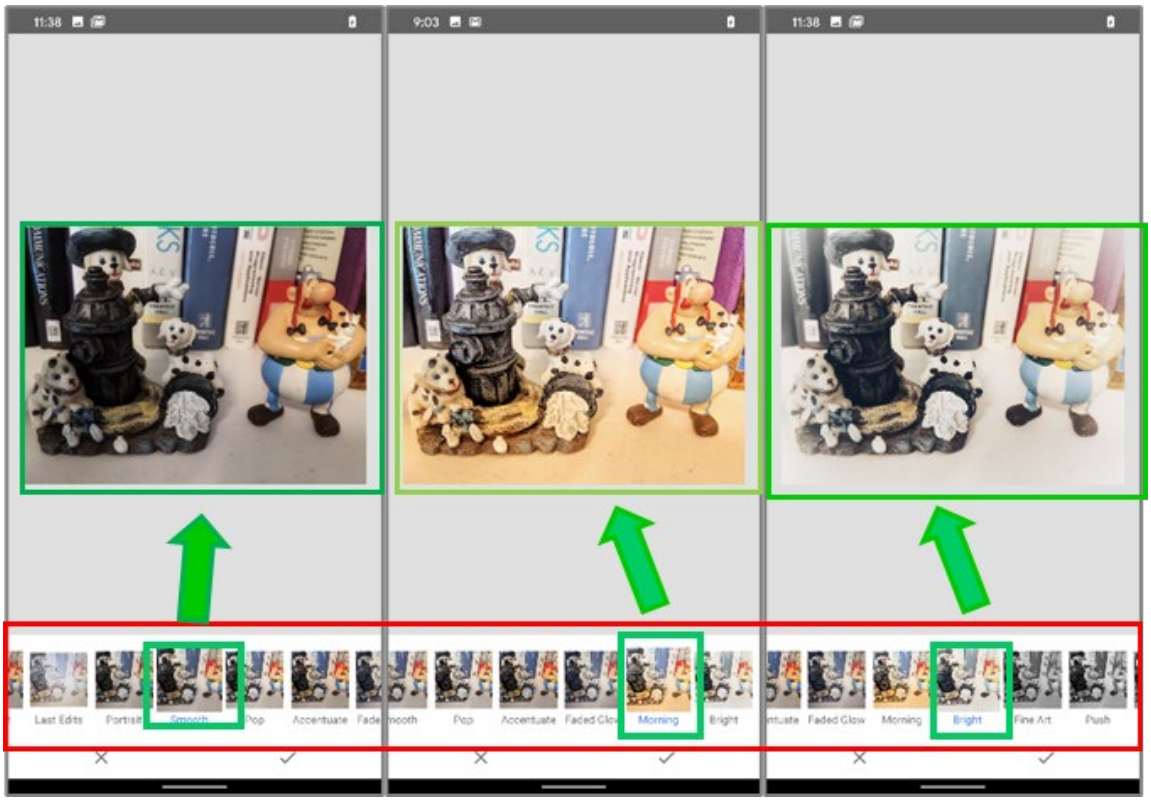

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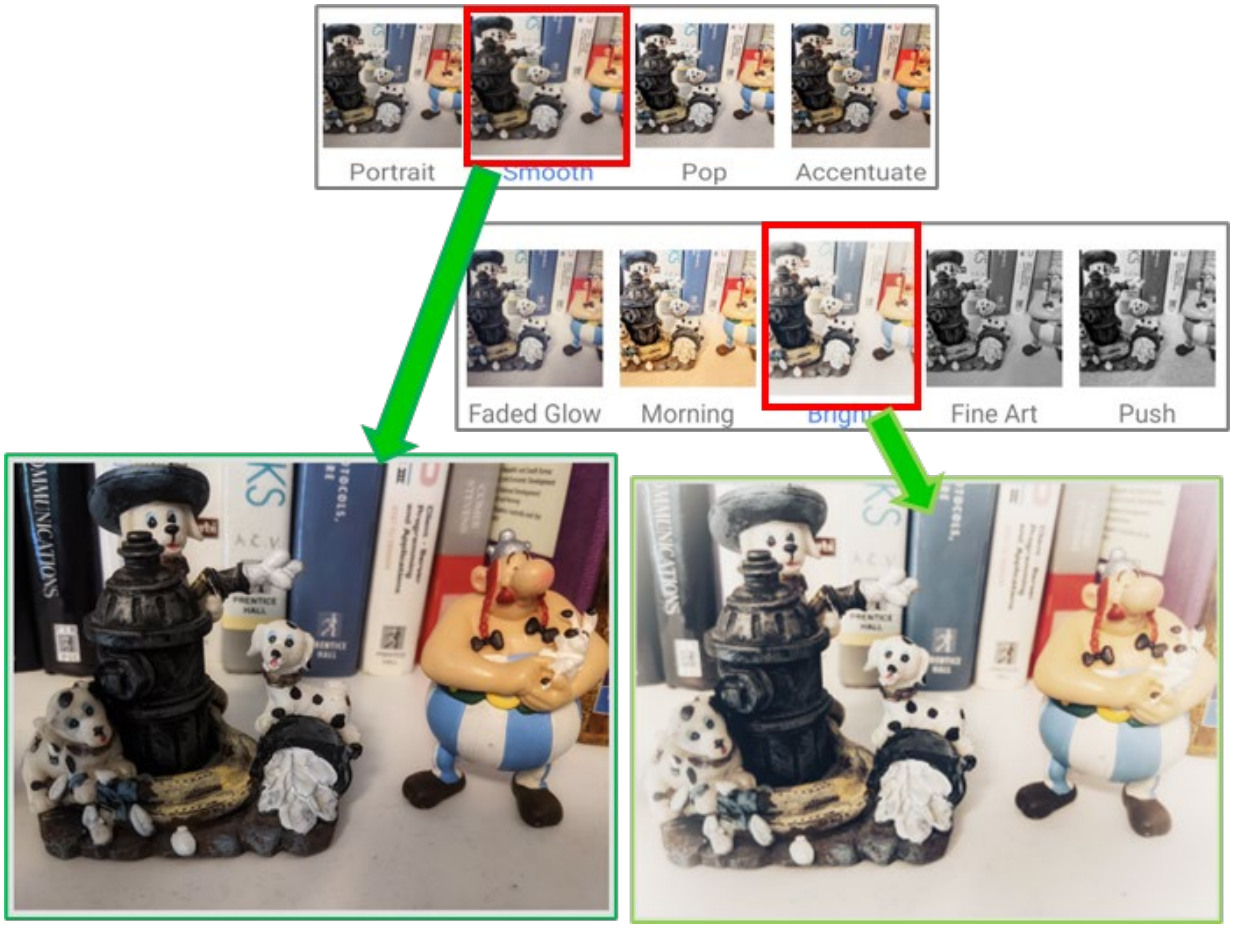
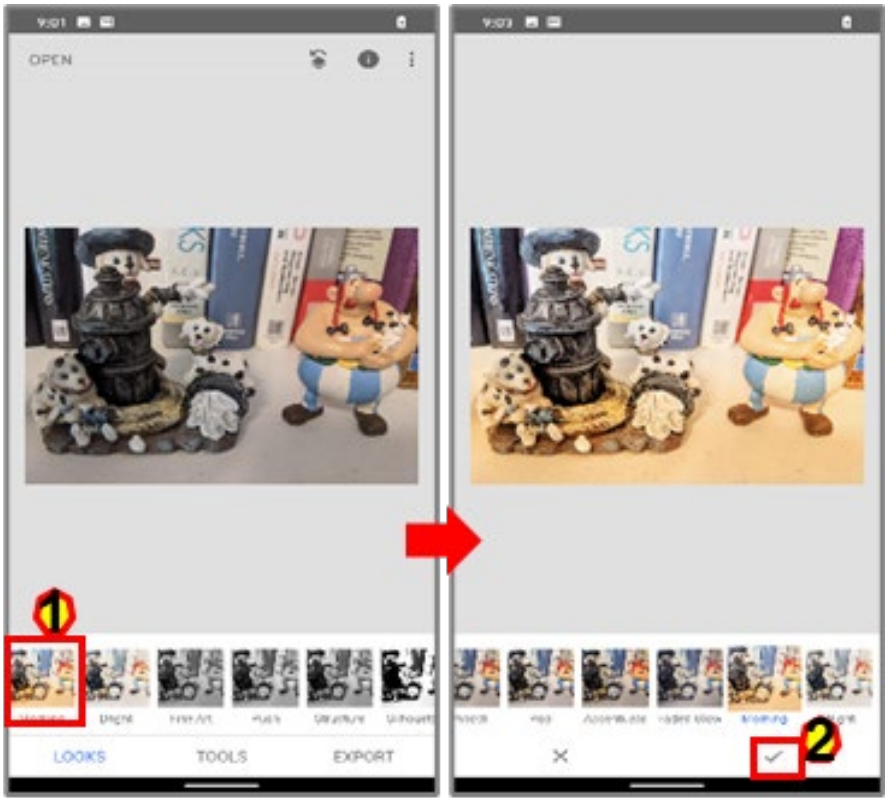
197. Google's Pixel smartphones, including, for example, the Pixel 4 XL smartphone, running the Snapseed app comprise a relating module configured to relate the image data to the image processing control data. For instance, the preloaded Looks in the Snapseed app perform image processing on the image. Logic in the Pixel 4 XL relates different Looks to the image data in a thumbnail preview panel according to the selected Look. Thumbnails of the different Looks preview the image processing control data applied to the original image.



198. Google's Pixel smartphones, including, for example, the Pixel 4 XL smartphone, running the Snapseed app comprise a storage manager configured to update at least a part of the image processing control data stored in the control data storage, based on specification data, which specifies the image processing control data to be updated. For instance, through the Snapseed app running on the Pixel 4 XL, users can create new, custom image filters to apply to image data. A user can apply a "Look" such as "Morning" (1 and 2 below) followed by a

particular frame effect (3 through 6 below) and save the new filter under a custom name (7 through 9 below).



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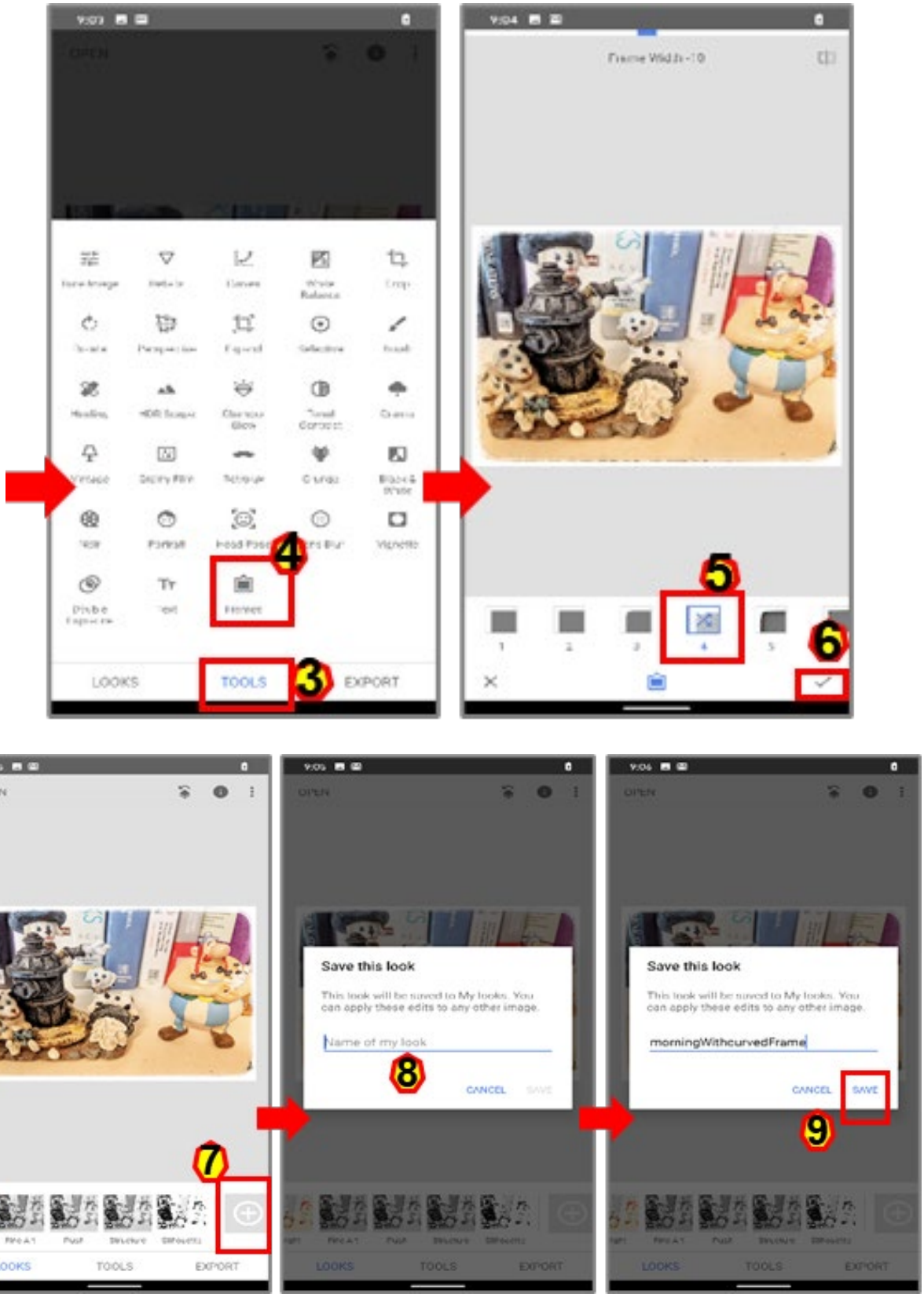
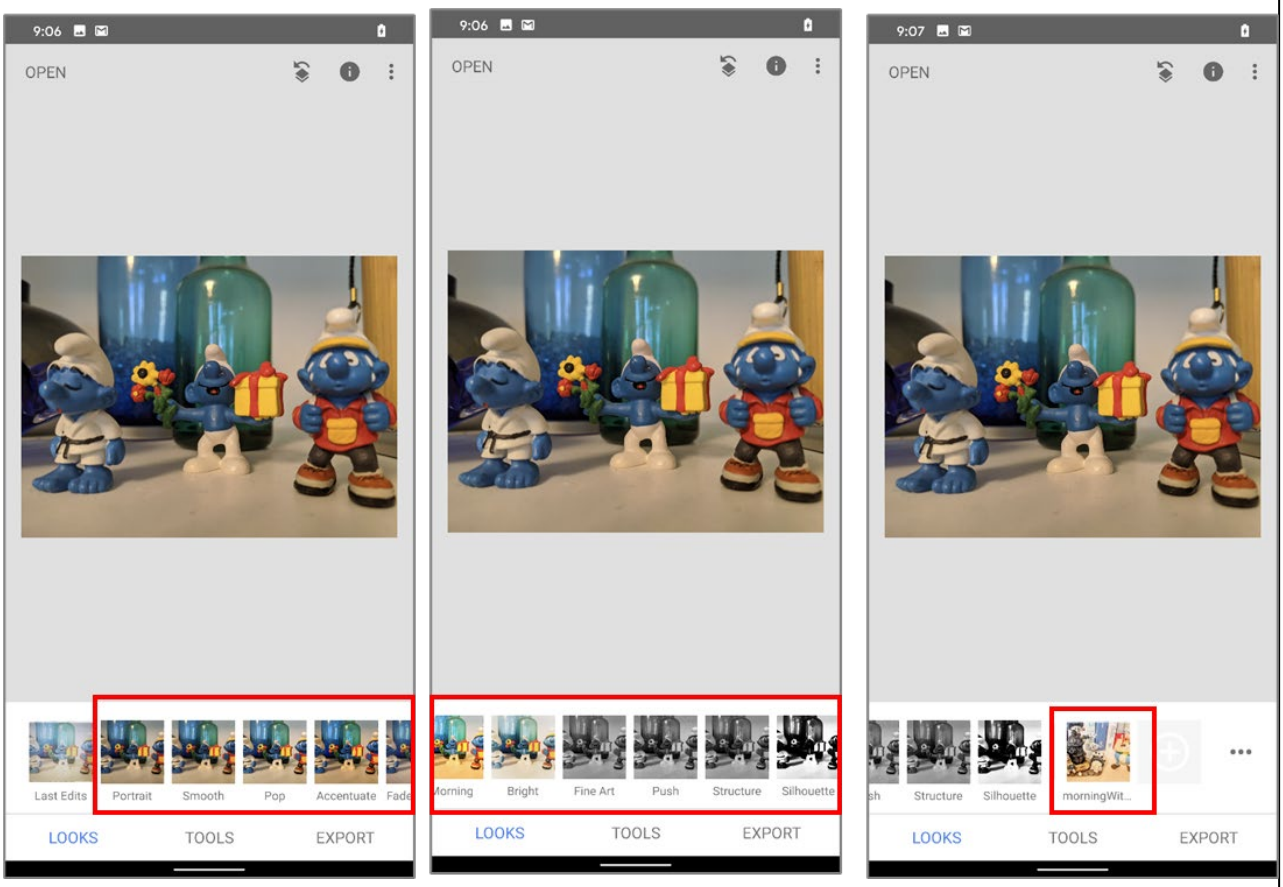


199. The storage manager on the Pixel 4 XL updates the set of filters (under "Looks," e.g.) based on specification data such as the name of the filter (e.g., "morningWithcurvedFrame"), which specifies the image processing control data to be updated to include the new image filter.

200. The new image filter is further stored in the control data storage module. For example, when a new image is generated by the image data generator, the new image filter (e.g., "morningWithcurvedFrame") is presented to the user as an available Look.



