IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
TEXARKANA DIVISION

MAXELL, LTD.,

Plaintiff,

v.

SAMSUNG ELECTRONICS CO., LTD., and SAMSUNG ELECTRONICS AMERICA, INC.,

Defendants.

Civil Action No. _____

COMPLAINT AND DEMAND FOR JURY TRIAL

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Maxell, Ltd. ("Maxell"), by and through its undersigned counsel, files this complaint under 35 U.S.C. § 271 for Patent Infringement against Defendants Samsung Electronics Co., Ltd. ("SEC"), and Samsung Electronics America, Inc. ("SEA") (together, "Samsung" or "Defendants") and further alleges as follows, upon actual knowledge with respect to itself and its own acts, and upon information and belief as to all other matters.

OVERVIEW

1. This is an action for patent infringement by Maxell. Founded in 1961 as Maxell Electric Industrial Co., Ltd., Maxell is a leading global manufacturer of information storage media products, including magnetic tapes, optical discs, and battery products such as lithium ion rechargeable micro batteries and alkaline dry batteries, and the company has over 50 years of experience producing industry-leading recordable media and energy products for both the consumer and the professional markets. Maxell has also been a leading manufacturer of projectors

IPR2025-01307; Samsung
Ex. 1024 - Page 1

and lenses and additionally sells various other devices, such as Bluetooth headsets, wireless charging solutions, etc.

2. Maxell has built up an international reputation for excellence and reliability, for pioneering the power supplies and digital recordings for today's mobile and multi-media devices, and leading the electronics industry in the fields of storage media and batteries.

3. Since being one of the first companies to develop alkaline batteries and Blu Ray camcorder discs, Maxell has always assured its customers of industry-leading product innovation and is one of the world's foremost suppliers of memory, power, audio, and video goods. Maxell's well-recognized logo and iconic "blown away" image exemplify the reputation Maxell carefully developed in these markets.



4. As more fully described below, in 2009 Hitachi, Ltd. assigned much of its consumer product-facing intellectual property to its consumer product business division, Hitachi Consumer Electronics Co., Ltd. Then, in 2013, the consumer electronics division of Hitachi Consumer Electronics Co., Ltd., was transferred to Hitachi Maxell, Ltd. This involved assigning the intellectual property, including the patents in this case, to Hitachi Maxell, Ltd. In 2017, Hitachi Maxell engaged in a reorganization and name change—to Maxell, Ltd.—in an effort to align its

IPR2025-01307; Samsung
Ex. 1024 - Page 2

intellectual property with the business development, and research and development, and licensing efforts of Maxell, including in the mobile and mobile-media device market (Hitachi, Ltd. and Hitachi Consumer Electronics Co., Ltd. are referred to herein collectively as "Hitachi"). Maxell continues to own all rights to the patents-in-suit, as well as the entire Maxell portfolio initially obtained from Hitachi.

5. Today, Maxell maintains a thriving business in the mobile device market including wireless charging solutions, wireless flash drives, multimedia players, storage devices, and headphones. Maxell also maintains intellectual property related to televisions, computer products, tablets, digital cameras, mobile phones, and other consumer electronics. As a mobile technology developer and industry leader, and due to its historical and continuous investment in research and development, including in the state of Texas, Maxell owns a portfolio of patents related to such technologies and actively enforces its patents through licensing and/or litigation. Leading smartphone manufacturers have recognized the value of Maxell's intellectual property and have obtained a license from Maxell in the recent past—including many of the smartphone companies well-known to consumers.

6. Maxell has had regular and continuous business in Texas since 2014. As a result of these business dealings and hopes to expand those and other business dealings, Maxell founded an affiliate, Maxell Research and Development America, LLC ("MRDA"), in Marshall, Texas. MRDA is part of a joint venture with another business in Marshall, and the entities work together on research and development related to IoT, mobile, media, and battery technologies. MRDA's ongoing projects include, for example, the research and development of lensless camera technology, which Maxell hopes will be utilized for sensor and camera technology in smartphones. Maxell has regularly met and continues to regularly meet with MRDA to expand its business, and

IPR2025-01307; Samsung
Ex. 1024 - Page 3

investments are being made by Maxell, MRDA, and others in this District to further the goals of these companies.

7. Maxell is forced to bring this action against Samsung as a result of Samsung's knowing and ongoing infringement of Maxell's patents as further described herein.

8. Samsung has been aware of Maxell's patents for well over a decade. In 2011, Samsung entered into a Patent Sale Agreement with Hitachi Consumer Electronics Co., Ltd. ("HCE"). Pursuant to that Agreement, HCE assigned 10 patent families to Samsung. At least one of these patents was later asserted by Samsung against Apple in litigation. The Patent Sale Agreement also provided Samsung a license to HCE's patents. This license is now expired. Though Samsung previously recognized the value the Maxell's patents, upon expiration of that prior license, Samsung has refused to take a new license. Maxell has made several attempts over the last few years to engage Samsung in negotiations for a new license. Specifically, since at least July 2021, Maxell has provided Samsung with specific notice of its patents and the parties have had numerous discussions and interrogations regarding its infringement of these patents. Samsung's representatives have been provided with detailed information regarding Maxell's patents, the developed technology, and Samsung's ongoing use of this patented technology. Through this process, Samsung's representatives requested and received detailed explanations regarding Maxell's patents and allegations. Maxell believed that a mutually beneficial agreement could be reached between the parties and continued to communicate with Samsung since informing Samsung about its infringement in July 2021. Samsung, however, elected not to enter into an agreement with Maxell or license Maxell's patents, even though many of the smartphone companies well-known to consumers have already entered into a license agreement with Maxell.

Instead, Samsung continued, and continues today, to make, use, sell, and offer for sale Maxell's patented technology without a license. Accordingly, Maxell has filed this Complaint.

PARTIES

9. Plaintiff Maxell, Ltd. is a Japanese corporation with a registered place of business at 1 Koizumi, Oyamazaki, Oyamazaki-cho, Otokuni-gun, Kyoto, Japan.

10. On information and belief, Defendant SEC is a Korea corporation with its principal place of business at 129 Samsung-Ro Yeongtong-gu, Gyeonggi-do 16677 Suwon-Shi, Republic of Korea. SEC may be served pursuant to FED. R. CIV. P. 4(f)(1).

11. Defendant SEA is a New York corporation. SEA is a wholly owned subsidiary of SEC. SEA may be served through its registered agent CT Corporation System, 1999 Bryan Street, Suite 900, Dallas, Texas 75201. SEA is registered to do business in the State of Texas and has been since at least June 10, 1996.

12. SEC exercises direction and control over the performance of SEA. Alternatively, Defendants form a joint business enterprise such that the performance by one Defendant is each attributable to the other Defendant.

13. SEC and SEA, individually and collectively as a common business enterprise, conduct business operations in the Eastern District of Texas at facilities located at 6625 Excellence Way Plano, TX 75023 ("Plano Facility").

14. Upon information and belief, Samsung employs full-term personnel such as sales personnel and engineers in this District.

15. In addition, Samsung has authorized sellers and sales representatives that offer and sell products pertinent to this Complaint throughout the State of Texas, including in this District, and to consumers throughout this District, such as: Best Buy, 4210 St Michael Dr, Texarkana, TX

75503; Best Buy, 422 West TX-281 Loop, Suite 100, Longview, TX 75605; T-Mobile, 1806 East End Boulevard North, Suite 100, Marshall, TX 75670; Verizon authorized retailers, including 3902 Saint Michael Dr., Texarkana, TX 75503, Russell Cellular Texarkana Walton, 404 Walton, Texarkana, TX 75501, and Russell Cellular, 1111 East Grand Avenue, Marshall, TX 75670; Victra, 1006 East End Boulevard, Marshall, TX 75670; and Cricket Wireless authorized retailers, including 4847 Texas Blvd., Texarkana, TX 75503 and 120 East End Boulevard South, Marshall, TX 75670.

16. Samsung offers its products and services, including the products accused of infringement in this Complaint, to customers and potential customers located in the Eastern District of Texas.

NATURE OF THE ACTION, JURISDICTION, AND VENUE

17. Maxell brings this action for patent infringement under the patent laws of the United States, 35 U.S.C. § 271 *et seq*.

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

19. This Court has personal jurisdiction over Samsung in this action pursuant to due process and/or the Texas Long Arm Statute, by virtue of at least the substantial business each Defendant conducts in this forum, directly and/or through intermediaries, including but not limited to: (1) having committed acts within the Eastern District of Texas giving rise to this action and having established minimum contacts with this forum such that the exercise of jurisdiction over each Defendant would not offend traditional notions of fair play and substantial justice; (2) having directed its activities to customers in the State of Texas and this District, solicited business in the State of Texas and this District, transacted business within the State of Texas and this District and

attempted to derive financial benefit from residents of the State of Texas and this District, including benefits directly related to the instant patent infringement causes of action set forth herein; (3) having placed their products and services into the stream of commerce throughout the United States and having been actively engaged in transacting business in Texas and in this District; and (4) either individually, as members of a common business enterprise, and/or in conjunction with third parties, having committed acts of infringement within Texas and in this District.

20. For example, SEA maintains regular and established offices in the Eastern District of Texas, including at 6625 Excellence Way, Plano, TX 75023. Further, on information and belief, SEC directs and controls the actions of SEA, or acts in consort with SEA, such that it too maintains regular and established offices in the Eastern District of Texas, including at 6625 Excellence Way, Plano, TX 75023. Furthermore, the purposeful contacts by SEA are imputable to SEC.

21. Upon information and belief, Samsung's Plano office serves as a hub for its smartphone product line with divisions, including networks, marketing, wearables, and product management being located in the Plano facilities in this District. Samsung has described this 216,000 square foot "flagship" Plano office, with over 1,000 employees, as part of its "continued investment in our Texas roots." *See* https://news.samsung.com/us/samsung-electronics-america-open-flagship-north-texas-campus/. In Samsung's words, "Samsung's move to Plano further demonstrates the company's dedication to Texas . . . [and the Plano facility] is home to Samsung Electronics America's second biggest employee population in the U.S. across multiple divisions – Customer Care, Mobile, Mobile R&D and Engineering." *Id.* In all, "more than 1,000 regional employees" were relocated to work out of the Plano facility. *Id.*

22. Both SEC and SEA, directly or through their distribution network, have purposefully and voluntarily placed infringing products in the stream of commerce knowing and

expecting them to be purchased and used by consumers in the United States, including in the Eastern District of Texas.

23. On information and belief, Samsung has also derived substantial revenues from infringing acts in the Eastern District of Texas, including from the sale and use of infringing products (including the Accused Products, to be defined below).

24. Venue is proper in this District pursuant to 28 U.S.C. § 1391 and 28 U.S.C. § 1400.

25. Venue is proper against SEC in this District pursuant to 28 U.S.C. § 1391(c)(3) because SEC is a foreign corporation not resident in the United States, and venue is proper in any district against a foreign corporation. Venue is further proper as to SEC under 28 U.S.C. § 1391(b)(2) because SEC performs a substantial part of its infringing acts in this District by making, using, selling, offering to sell, and importing infringing products in this District. Thus SEC has committed, and continues to commit, acts of patent infringement within the District.

26. Venue is proper against SEA in this District pursuant to 28 U.S.C. § 1400(b) because SEA has a regular and established places of business in this District, including a 216,000 square foot facility at 6625 Excellence Way, Plano, TX 75023. *See In re HTC Corp.*, 889 F.3d 1349, 1354 (Fed. Cir. 2018), *In re Cray Inc.*, 871 F.3d 1355, 1362–63 (Fed. Cir. 2017).

27. Defendants are properly joined under 35 U.S.C. § 299(a)(1) because Defendants, through their own acts and/or through the acts of other entities acting as their agent, representative, or alter ego, commonly and/or jointly design and/or sell accused products such that at least one right to relief is asserted against Defendants jointly, severally, and in the alternative with respect to the same transactions, occurrences, or series of transactions or occurrences relating to the making, using, selling and/or offering to sell in, and/or importing into the United States the same accused products.

28. Defendants are properly joined under 35 U.S.C. § 299(a)(2) because Defendants, through their own acts and/or through the acts of other entities acting as their agent, representative, or alter ego, make, use, sell, and/or offer to sell in, and/or import into the United States the same or similar accused products, such that questions of fact will arise that are common to all Defendants.

29. Upon information and belief, SEC and SEA, acting in consort, have placed the accused products in the stream of commerce, knowing the likely destination of the products in the United States and this District. Upon information and belief, SEC has further purposefully availed itself of the United States and this District by directing SEA to take action in the United States and this District.

30. Upon information and belief, each Defendant serves as agent, representative, and/or alter ego of each other Defendant for the purposes of conducting business in the United States and this District in relation to making, using, selling, offering to sell, and importing into the United States the accused products.

31. Upon information and belief, each Defendant exercises direction and control over the performance of each other Defendant, or the Defendants form a joint enterprise such that the performance by one Defendant is attributable to the other Defendant.

COUNT 1 – INFRINGEMENT OF U.S. PATENT NO. 8,037,161

32. Maxell incorporates paragraphs 1-31 above by reference.

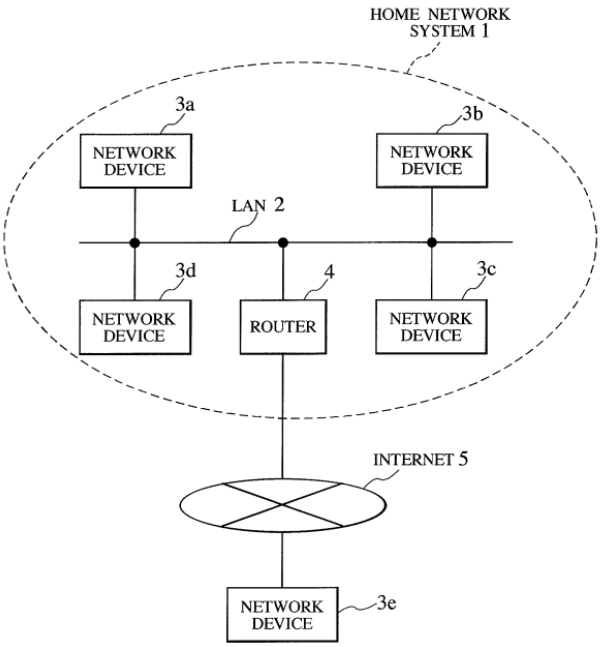
33. U.S. Patent No. 8,037,161 (the "'161 Patent," attached hereto at Exhibit 1) duly issued on October 11, 2011 and is entitled *Network System, Network Device, And Network Belonging Judgment Method*.

34. Maxell is the owner by assignment of the '161 Patent and possesses all rights under the '161 Patent, including the exclusive right to recover for past and future infringement.

35. The '161 Patent is directed to establishing and managing a home network of devices. In particular, the system and methods disclosed in the '161 Patent ensure that network devices that are not authorized to be a part of the home network system are prevented from joining and gaining access to the home network system as such a device may join the home network and "steal content, which is private information distributed within the network." '161 Patent, 2:17-23.

36. Specifically, the '161 Patent discloses a specific configuration of each network device including "a peripheral device information collection unit," "a peripheral device information storage unit," "a peripheral device information transmission unit," "a peripheral device information reception unit," and "a peripheral device information collation unit," that all work in conjunction to judge whether the network device they are communicating with belongs to the same network and then establish a home network in such a way, as shown below in Figure 1 of the '161 Patent:

FIG.1



37. Samsung has directly infringed one or more claims of the '161 Patent in this District and elsewhere in Texas, including at least claim 3 literally and/or under the doctrine of equivalents, by or through making, using, importing, offering for sale and/or selling its home networking technology, including at least Samsung products having materially similar functionality while implementing a SmartThings network using Samsung smartphones, tablets, laptops, watches, SmartThings Station, SmartThings Hubs, refrigerators, ranges, washers, dryers, air dressers, dishwashers, vacuums, air purifiers, microwaves, and wall ovens.

38. For example, Samsung has literally and/or under the doctrine of equivalents directly infringed at least claim 3 of the '161 Patent in this District and elsewhere in Texas by or through making, using, importing, offering for sale and/or selling at least the following: **smartphones** including Galaxy A Quantum, Galaxy A03s, Galaxy A04s, Galaxy A10s, Galaxy A11, Galaxy A12, Galaxy A12s (aka Nacho), Galaxy A13, Galaxy A13 5G, Galaxy A14, Galaxy A14 5G, Galaxy A20, Galaxy A20e, Galaxy A20s, Galaxy A21, Galaxy A21s, Galaxy A22, Galaxy A22s 5G, Galaxy A23, Galaxy A23 5G, Galaxy A24 4G, Galaxy A30, Galaxy A30s, Galaxy A32, Galaxy A32 5G, Galaxy A33 5G, Galaxy A34, Galaxy A40, Galaxy A42 5G, Galaxy A50, Galaxy A50s, Galaxy A51, Galaxy A51 5G, Galaxy A51 5G UW, Galaxy A52, Galaxy A52 5G, Galaxy A53 5G, Galaxy A54, Galaxy A60, Galaxy A70, Galaxy A70s, Galaxy A71, Galaxy A71 5G, Galaxy A71 5G UW, Galaxy A72, Galaxy A73 5G, Galaxy A8, Galaxy 8+, Galaxy A80, Galaxy A90 5G, Galaxy Fold, Galaxy Fold 5G, Galaxy Note10, Galaxy Note10 5G, Galaxy Note10 Lite, Galaxy Note10+, Galaxy Note10+ 5G, Galaxy Note20, Galaxy Note20 5G, Galaxy Note20 Ultra, Galaxy Note20 Ultra 5G, Galaxy Note9, Galaxy S10, Galaxy S10 5G, Galaxy S10 Lite, Galaxy S10+, Galaxy S10e, Galaxy S20, Galaxy S20 5G, Galaxy S205G UW, Galaxy S20 FE, Galaxy S20 FE 5G, Galaxy S20 Ultra, Galaxy S20 Ultra 5G, Galaxy S20+, Galaxy S20+ 5G, Galaxy S21

5G, Galaxy S21 FE 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22 5G, Galaxy S22 Ultra 5G, Galaxy S22+ 5G, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy S9, Galaxy S9+, Galaxy Xcover FieldPro, Galaxy Xcover Pro, Galaxy Xcover6 Pro, Galaxy Z Flip, Galaxy Z Flip 5G, Galaxy Z Flip3 5G, Galaxy Z Flip4, Galaxy Z Flip5, Galaxy Z Fold2 5G, Galaxy Z Fold3 5G, Galaxy Z Fold4, Galaxy Z Fold5; **tablets** including Galaxy Tab Active Pro, Galaxy Tab Active3, Galaxy Tab Active4 Pro, Galaxy Tab S5e, Galaxy Tab S6, Galaxy Tab S6 5G, Galaxy Tab S7, Galaxy Tab S7+, Galaxy Tab S8, Galaxy Tab S8 Ultra, Galaxy Tab S8+, Galaxy Tab S9, Galaxy Tab S9 Ultra, Galaxy Tab S9+; **laptops** including Galaxy Book2 360, 13", Intel Core i5, 256GB, Galaxy Book2 360, 13", Intel Core i7, 512GB, Galaxy Book2 Pro 360, 13", Intel Core i7, 256GB, Galaxy Book2 Pro 360, 13", Intel Core i7, 512GB, Galaxy Book2 Pro 360, 15", Intel Core i7, 1TB, Galaxy Book2 Pro 360, 15", Intel Core i7, 512GB, Galaxy Book2 Pro, 13", Intel Core i5, 256GB, Galaxy Book2 Pro, 13", Intel Core i7, 512GB, Galaxy Book2 Pro, 15", Intel Core i5, 512 GB, Galaxy Book2 Pro, 15", Intel Core i7, 512GB, Galaxy Book2 Pro, 15", Intel Core i7, Intel ARC Discrete Graphics, 1TB, Galaxy Book3 360, 13", Intel Core i7, 512GB, Galaxy Book3 360, 15", Intel Core i7, 512GB, Galaxy Book3 Pro 360, 16", Intel Core i7, 1TB, Galaxy Book3 Pro, 14", Intel Core i7, 512 GB, Galaxy Book3 Pro, 16" Intel Core i7, 1TB, Galaxy Book3 Ultra, 16" Intel Core i7, 1TB, Galaxy Book3 Ultra, 16" Intel Core i9, 1TB, and Galaxy Book3, 15", Intel Core i7, 512GB; **watches** including Galaxy Watch5 Pro Golf Edition, Galaxy Watch5 Pro, Galaxy Watch5, Galaxy Watch4, Galaxy Watch4 Classic; **SmartThings Station** with Travel Adapter, SmartThings Station, SmartThings Hub, SmartThings Hub Dongle; **refrigerators** including Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in Matte Black Steel, Bespoke Counter Depth 4-Door Flex™ Refrigerator (23 cu. ft.) in Matte Black Steel, 25 cu. ft. 33" 3-Door French Door Refrigerator with Dual Auto Ice Maker in Stainless Steel, 25 cu. ft. 33" 3-Door French Door Refrigerator with

Beverage Center in Stainless Steel, Bespoke Side-by-Side 28 cu. ft. Refrigerator with Beverage Center in White Glass, Bespoke Counter Depth Side-by-Side 23 cu. ft. Refrigerator with Beverage Center in Stainless Steel, Bespoke Counter Depth 4-Door Flex™ Refrigerator (23 cu. ft.) with Family Hub™ + in Charcoal Glass Top and Stainless Steel Bottom Panels, Bespoke 3-Door French Door Refrigerator (30 cu. ft.) with AutoFill Water Pitcher in White Glass, Bespoke 4-Door French Door Refrigerator (29 cu. ft.) with AutoFill Water Pitcher in Stainless Steel, Bespoke 3-Door French Door Refrigerator (24 cu. ft.) with AutoFill Water Pitcher in White Glass, Bespoke 4-Door French Door Refrigerator (29 cu. ft.) – with Top Left and Family Hub™ Panel in Charcoal Glass - and Matte Black Steel Middle and Bottom Door Panels, Bespoke 3-Door French Door Refrigerator (30 cu. ft.) with Beverage Center in Stainless Steel, Bespoke 4-Door French Door Refrigerator (23 cu. ft.) with AutoFill Water Pitcher in Stainless Steel, Bespoke 4-Door French Door Refrigerator (29 cu. ft.) with Beverage Center in Morning Blue Glass Top Panels and White Glass Middle and Bottom Panels, Bespoke 3-Door French Door Refrigerator (30 cu. ft.) – with Top Left and Family Hub™ Panel in White Glass - and Matte Grey Glass Bottom Door Panel, Bespoke 3-Door French Door Refrigerator (24 cu. ft.) with Beverage Center in White Glass, Bespoke 4-Door French Door Refrigerator (23 cu. ft.) with Beverage Center in White Glass, Bespoke 4-Door French Door Refrigerator (23 cu. ft.) – with Top Left and Family Hub™ Panel in Charcoal Glass - and Matte Black Steel Middle and Bottom Panels, Bespoke 3-Door French Door Refrigerator (24 cu. ft.) – with Top Left and Family Hub™ Panel in White Glass - and Matte Grey Glass Bottom Door Panel, 18 cu. ft. Smart Counter Depth 3-Door French Door Refrigerator in Black Stainless Steel, 17.3 cu. ft. Smart Kimchi & Specialty 4-Door French Door Refrigerator in White-Navy Glass, 22 cu. ft. Smart 3-Door French Door Refrigerator in Stainless Steel, 26.5 cu. ft. Large Capacity 3-Door French Door Refrigerator with Family Hub™ and External Water & Ice

Dispenser in Black Stainless Steel, 23 cu. ft. Smart Counter Depth Side-by-Side Refrigerator in Stainless Steel, 28 cu. ft. Smart Side-by-Side Refrigerator in Stainless Steel, 23 cu. ft. Counter Depth 4-Door French Door Refrigerator with FlexZone Drawer in Black Stainless Steel, 28 cu. ft. 4-Door French Door Refrigerator with FlexZone Drawer in Stainless Steel, 23 cu. ft. Smart Counter Depth 4-Door Flex™ Refrigerator with Beverage Center and Dual Ice Maker in Stainless Steel, 29 cu. ft. Smart 4-Door Flex™ Refrigerator with Family Hub™ and Beverage Center in Stainless Steel, 29 cu. ft. Smart 4-Door Flex™ Refrigerator with AutoFill Water Pitcher and Dual Ice Maker in Stainless Steel, 23 cu. ft. Smart Counter Depth 4-Door Flex™ refrigerator with Family Hub™ and Beverage Center in Black Stainless Steel, 29 cu. ft. Smart 4-Door Flex™ Refrigerator with Beverage Center and Dual Ice Maker in Stainless Steel, 22 cu. ft. Counter Depth Side-by-Side Refrigerator with Touch Screen Family Hub™ in Stainless Steel, 22 cu. ft. Smart 3-Door French Door Refrigerator with External Water Dispenser in Fingerprint Resistant Stainless Steel, 22 cu. ft. Counter Depth Side-by-Side Refrigerator in Stainless Steel, 26.7 cu. ft. Large Capacity Side-by-Side Refrigerator with Touch Screen Family Hub™ in Stainless Steel, 23 cu. ft. Smart Counter Depth 4-Door Flex™ refrigerator with AutoFill Water Pitcher and Dual Ice Maker in Stainless Steel, 15.6 cu. ft. Top Freezer Refrigerator with All-Around Cooling in Stainless Steel, 19.5 cu. ft. Smart 3-Door French Door Refrigerator in White, 29 cu. ft. Smart BESPOKE 4-Door Flex™ Refrigerator with Customizable Panel Colors in White Glass, Bespoke 3-Door French Door Refrigerator (30 cu. ft.) – with Family Hub™ in Charcoal Glass, Bespoke 3-Door French Door Refrigerator (24 cu. ft.) – with Family Hub™ in Charcoal Glass, Bespoke 4-Door French Door Refrigerator (23 cu. ft.) with Customizable Door Panel Colors and Beverage Center in Rose Pink Glass, Bespoke 4-Door French Door Refrigerator (23 cu. ft.) with Customizable Door Panel Colors and Beverage Center in Morning Blue Glass, Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in