201. Google's Pixel smartphones, including, for example, the Pixel 4 XL smartphone, running the Snapseed app comprise a storage manager configured to update at least a part of the image processing control data stored in the control data storage, based on specification data, which specifies the image processing control data to be updated, and further wherein the image processing control data is to be used in processing of the image data by an image processing device that receives the image data and the image processing control data that are transferred from the image related data generator. For instance, upon selecting one of the Looks, such as

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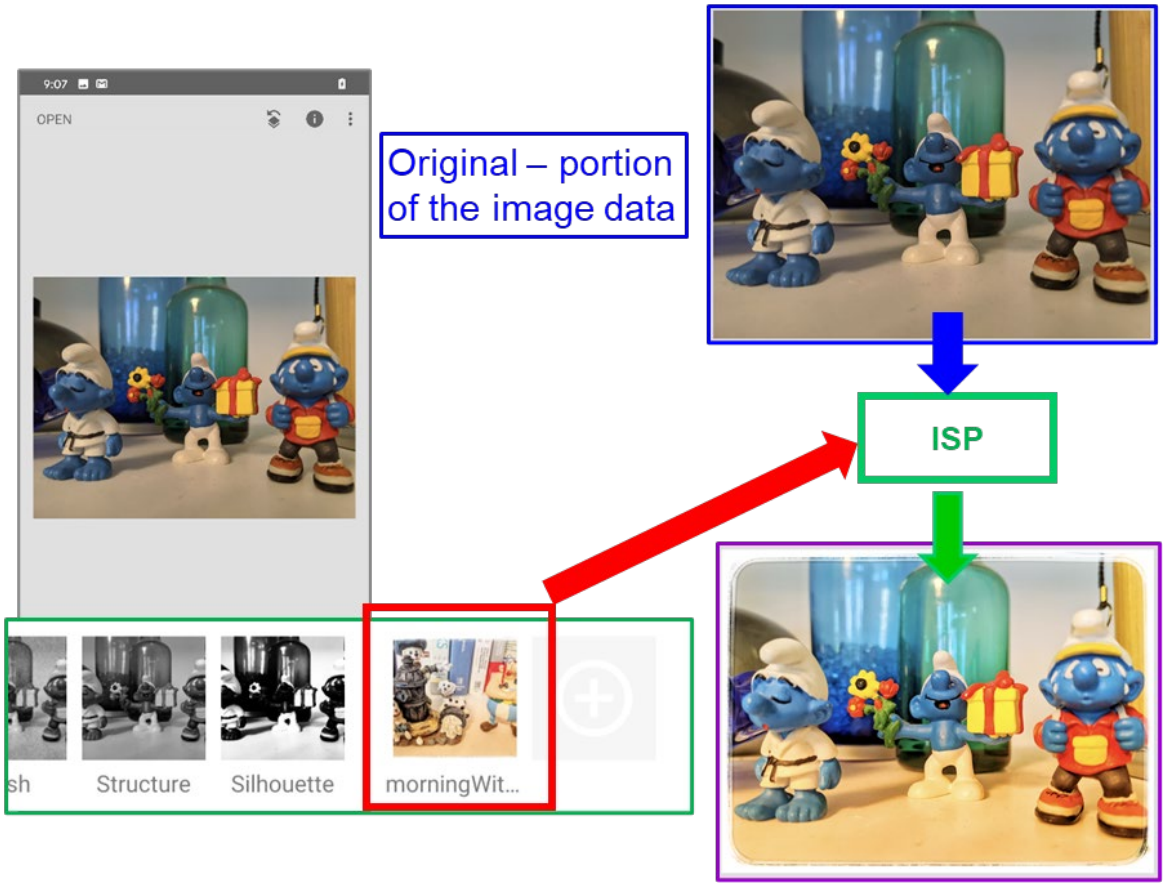
"morningWithcurvedFrame," a new image is generated where the specific image processing related to the selected Look is applied to the original image by the image processing device.



202. In this example, the image processing device comprises an Image Signal Processor (ISP) on the Pixel 4 XL.

203. On information and belief, Google has directed infringed and continues to direct infringe at least claims 1, 2, and 4 of the '082 patent by making, using, offering to sell, selling, and/or importing into the United States the '082 Accused Instrumentalities. For instance, the LinkedIn profile of a "Senior iOS Developer" at Google, located in Mountain View, California, describes a role in "Contributing to Google Photos and Snapseed."[11] According to LinkedIn, a different current Google employee in the San Francisco Bay Area describes himself as a "Product Manager" for "Google Pixel Camera," and further lists "PM for photography and videography

[11] https://www.linkedin.com/in/tlextrait/.

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software on Google Pixel phones."[12] Another current Google employee, located in Mountain View, California, describes himself as "Technical Program Manager – Google Pixel Camera."[13]

204. On information and belief, Google has directly infringed and continues to directly infringe at least claims 1, 2, and 4 of the '082 patent when it tests the '082 Accused Instrumentalities prior to releasing them to its customers. On information and belief, Google tests the '082 Accused Instrumentalities on, e.g., Android and iOS devices and on laptops running the ChromeOS operating system, to confirm that the application works properly before releasing it to users.

205. On information and belief, testing of the '082 Accused Instrumentalities is important to Google's success. This testing allows Google to ensure that iterative versions, updates, and subsequent releases of the Snapseed app remain compatible and operable with various consumer devices, including a wide variety of smartphones and tablets running the Android or iOS operating systems and laptops running the ChromeOS operating system.

206. Google had actual notice pursuant to 35 U.S.C. § 287(a) of the '082 patent and the infringement alleged herein as of on or around August 20, 2020, when Longitude provided notice to Google.

207. Google has indirectly infringed and continues to indirectly infringe the '082 patent by actively inducing, in violation of 35 U.S.C. § 271(b), the direct infringement of the '082 patent by others in the United States.

208. Google has induced, and continues to induce, through affirmative acts, its customers and other third parties to directly infringe the '082 patent by using the '082 Accused Instrumentalities in the United States.

209. On information and belief, Google knows that it provides and markets an application, through the Google Play Store and the Apple App Store, for use on devices that

[12] https://www.linkedin.com/in/ken123103/.

[13] https://www.linkedin.com/in/markusgartner/.

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causes the devices and their users, importers, sellers, and customers to directly infringe the '082 patent when used as intended.

210. On information and belief, Google has designed and marketed the Snapseed app to third parties with knowledge and the specific intent to cause the third parties to make, use, offer to sell, or sell in the United States, and/or import into the United States, products incorporating the Snapseed app. For example, in the Google Play Store, Google describes Snapseed as "a complete and professional photo editor developed by Google."[14] Google further markets Snapseed with various statements including "[s]ave and share your favorite looks," "[p]erfect any photo fast using tools and filters," and "[t]une any effect with precision."[15]

211. On information and belief, Google actively encourages its customers and end users to directly infringe the '082 patent by encouraging them to use the Snapseed app as intended on various devices. For instance, Google instructs Snapseed users to "save your personal looks and apply them to new photos later."[16] Google provides detailed instructions to Snapseed users explaining how to create and save custom filters on its Snapseed support website.[17] The instructions explain that users can use "stacks," sequences of filters that have been applied to edit an image, to use, modify, and apply "[f]ilters that have been previously applied to an image."[18] Snapseed enables users to copy and paste edits "from one image to another, insert additional Tools and Filters into the workflow, or adjust slider settings, all without having to start over."[19] Thus, on information and belief, Google provides detailed, step-by-step instructions to Snapseed

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[14] https://play.google.com/store/apps/details?id=com.niksoftware.snapseed&hl=en_US&gl=US.

[15] *Id.*

[16] *Id.*

[17] https://support.google.com/snapseed/answer/6155517?hl=en&ref_topic=6155507&sjid=10838383699742808373-NA.

[18] https://support.google.com/snapseed/answer/6155543?hl=en&ref_topic=6155507&sjid=10838383699742808373-NA.

[19] *Id.* ("Tap 2 to access the stack for the current image. The number in the icon will change based on how many Tools and Filters have been applied to the image.").

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users explaining how to create new filters or edit preexisting filters, and save those custom filters to be used with other images.

212. Google has induced others' direct infringement despite actual notice that the '082 Accused Instrumentalities infringe the '082 patent. As of at least August 20, 2020, Google knew that the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been and continue to be committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

213. The above-described acts of infringement have caused injury and damage to Longitude.

214. Longitude is entitled to recover damages sustained as a result of Google's infringement in an amount subject to proof at trial, but in no event less than a reasonable royalty.

COUNT V: INFRINGEMENT OF U.S. PATENT NO. 7,486,807

215. The allegations of paragraphs 1-112 of this Complaint are incorporated by reference here.

216. Pursuant to 35 U.S.C. § 282, the '807 patent is presumed valid.

217. Google has directly infringed and continues to directly infringe at least claims 1, 7, and 8 of the '807 patent, in violation of 35 U.S.C. § 271(a), by making, using, offering to sell, selling, and/or importing into the United States the '807 Accused Instrumentalities, which include at least those versions of Google Photos that permit manual face tagging. On information and belief, the '807 Accused Instrumentalities include at least Google Photos v4.32[20] and later as configured to run on any compatible device, including devices with the Android or iOS operating

[20] *See* "Google Photos rolls out manual face tagging: Tutorial, benefits, and a big asterisk" ("Manual Face Tagging"), https://www.androidpolice.com/2019/11/27/google-photos-rolls-out-manual-face-tagging-tutorial-benefits-and-a-big-asterisk/ ("A few months ago, Google Photos product lead, David Lieb, told us that manually tagging faces was on the app's update roadmap. We didn't hear anything about the feature until last week, when XDA developers managed to find it hidden inside Photos v4.32 and enable it.").

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systems, as well as on Google servers accessible from, e.g., personal computers running the MacOS or Microsoft Windows operating systems.

218. Paragraphs 220-251 describe how the '807 Accused Instrumentalities infringe claim 1 of the '807 patent, by way of the Google Photos app installed on an exemplary smartphone running the Android operating system (exemplary Infringing Scenario 1) and further by way of the photos.google.com website as accessed by a Macintosh laptop (exemplary Infringing Scenario 2); on information and belief, photos.google.com is stored on servers operated and controlled by Google. Longitude's allegations of infringement are not limited to claim 1 or these exemplary configurations, and additional infringement will be identified and disclosed through discovery and in infringement contentions.

219. On information and belief, the '807 Accused Instrumentalities are in relevant part substantially similar to those demonstrated in exemplary Infringing Scenarios 1 and 2 below, in particular with regard to how all versions of Google Photos from v4.32 onward facilitate face tagging. Paragraphs 220-251 are thus illustrative of how the '807 Accused Instrumentalities infringe.

220. Google Photos, including, for example, the Google Photos app running on an Android smartphone or tablet, or the Google Photos service as accessed, for example, at photos.google.com, comprises an image retrieving device for classifying and retrieving an image by detecting an object in the image and adding a keyword. For instance, the Google Photos app is capable of classifying images stored within a database, by detecting a face and adding a user-edited tag corresponding to that face. Photos of the same person are classified under the same tag, and can subsequently be retrieved according to that tag. As shown below for exemplary Infringing Scenario 1, for instance, the Google Photos app running on the Android smartphone detects a face in an image and adds a keyword (a tag), here, "Rita El Khoury."

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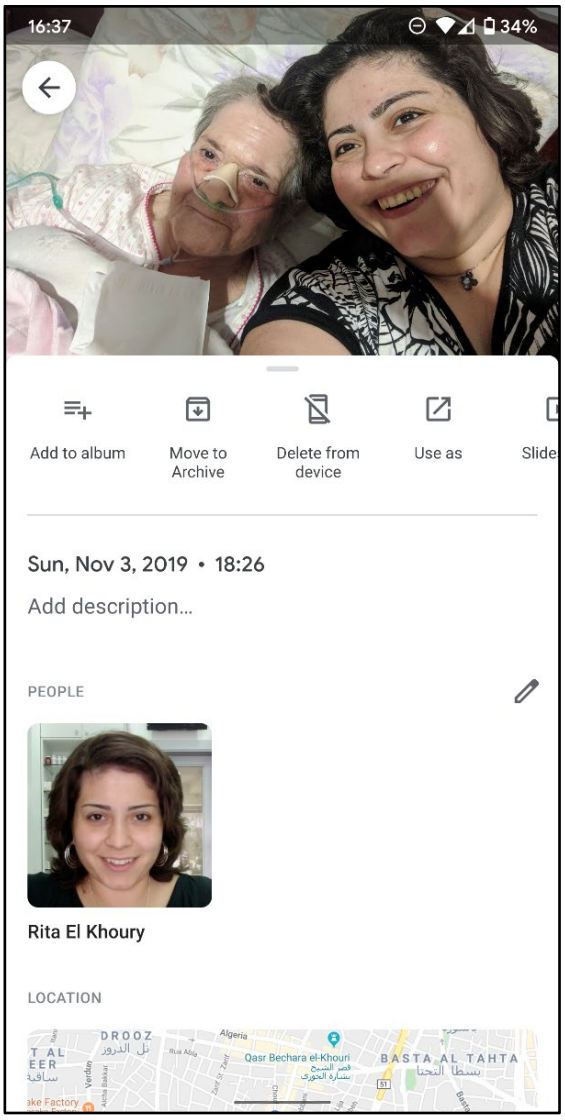

Source: "Manual Face Tagging."

221. As shown below for exemplary Infringing Scenario 2, for example, Google Photos detects a face in an image and adds a keyword, in this case, "Paul McCartney."

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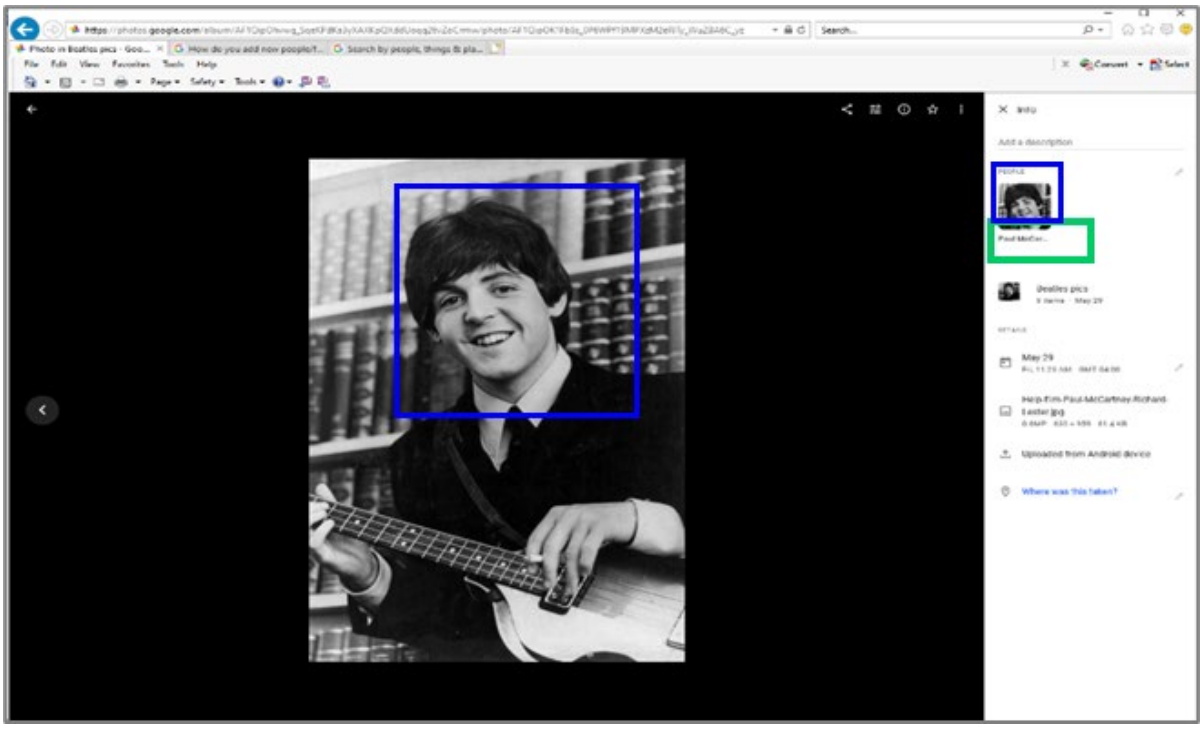
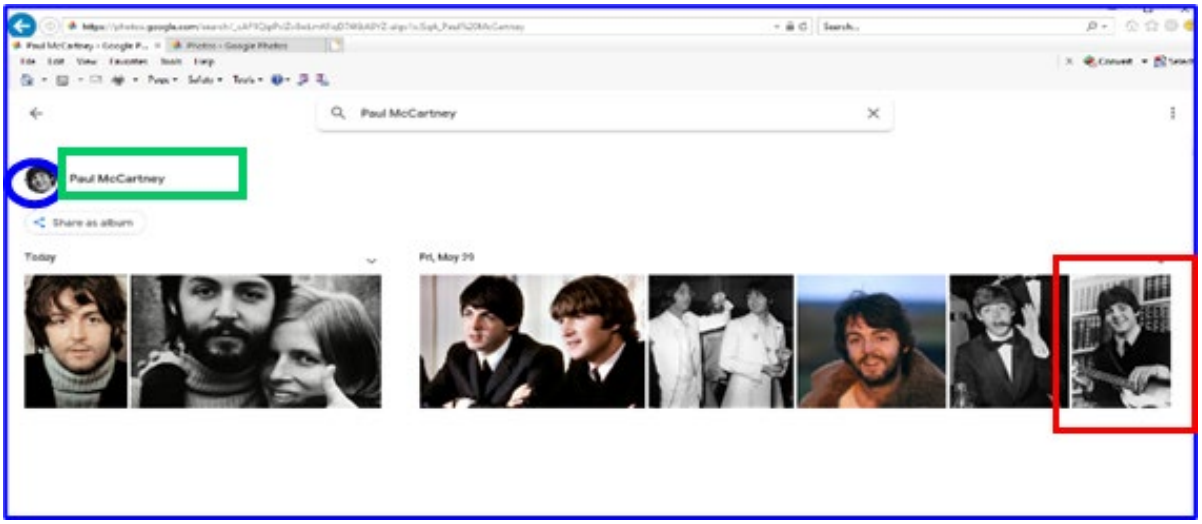




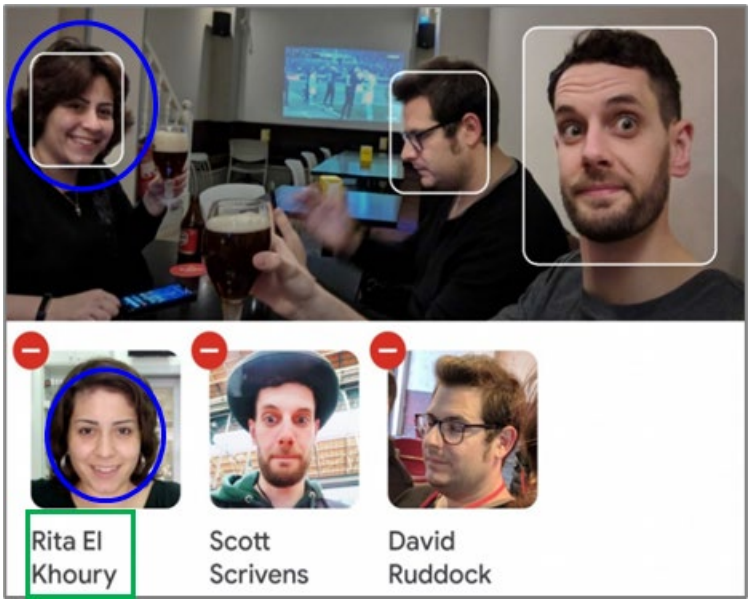
222. Google Photos is further capable of retrieving an image following classification based on detecting an object in the image and adding a keyword. For instance, photos in the database can be retrieved by searching on the keyword label for people or pets, where the keyword can include "a name or a nickname."

Search your photos

1. On your Android phone or tablet, open the Google Photos app .
2. Sign in to your Google Account.
3. At the bottom, tap Search.
   - To search by text:
     - Tap on the search box at the top, and enter what you want to find, for example:
     - New York City
     - A name or nickname, if you've labeled people or pets

https://support.google.com/photos/answer/6128838?co=GENIE.Platform%3DAndroid&hl=en&oco=0#nofacegrouping&zippy=%2Clearn-about-face-models%2Cchange-or-remove-a-label%2Cremove-add-or-change-people-pet-labels-to-your-photos%2Cremove-a-face-group-from-the-search-page ("Google Photos Help") (annotations added).

223. Google Photos, including, for example, the Google Photos app running on an Android smartphone or tablet, or the Google Photos service as accessed, for example, at photos.google.com, further comprises an image storing section for storing the image which is supposed to be classified and retrieved together with a keyword in a database and an object of the image being previously contained in the database. For instance, the Google Photos app running on an Android smartphone contains a database where all the photos are stored. On information and belief, the database is on the device itself, on Google Cloud, or both. Exemplary photos stored in the device are shown below for exemplary Infringing Scenario 1. The first photo contains three objects, in this case human faces. Each object has an associated keyword ("Rita El Khoury," "Scott Scrivens," and "David Ruddock"), and both the photo and accompanying keywords are retrieved from the database:



Source: "Manual Face Tagging" (annotations added.)