Charcoal Glass, Bespoke 4-Door Flex™ Refrigerator (23 cu. ft.) in Charcoal Glass, Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in White Glass (2022), Bespoke 4-Door Flex™ Refrigerator (23 cu. ft.) in White Glass (2022), Bespoke 4-Door Flex™ Refrigerator (23 cu. ft.) in Sunrise Yellow Glass, Bespoke 4-Door Flex™ Refrigerator (23 cu. ft.) in Stainless Steel, Bespoke 4-Door Flex™ Refrigerator (23 cu. ft.) in Pink Glass (2022), Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in Emerald Green Steel, Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in Sunrise Yellow Glass, Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in Stainless Steel, Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in Clementine Glass, Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in Pink Glass (2022), Bespoke 4-Door Flex™ Refrigerator (23 cu. ft.) in Emerald Green Steel, Bespoke 4-Door Flex™ Refrigerator (23 cu. ft.) in Clementine Glass, Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in Morning Blue Glass, Bespoke 4-Door Flex™ Refrigerator (23 cu. ft.) in Morning Blue Glass, Bespoke 3-Door French Door Refrigerator (30 cu. ft.) - with Family Hub™ in White Glass, Bespoke 4-Door French Door Refrigerator (23 cu. ft.) with Customizable Door Panel Colors and Beverage Center in Emerald Green Steel, Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in White Glass Top and Grey Glass Bottom, Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in White Glass Top and Matte Black Steel Bottom, Bespoke 4-Door Flex™ Refrigerator (29 cu. ft.) in Matte Black Steel, Bespoke Counter Depth 4-Door Flex™ Refrigerator (23 cu. ft.) in White Glass Top and Grey Glass Bottom, Bespoke Counter Depth 4-Door Flex™ Refrigerator (23 cu. ft.) in White Glass Top and Matte Black Steel Bottom, 23 cu. ft. Smart Counter Depth BESPOKE 4-Door Flex™ Refrigerator with Customizable Panel Colors in White Glass, Bespoke 4-Door Flex™ Refrigerator (23 cu. ft.) in Matte Black Steel, 6.3 cu. ft.; **ranges** including Smart Freestanding Electric Range with No-Preheat Air Fry & Convection in Stainless Steel, 6.3 cu. ft. Smart Slide-in Electric Range with Convection in Stainless Steel, 6.0 cu. ft. Smart Slide-in Gas

Range with Air Fry in Stainless Steel, 6.0 cu. ft. Smart Freestanding Gas Range with 18K BTU Dual Power Burner & Self Clean in Stainless Steel, 6.0 cu. ft. Smart Freestanding Gas Range with No-Preheat Air Fry, Convection+ & Stainless Cooktop in Stainless Steel, 6.3 cu. ft. Smart Slide-in Electric Range with Air Fry in Stainless Steel, 6.3 cu ft. Smart Slide-in Electric Range with Smart Dial & Air Fry in Stainless Steel, 6.0 cu. ft. Smart Freestanding Gas Range with No-Preheat Air Fry & Convection in Stainless Steel, 6.3 cu. ft. Smart Freestanding Electric Range with No-Preheat Air Fry, Convection+ & Griddle in Black Stainless Steel, Bespoke Smart Slide-in Gas Range 6.0 cu. ft. with Smart Dial, Air Fry & Wi-Fi in Navy Steel, 6.3 cu. ft. Smart Slide-in Electric Range in Stainless Steel, 6.0 cu. ft. Smart Slide-in Gas Range in Stainless Steel, 6.3 cu. ft. Flex Duo™ Front Control Slide-in Dual Fuel Range with Smart Dial, Air Fry, and Wi-Fi in Black Stainless Steel, 6.0 cu ft. Smart Slide-in Gas Range with Smart Dial & Air Fry in Black Stainless Steel, 6.0 cu ft. Smart Slide-in Gas Range with Flex Duo™, Smart Dial & Air Fry in Stainless Steel, 6.3 cu. ft. Smart Slide-in Induction Range with Flex Duo™, Smart Dial & Air Fry in Stainless Steel, 6.3 cu. ft. Smart Slide-in Induction Range with Smart Dial & Air Fry in Stainless Steel, 6.0 cu. ft. Smart Slide-in Gas Range with Convection in Stainless Steel, 6.3 cu ft. Smart Slide-in Electric Range with Smart Dial, Air Fry, & Flex Duo™ in Stainless Steel, 6.3 cu. ft. Smart Freestanding Electric Range with Rapid Boil™ & Self Clean in Stainless Steel, 6.3 cu ft. Smart Slide-in Electric Range with Smart Dial & Air Fry in Stainless Steel, 6.3 cu. ft. Smart Freestanding Electric Range with Steam Clean in Stainless Steel, 6.0 cu. ft. Smart Freestanding Gas Range with Flex Duo™ & Air Fry in Black Stainless Steel, 6.0 cu. ft. Smart Freestanding Gas Range with Integrated Griddle in Stainless Steel, 6.3 cu. ft. Smart Freestanding Electric Range with Flex Duo™, No-Preheat Air Fry & Griddle in Black Stainless Steel, 6.3 cu. ft. Smart Rapid Heat Induction Slide-in Range with Air Fry & Convection+ in Black Stainless Steel, 6.3 cu. ft. Smart

Slide-in Electric Range with Air Fry & Convection in Stainless Steel, Bespoke 6.3 cu. ft. Smart Slide-in Electric Range with Air Fry & Convection in White Glass, 6.0 cu. ft. Smart Slide-in Gas Range with Air Fry & Convection in Fingerprint Resistant Stainless Steel, Bespoke 5.3 cu. ft.; **washing machines** including Ultra Capacity Front Load Washer with AI OptiWash™ and Auto Dispense in Brushed Navy, 4.5 cu. ft. Large Capacity Smart Front Load Washer with Super Speed Wash - Champagne, Bespoke 5.3 cu. ft. Ultra Capacity Front Load Washer with Super Speed Wash and AI Smart Dial in Silver Steel, 5.0 cu. ft. Extra Large Capacity Smart Front Load Washer with Super Speed Wash and Steam in Ivory, 4.6 cu. ft. Large Capacity AI Smart Dial Front Load Washer with Auto Dispense and Super Speed Wash in Brushed Black, 5.5 cu. ft. Extra-Large Capacity Smart Top Load Washer with Auto Dispense System in Brushed Black, 5.5 cu. ft. Extra-Large Capacity Smart Top Load Washer with Super Speed Wash in Ivory, 5.1 cu. ft. Smart Top Load Washer with ActiveWave™ Agitator and Super Speed Wash in Brushed Black, 5.0 cu. ft. Extra-Large Capacity Smart Dial Front Load Washer with MultiControl™ in Brushed Black, 5.0 cu. ft. Extra-Large Capacity Smart Dial Front Load Washer with OptiWash™ in Brushed Black, 4.5 cu. ft. Front Load Washer with Vibration Reduction Technology+ in White, 6.0 cu. ft. Total Capacity Smart Dial Washer with FlexWash™ and Super Speed Wash in Brushed Black, 5.0 cu. ft. Extra-Large Capacity Smart Front Load Washer with Super Speed Wash in Brushed Black, 2.5 cu. ft. Compact Front Load Washer with AI Smart Dial and Super Speed Wash in White, 7.5 cu. ft.; **dryers** including Smart Gas Dryer with Steam Sanitize+ in Champagne, Bespoke 7.6 cu. Ft. Ultra Capacity Gas Dryer with Super Speed Dry and AI Smart Dial in Silver Steel, Bespoke 7.6 cu. Ft. Ultra Capacity Electric Dryer with AI Optimal Dry and Super Speed Dry in Silver Steel, 7.5 cu. Ft. AI Smart Dial Electric Dryer with Super Speed Dry and MultiControl™ in Brushed Black, Bespoke 7.6 cu. Ft. Ultra Capacity Gas Dryer with AI Optimal Dry and Super Speed Dry

IPR2025-01307; Samsung
Ex. 1024 - Page 17

in Silver Steel, 7.5 cu. Ft. Smart Electric Dryer with Steam Sanitize+ and Sensor Dry in Ivory, Bespoke 7.6 cu. Ft. Ultra Capacity Electric Dryer with Super Speed Dry and AI Smart Dial in Silver Steel, 7.5 cu. Ft. Smart Gas Dryer with Steam Sanitize+ in White, 7.5 cu. Ft. AI Smart Dial Gas Dryer with Super Speed Dry and MultiControl™ in Brushed Black, 7.5 cu. Ft. Smart Gas Dryer with Steam Sanitize+ in Platinum, 7.5 cu. Ft. Smart Gas Dryer with Steam Sanitize+ and Sensor Dry in Brushed Black, 7.5 cu. Ft. Smart Electric Dryer with Steam Sanitize+ in Champagne, 7.4 cu. Ft. Smart Electric Dryer with Steam Sanitize+ in Brushed Black, 7.5 cu. Ft. Smart Dial Electric Dryer with FlexDry™ and Super Speed Dry in Brushed Black, 7.4 cu. Ft. Smart Electric Dryer with Steam Sanitize+ in Ivory, 7.4 cu. Ft. Smart Gas Dryer with Steam Sanitize+ in Brushed Black, 7.4 cu. Ft. Smart Electric Dryer with Steam Sanitize+ in White, 7.4 cu. Ft. Smart Gas Dryer with Steam Sanitize+ in Ivory, 7.5 cu. Ft. Smart Dial Gas Dryer with FlexDry™ and Super Speed Dry in Brushed Black, 7.4 cu. Ft. Smart Gas Dryer with Steam Sanitize+ in White, 7.4 cu. Ft. Smart Gas Dryer with Steam Sanitize+ in Champagne, 7.4 cu. Ft. Smart Electric Dryer with Steam Sanitize+ in Brushed Black, 7.4 cu. Ft. Smart Gas Dryer with Steam Sanitize+ in Brushed Black, 7.5 cu. Ft. Electric Dryer with Sensor Dry in Brushed Black, 7.5 cu. Ft. Smart Electric Dryer with Steam Sanitize+ in Brushed Black, 7.5 cu. Ft. Smart Dial Electric Dryer with Super Speed Dry in Ivory, 7.5 cu. Ft. Smart Dial Electric Dryer with Super Speed Dry in Brushed Black, 7.4 cu. Ft. Smart Electric Dryer with Steam Sanitize+ in Champagne, 7.5 cu. Ft. Smart Dial Electric Dryer with Super Speed Dry in Brushed Black, 4.0 cu. Ft. Electric Dryer with AI Smart Dial and Wi-Fi Connectivity in White; **AirDressers** including Bespoke AirDresser Grand Clothing Care System with Steam Refresh in Crystal Mirror Finish, Bespoke AirDresser Clothing Care System with Steam Refresh in Crystal Mirror Finish; **Dishwashers** including Smart Linear Wash 39dBA Dishwasher in Stainless Steel, Bespoke Smart 39dBA

Dishwasher with Linear Wash in Fingerprint Resistant Navy Steel, Smart 44dBA Dishwasher with StormWash+™ in Black Stainless Steel, Smart 44dBA Dishwasher with StormWash+™ in Stainless Steel, Smart 42dBA Dishwasher with StormWash+™ and Smart Dry in Black Stainless Steel, Smart 42dBA Dishwasher with StormWash+™ and Smart Dry in Black Stainless Steel, Jet Bot AI+ Robot Vacuum with Object Recognition, Jet Bot+ Robot Vacuum with Clean Station, Bluesky Compact Air Purifier, Bespoke Cube Air Purifier; **Microwaves and/or Microwave combinations** including 1.1 cu. ft. Smart SLIM Over-the-Range Microwave with 400 CFM Hood Ventilation, Wi-Fi & Voice Control in Black Stainless Steel, 1.1 cu. ft. Smart SLIM Over-the-Range Microwave with 550 CFM Hood Ventilation, Wi-Fi & Voice Control in Stainless Steel, Bespoke Smart 1.9 cu. ft. Over-the-Range Microwave with Sensor Cook in White Glass, 30" Smart Single Wall Oven in Stainless Steel, 30" Smart Microwave Combination Wall Oven in Stainless Steel, 30" Smart Double Wall Oven in Black Stainless Steel, 30" Smart Double Wall Oven with Flex Duo™ in Stainless Steel, 30" Smart Microwave Combination Wall Oven with Flex Duo™ in Black Stainless Steel, 30" Smart Single Wall Oven with Steam Cook in Black Stainless Steel, 30" Smart Microwave Combination Wall Oven with Steam Cook in Black Stainless Steel, 30" Smart Single Wall Oven with Flex Duo™ in Black Stainless Steel, and other Samsung devices with the ability to be a node in a SmartThings network (collectively, "the '161 Accused Products"). *See* https://www.smartthings.com/. Maxell reserves the right to discover and pursue any additional infringing devices that incorporate infringing functionalities. For the avoidance of doubt, the '161 Accused Products are identified to describe Samsung's infringement and in no way limit the discovery and infringement allegations against Samsung concerning other devices that incorporate the same or reasonably similar functionalities.

IPR2025-01307; Samsung
Ex. 1024 - Page 19

39. Each of the '161 Accused Products is one of a plurality of network devices connectable to a network based on being a node within the SmartThings ecosystems. *See* https://www.smartthings.com/. Further, each of the '161 Accused Products includes a peripheral device information collection unit such as network input interfaces (*e.g.*, Bluetooth or WiFi), which collects device information indicating which ones of the network devices are connected to the network while the connection to the network is established when joining or operating within a SmartThings network. Each of the '161 Accused Products also includes a peripheral device information storage unit, such as memory, which stores home network information including a chronological list of devices within the SmartThings network so that the devices can communicate with each other within the SmartThings network and can check on the status and/or health of the devices. Each of the '161 Accused Products further includes a peripheral device information transmission unit and a peripheral device information reception unit, such as WiFi circuity for communicating with various devices within the SmartThings network. Further, each of the '161 Accused Products includes a peripheral device information collation unit, such as processor or CPU, to collates stored information with information received from an additional device to determine whether the device is within the SmartThings network and to ensure that the network devices are communicating with Samsung devices that belong to the same SmartThings network. Each of the '161 Accused Products functions in a similar manner within the home network as related to the claimed language because they are required to communicate with each other using the Matter protocol. *See* https://www.smartthings.com/matter. Further, Samsung's SmartThings requirements dictates that each of the '161 Accused Products implement certain "Interaction Types," as noted below. *See* https://developer.smartthings.com/docs/devices/cloud-connected/interaction-types/ (excerpted below).

Interaction Types

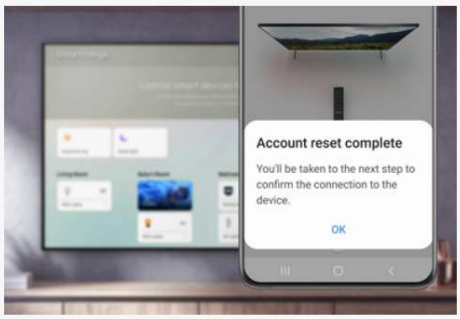
The interaction type is located in the payload `headers.interactionType`. The token context for the request is indicated in `authentication.token`.

For WWST approval, you must implement the following SmartThings interaction types:

- `discoveryRequest`: SmartThings requests a list of devices. Automatic polling occurs every ~24 hours. The Discovery request is followed by the State Refresh request.
- `stateRefreshRequest`: SmartThings requests the states of the indicated devices.
- `commandRequest`: SmartThings requests that you issue commands for the indicated devices.
- Callbacks allow your Cloud Connector to push a device's state to SmartThings:
  - Reciprocal Access Token Callbacks: Receive and refresh access tokens for use with a Callback interaction. Consists of the following interaction types:
    - `grantCallbackAccess`: Originates from SmartThings. Involved in initial token exchange.
    - `accessTokenRequest`: Originates from your Cloud Connector. Involved in initial token exchange.
    - `accessTokenResponse`: Originates from SmartThings. Involved in initial token exchange + refreshing the SmartThings token.
    - `refreshAccessTokens`: Originates from your Cloud Connector. Involved in refreshing the SmartThings token.
  - `stateCallback` is used by your Cloud Connector to update the state of a device that changed as a result of an interaction that did not originate from SmartThings.
  - `discoveryCallback` allows your Cloud Connector to perform on-demand discovery.
- `interactionResult` notifies you of where issues were found in the response on a request from SmartThings Schema.
- `integrationDeleted` notifies you when a connected service is deleted.
- Error Responses can be appended with `globalError` or `deviceError` in your interaction type response.

40. These "Interaction Types" include, for example, "discoveryRequest" that confirms that the '161 Accused Products include "a peripheral device information collection unit," "a peripheral device information storage unit," and "a peripheral device information transmission unit," because "SmartThings requests a list of devices [and a]utomatic polling occurs every ~24 hours." *Id.* Further, Samsung's SmartThings requirements also dictate that each of the '161 Accused Products also include "a peripheral device information collation unit" because "Discovery is the first SmartThings request . . . [and] this request is [handled] by retrieving a list of devices." *Id.* Further, the '161 Accused Products implement the interaction of "stateRefreshRequest" that require the devices to provide their states, which, upon information and belief, are provided after collation and confirming that the requesting device is part of the SmartThings network. Additionally each of the '161 Accused Products includes "a peripheral

device information collation unit" as evidence by SmartThings preventing from adding a device in a home network when that device is already added indicating that collation is being performed.



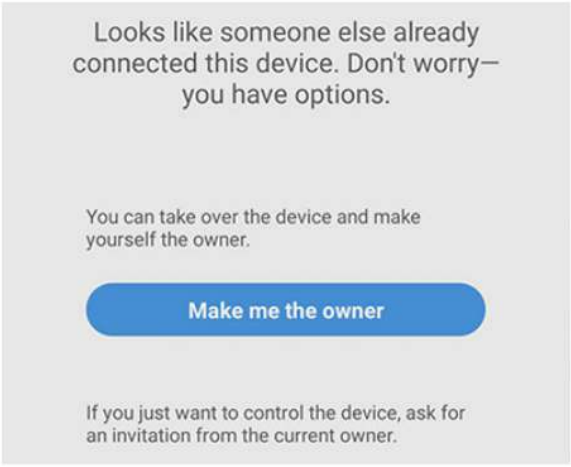
Someone already registered this device error when adding TV or projector to SmartThings

If your TV, Odyssey Ark gaming screen, or projector is still registered to an older SmartThings account or if you accidentally added it to the wrong account, you can easily reset it and transfer it. All you need to do is add the TV/projector to your new account and the SmartThings app will take care of the rest for you.

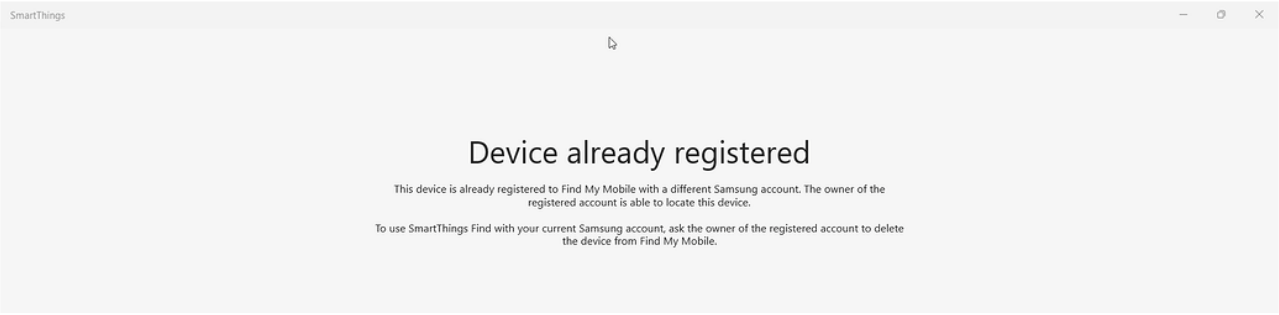
4 **Make yourself the owner of the TV/projector.**

Once the app detects the device, select its name. Read the information, and then tap **Make me the owner** to transfer the TV/projector to your new SmartThings account.

You may be required to allow the reset on your screen. You may also be required to enter a PIN that appears on the TV/projector. A popup message will display on your phone when the reset is complete; tap **OK**.



https://www.samsung.com/us/support/troubleshooting/TSG01201929/



https://community.smartthings.com/t/after-factory-resetting-my-samsung-galaxy-book-flex-2a-i-cant-reactivate-find-my-device/237472

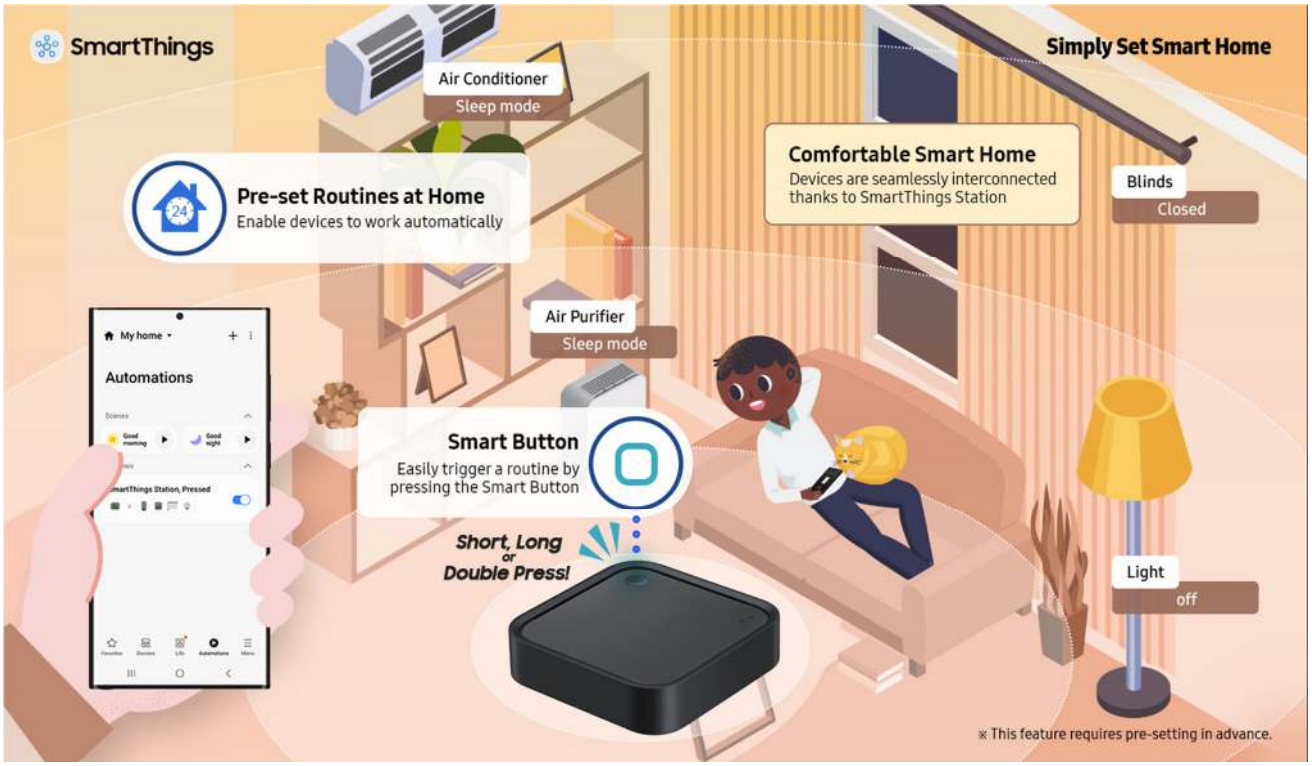
41. Similarly, the following excerpts from Samsung's websites provides non-limiting examples of the '161 Accused Products infringing at least claim 3 of the '161 Patent:



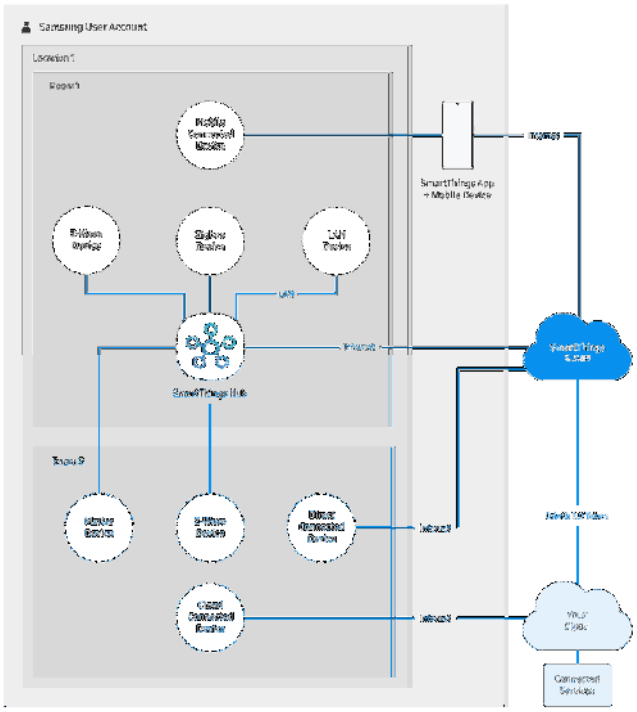
https://www.samsung.com/us/home-appliances/smartthings/



https://www.samsung.com/us/smartthings/



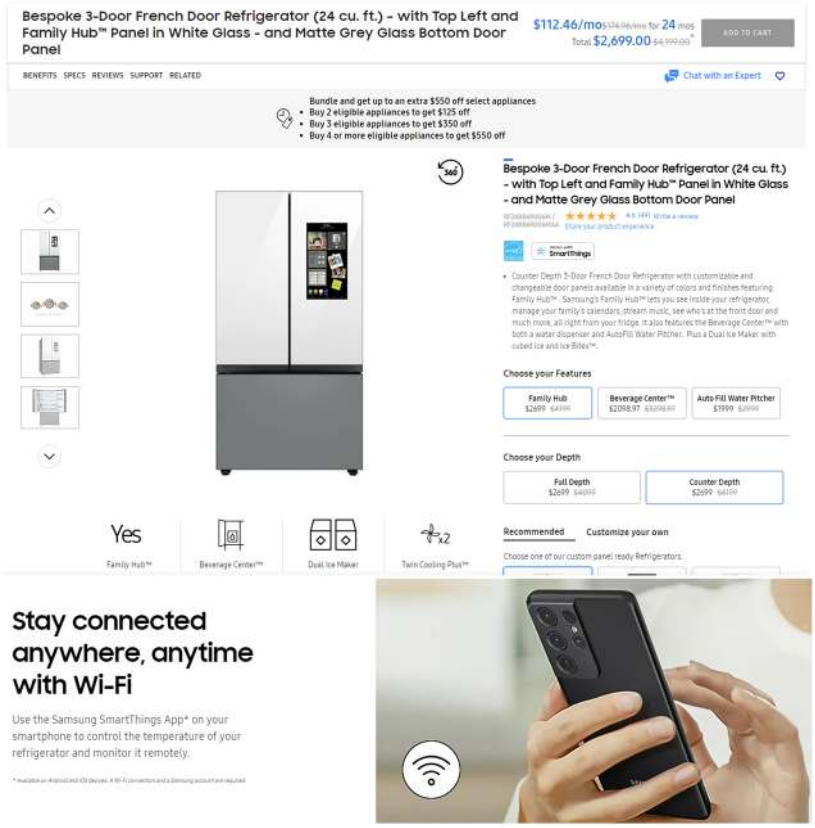
https://news.samsung.com/us/samsung-unveils-smartthings-station-making-smarter-homes-accessible-ces-2023/?utm_source=twitter&utm_medium=usnews&utm_campaign=ces



https://developer.smartthings.com/docs/getting-started/architecture-of-smartthings/