224. Exemplary photos stored in the device are shown below for exemplary Infringing Scenario 2. On information and belief, the database is on the device itself, on Google Cloud, or both. Google Photos running on the device contains a database where all images are stored. Images of Paul McCartney are included in the exemplary "Beatle pics" album in Google Photos:

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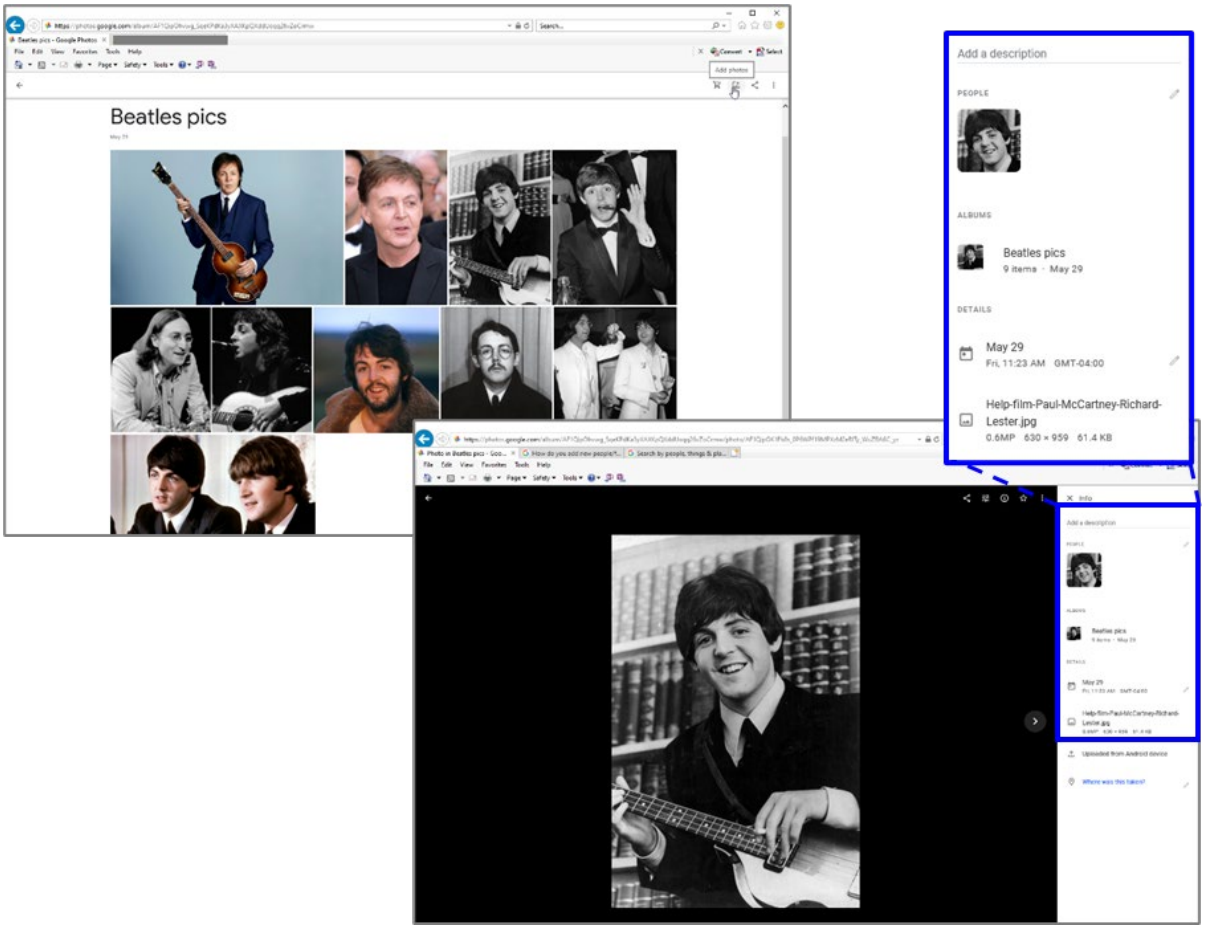

225. An exemplary image to be classified and later retrieved is assigned a keyword (a tag), such as "Paul McCartney" (1 through 4 below), and the image and keyword are then stored in the database.

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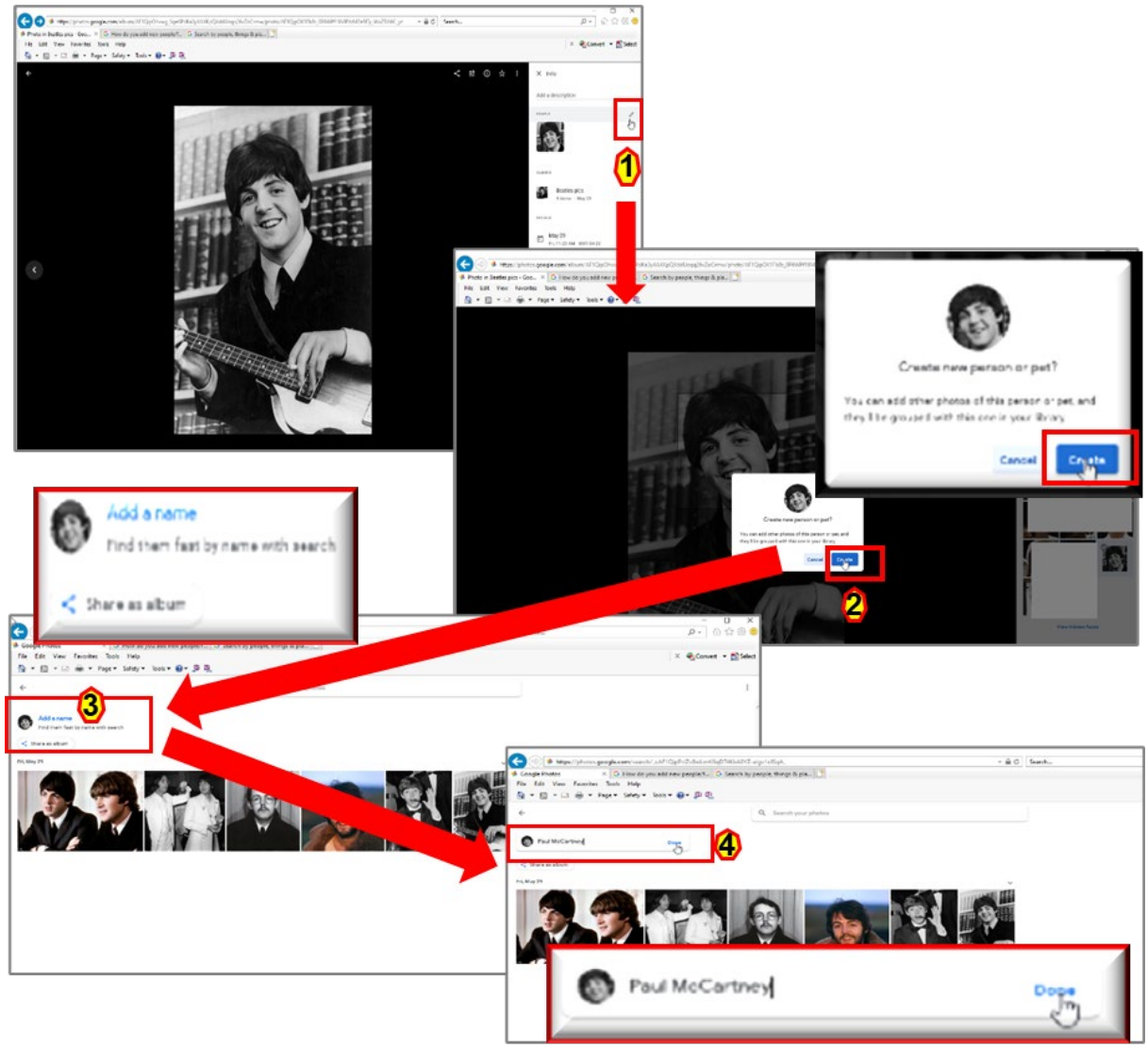

226. Here, other images with the same person's face are included in the database, and those images are identified as the same object and tagged accordingly with the keyword, in this case, "Paul McCartney."

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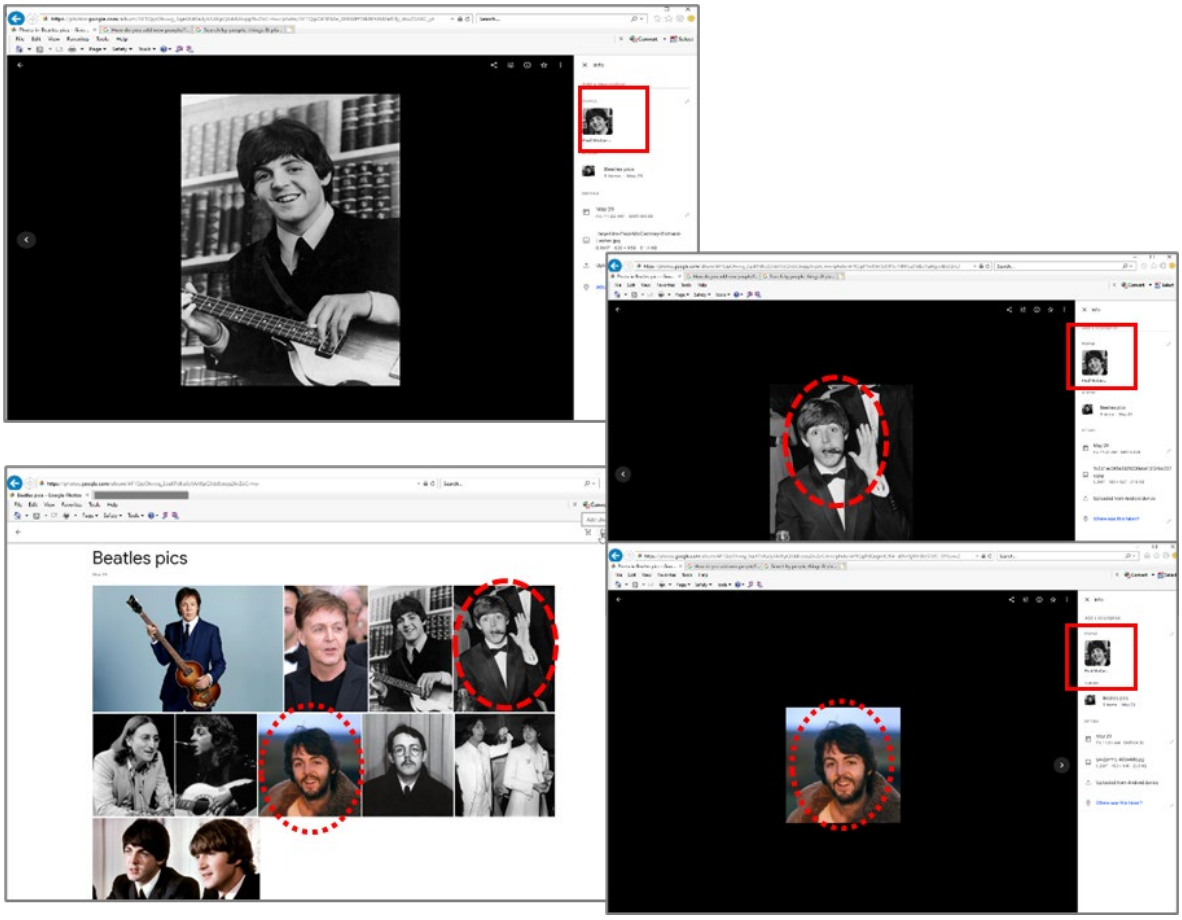

227. Google Photos, including, for example, the Google Photos app running on an Android smartphone or tablet, or the Google Photos service as accessed, for example, at photos.google.com, further comprises an image inputting detecting section that detects an inputted image that is newly inputted to the image retrieving device. For instance, in exemplary Infringing Scenario 1, the app detects a newly taken photo, and a user can select that newly taken photo from Google Photos and tag faces with a keyword (a person's name, e.g.) following the face detection process.

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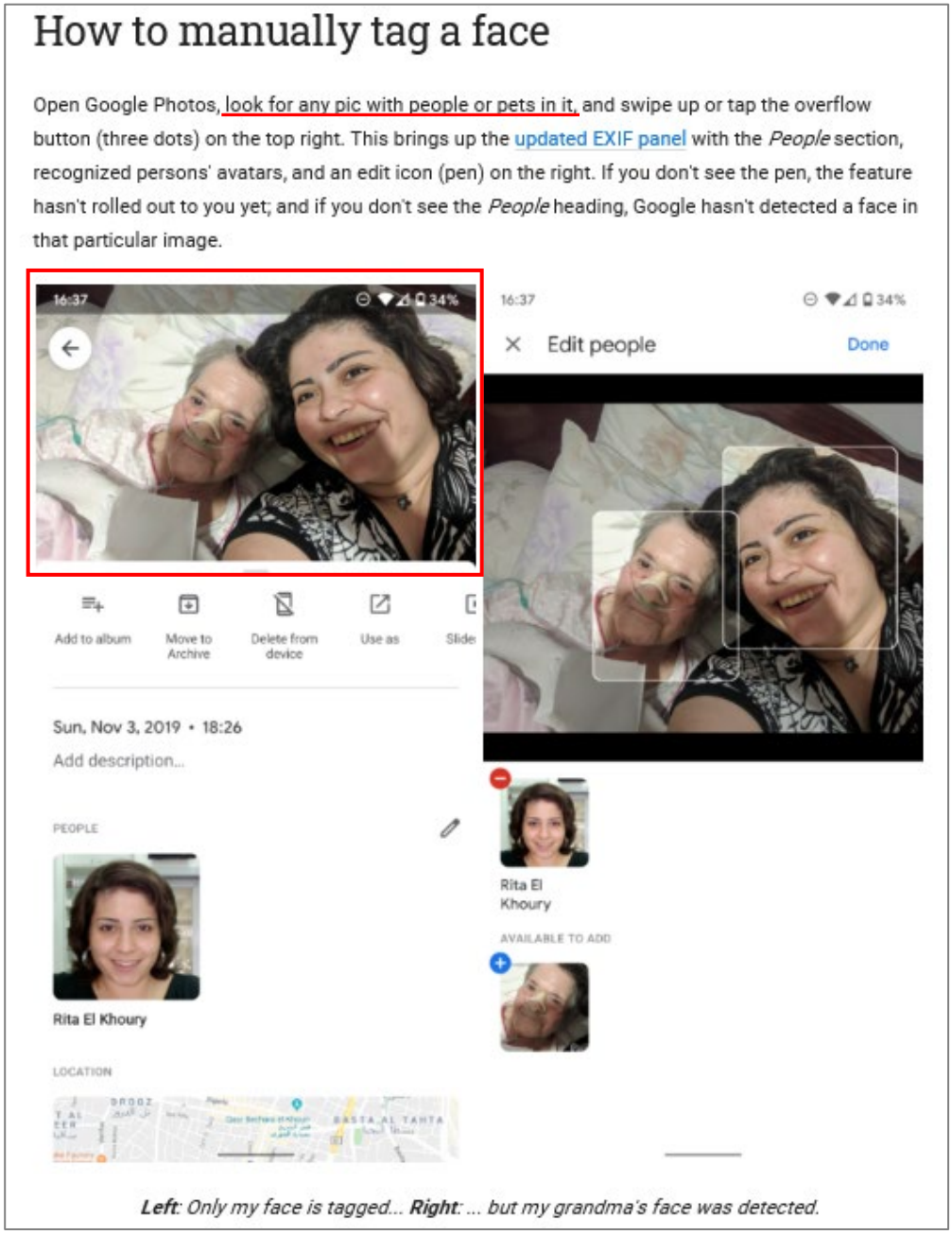
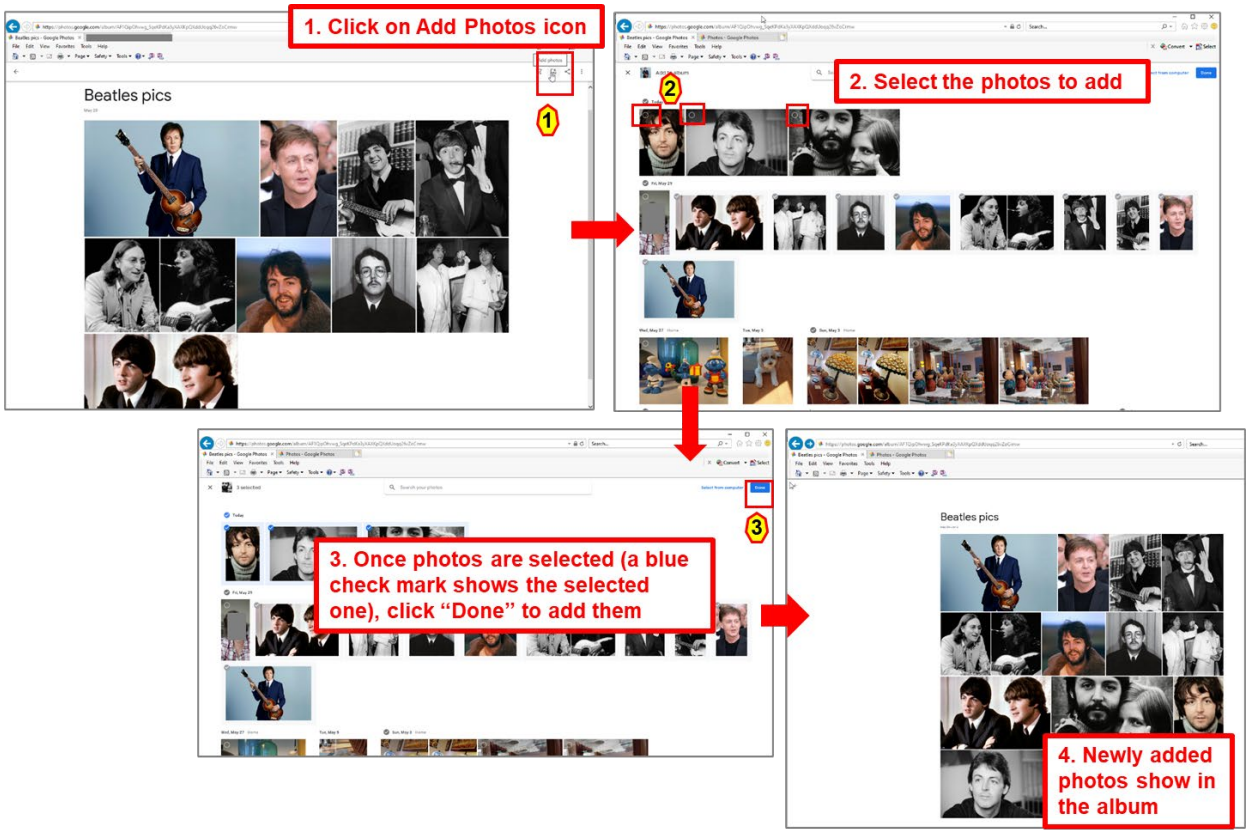


Source: "Manual Face Tagging" (annotations added).

228. Similarly, in Infringing Scenario 2, three photos of Paul McCartney are selected (at 1, 2) and added to an existing set of photos (at 3), and the system detects the newly input images (at 4).



229. Google Photos, including, for example, the Google Photos app running on an Android smartphone or tablet, or the Google Photos service as accessed, for example, at photos.google.com, further comprises an object acknowledging section for acknowledging an inputted object in the inputted image that has been detected by the image inputting detecting section. For instance, Google Photos is capable of detecting a face in the newly input and detected image described above.

> Face grouping occurs in 3 steps:
>
> 1. We detect whether any photo has a face in it.
> 2. If the face grouping feature is on, algorithms are used to create face models that numerically represent the images of faces, predict the similarity of different images of faces and estimate whether different images represent the same face.
> 3. Photos with very similar faces that are likely to be of the same person are grouped together in a face group. You can always remove a photo from a face group if you think it's in the wrong group.

Source: "Google Photos Help" (annotations added).

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> **Where manual face tags work**
>
> With the previous limitation in mind, it's easy to understand that manual tags only work when Google detects a face in a pic. Whether the face is linked to an already-created people profile in Photos, or it's a newly-recognized face whose pics haven't been grouped yet, you can access the feature and either edit, name, or add a new tag.

Source: "Manual Face Tagging" (annotations added.)

230. Google Photos, including, for example, the Google Photos app running on an Android smartphone or tablet, or the Google Photos service as accessed, for example, at photos.google.com, further comprises a keyword proposing section for proposing the keyword on a display, the keyword which relates to the inputted object which is acknowledged by the object acknowledging section. For instance, when the Google Photos app detects a face in a photo, it groups that photo together with other photos containing the same face.

> Face grouping occurs in 3 steps:
>
> 1. We detect whether any photo has a face in it.
> 2. If the face grouping feature is on, algorithms are used to create face models that numerically represent the images of faces, predict the similarity of different images of faces and estimate whether different images represent the same face.
> 3. Photos with very similar faces that are likely to be of the same person are grouped together in a face group. You can always remove a photo from a face group if you think it's in the wrong group.

Source: "Google Photos Help" (annotations added).

231. After grouping the photo with other photos containing the same face, the Google Photos app proposes a keyword relating to the inputted object. In exemplary Infringing Scenario 1, for instance, the Google Photos app proposes the keyword "Rita El Khoury," which corresponds to one of the previously tagged faces in the image, or the names "Rita El Khoury" and "Teta Lili," which correspond to both of the previously tagged faces in the image.

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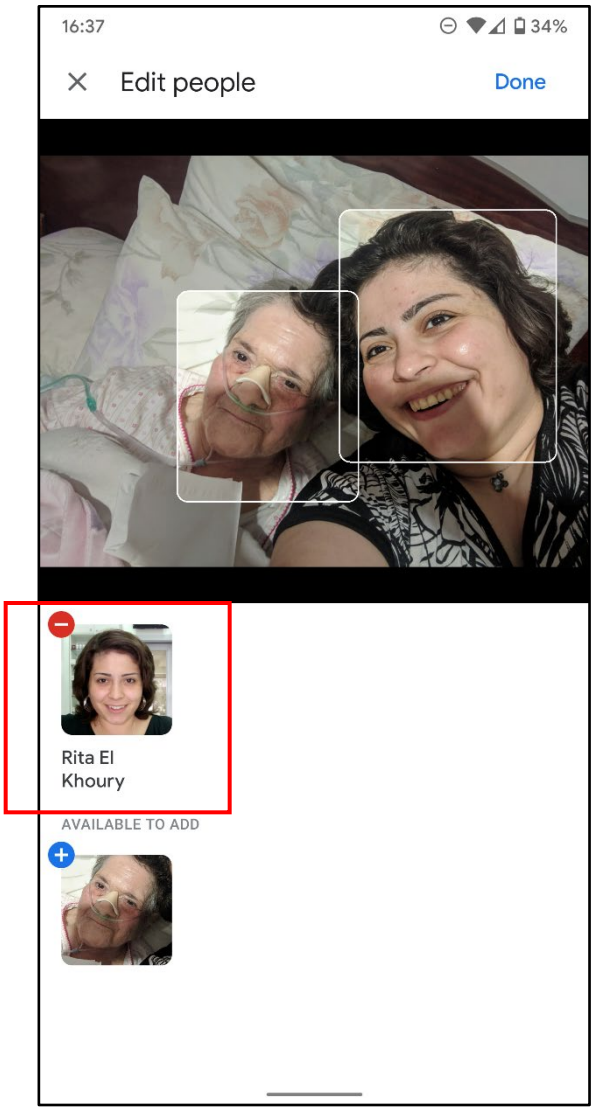

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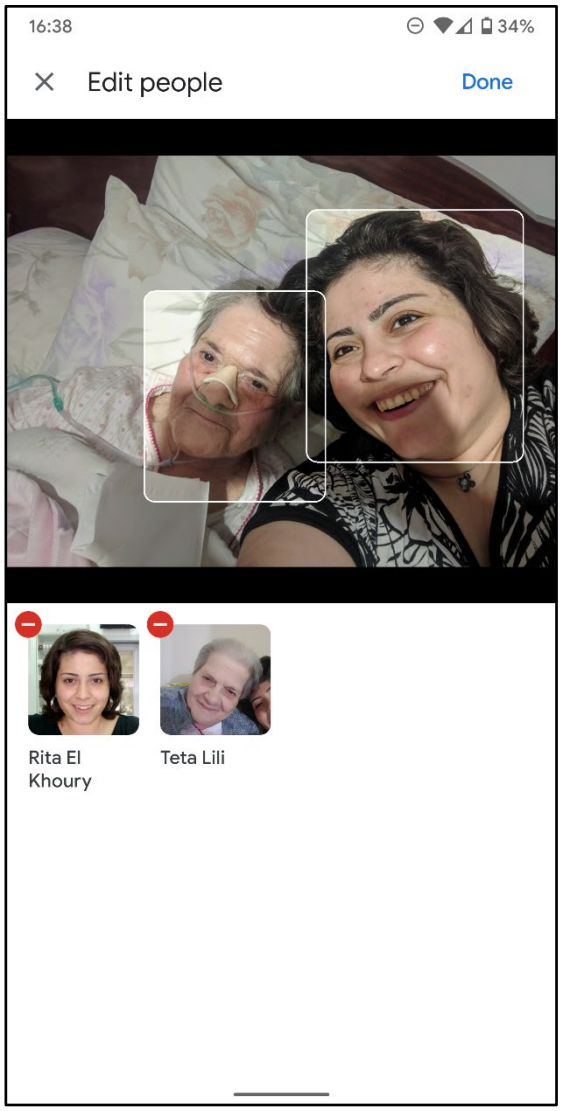

Source: "Manual Face Tagging" (annotation added).

232. Similarly, in exemplary Infringing Scenario 2, Google Photos proposes the same tag, "Paul McCartney," for the inputted object (e.g., the face) as found in previously tagged objects in other stored photos.

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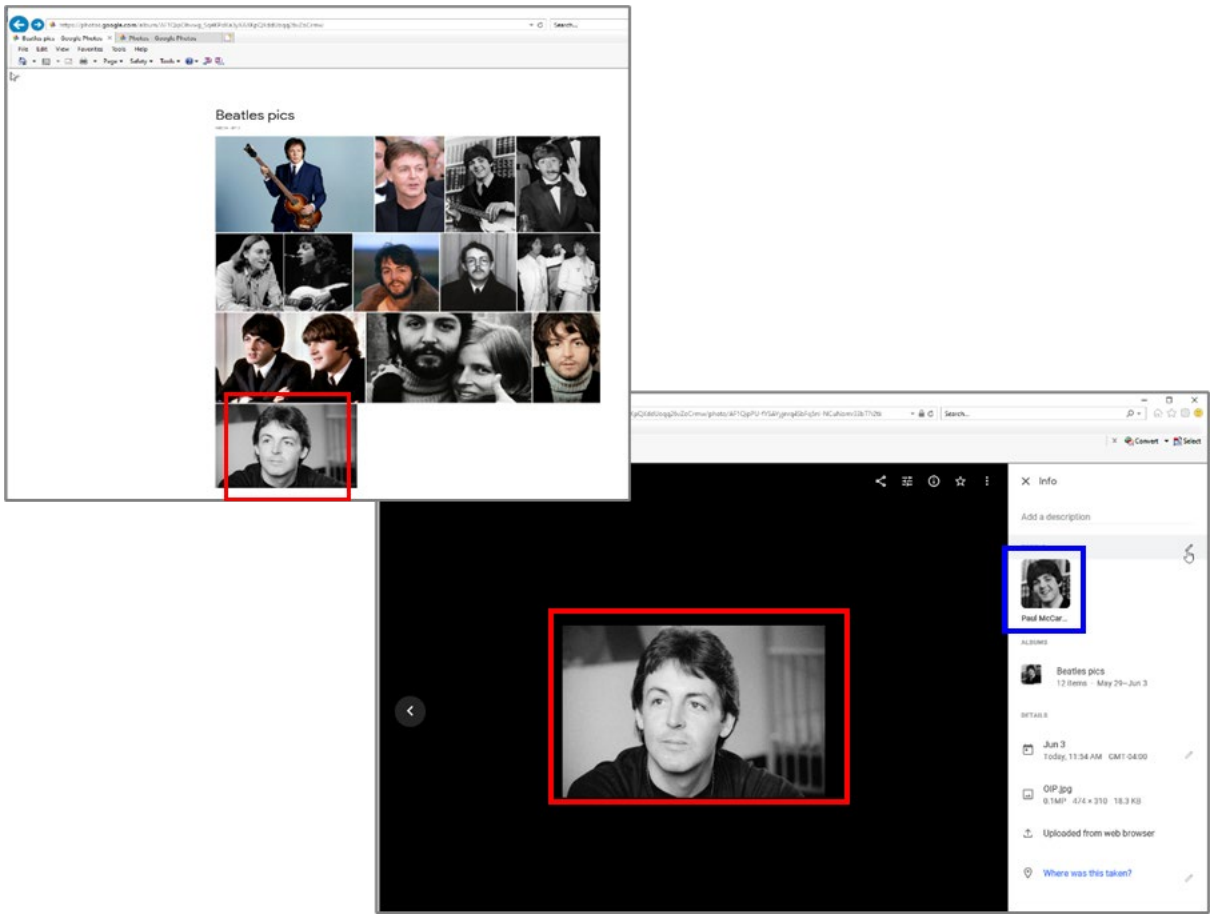
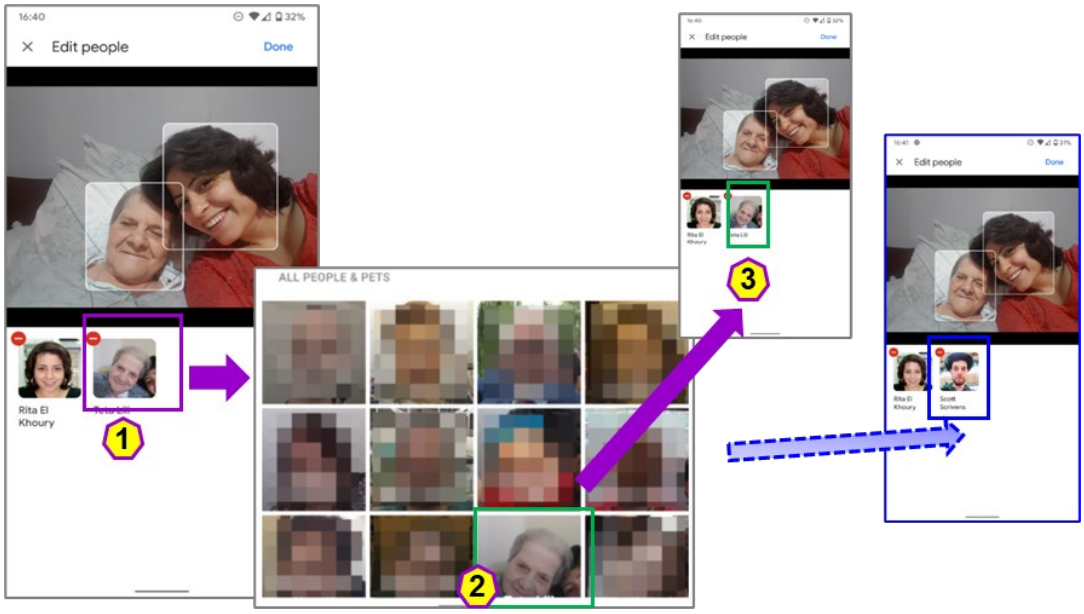


233. Google Photos, including, for example, the Google Photos app running on an Android smartphone or tablet, or the Google Photos service as accessed, for example, at photos.google.com, further comprises an object information inputting section for confirming by the user, adding, and correcting the keyword which is proposed by the keyword proposing section when the inputted object acknowledged by the object acknowledging section is similar to the object of the image previously contained in the database.

234. For instance, the Google Photos app proposes to the user a keyword for an object (e.g., a face in a digital photo) that is similar to a preexisting tagged object (e.g., a face in a different digital photo). The display provides the proposed keyword to the user for confirmation and allows for correcting the keyword by selecting a different face from the "All People & Pets" list. The user may confirm the removed keyword by re-selecting the keyword from the "All People & Pets" list, or the user can change the keyword to a new one. As illustrated below exemplary Infringing Scenario 1, for "Teta Lili," the selection of the object in green confirms the

selection. Alternatively, the user can correct the keyword by selecting the "Scott Scrivens" keyword instead.



Source: "Manual Face Tagging" (annotations added).

235. A user can also add a keyword for a detected object, such as face, for example by clicking to select the face (1) then choosing a keyword associated with previously stored faces (2) to associate with that face (3), as shown below for "Teta Lili."

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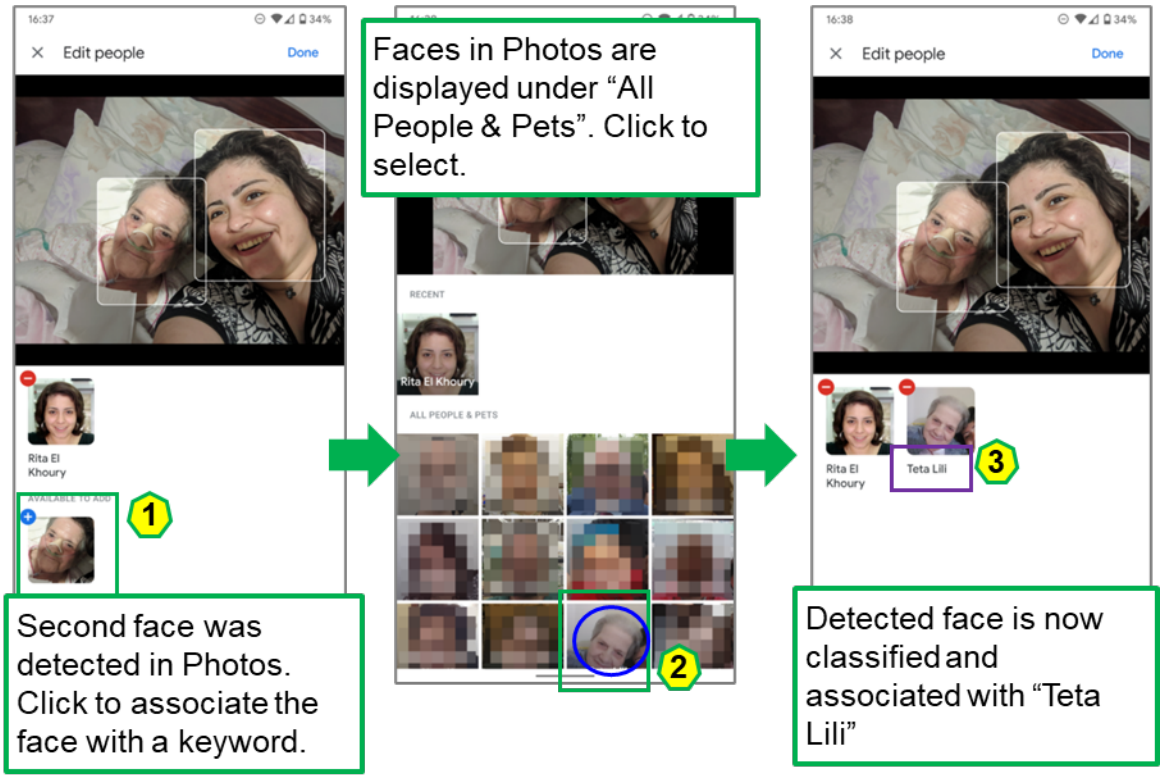

Source: "Manual Face Tagging" (annotations added.)

236. Similarly, for exemplary Infringing Scenario 2, Google Photos offers the user a proposed keyword for an object detected as being similar to a preexisting tagged object (at 1). The display provides the proposed keyword to the user for confirmation (at 2) and allows for correcting the keyword by editing it through the pencil icon and selecting another face (at 3) to correct the tag (at 4).

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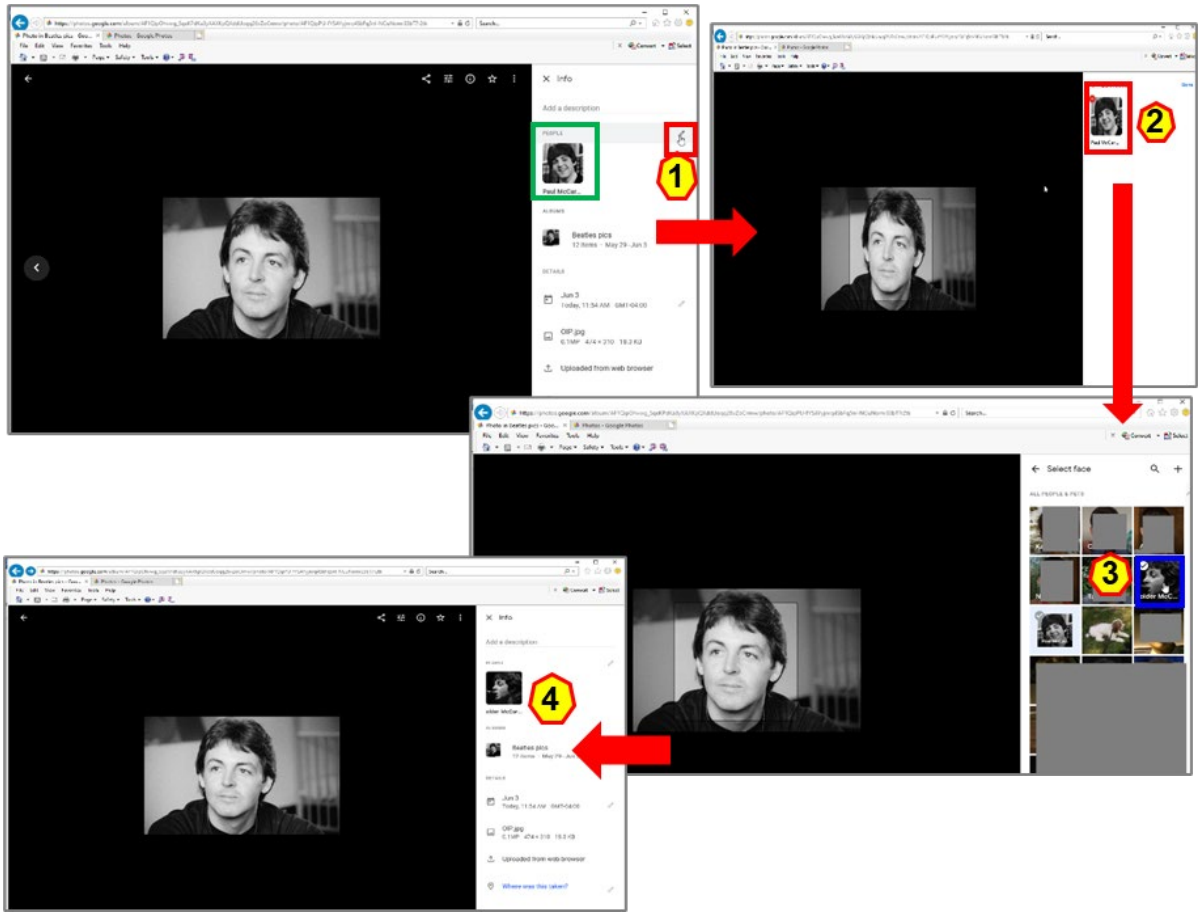

237. The user can reconfirm the removed keyword by re-selecting it from the available choices or can correct it by changing it to a new one. The person shown in green below, if selected, shows the re-confirmation. The user can also change the keyword, for instance by selecting the person shown in blue, which corresponds to "older McCartney". The bottom-most image below shows the image re-tagged with the new keyword.