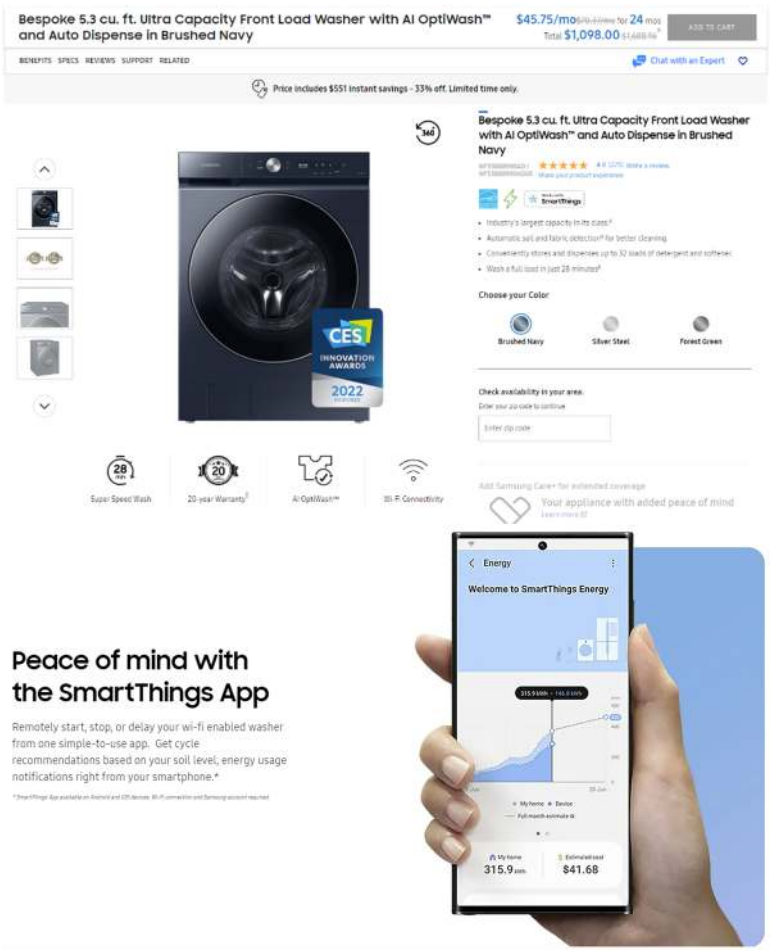
https://www.samsung.com/us/computing/monitors/smart-monitors/32-m80c-smart-monitor-4k-uhd-with-streaming-tv-usb-c-ergonomic-stand-and-slimfit-camera-ls32cm80bunxza/#benefits



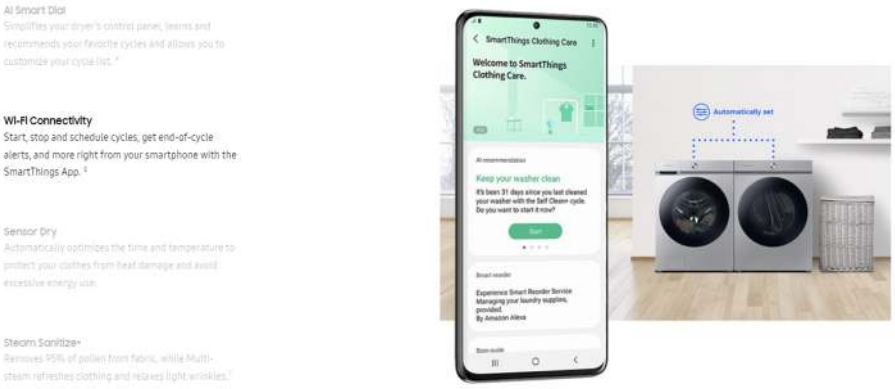
https://www.samsung.com/us/home-appliances/refrigerators/bespoke/bespoke-3-door-french-door-refrigerator-24-cu-ft-with-top-left-and-family-hub-panel-in-white-glass-and-matte-grey-glass-bottom-door-panel-rf24bb69006maa/



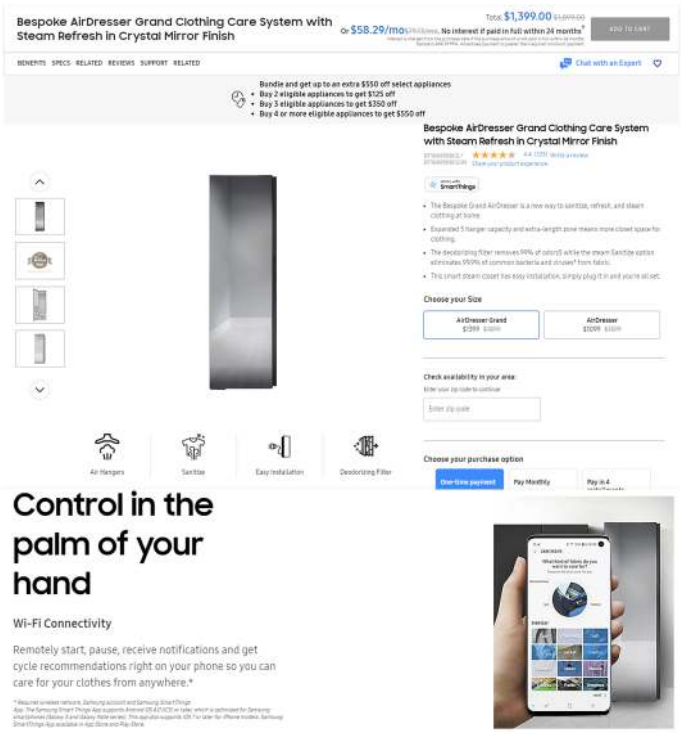
https://www.samsung.com/us/home-appliances/ranges/gas/6-0-cu-ft-front-control-slide-in-gas-range-with-smart-dial-air-fry-wi-fi-in-tuscan-stainless-steel-nx60t8711st-aa/



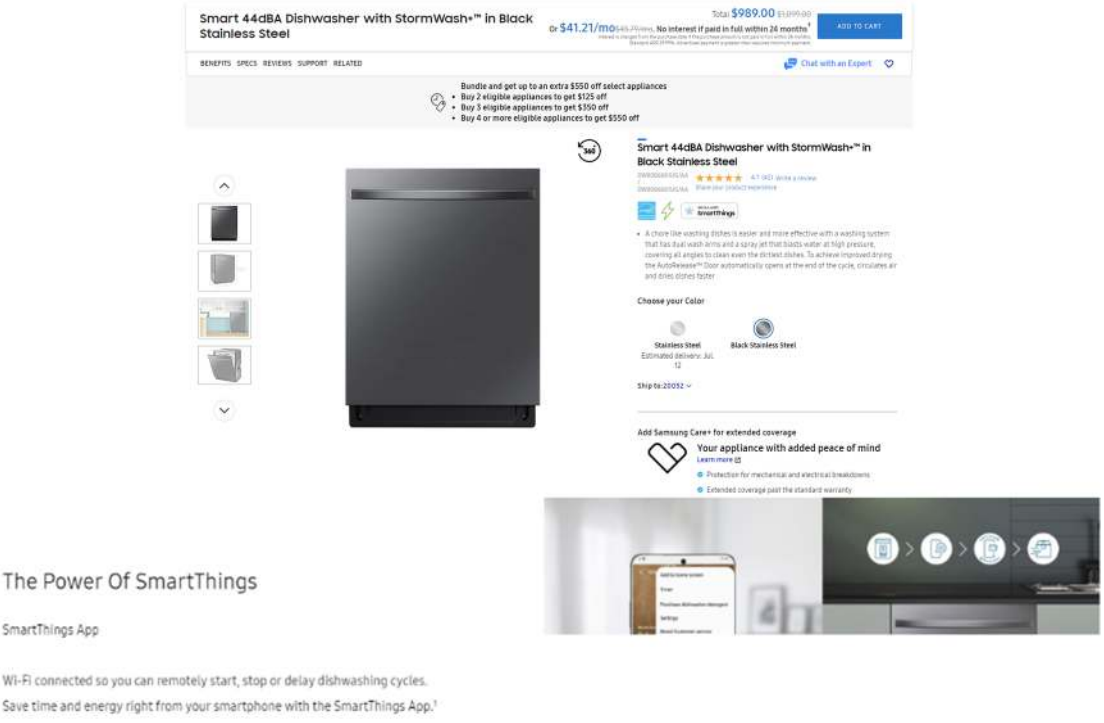
https://www.samsung.com/us/home-appliances/washers/bespoke/bespoke-5-3-cu-ft-ultra-capacity-front-load-washer-with-ai-optiwash-and-auto-dispense-in-brushed-navy-wf53bb8900adus/



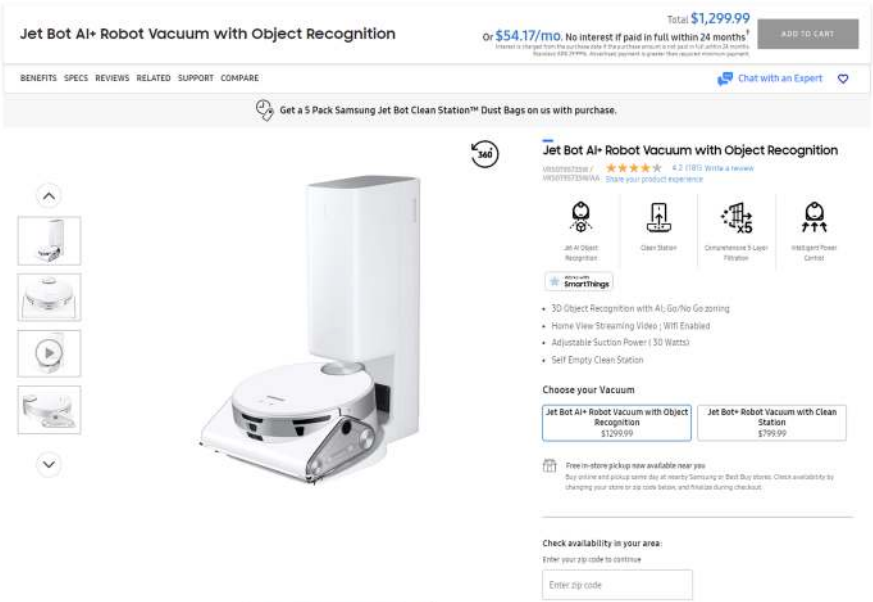
https://www.samsung.com/us/home-appliances/dryers/gas/bespoke-7-6-cu-ft-ultra-capacity-gas-dryer-with-super-speed-dry-and-ai-smart-dial-in-silver-steel-dvg53bb8700ta3/

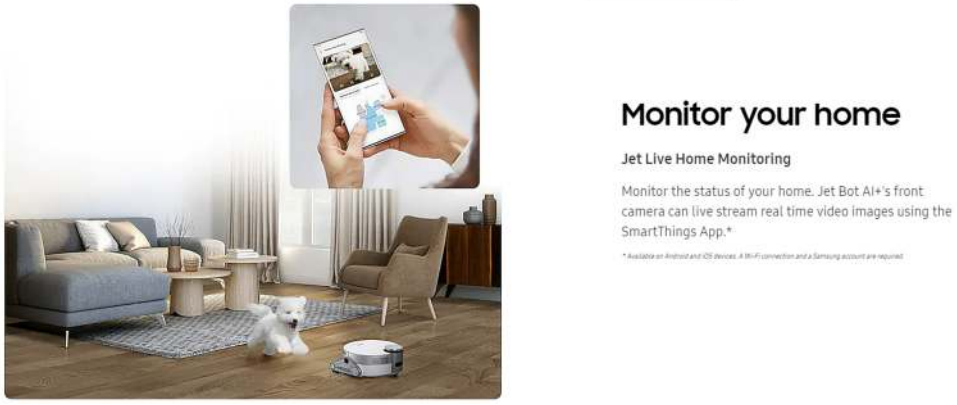


https://www.samsung.com/us/home-appliances/air-dresser/air-dresser/airdresser-grand-clothing-care-system-with-steam-refresh-and-sanitize-in-mirror-finish-df10a9500cg-a1/

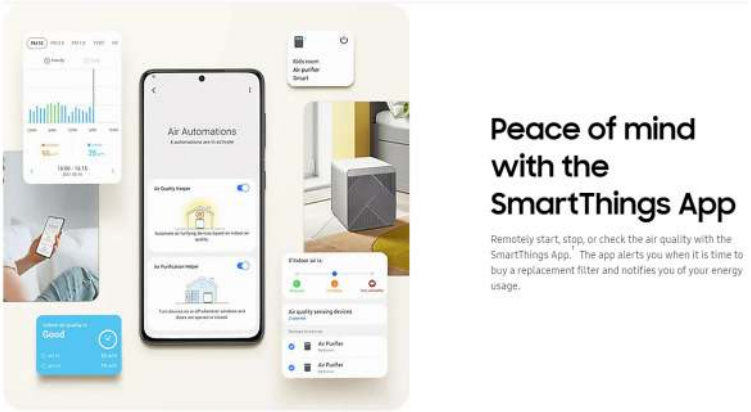


https://www.samsung.com/us/home-appliances/dishwashers/rotary/smart-44dba-dishwasher-with-stormwash-in-black-stainless-steel-dw80b6061ug-aa/

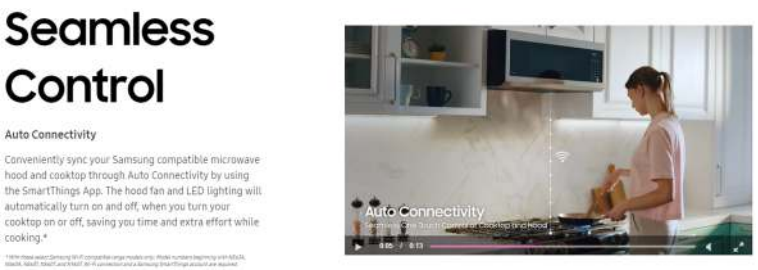




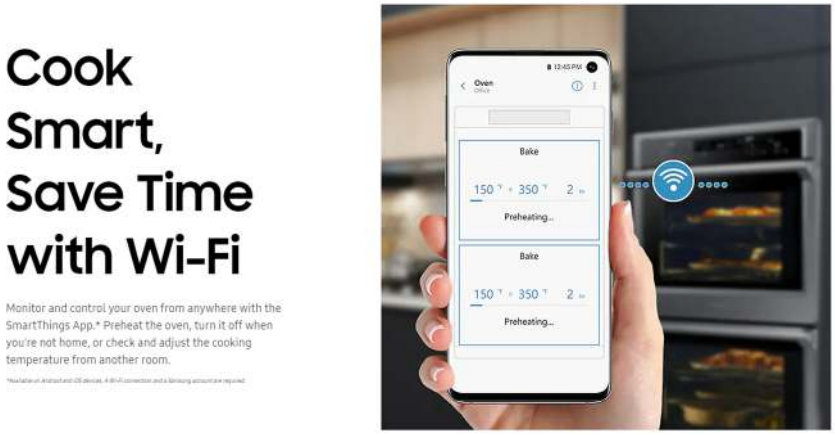
https://www.samsung.com/us/home-appliances/vacuums/jet-bot-robot/jet-bot-ai-plus-robot-vacuum-with-object-recognition-vr50t95735w-aa/



https://www.samsung.com/us/home-appliances/air-purifiers/cube-air-purifier/bespoke-air-purifier-in-grey-ax350a9350g-aa/



https://www.samsung.com/us/home-appliances/microwaves/over-the-range/1-1-cu--ft--smart-slim-over-the-range-microwave-with-550-cfm-hood-ventilation--wi-fi---voice-control-in-stainless-steel-me11a7710ds-aa/



https://www.samsung.com/us/home-appliances/wall-ovens/microwave-combination-oven/30-microwave-combination-wall-oven-in-stainless-steel-nq70t5511ds-aa/

42. The foregoing features and capabilities of the '161 Accused Products and Samsung's description and/or demonstration thereof, including in user manuals and advertising, reflect Samsung's direct infringement by satisfying every element of at least claim 3 of the '161 Patent, under 35 U.S.C. § 271(a).

43. Samsung has indirectly infringed at least claim 3 of the '161 Patent in this District and elsewhere in the United States by, among other things, actively inducing the use, offering for sale, selling, or importation of at least the '161 Accused Products. Samsung's customers who purchase devices and components thereof and operate such devices and components in accordance with Samsung's instructions directly infringe one or more claims of the '161 Patent in violation of 35 U.S.C. § 271. Samsung instructs its customers through at least user guides or websites, such as those located at:

https://downloadcenter.samsung.com/content/UM/202302/20230207045923682/SAM_S911_S916_S918_EN_UM_OS13_020223_FINAL.pdf, https://downloadcenter.samsung.com/content/UM/202204/20220413011651769/SAM_X700_X800_X808_X900_EN_UM_OS12_012422_FINAL_AC.pdf, and https://www.samsung.com/us/smartthings/.

44. For example, as shown above Samsung instructs its customers to ”Build a smart home to uplift your everyday,” “Be kind to the planet and your wallet by automating your energy and appliances,” “Check the front door from your fridges, sofa, wherever,” “Monitor your home, inside and out, all from your TV or tablet,” “Use the SmartThings App* on your smartphone to control the temperature of your refrigerator and monitor it remotely,” “Monitor your cooktop and adjust cook time and temperature of your oven right from your smartphone through the SmartThings™ App,” “Remotely start, stop, or delay your wi-fi enabled washer from one simple-to-use app,” “Start, stop and schedule cycles, get end-of-cycle alerts, and more right from your smartphone with the SmartThings App.” *See* https://www.samsung.com/us/smartthings/, *see also* https://www.samsung.com/us/computing/monitors/smart-monitors/32-m80c-smart-monitor-4k-uhd-with-streaming-tv-usb-c-ergonomic-stand-and-slimfit-camera-ls32cm80bunxza/#benefits, https://www.samsung.com/us/home-appliances/refrigerators/bespoke/bespoke-3-door-french-door-refrigerator-24-cu-ft-with-top-left-and-family-hub-panel-in-white-glass-and-matte-grey-glass-bottom-door-panel-rf24bb69006maa/, https://www.samsung.com/us/home-appliances/ranges/gas/6-0-cu-ft-front-control-slide-in-gas-range-with-smart-dial-air-fry-wi-fi-in-tuscan-stainless-steel-nx60t8711st-aa/, https://www.samsung.com/us/home-appliances/washers/bespoke/bespoke-5-3-cu-ft-ultra-capacity-front-load-washer-with-ai-optiwash-and-auto-dispense-in-brushed-navy-wf53bb8900adus/,

https://www.samsung.com/us/home-appliances/dryers/gas/bespoke-7-6-cu-ft-ultra-capacity-gas-dryer-with-super-speed-dry-and-ai-smart-dial-in-silver-steel-dvg53bb8700ta3/, https://www.samsung.com/us/home-appliances/air-dresser/air-dresser/airdresser-grand-clothing-care-system-with-steam-refresh-and-sanitize-in-mirror-finish-df10a9500cg-a1/, https://www.samsung.com/us/home-appliances/dishwashers/rotary/smart-44dba-dishwasher-with-stormwash-in-black-stainless-steel-dw80b6061ug-aa/, https://www.samsung.com/us/home-appliances/vacuums/jet-bot-robot/jet-bot-ai-plus-robot-vacuum-with-object-recognition-vr50t95735w-aa/, https://www.samsung.com/us/home-appliances/air-purifiers/cube-air-purifier/bespoke-air-purifier-in-grey-ax350a9350g-aa/, https://www.samsung.com/us/home-appliances/microwaves/over-the-range/1-1-cu--ft--smart-slim-over-the-range-microwave-with-550-cfm-hood-ventilation--wi-fi---voice-control-in-stainless-steel-me11a7710ds-aa/, https://www.samsung.com/us/home-appliances/wall-ovens/microwave-combination-oven/30-microwave-combination-wall-oven-in-stainless-steel-nq70t5511ds-aa/.

45. Samsung is thereby liable for infringement of the ’161 Patent pursuant to 35 U.S.C. § 271(b).

46. Samsung has indirectly infringed at least claim 3 of the ’161 Patent, by, among other things, contributing to the direct infringement of others, including customers of the ’161 Accused Products by making, offering to sell, or selling, in the United States, or importing a component of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in infringement of the ’161 Patent, and not a staple article or commodity of commerce suitable for substantial non-infringing use.

47. For example, the '161 Accused Products include hardware and software for implementing SmartThings home networks. These are components of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process. Furthermore, these components are a material part of the invention and upon information and belief are not a staple article or commodity of commerce suitable for substantial non-infringing use. Thus, Samsung is liable for infringement of the '161 Patent pursuant to 35 U.S.C. § 271(c).

48. Samsung has been on notice of the '161 Patent since, at least, July 7, 2021, based on correspondence directed to Mr. Injung Lee at SEC's Intellectual Property Center from Mr. Tatsuya Yamamoto, General Manager, IP Innovation Business Unit, Maxell, Ltd. *See* Letter from T. Yamamoto to I. Lee dated July 7, 2021 (Exhibit 2). That correspondence set forth Maxell's belief that Samsung makes, uses, sells, offers to sell, or imports products that infringe certain of Maxell's patents, and specifically identified the '161 Patent as well as exemplary claims and exemplary accused products for that patent including SmartThings network. By the time of trial, Samsung will thus have known and intended (since receiving such notice), that its continued actions would actively induce and contribute to actual infringement of at least claim 3 of the '161 Patent.

49. Samsung undertook and continued its infringing actions despite an objectively high likelihood that such activities infringed the '161 Patent, which has been duly issued by the USPTO, and is presumed valid. For example, since at least July 7, 2021, Samsung has been aware of an objectively high likelihood that its actions constituted and continue to constitute infringement of the '161 Patent, and that the '161 Patent is valid. On information and belief, Samsung could not reasonably, subjectively believe that its actions do not constitute infringement of the '161 Patent, nor could it reasonably, subjectively believe that the patent is invalid. Despite that knowledge and

subjective belief, and the objectively high likelihood that its actions constitute infringement, Samsung continued its infringing activities. As such, Samsung has willfully infringed and continues to willfully infringe the '161 Patent.

50. Maxell has been and continues to be damaged by Samsung's infringement of the '161 Patent.

COUNT 2 - INFRINGEMENT OF U.S. PATENT NO. 8,982,086

51. Maxell incorporates paragraphs 1-50 above by reference.

52. U.S. Patent No. 8,982,086 (the "'086 Patent," attached hereto as Exhibit 3) duly issued on March 17, 2015 and is entitled *Information Processing Apparatus*.

53. Maxell is the owner by assignment of the '086 Patent and possesses all rights under the '086 Patent, including the exclusive right to recover for past and future infringement.

54. The '086 Patent was subject to an *ex parte reexamination* No. 90/014,638, filed December 23, 2020, on behalf of third-party requester Apple Inc. On September 28, 2021, the USPTO completed the reexamination and issued an *ex parte reexamination* certificate (attached hereto as Exhibit 4) confirming the patentability and validity of the '086 Patent.

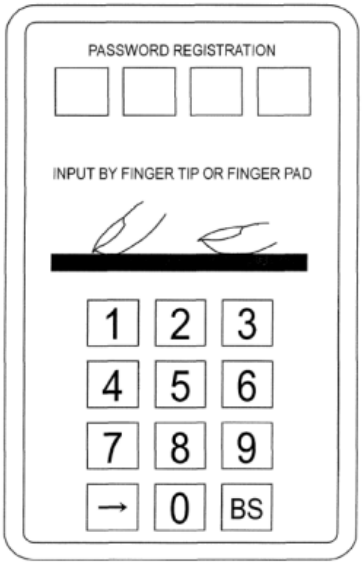
55. Altogether, four USPTO Examiners—Primary Examiner Michael Fargalla, Primary Examiner Robert L Nasser, Primary Examiner Joshua D Campbell, and Supervisory Patent Examiner Alexander J Kosowski—have confirmed the validity of the '086 Patent's claims.

56. The '086 Patent discloses techniques for unlocking information processing devices, such as smartphones, with convenience. For example, prior to the '086 Patent, one way of unlocking devices was by inputting a passcode that was preset by a user. This process would be time consuming and would require the user to memorize the passcode. Further, if the user has multiple devices he or she would need to memorize different passcodes or have the same passcode

on all of the devices but increase the risk of the security breach of all the devices if another user learnt of the passcode.

57. The ’086 Patent allowed users to conveniently execute an unlock operation on their devices by using the tip or pad of their fingers as shown below in Figure 11A of the ’086 Patent:

FIG. 11A



58. Further, the ’086 Patent also allows users to associate specific operations with their fingertip and finger pad such that when a user uses his or her fingertip the device recognizes that the user is entering an input via the fingertip and executes a corresponding operation. This is further shown in Figure 12B of the ’086 Patent:

FIG. 12B

DIGIT		1	2	3	4	OPERATION
PASSWORD		0	5	2	8	—
INPUT METHOD	1	FINGER TIP	FINGER PAD	FINGER PAD	FINGER PAD	WAITING SCREEN
	2	FINGER TIP	FINGER TIP	FINGER TIP	FINGER TIP	MAIL CREATING SCREEN
	3	FINGER PAD	FINGER TIP	FINGER PAD	FINGER TIP	APPLICATION STARTING

59. Samsung has directly infringed one or more claims of the '086 Patent in this District and elsewhere in Texas, including at least claim 1, literally and/or under the doctrine of equivalents, by or through making, using, importing, offering for sale and/or selling its consumer electronic devices, including at least Samsung products having materially similar functionality while implementing fingerprint unlock using Samsung smartphones, tablets, and laptops.