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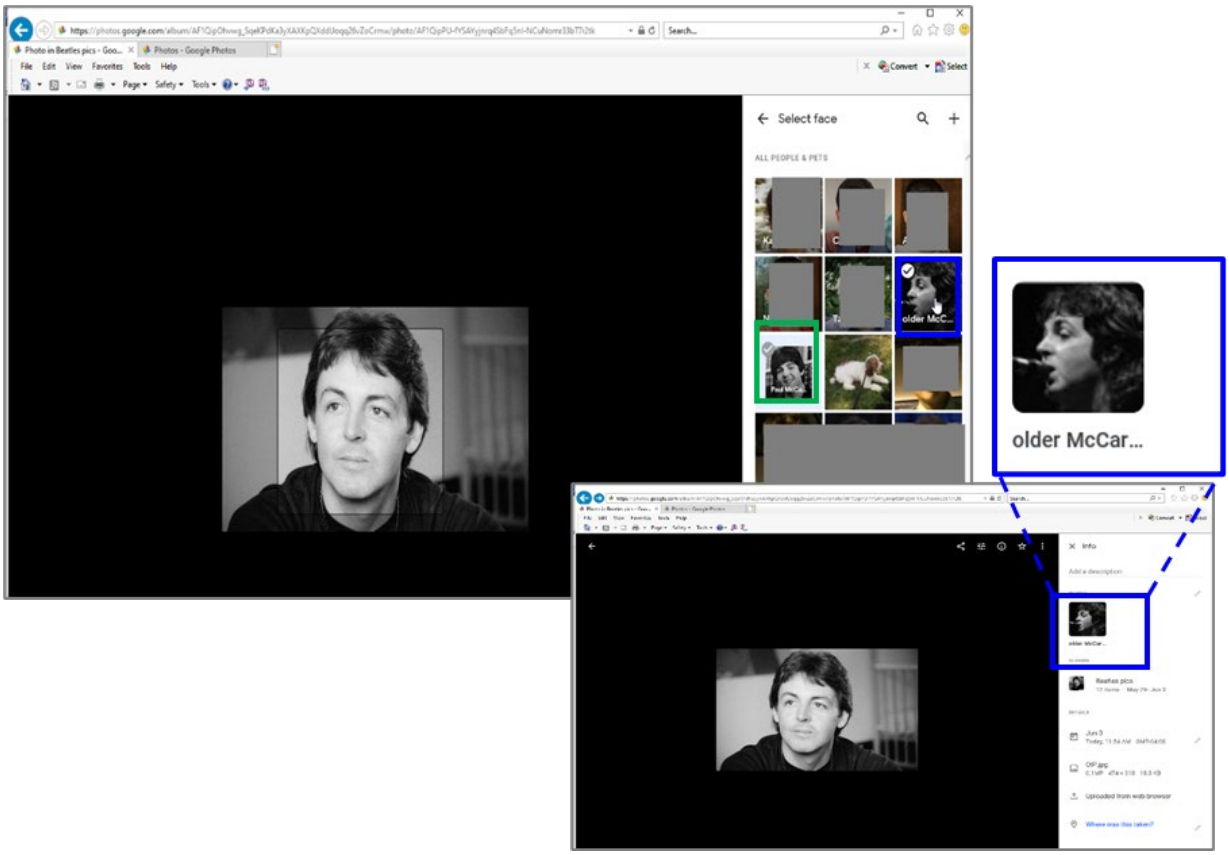

238. Similarly, when uploading new images, the system detects and acknowledges the object as similar to an existing tagged object in a different image or images and proposes a keyword (e.g., "Paul McCartney"). Again, by following the described procedure, the user can confirm the proposed keyword or correct it.

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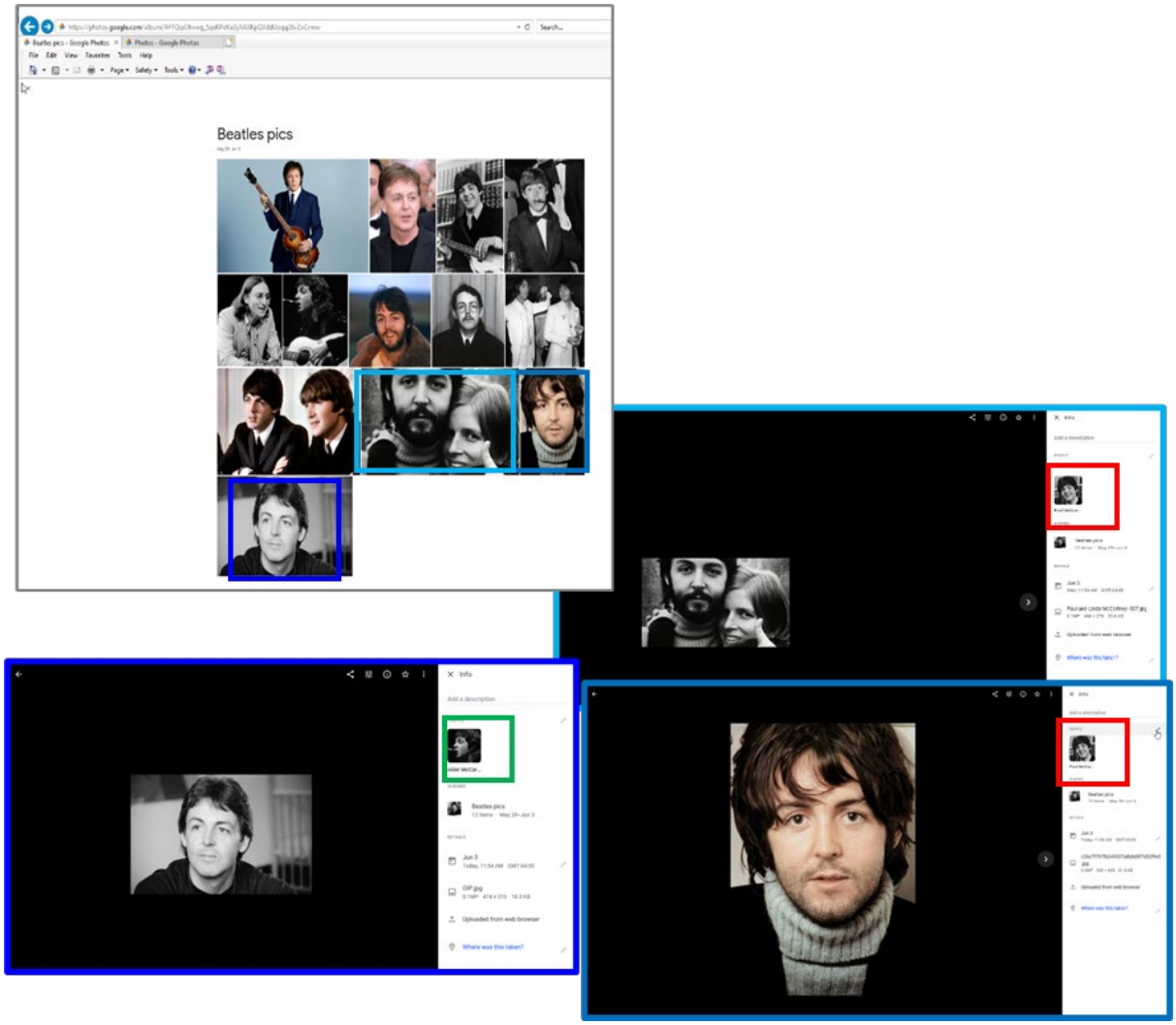
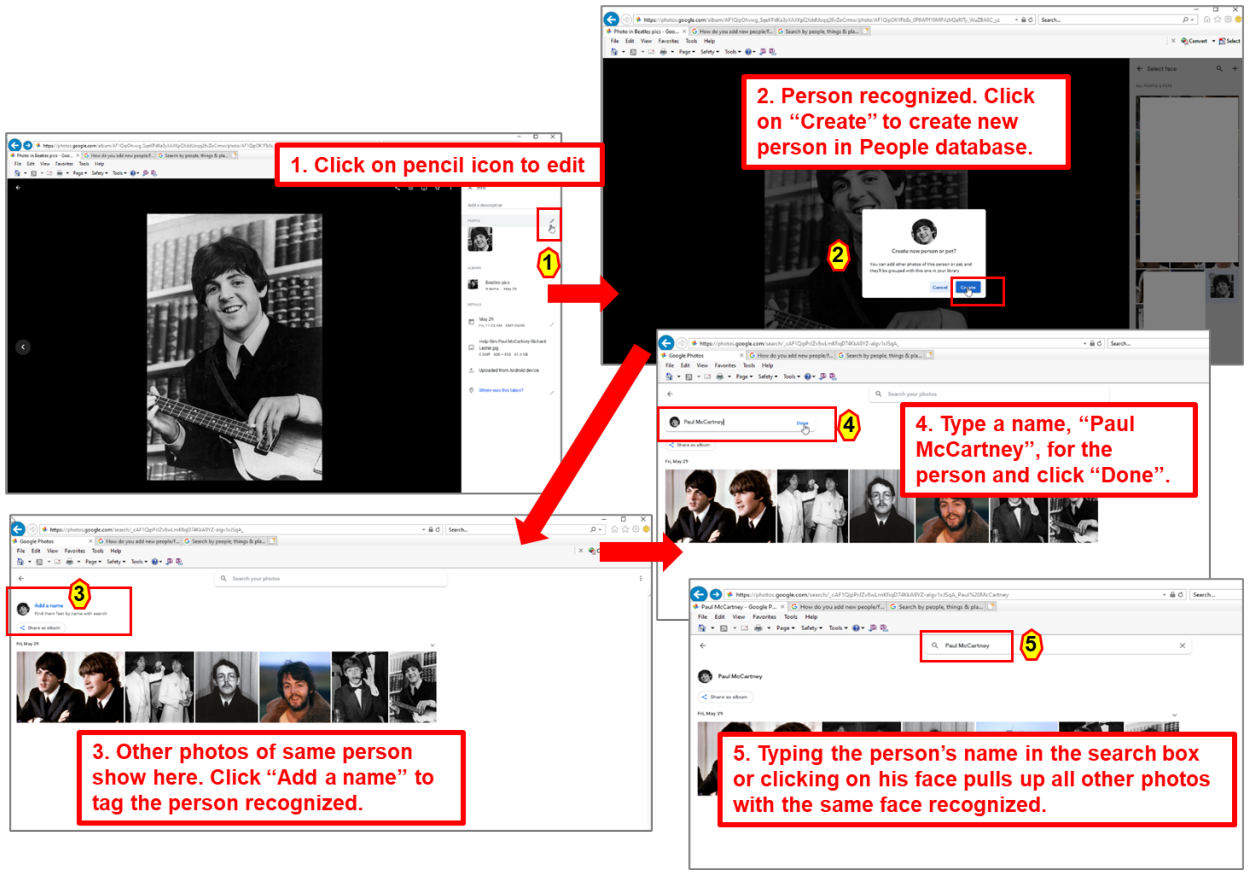


239. The system also allows a user to add a keyword to associate with a detected object such a face in a newly added image, as shown below.



240. Google's own documentation similarly describes how a user can "add, remove, or change a face label when Google Photos labels the wrong person or pet."

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Change which face group a photo belongs to

You can add, remove, or change a face label when Google Photos labels the wrong person or pet.

1. On your Android phone or tablet, open the Google Photos app.
2. Select a photo > tap More ···.
3. Scroll to "People" and tap Edit.
4. Remove, add, or change a label:
   - **To remove a label:** On the face label, tap Remove −.
   - **To add a label:** Under "Available to add," tap Add + on the face label. Then, in the photo, tap a label to add, or select Add + to create a new label.
   - **To change a label:**
     a. On the face label, tap Remove −.
     b. Under "Available to add," on the face label, tap Add +.
     c. Select a face label to add.

Source: "Google Photos Help" (annotation added).

241. On information and belief, Google has directly infringed and continues to directly infringe at least claim 1 of the '807 patent by making, using, offering to sell, selling, and/or importing into the United States the '807 Accused Instrumentalities, for example, through its development of the Google Photos app and online service. For instance, LinkedIn profiles of current and former Google employees located in the United States describe development of "G+ face tag notification batching" for "Photos"[21] and "scaling the backend infrastructure for Google Photos" including "management of our database . . . and video processing and serving."[22]

242. On information and belief, Google directly infringes at least claims 1, 7, and 8 of the '807 patent when it tests the '807 Accused Instrumentalities prior to releasing them to its customers.

243. On information and belief, Google tests the '807 Accused Instrumentalities on, e.g., Android and iOS devices and as accessed by personal computers running MacOS or

[21] https://www.linkedin.com/in/nicholas-butko/.

[22] https://www.linkedin.com/in/clay-wood-928a27a3/details/experience/.

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Microsoft Windows to confirm that the application and service work properly before releasing them to users.

244. On information and belief, testing of the '807 Accused Instrumentalities is important to Google's success. This testing allows Google to ensure that its application and service operate seamlessly on devices and systems that host or access Google Photos—an enormous ecosystem. Google's testing further ensures that iterative versions, updates, and subsequent releases of the Google Photos application and service remain compatible and operable with various consumer devices, including smartphones, tablets, and personal computers.

245. Google had actual notice pursuant to 35 U.S.C. § 287(a) of the '807 patent and the infringement alleged herein as of on or around August 20, 2020, when Longitude provided notice to Google.

246. Google has indirectly infringed and continues to indirectly infringe the '807 patent by actively inducing, in violation of 35 U.S.C. § 271(b), the direct infringement of the '807 patent by others in the United States.

247. Google has induced, and continues to induce, through affirmative acts, its customers and other third parties to directly infringe the '807 patent by using the '807 Accused Instrumentalities in the United States.

248. On information and belief, Google knows that it provides and markets an application and service, through its website, the Google Play Store, and the Apple App Store, for use on devices that causes the devices and their users, importers, sellers, and customers to directly infringe the '807 patent when used as intended.

249. On information and belief, Google has designed and marketed the Google Photos application and service to third parties with knowledge and the specific intent to cause the third parties to make, use, offer to sell, or sell in the United States, and/or import into the United States, products incorporating the Google Photos application and service. For example, at the Google Store, Google describes Google Photos as "the home for all your photos and videos,

automatically organized and easy to share."[23] Google further markets Google Photos with various statements, including "[t]he home for all your photos and videos," "[s]earch what you see," and "[f]ind your photos faster."[24]

250. On information and belief, Google actively encourages its customers and end users to directly infringe the '807 patent by encouraging them to use Google Photos as intended on various devices. For instance, Google instructs users to "[f]ind photos of a person or pet," "apply a label," which is a "name or nickname," and "search with that label using the search box."[25] Google further instructs users to "change or remove a label," explaining that users "can edit or remove [their] face group labels."[26] Google instructs users in how to "add, remove, or change a face label when Google Photos labels the wrong person or pet," with specific instructions "[t]o remove a label," "[t]o add a label," and "[t]o change a label."[27]

251. Google has induced others' direct infringement despite actual notice that the '807 Accused Instrumentalities infringe the '807 patent. As of at least August 20, 2020, Google knew that the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been and continue to be committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

252. The above-described acts of infringement have caused injury and damage to Longitude.

253. Longitude is entitled to recover damages sustained as a result of Google's infringement in an amount subject to proof at trial, but in no event less than a reasonable royalty.

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[23] https://play.google.com/store/apps/details?id=com.google.android.apps.photos&hl=en_US&gl=US.

[24] *Id.*

[25] "Google Photos Help."

[26] *Id.*

[27] *Id.*

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COUNT VI: INFRINGEMENT OF U.S. PATENT NO. 7,945,109

254. The allegations of paragraphs 1-112 of this Complaint are incorporated by reference here.

255. Pursuant to 35 U.S.C. § 282, the ’109 patent is presumed valid.

256. Google has directly infringed and continues to directly infringe claims 1-3 of the ’109 patent, in violation of 35 U.S.C. § 271(a), by making, using, offering to sell, selling, and/or importing into the United States the ’109 Accused Instrumentalities, which include Google’s Pixel smartphones and tablets capable of generating and processing images using Portrait Mode.

257. Paragraphs 259-275 describe how the ’109 Accused Instrumentalities infringe claim 1 of the ’109 patent, by way of the exemplary Pixel 6 Pro smartphone. Longitude’s allegations of infringement are not limited to claim 1 or the exemplary product, and additional infringement will be identified and disclosed through discovery and in infringement contentions.

258. On information and belief, the Google Pixel 2 line of smartphones (Pixel 2, Pixel 2 XL), the Google Pixel 3 line of smartphones (Pixel 3, Pixel 3 XL, Pixel 3a, Pixel 3a XL), the Google Pixel 4 line of smartphones (Pixel 4, Pixel 4 XL, Pixel 4a, Pixel 4a (5G)), the Google Pixel 5 line of smartphones (Pixel 5, Pixel 5a), the Google Pixel 6 line of smartphones (Pixel 6, Pixel 6 Pro, and Pixel 6a), the Google Pixel 7 line of smartphones (Pixel 7, Pixel 7 Pro, and Pixel 7a), the Google Pixel Fold, the Google Pixel Tablet and Pixel Slate tablets, and all other Google products that include the Portrait Mode feature are in relevant part substantially similar to the exemplary Pixel 6 Pro, in particular with regard to Portrait Mode. Paragraphs 259-275 are thus illustrative of how the ’109 Accused Instrumentalities infringe.

259. Google’s Pixel smartphones and tablets, including, for example, the Pixel 6 Pro, comprise an image processing apparatus. The Pixel 6 Pro includes a triple rear camera system, comprising a main camera (50 MP wide), an ultrawide camera (12 MP ultrawide), and a telephoto camera (48 MP telephoto). It also includes a front-facing camera. The Pixel 6 Pro generates and processes images, including, for example, using “Portrait Mode.”

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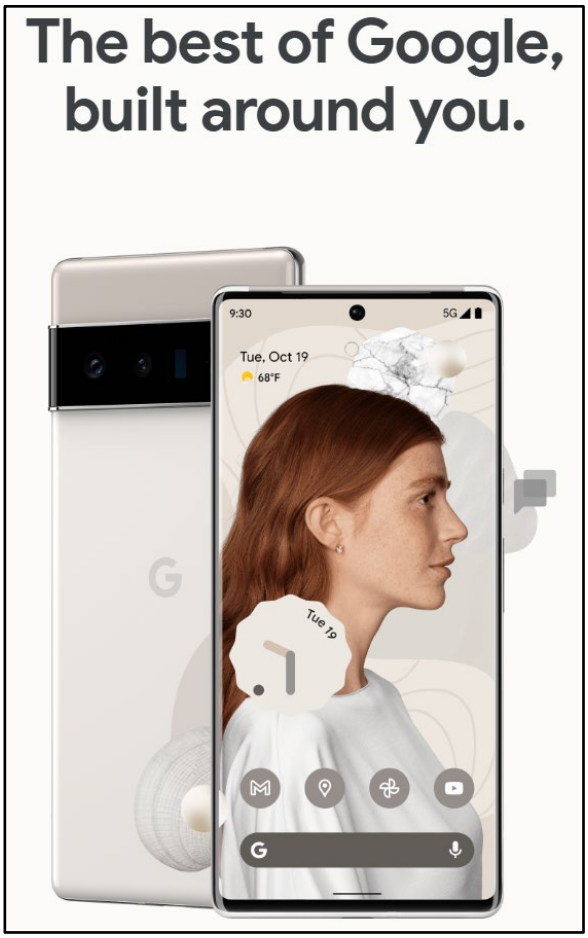
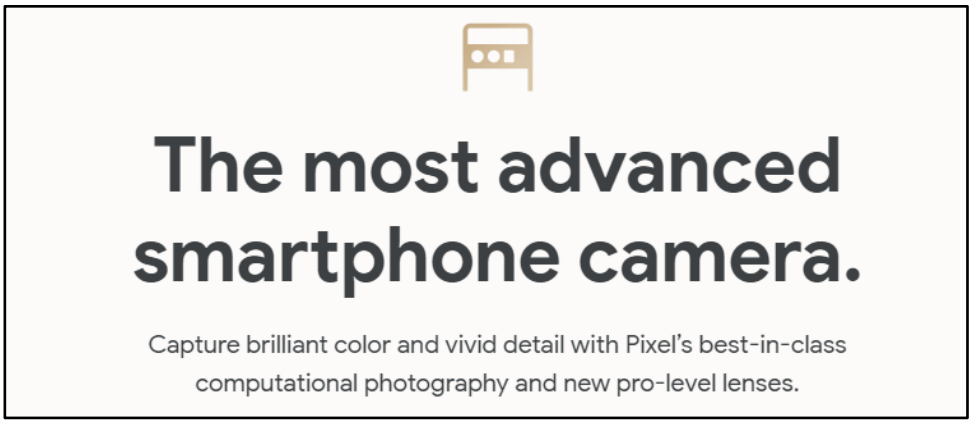
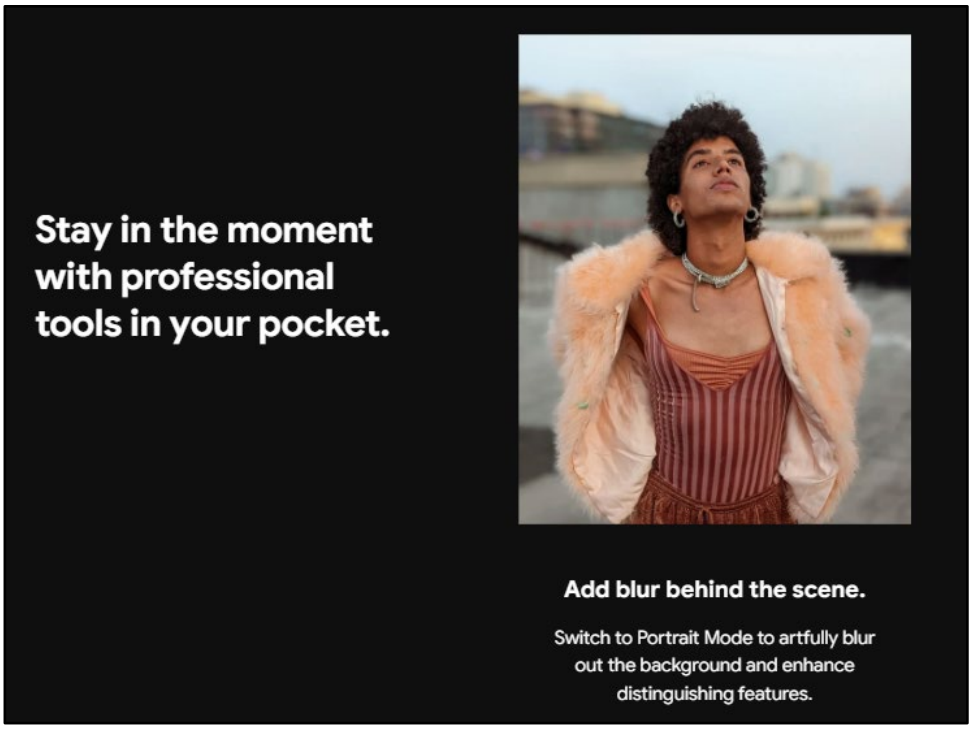
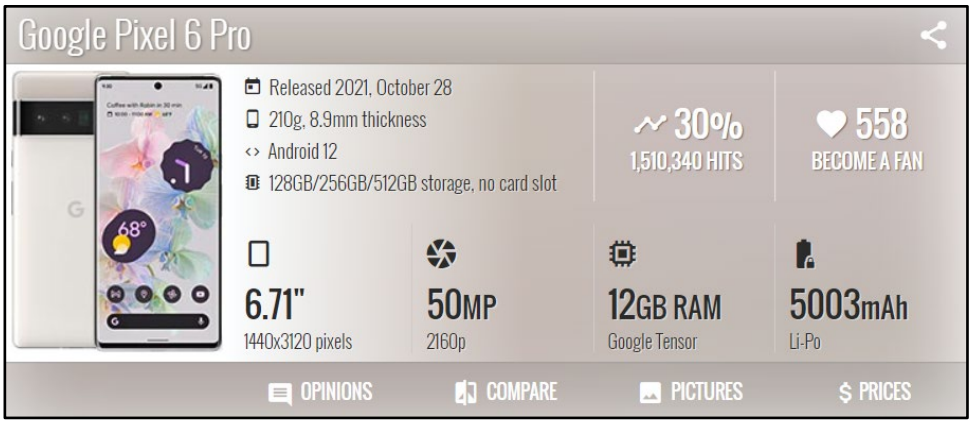






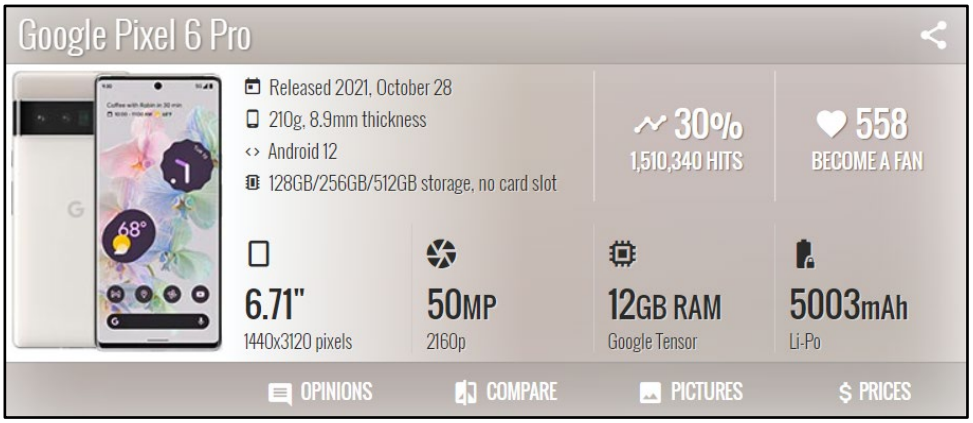
https://store.google.com/us/product/pixel_6_pro?hl=en-US.



MAIN CAMERA	Triple	50 MP, f/1.9, 26mm (wide), 1/1.31", 1.2µm, omnidirectional PDAF, Laser AF, OIS
		48 MP, f/3.5, 104mm (telephoto), 1/2", 0.8µm, PDAF, OIS, 4x optical zoom
		12 MP, f/2.2, 114˚ (ultrawide), 1.25µm
	Features	Dual-LED flash, Pixel Shift, Auto-HDR, panorama
	Video	4K@30/60fps, 1080p@30/60/120/240fps; gyro-EIS, OIS
SELFIE CAMERA	Single	11.1 MP, f/2.2, 20mm (ultrawide), 1.22µm
	Features	Auto-HDR, panorama
	Video	4K@30fps, 1080p@30/60fps

https://www.gsmarena.com/google_pixel_6_pro-10918.php.

260. Google's Pixel smartphones and tablets, including, for example, the Pixel 6 Pro, comprise an image processing apparatus comprising a CPU. The Pixel 6 Pro includes a "Google Tensor" custom processor and octa-core.



PLATFORM	OS	Android 12
	Chipset	Google Tensor (5 nm)
	CPU	Octa-core (2x2.80 GHz Cortex-X1 & 2x2.25 GHz Cortex-A76 & 4x1.80 GHz Cortex-A55)
	GPU	Mali-G78 MP20

https://www.gsmarena.com/google_pixel_6_pro-10918.php.

261. Google's Pixel smartphones and tablets, including, for example, the Pixel 6 Pro, comprise an image processing apparatus comprising a CPU, the CPU executing functions

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including acquiring an image file, including image data, shooting scene information, and location information of a person in the image data. The Pixel 6 Pro generates and processes images using "Portrait Mode" and acquires certain data and information, including the image data, shooting scene information including information identifying "Portrait Mode," and location information.

Take a selfie on your Pixel phone

You can use the front camera on your Pixel phone to take a self-portrait (selfie).

Flip your lens

1. Open your Google Camera app . Learn how.
2. To swap to your front camera, tap Switch .
3. Tap Capture .

To flip your lens for a selfie without buttons:

1. Twist your phone away from you and back.
2. To flip your lens again, repeat step 1. Learn how to turn gestures on or off.

https://support.google.com/googlecamera/answer/9937027?hl=en.

Take Portrait-style photos

1. Open your Google Camera app . Learn how.
2. Tap **Portrait** > Capture .
   - To view the enhanced version, in the bottom right corner, tap the photo.

Tip: To add a blurred background after you take a photo, tap Edit photo > **Tools** > Blur . Then, move the Blur slider.

https://support.google.com/googlecamera/answer/9940184?hl=en#zippy=%2Ctake-portrait-style-photos.

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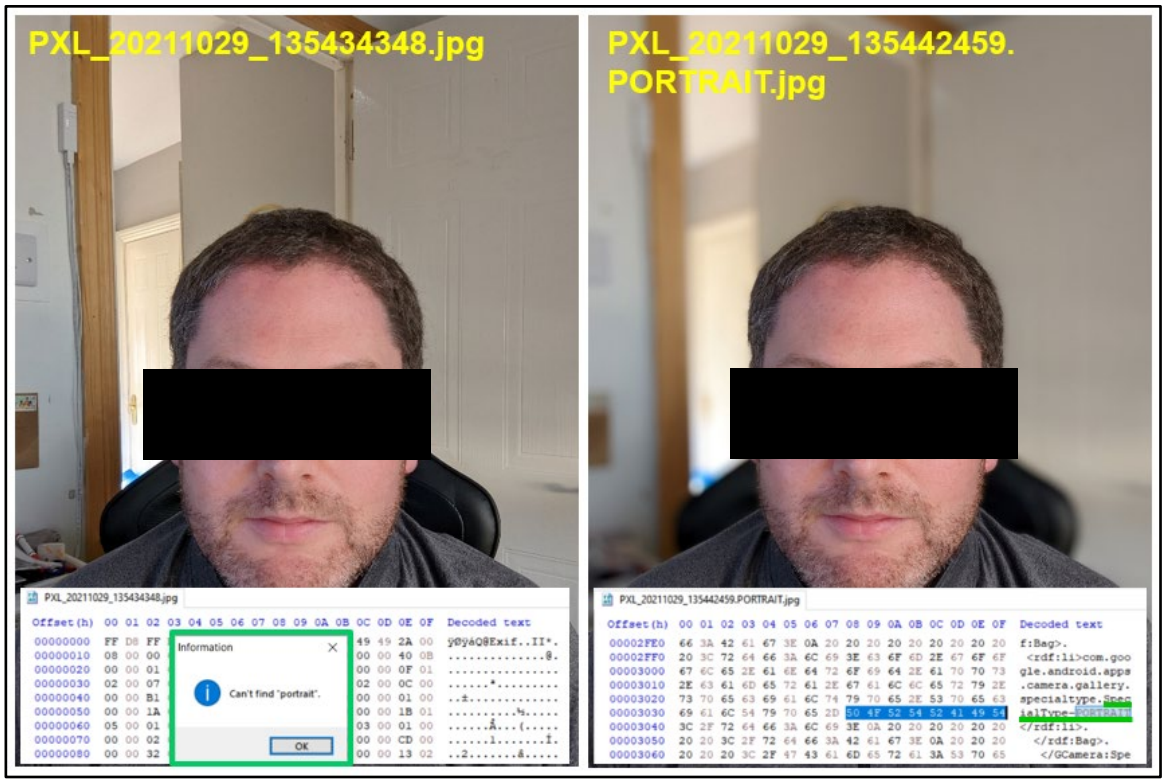
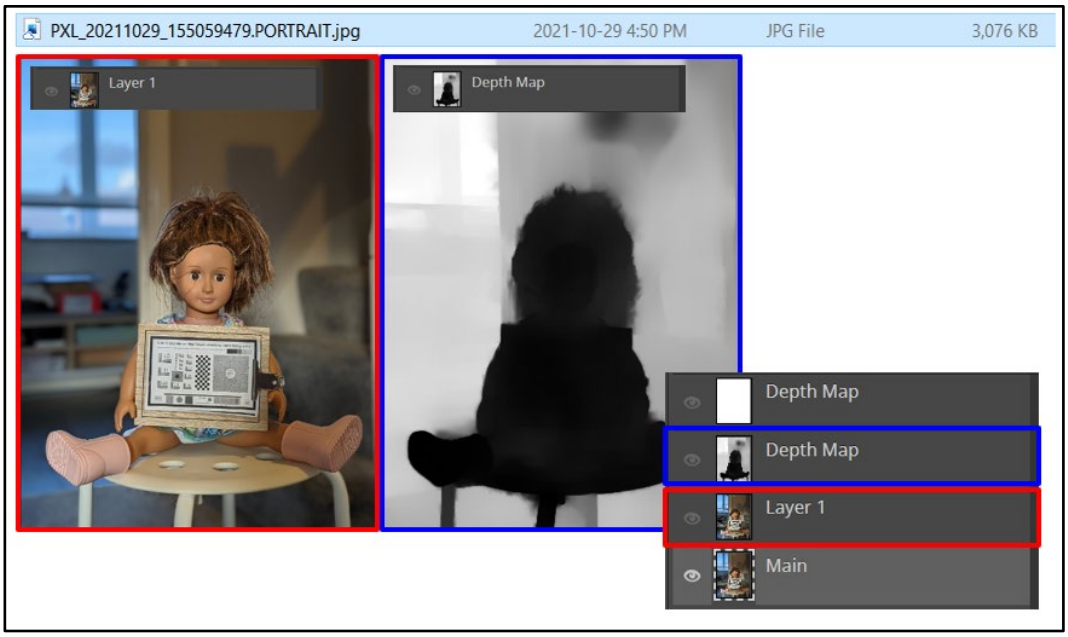
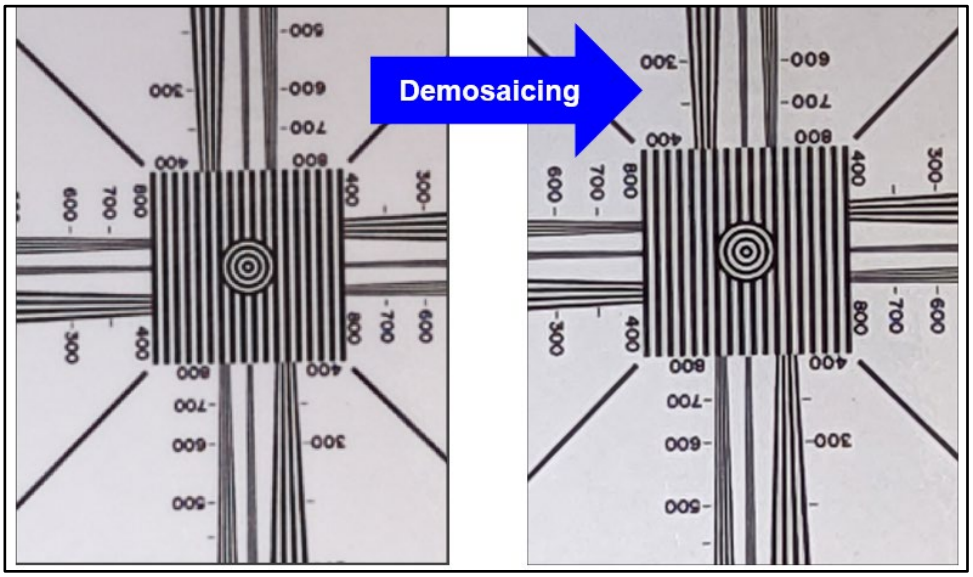


262. In Portrait Mode, the Pixel 6 Pro acquires an image file including image data, shooting scene information (e.g., Portrait Mode), and location information— e.g., file "PXL_20211029_135442459.PORTRAIT.jpg." The Portrait Mode image file contains shooting scene information—"SpecialType-PORTRAIT." Further, the Portrait Mode image file contains location information of a person. Analyzing Portrait Mode images using a depth map (information about the scene's spatial dimensions, e.g., an image's layers) indicates that the image file necessarily includes location information distinguishing the subject (person) from the rest of the image (background).



263. Google's Pixel smartphones and tablets, including, for example, the Pixel 6 Pro, comprise an image processing apparatus comprising a CPU, the CPU executing functions including increasing sharpness of an area in which the person is located. The Pixel 6 Pro sharpens image data—including an area in which the person is located—when it converts raw image data to an image file (e.g., JPEG). For example, the Pixel 6 Pro sharpens the raw image data (left) when it creates a JPEG file from that raw image data.



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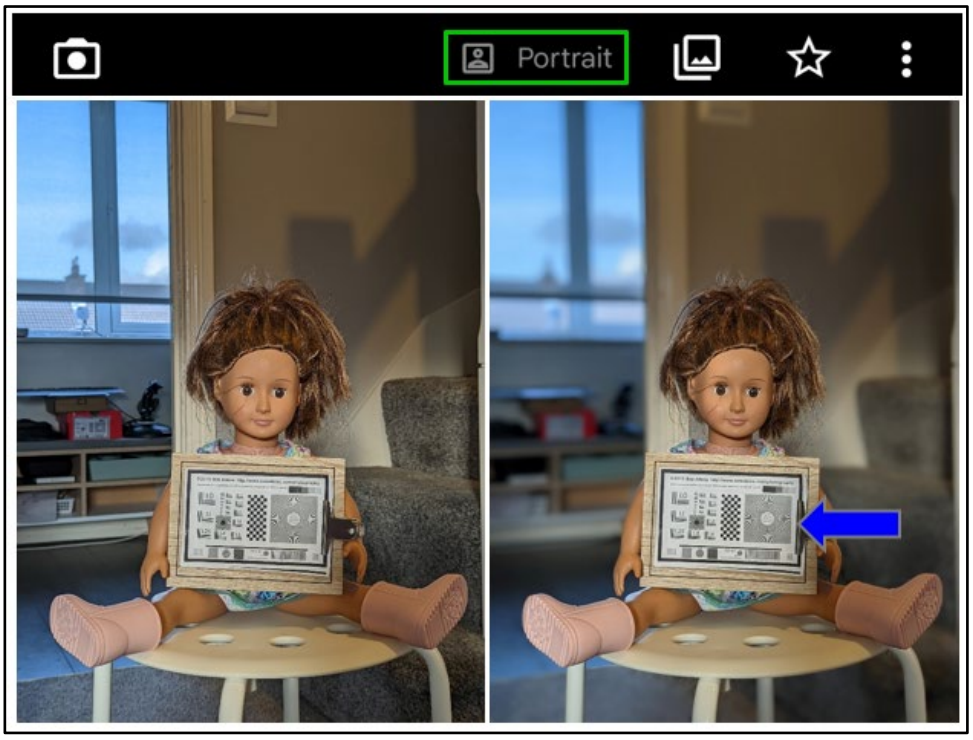
264. Further, in Portrait Mode, the Pixel 6 Pro uses the location information of a person in the image data to process the image's subject (a person—here, to illustrate Portrait Mode, a doll), including increasing the sharpness of an area in which the person is located.