60. For example, Samsung has literally and/or under the doctrine of equivalents directly infringed at least claim 1 of the '086 Patent in this District and elsewhere in Texas by or through making, using, importing, offering for sale and/or selling at least the following: **smartphones** including Galaxy A Quantum, Galaxy A03s, Galaxy A04s, Galaxy A10s, Galaxy A11, Galaxy A12, Galaxy A12s (aka Nacho), Galaxy A13, Galaxy A13 5G, Galaxy A14, Galaxy A14 5G, Galaxy A20, Galaxy A20e, Galaxy A20s, Galaxy A21, Galaxy A21s, Galaxy A22, Galaxy A22s 5G, Galaxy A23, Galaxy A23 5G, Galaxy A24 4G, Galaxy A30, Galaxy A30s, Galaxy A32, Galaxy A32 5G, Galaxy A33 5G, Galaxy A34, Galaxy A40, Galaxy A42 5G, Galaxy A50, Galaxy A50s, Galaxy A51, Galaxy A51 5G, Galaxy A51 5G UW, Galaxy A52, Galaxy A52 5G, Galaxy A53 5G, Galaxy A54, Galaxy A60, Galaxy A70, Galaxy A70s, Galaxy A71, Galaxy A71 5G, Galaxy A71 5G UW, Galaxy A72, Galaxy A73 5G, Galaxy A8, Galaxy 8+, Galaxy A80, Galaxy A90 5G, Galaxy Fold, Galaxy Fold 5G, Galaxy Note10, Galaxy Note10 5G, Galaxy Note10 Lite, Galaxy Note10+, Galaxy Note10+ 5G, Galaxy Note20, Galaxy Note20 5G, Galaxy Note20 Ultra, Galaxy Note20 Ultra 5G, Galaxy Note9, Galaxy S10, Galaxy S10 5G, Galaxy S10 Lite, Galaxy S10+, Galaxy S10e, Galaxy S20, Galaxy S20 5G, Galaxy S205G UW, Galaxy S20 FE, Galaxy S20 FE 5G, Galaxy S20 Ultra, Galaxy S20 Ultra 5G, Galaxy S20+, Galaxy S20+ 5G, Galaxy S21 5G, Galaxy S21 FE 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22 5G, Galaxy S22 Ultra 5G, Galaxy S22+ 5G, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy S9, Galaxy S9+,

Galaxy Xcover FieldPro, Galaxy Xcover Pro, Galaxy Xcover6 Pro, Galaxy Z Flip, Galaxy Z Flip 5G, Galaxy Z Flip3 5G, Galaxy Z Flip4, Galaxy Z Flip5, Galaxy Z Fold2 5G, Galaxy Z Fold3 5G, Galaxy Z Fold4, Galaxy Z Fold5; t**ablets** including Galaxy Tab Active Pro, Galaxy Tab Active3, Galaxy Tab Active4 Pro, Galaxy Tab S5e, Galaxy Tab S6, Galaxy Tab S6 5G, Galaxy Tab S7, Galaxy Tab S7+, Galaxy Tab S8, Galaxy Tab S8 Ultra, Galaxy Tab S8+, Galaxy Tab S9, Galaxy Tab S9 Ultra, Galaxy Tab S9+; **laptops** including Galaxy Book2 360, 13", Intel Core i5, 256GB, Galaxy Book2 360, 13", Intel Core i7, 512GB, Galaxy Book2 Pro 360, 13", Intel Core i7, 256GB, Galaxy Book2 Pro 360, 13", Intel Core i7, 512GB, Galaxy Book2 Pro 360, 15", Intel Core i7, 1TB, Galaxy Book2 Pro 360, 15", Intel Core i7, 512GB, Galaxy Book2 Pro, 13", Intel Core i5, 256GB, Galaxy Book2 Pro, 13", Intel Core i7, 512GB, Galaxy Book2 Pro, 15", Intel Core i5, 512 GB, Galaxy Book2 Pro, 15", Intel Core i7, 512GB, Galaxy Book2 Pro, 15", Intel Core i7, Intel ARC Discrete Graphics, 1TB, Galaxy Book3 360, 13", Intel Core i7, 512GB, Galaxy Book3 360, 15", Intel Core i7, 512GB, Galaxy Book3 Pro 360, 16", Intel Core i7, 1TB, Galaxy Book3 Pro, 14", Intel Core i7, 512 GB, Galaxy Book3 Pro, 16" Intel Core i7, 1TB, Galaxy Book3 Ultra, 16" Intel Core i7, 1TB, Galaxy Book3 Ultra, 16" Intel Core i9, 1TB, and Galaxy Book3, 15", Intel Core i7, 512GB; and other Samsung devices with the ability to perform fingerprint unlock secured by Samsung Knox or Windows Hello (collectively, "the '086 Accused Products"). *See* https://www.samsung.com/us/support/answer/ANS00082563/; *see also* https://www.samsung.com/us/support/answer/ANS00062951/. Maxell reserves the right to discover and pursue any additional infringing devices that incorporate infringing functionalities. For the avoidance of doubt, the '086 Accused Products are identified to describe Samsung's infringement and in no way limit the discovery and infringement allegations against Samsung concerning other devices that incorporate the same or reasonably similar functionalities.

61. The ’086 Accused Products include a processor and software confirming that they include an information processing apparatus. Further, each of the ’086 Accused Products includes a touch panel, for example, a fingerprint sensor, configured to detect a contact of a finger of a user. Each of the ’086 Accused Products also include a detector configured to detect information, such as a user’s fingerprint, to identify the user when the contact is detected between the touch panel and the finger of the user. Further, each of the ’086 Accused Products include a memory that is configured to store information relating to the identification of the user. Each of the ’086 Accused further include a first controller configured to control the information processing apparatus to operate into two operating modes (*e.g.*, CPU) and another controller (*e.g.*, Samsung Knox) configured to execute a specified process when the information of the detected user and the information stored in the memory are coincident within one of the modes. Further, each of the ’086 Accused Products implement two registering modes to provide input from different portions of the finger during registration.

62. For example, the following excerpts from Samsung’s websites provides non-limiting examples of the ’086 Accused Products infringing at least claim 1 of the ’086 Patent:

Use the fingerprint sensor on your Galaxy phone or tablet

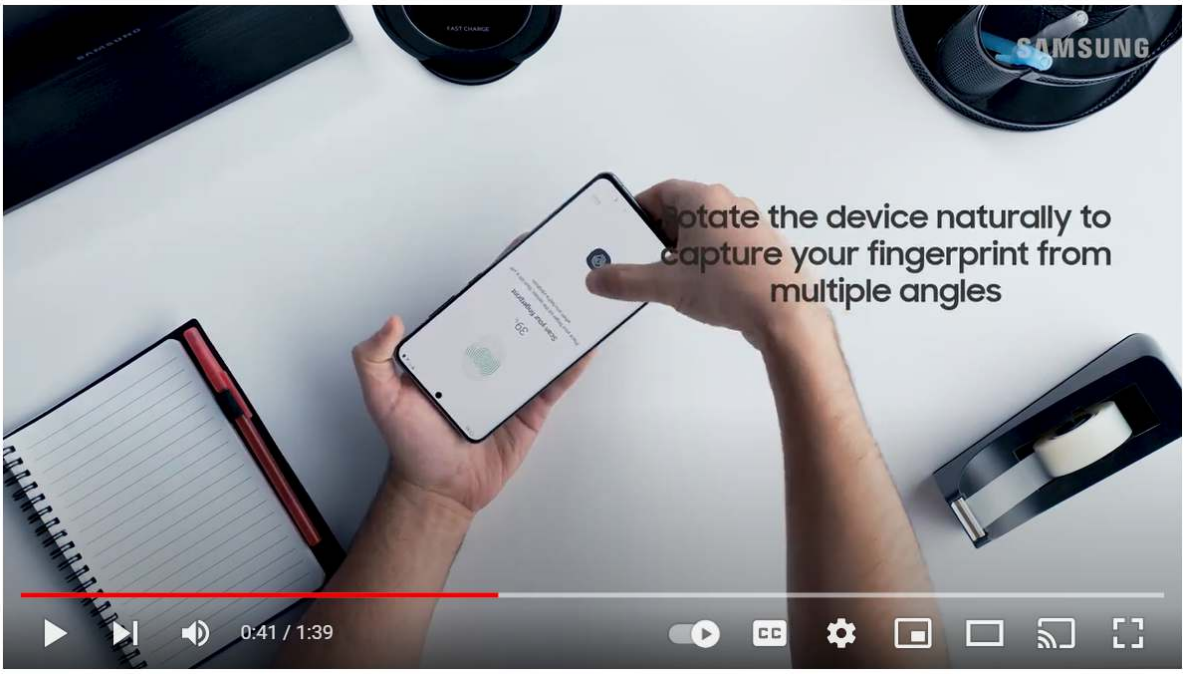


No one in the world is quite like you, and no two fingerprints are exactly the same. That’s why fingerprint security on Galaxy phones and tablets is so dependable. However, using the fingerprint scanner may be a little different based on which type of device you have.

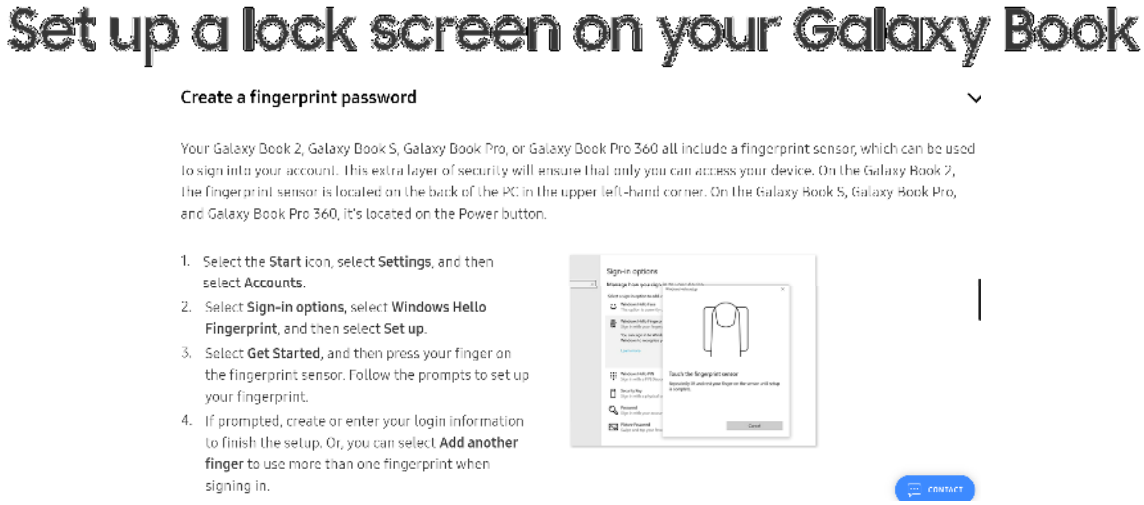
https://www.samsung.com/us/support/answer/ANS00082563/

1. Navigate to **Settings**, then tap **Security and privacy**, and then tap **Biometrics**. Tap **Fingerprints**.
2. Enter your lock screen credentials. If you do not have a screen lock set up, you may be prompted to create one at this point. When you're ready, read the information, and then tap **Continue**.
3. Use the on-screen prompts to register your fingerprint. When registering your fingerprint, make sure to fully cover the fingerprint sensor with your finger to prevent strong light from entering the fingerprint sensor. When you're finished, tap **Done**.
4. Next, make sure that the **switch** next to Fingerprint unlock is turned on.

https://www.samsung.com/us/support/answer/ANS00082563/



https://www.youtube.com/watch?v=gBAaLezosQE&t=17s ("Samsung Care" Channel)



Set up a lock screen on your Galaxy Book

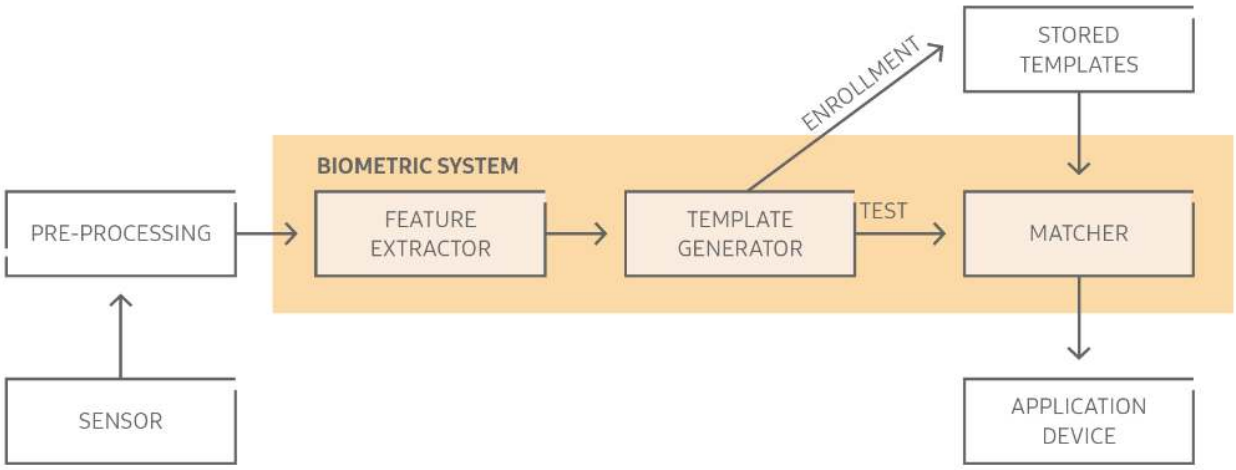
Create a fingerprint password

Your Galaxy Book 2, Galaxy Book S, Galaxy Book Pro, or Galaxy Book Pro 360 all include a fingerprint sensor, which can be used to sign into your account. This extra layer of security will ensure that only you can access your device. On the Galaxy Book 2, the fingerprint sensor is located on the back of the PC in the upper left-hand corner. On the Galaxy Book S, Galaxy Book Pro, and Galaxy Book Pro 360, it's located on the Power button.

1. Select the **Start** icon, select **Settings**, and then select **Accounts**.
2. Select **Sign-in options**, select **Windows Hello Fingerprint**, and then select **Set up**.
3. Select **Get Started**, and then press your finger on the fingerprint sensor. Follow the prompts to set up your fingerprint.
4. If prompted, create or enter your login information to finish the setup. Or, you can select **Add another finger** to use more than one fingerprint when signing in.

https://www.samsung.com/us/support/answer/ANS00062951/

Unique advantages of Knox Biometrics



The Knox Platform provides the following in addition to standard Android capabilities:

- **Secure storage** — On Samsung devices, the authentication software doesn't share or distribute the biometric measurements of any user. The measurements are stored in a format that can't be used to reproduce the original biometric, and can only be accessed and decoded within the specific part of the TrustZone that has access to the biometric hardware. Biometrics are used only on the correct device and by the correct user. This functionality means there is a lower chance of someone spoofing biometrics credentials to access a device.

https://docs.samsungknox.com/admin/whitepaper/kpe/biometric-authentication.htm

63. The foregoing features and capabilities of the ’086 Accused Products and Samsung’s description and/or demonstration thereof, including in user manuals and advertising, reflect Samsung’s direct infringement by satisfying every element of at least claim 1 of the ’086 Patent, under 35 U.S.C. § 271(a).