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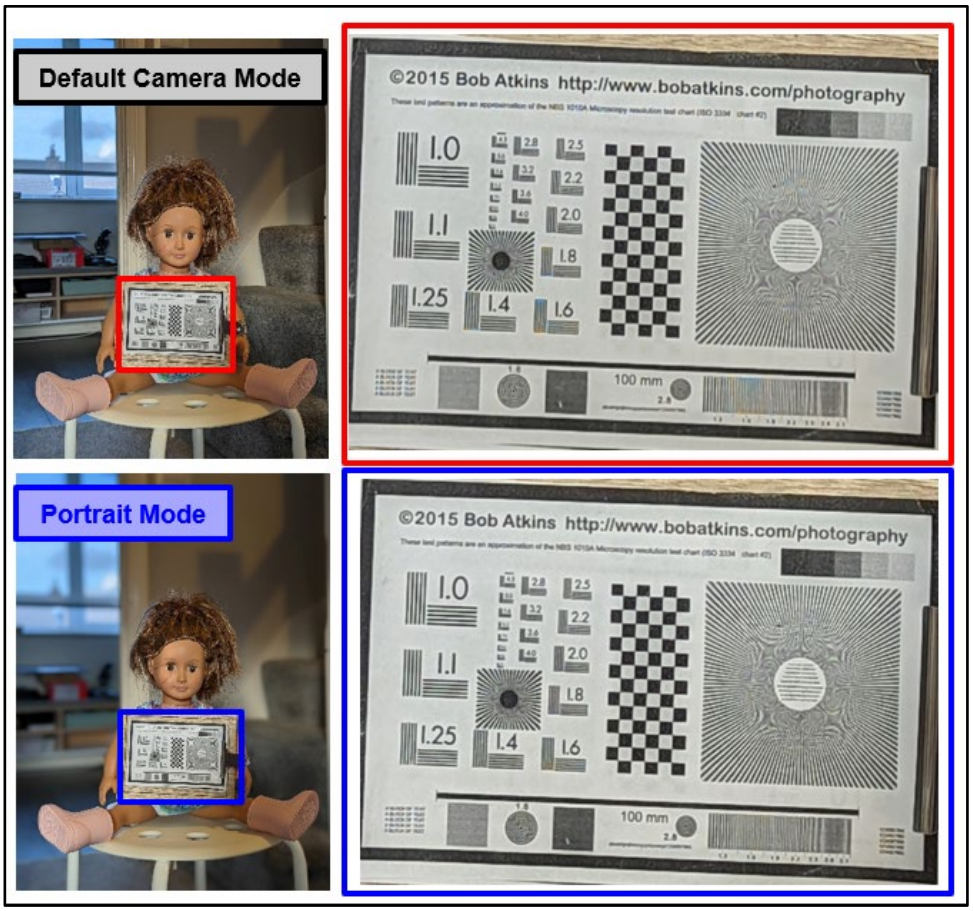

265. Google's Pixel smartphones and tablets, including, for example, the Pixel 6 Pro, comprise an image processing apparatus comprising a CPU, the CPU executing functions including decreasing sharpness of an area in which the person is not located.

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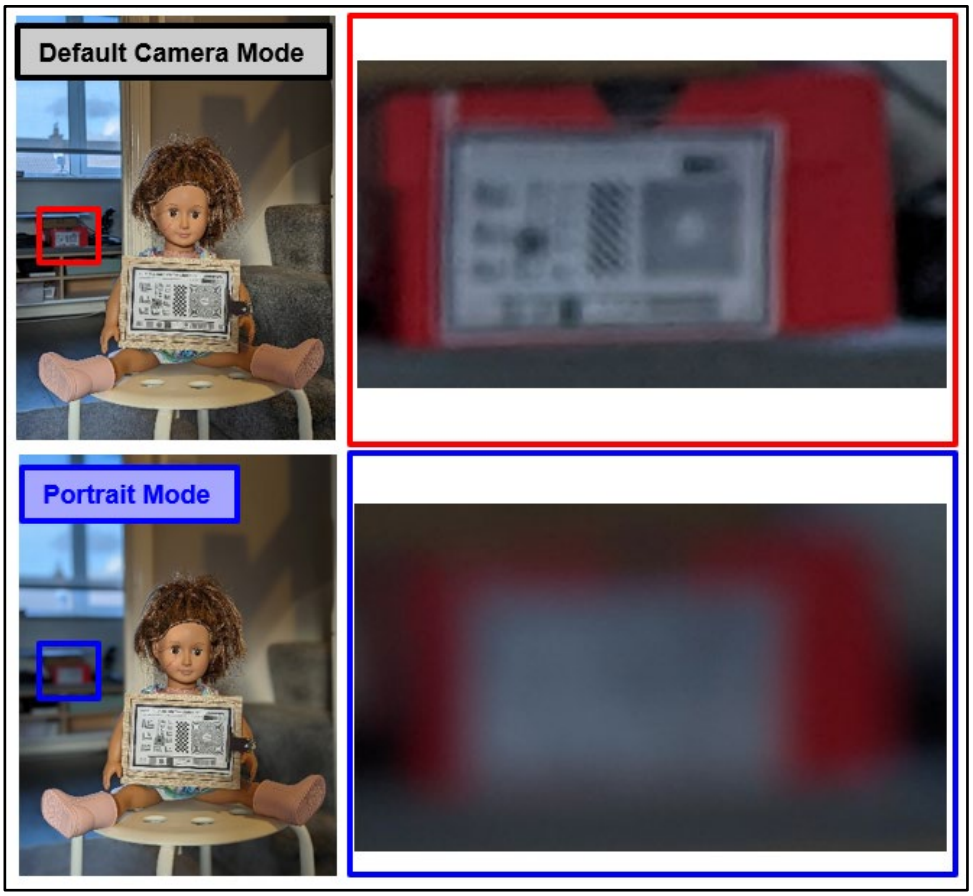

266. Google's Pixel smartphones and tablets, including, for example, the Pixel 6 Pro, comprise an image processing apparatus comprising a CPU, the CPU executing functions including increasing and decreasing sharpness as claimed based on the acquired location information when the acquired shooting scene information indicates a portrait scene. In Portrait Mode, the Pixel 6 Pro uses the location information of a person in the image data to process the image.

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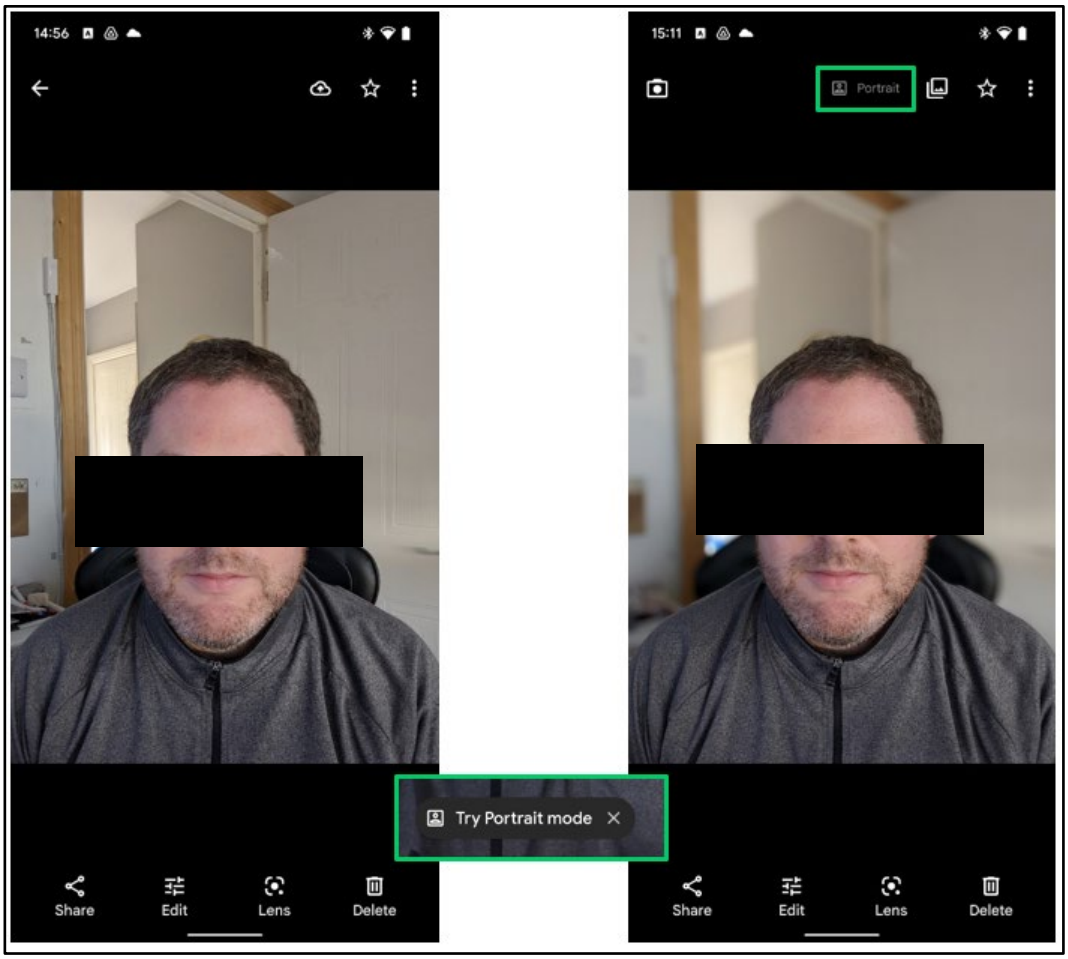


267. On information and belief, Google directly infringes claims 1 and 3 of the ’109 patent by making, using, offering to sell, selling, and/or importing into the United States the ’109 Accused Instrumentalities.

268. On information and belief, Google directly infringes claims 1-3 of the ’109 patent when it tests the ’109 Accused Instrumentalities. On information and belief, testing is important to Google’s success. Testing allows Google to ensure that its devices, applications, and service operate seamlessly.

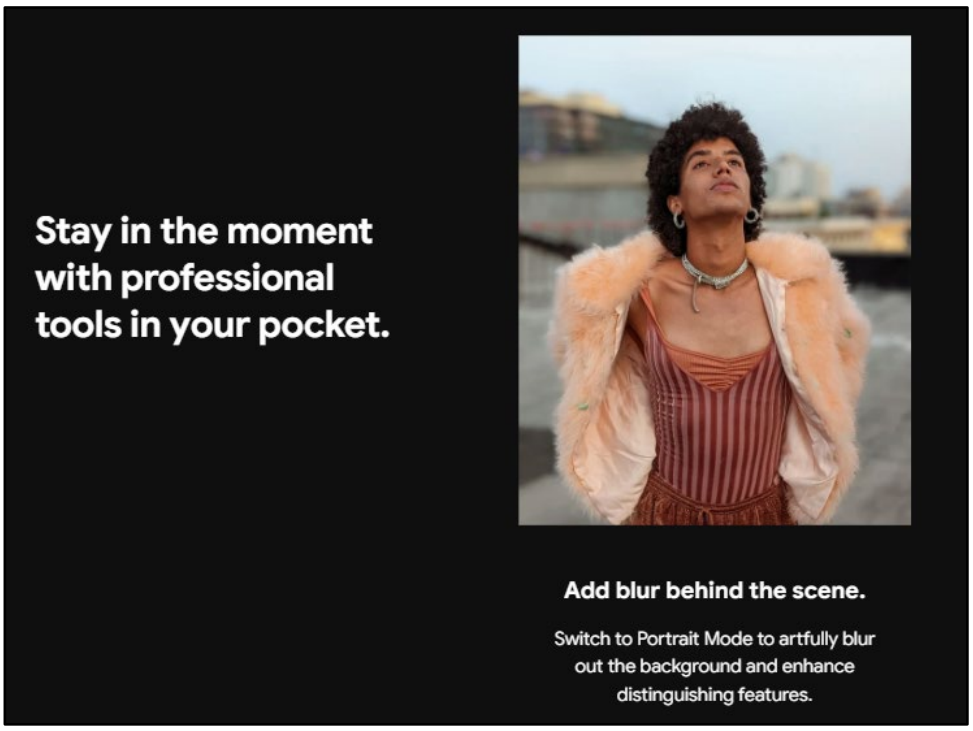
269. Google had actual notice pursuant to 35 U.S.C. § 287(a) of the ’109 patent and the infringement alleged herein as of on or around August 20, 2020, when Longitude provided notice to Google.

270. Google has indirectly infringed and continues to indirectly infringe the ’109 patent by actively inducing, in violation of 35 U.S.C. § 271(b), the direct infringement of the ’109 patent by others in the United States.

271. Google has induced, and continues to induce, through affirmative acts, its customers and other third parties to directly infringe the ’109 patent by using the ’109 Accused Instrumentalities.

272. On information and belief, Google knows that it provides, markets, and actively promotes its Pixel smartphones and tablets and Portrait Mode.

273. On information and belief, Google designed, marketed, and continues to market its Pixel smartphones, tablets, and, specifically, Portrait Mode to third parties with knowledge and the specific intent to cause the third parties to use, offer to sell, or sell in the United States, and/or import into the United States, the ’109 Accused Instrumentalities. For example, Google encourages its customers to “[s]witch to Portrait Mode to artfully blur out the background and enhance distinguishing features” and to use the “Blur slider” in Portrait mode to practice the ’109 inventions.



https://store.google.com/us/product/pixel_6_pro?hl=en-US.

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Take Portrait-style photos

1. Open your Google Camera app . Learn how.
2. Tap **Portrait** > Capture .
   - To view the enhanced version, in the bottom right corner, tap the photo.

Tip: To add a blurred background after you take a photo, tap Edit photo > **Tools** > Blur . Then, move the Blur slider.

https://support.google.com/googlecamera/answer/9940184?hl=en#zippy=%2Ctake-portrait-style-photos.

274. Google knew that its customers would use, offer to sell, and/or sell the '109 Accused Instrumentalities in the United States, and Google specifically intended its customers to purchase and use the '109 Accused Instrumentalities.

275. Google has induced others' direct infringement despite actual notice that the '109 Accused Instrumentalities infringe the '109 patent. As of at least August 20, 2020, Google knew that the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been and continue to be committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

276. The above-described acts of infringement have caused injury and damage to Longitude.

277. Longitude is entitled to recover damages sustained as a result of Google's infringement in an amount subject to proof at trial, but in no event less than a reasonable royalty.

COUNT VII: INFRINGEMENT OF U.S. PATENT NO. 8,482,638

278. The allegations of paragraphs 1-112 of this Complaint are incorporated by reference here.

279. Pursuant to 35 U.S.C. § 282, the '638 patent is presumed valid.

280. Google has directly infringed and continues to directly infringe one or more claims of the '638 patent, in violation of 35 U.S.C. § 271(a), by making, using, offering to sell, selling,

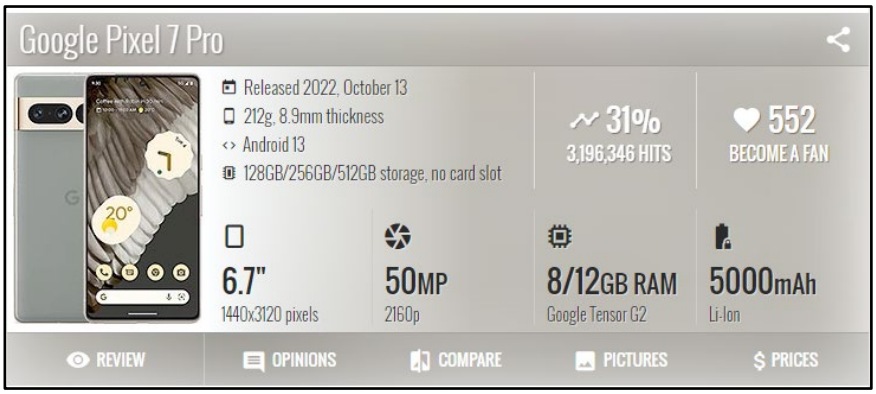
and/or importing into the United States the ’638 Accused Instrumentalities, which include Google’s Pixel smartphones and tablets with the Face Unblur camera feature.

281. Google has infringed and continues to infringe at least, for example, claim 1 of the ’638 patent. Longitude’s allegations of infringement are not limited to claim 1, and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

282. Paragraphs 284-298 describe how the ’638 Accused Instrumentalities practice claim 1 of the ’638 patent, by way of the exemplary Pixel 7 Pro smartphone.

283. On information and belief, the Google Pixel 6 line of smartphones (Pixel 6, Pixel 6 Pro, and Pixel 6a), the Google Pixel 7 line of smartphones (Pixel 7 and Pixel 7a), and the Google Pixel Fold are in relevant part substantially similar to the exemplary Pixel 7 Pro, in particular with regard to how the ’638 Accused Instrumentalities include the Face Unblur camera feature. Paragraphs 284-298 are thus illustrative of how the ’638 Accused Instrumentalities infringe.

284. Google’s Pixel smartphones, including, for example, the Pixel 7 Pro, include digital cameras having a focusing function and a focal length varying function of a main lens. The Pixel 7 Pro includes a triple main camera module, comprising a main imaging camera, an ultra-wide angle camera, and a telephoto camera.



MAIN CAMERA	Triple	50 MP, f/1.9, 25mm (wide), 1/1.31", 1.2µm, multi-directional PDAF, Laser AF, OIS
		48 MP, f/3.5, 120mm (telephoto), 1/2.55", 0.7µm, multi-directional PDAF, OIS, 5x optical zoom
		12 MP, f/2.2, 126˚ (ultrawide), 1/2.9", 1.25µm, AF
	Features	Dual-LED flash, Pixel Shift, Auto-HDR, panorama
	Video	4K@30/60fps, 1080p@30/60/120/240fps; gyro-EIS, OIS, 10-bit HDR
SELFIE CAMERA	Single	10.8 MP, f/2.2, 21mm (ultrawide), 1/3.1", 1.22µm
	Features	Auto-HDR, panorama
	Video	4K@30/60fps, 1080p@30/60fps

https://www.gsmarena.com/google_pixel_7_pro-11908.php.

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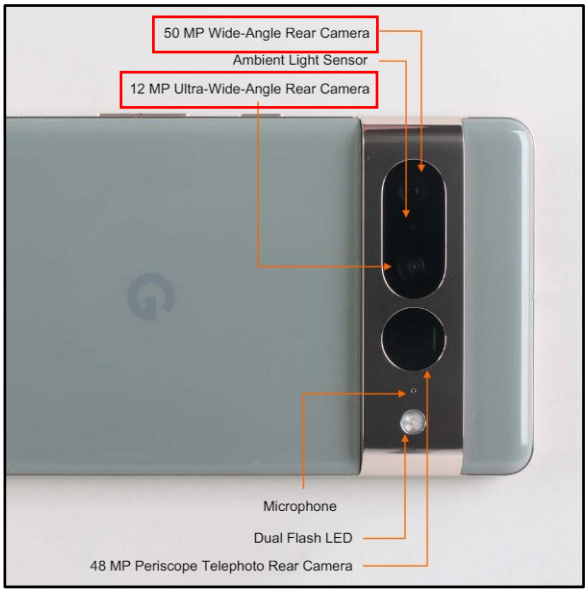
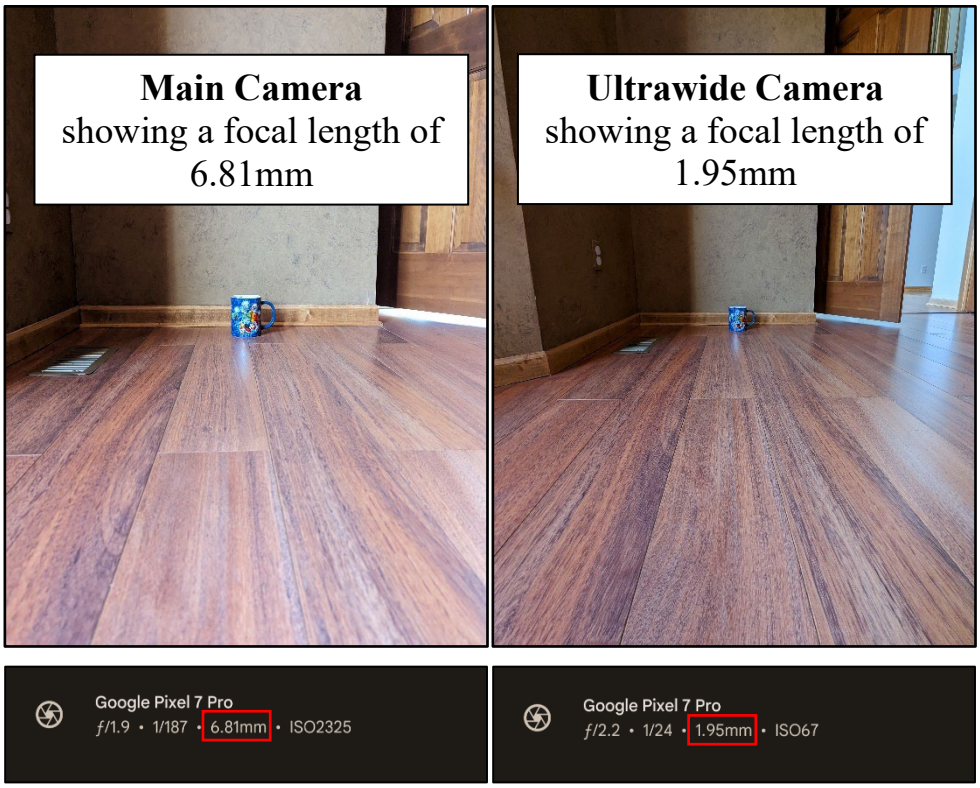
285. Google's Pixel smartphones, including, for example, the Pixel 7 Pro, include digital cameras comprising a main imaging unit configured to generate a main image by performing a photoelectric conversion from a subject obtained via the main lens, and a sub-imaging unit configured to generate a sub-image by performing a photoelectric conversion from the subject obtained via a sub-lens. The Pixel 7 Pro includes a 50 MP wide-angle rear camera (the main imaging unit), and a 12 MP ultra-wide-angle rear camera (the sub-imaging unit).

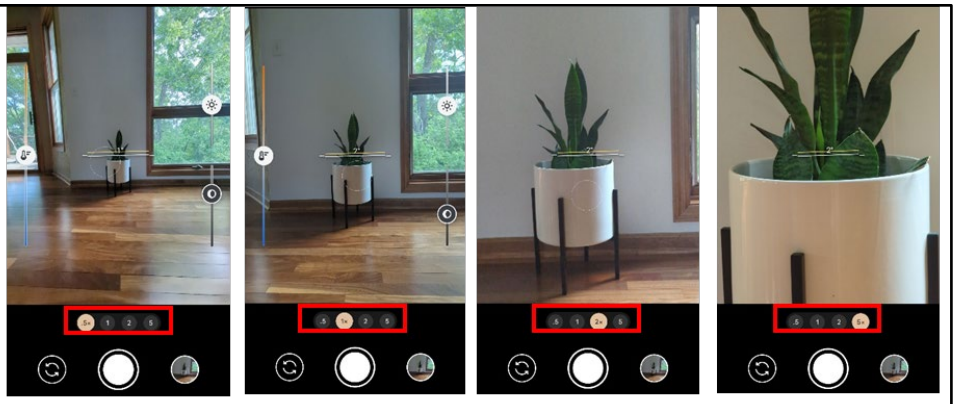


https://library.techinsights.com/search/device-details?genealogyCode=GOO-GA03458-US-US&activeTab=Reports (annotations added).

286. Google's Pixel smartphones, including, for example, the Pixel 7 Pro, include digital cameras comprising a focal length acquiring unit configured to acquire the focal length of the main lens. The Pixel 7 Pro acquires the focal length of the image captured by each camera based on the fixed focal length of each camera and the optical and digital zoom, as shown below for the main and ultrawide cameras.



287. Google's Pixel smartphones, including, for example, the Pixel 7 Pro, include digital cameras comprising a magnification setting unit configured to set a level of magnification on the basis of the focal length. The magnification level of the digital cameras of the Pixel 7 Pro can be zoomed in or out (i.e., magnified) using either digital or optical zoom, which changes the focal length of the camera used. The magnification unit matches the magnification of the imaging lens to allow smooth zooming when switching from one lens to another. The effective magnification ratio is shown on the shortcut menu buttons in the Pixel 7 Pro camera application.



0.7x Magnification	1x Magnification	2x Magnification	5x Magnification

288. Google's Pixel smartphones, including, for example, the Pixel 7 Pro, include digital cameras comprising a composite image generating unit configured to generate a composite image by combining the main image and the sub-image, after at least one of the main image and the sub-image is magnified at the level of magnification. The Pixel 7 Pro can generate a composite image by combining an image from the main camera with an image from the ultrawide angle camera by increasing the magnification of the image from the ultrawide angle camera so that it matches the effective focal length of an image generated by the main camera.

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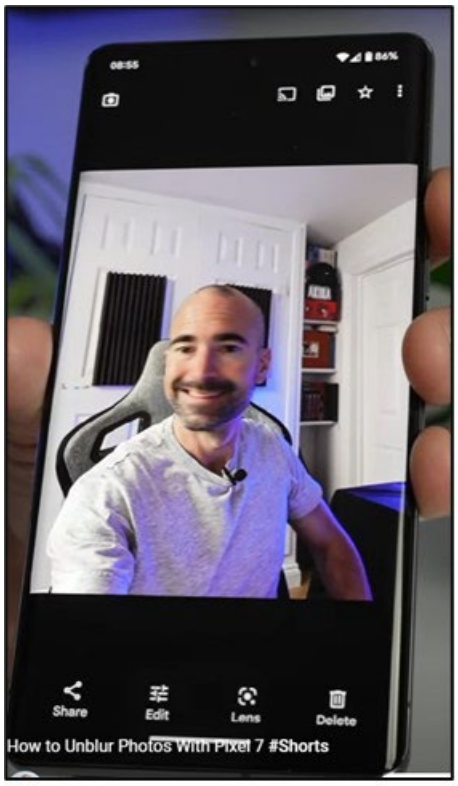
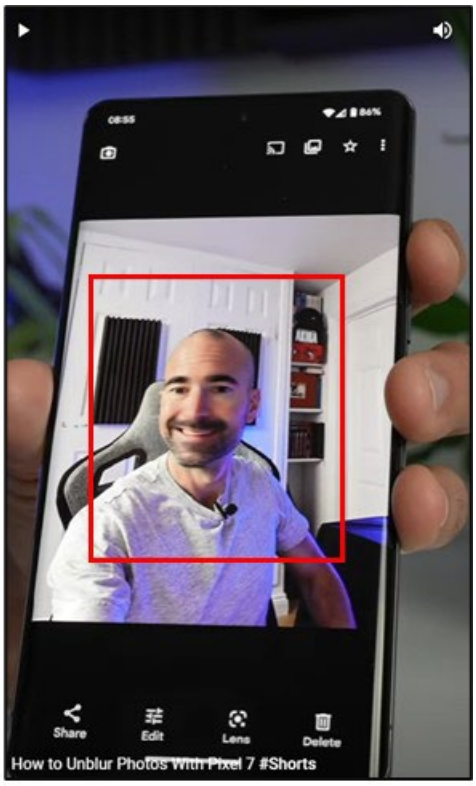


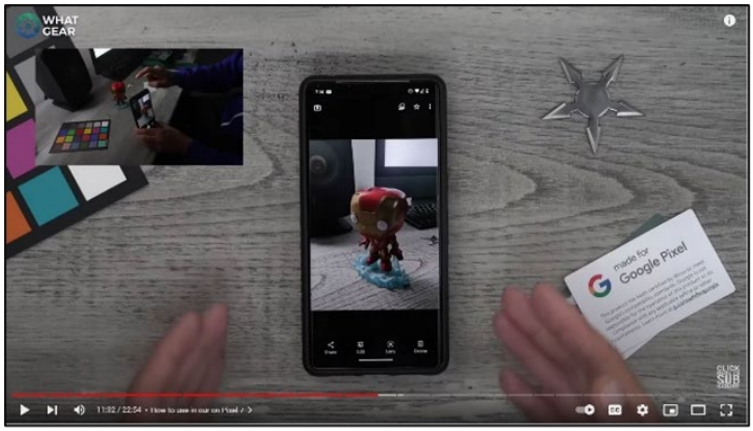
no Face Unblur (main camera image)



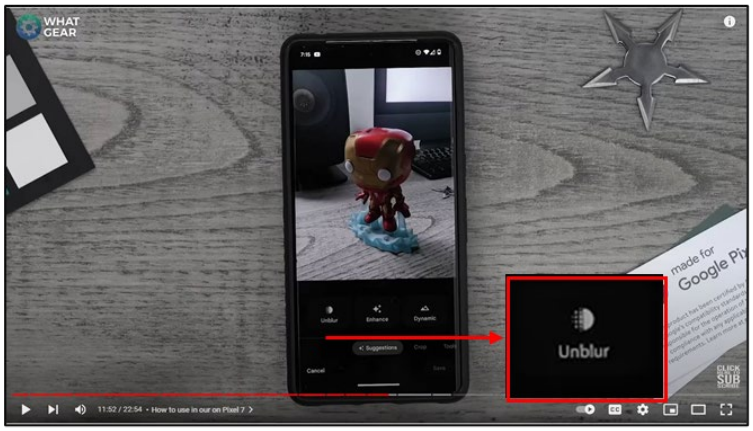
Face Unblur applied (main camera image with portion of ultrawide angle image applied, indicated in red)

Excerpts from video available at https://www.youtube.com/shorts/3OxdS71Kt5c (annotations added).

289. Google's Pixel smartphones, including, for example, the Pixel 7 Pro, include digital cameras comprising an image display unit configured to display the composite image. The Pixel 7 Pro displays the composite image, as shown below.



Face Unblur not applied



Face Unblur applied, showing composite image

Excerpts from video available at https://www.youtube.com/watch?v=rjX7dqGVsG4 (annotations added).

290. Google's Pixel smartphones, including, for example, the Pixel 7 Pro, include digital cameras comprising a magnification setting unit that is configured to set the level of the magnification to match substantially the size of the main image and a size of the sub-image.

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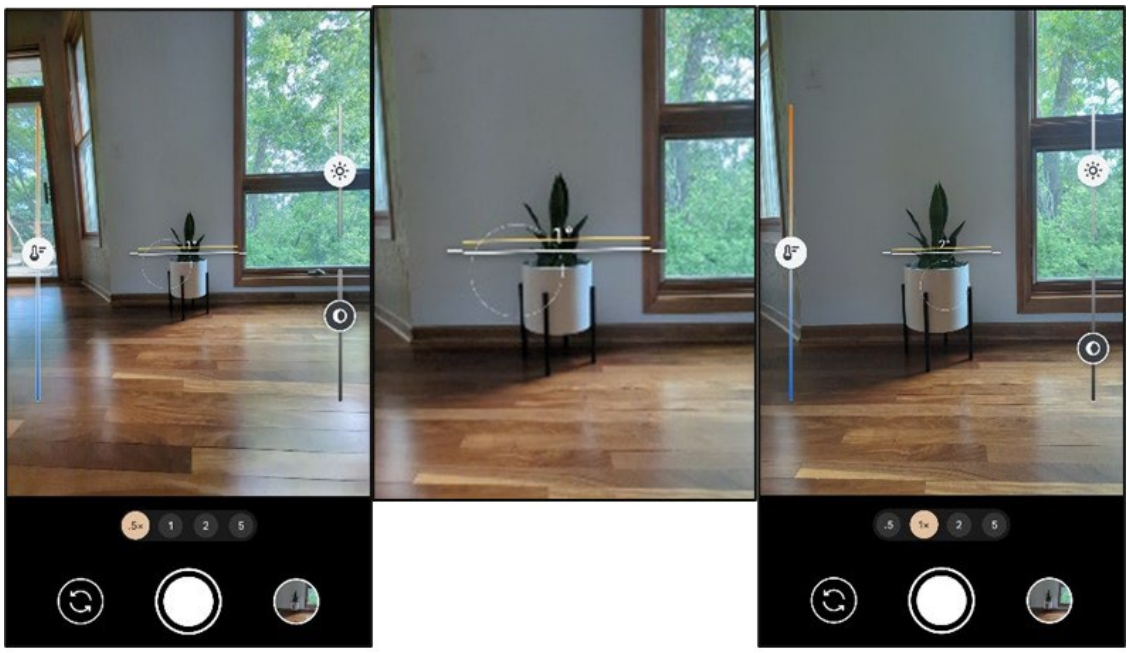


Ultrawide Camera | Ultrawide Camera (magnified to match the size of main camera image) | Main Camera

291. On information and belief, Google has directly infringed and continues to directly infringe at least claim 1 of the ’638 patent by making, using, offering to sell, selling, and/or importing into the United States Pixel the ’638 Accused Instrumentalities.

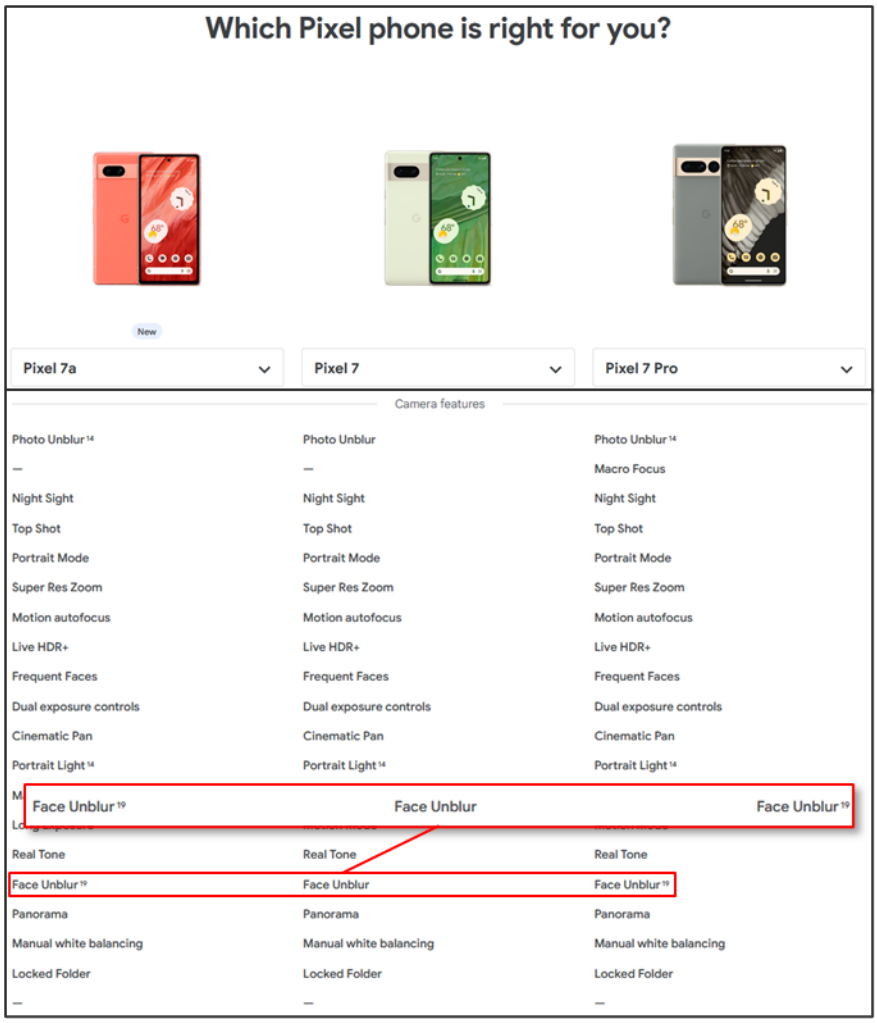
292. Google had actual notice pursuant to 35 U.S.C. § 287(a) of the ’638 patent and the infringement alleged herein as of on or around June 7, 2023, when Longitude provided notice to Google.

293. Google has indirectly infringed and continues to indirectly infringe the ’638 patent by actively inducing, in violation of 35 U.S.C. § 271(b), the direct infringement of the ’638 patent by others in the United States.

294. Google has induced, and continues to induce, through affirmative acts, its customers and other third parties to directly infringe the ’638 patent by using the ’638 Accused Instrumentalities.

295. On information and belief, Google knows that it provides, markets, and actively promotes the Face Unblur camera feature of its Pixel smartphones.

296. On information and belief, Google designed, marketed, and continues to market the Face Unblur camera feature of its Pixel smartphones and tablets to third parties with knowledge and the specific intent to cause third parties to use, offer to sell, or sell in the United States, and/or import into the United States, the ’638 Accused Instrumentalities. For example, Google promotes the Face Unblur camera feature of its Google Pixel smartphones.



https://store.google.com/magazine/compare_pixel?hl=en-US (annotations added).

297. Google knew that its customers would use, offer to sell, and/or sell accused Pixel smartphones with the Face Unblur camera feature in the United States, and Google specifically intended its customers to purchase and use the ’638 Accused Instrumentalities.

298. Google has induced others’ direct infringement despite actual notice that the ’638 Accused Instrumentalities infringe the ’638 patent. As of at least June 7, 2023, Google knew that

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the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been and continue to be committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

299. The above-described acts of infringement have caused injury and damage to Longitude.

300. Longitude is entitled to recover damages sustained as a result of Google's infringement in an amount subject to proof at trial, but in no event less than a reasonable royalty.

JURY TRIAL DEMANDED

Longitude demands a trial by jury on all claims and issues so triable.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff Longitude Licensing Limited respectfully requests that this Court:

A. Enter judgment that Google has infringed one or more claims of each of the Longitude Patents;

B. Enter an order, pursuant to 35 U.S.C. § 284, awarding to Plaintiff Longitude Licensing Limited monetary relief in an amount adequate to compensate for Google's infringement of the Longitude Patents, to be determined at trial, but not less than a reasonable royalty, as well as pre- and post-judgment interest and costs;

C. Enter an order, pursuant to 35 U.S.C. § 285, declaring this to be an exceptional case and thereby awarding to Plaintiff Longitude Licensing Limited its reasonable attorneys' fees;

D. Enter an order awarding to Plaintiff Longitude Licensing Limited a permanent injunction enjoining Google's ongoing patent infringement; and

E. Enter an order awarding to Plaintiff Longitude Licensing Limited such other and further relief, whether at law or in equity, that this Court seems just, equitable, and proper.

DATED: June 21, 2023

ROBINS KAPLAN LLP

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