64. Samsung has indirectly infringed at least claim 1 of the ’086 Patent in this District and elsewhere in the United States by, among other things, actively inducing the use, offering for sale, selling, or importation of at least the ’086 Accused Products. Samsung’s customers who purchase devices and components thereof and operate such devices and components in accordance with Samsung’s instructions directly infringe one or more claims of the ’086 Patent in violation of

35 U.S.C. § 271. Samsung instructs its customers through at least user guides or websites, such as those located at:

https://downloadcenter.samsung.com/content/UM/202302/20230207045923682/SAM_S911_S916_S918_EN_UM_OS13_020223_FINAL.pdf,

https://downloadcenter.samsung.com/content/UM/202204/20220413011651769/SAM_X700_X800_X808_X900_EN_UM_OS12_012422_FINAL_AC.pdf, and

https://www.samsung.com/us/support/answer/ANS00082563/

65. For example, as shown above Samsung instructs its customers to "Use the fingerprint sensor on your Galaxy phone or tablet," "Set up and use fingerprint unlock," "Set up a lock screen on your Galaxy Book," "Record up to 4 fingerprints for faster recognition." *See* https://www.samsung.com/us/support/answer/ANS00082563/; *see also* https://www.youtube.com/watch?v=gBAaLezosQE&t=17s ("Samsung Care" Channel); https://www.samsung.com/us/support/answer/ANS00062951/;https://docs.samsungknox.com/admin/whitepaper/kpe/biometric-authentication.htm.

66. Samsung is thereby liable for infringement of the '086 Patent pursuant to 35 U.S.C. § 271(b).

67. Samsung has indirectly infringed at least claim 1 of the '086 Patent, by, among other things, contributing to the direct infringement of others, including customers of the '086 Accused Products by making, offering to sell, or selling, in the United States, or importing a component of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in infringement of the '086 Patent, and not a staple article or commodity of commerce suitable for substantial non-infringing use.

68. For example, the '086 Accused Products include hardware and software for implementing Fingerprint unlock as secured by Samsung Knox. These are components of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process. Furthermore, such components are a material part of the invention and upon information and belief are not a staple article or commodity of commerce suitable for substantial non-infringing use. Thus, Samsung is liable for infringement of the '086 Patent pursuant to 35 U.S.C. § 271(c).

69. Samsung has been on notice of the '086 Patent since, at least, July 7, 2021, based on correspondence directed to Mr. I. Lee of SEC from Mr. T. Yamamoto of Maxell. *See* Letter from T. Yamamoto to I. Lee dated July 7, 2021 (Exhibit 2). Samsung was further provided notice of the successful reexamination of the '086 Patent in follow-up correspondence directed to Mr. Daejin Jeon of SEC's IP Center from Mr. T. Hirabayashi of Maxell, dated December 29, 2021 (Exhibit 5). This correspondence set forth Maxell's belief that Samsung makes, uses, sells, offers to sell, or imports products that infringe certain of Maxell's patents, and specifically identified the '086 Patent as well as exemplary claims and exemplary accused products for that patent. By the time of trial, Samsung will thus have known and intended (since receiving such notice), that its continued actions would actively induce and contribute to actual infringement of at least claim 1 of the '086 Patent.

70. Samsung undertook and continued its infringing actions despite an objectively high likelihood that such activities infringed the '086 Patent, which has been duly issued by the USPTO, and is presumed valid. For example, since at least July 7, 2021, Samsung has been aware of an objectively high likelihood that its actions constituted and continue to constitute infringement of the '086 Patent, and that the '086 Patent is valid. On information and belief, Samsung could not reasonably, subjectively believe that its actions do not constitute infringement of the '086 Patent,

nor could it reasonably, subjectively believe that the patent is invalid. Despite that knowledge and subjective belief, and the objectively high likelihood that its actions constitute infringement, Samsung continued its infringing activities. As such, Samsung has willfully infringed and continues to willfully infringe the '086 Patent.

71. Maxell has been and continues to be damaged by Samsung's infringement of the '086 Patent.

COUNT 3 - INFRINGEMENT OF U.S. PATENT NO. 10,176,848

72. Maxell incorporates paragraphs 1-71 above by reference.

73. U.S. Patent No. 10,176,848 (the "'848 Patent," attached hereto as Exhibit 6) duly issued on January 8, 2019 and is entitled *Recording And Reproducing Apparatus And Method Thereof*.

74. Maxell is the owner by assignment of the '848 Patent and possesses all rights under the '848 Patent, including the exclusive right to recover for past and future infringement.

75. The '848 Patent was subject to an *ex parte reexamination* No. 90/014,641, filed December 23, 2020, on behalf of third party requester Apple Inc. On March 18, 2022, the USPTO completed the reexamination and issued an *ex parte reexamination* certificate (attached hereto as Exhibit 7) confirming the patentability and validity of certain claims of the '848 Patent.

76. Altogether, four USPTO Examiners—Primary Examiner Thai Q Tran, Assistant Examiner Syed Hasan, Primary Examiner B. James Peikari, and Supervisory Patent Examiner Alexander J Kosowski—have confirmed the validity of certain claims of the '848 Patent.

77. The '848 Patent is directed to a recording and reproducing apparatus that makes it easier for a user to navigate through a large number of recorded images and videos. For example, prior to the '848 Patent, recording and reproducing apparatuses like smartphones and laptops were

being used to record a large number of videos and pictures. In order to make it easier for a user to find recorded content, conventional techniques generated a list of thumbnails corresponding to each recorded content, giving the user a type of "preview" of the recorded content. But as the volume of recorded content increased it became difficult to identify a specific picture or video simply by looking through thumbnails.

78. The '848 Patent discloses techniques that enable a user to identify and search through recorded content more efficiently and effectively. For example, the '848 Patent discloses executing a face recognizing process on the recorded pictures and allows a user to register pictures of a specific person in an organized manner. Further, the '848 Patent also discloses techniques whereby once a picture of a specific person is registered, future pictures of the same person will continue to be categorized and associated with the previously identified pictures of that person. Further, the '848 Patent also discloses displaying thumbnails corresponding to recorded images with an icon having predetermined shape when an importance level is set for a specific recorded image. The '848 Patent also discloses recording video information including a plurality of sections corresponding to a plurality of thumbnails and displaying the thumbnails. This manner of recording and reproducing images and video information allows users of the recording and reproducing apparatus to navigate and search through pictures and video in a more manageable and efficient manner.

79. Samsung has directly infringed one or more claims of the '848 Patent in this District and elsewhere in Texas, including at least claim 84 literally and/or under the doctrine of equivalents, by or through making, using, importing, offering for sale and/or selling its consumer electronic devices, including at least Samsung products having materially similar functionality

while implementing various picture and video recording and editing functions within the "Gallery" application in Samsung smartphones and tablets.

80. For example, Samsung has literally and/or under the doctrine of equivalents directly infringed at least claim 84 of the '848 Patent in this District and elsewhere in Texas by or through making, using, importing, offering for sale and/or selling at least the following: **smartphones** including Galaxy A04e, Galaxy A04s, Galaxy A13, Galaxy A14, Galaxy A14 5G, Galaxy A23, Galaxy A23 5G, Galaxy A23, Galaxy A23 5G, Galaxy A24 4G, Galaxy A33 5G, Galaxy A34, Galaxy A53 5G, Galaxy A54, Galaxy A73 5G, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy XCover6 Pro, Galaxy Z Flip4, Galaxy Z Flip5, Galaxy Z Fold4, Galaxy Z Fold5; **tablets** including Galaxy Tab A7 10.4 (2022), Galaxy Tab Active4 Pro, Galaxy Tab S6 Lite (2022), Galaxy Tab S8, Galaxy Tab S8 Ultra, Galaxy Tab S8+, Galaxy Tab S9, Galaxy Tab S9 Ultra, Galaxy Tab S9+; and other Samsung devices with the ability to perform various picture and video recording and editing functions within Samsung's "Gallery" application (collectively, "the '848 Accused Products"). *See* https://www.samsung.com/us/support/answer/ANS00079026/; *see also* https://www.samsung.com/us/apps/one-ui/features/; https://www.samsung.com/uk/support/mobile-devices/how-to-use-samsung-video-editor/. Maxell reserves the right to discover and pursue any additional infringing devices that incorporate infringing functionalities. For the avoidance of doubt, the '848 Accused Products are identified to describe Samsung's infringement and in no way limit the discovery and infringement allegations against Samsung concerning other devices that incorporate the same or reasonably similar functionalities.

81. The '848 Accused Products each include a processor, a display, multiple cameras, memory, an analog/digital converter, a codec, a touch panel, and Samsung Gallery application

confirming that they include a recording and reproducing apparatus that records pictures and videos in an organized manner. Further, each of the ’848 Accused Products executes a face-recognition process and includes a Samsung Gallery application that registers albums for specific person based on the face-recognition. Each of the ’848 Accused Products further includes a Samsung Gallery application that generates thumbnails corresponding to recorded images and a display that displays the thumbnails with a predetermined shape when an importance level is set for a recorded image via a user interface (*e.g.*, via selecting Favorites in the Samsung Gallery application). Further, each of the ’848 Accused Products includes a video camera for providing video image data corresponding to a face and a display for displaying the image data with a frame surrounding at least a portion of the face when the face is detected in the video image data. Each of the ’848 Accused Products further includes a video camera that automatically sets a plurality of sections corresponding to video information, generates thumbnails corresponding to the plurality of sections, and the display displays the plurality of thumbnails. Each of the ’848 Accused Products further includes a display that displays images of faces without displaying all of the background objects including in the contents of such images.

82. For example, the following excerpts from Samsung’s websites provides non-limiting examples of the ’848 Accused Products infringing at least claim 84 of the ’848 Patent:

Use the Gallery app on your Galaxy phone or tablet



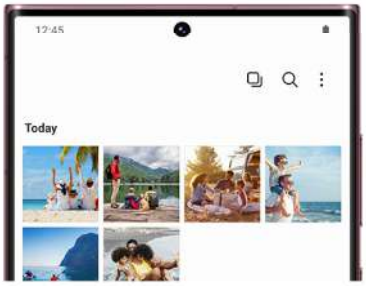
Leave that bulky photo album at home and use your **phone** or **tablet** instead to relive all those precious memories. With the Gallery app, you can view, edit, and manage your pictures, videos, and albums right on your Galaxy device.

https://www.samsung.com/us/support/answer/ANS00079026/

View and edit pictures and videos

If you spent an hour trying to take that perfect selfie or video, you can look back at your hard work by viewing it in Gallery. You can also edit your image or video using **different filters, effects, and styles**!

1. Navigate to and open **Gallery**, and then tap the **Pictures** tab. To search for a specific picture or video, tap the **Search** icon in the upper right corner. You can search by its tag, album name, or other details.

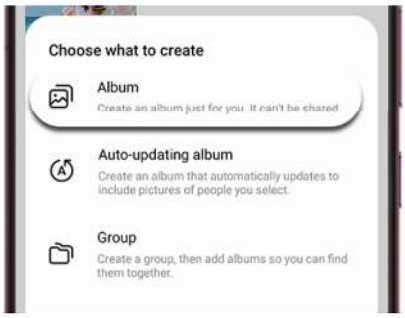


https://www.samsung.com/us/support/answer/ANS00079026/

Create albums

With so many photos and videos, your Gallery can get a little disorganized. Just create an album to get rid of the clutter.

1. From **Gallery**, tap the **Albums** tab, and then tap **Add** (the plus sign). You can select from the following album types:



- **Album:** Create a standard album.
- **Auto-updating album:** Create an album that will automatically update to include pictures of people that you select.

https://www.samsung.com/us/support/answer/ANS00079026/

How to use Samsung Video editor

Last Update date : May 19, 2023

What can I do with Samsung Video editor?

To edit your video, follow these steps.



Step 1. Open **Gallery app.**



Step 2. Tap to select a video to edit.



Step 3. Tap **Edit icon.**

https://www.samsung.com/levant/support/mobile-devices/how-to-use-samsung-video-editor/

Remove unwanted parts or shorten a video.



Step 1. Tap **Trim icon.**



Step 2. Use the white slider bars at the bottom of the screen to select when the video begins or ends.

https://www.samsung.com/levant/support/mobile-devices/how-to-use-samsung-video-editor/

How to select and view only the albums you want to see in Galaxy gallery

Last Update date : Jan 13, 2023

Photos saved on the phone are automatically added and displayed in the Gallery app. The select albums to show feature lets you view only the albums you want. This is supported in Android 13 or higher.

How to select albums to show



Step 1. Tap **Gallery**.



Step 2. Tap "Albums".



Step 3. Tap **More options icon**.



Step 4. Tap "Select albums to show".



Step 5. Tap to select any albums you wish to show in the gallery and tap "Done" when you have finished selecting.



Step 6. Now you can the view the selected albums in Gallery.

https://www.samsung.com/sg/support/mobile-devices/how-to-select-and-view-only-the-albums-you-want-to-see-in-galaxy-gallery/

83. The foregoing features and capabilities of the '848 Accused Products and Samsung's description and/or demonstration thereof, including in user manuals and advertising, reflect Samsung's direct infringement by satisfying every element of at least claim 84 of the '848 Patent, under 35 U.S.C. § 271(a).

84. Samsung has indirectly infringed at least claim 84 of the '848 Patent in this District and elsewhere in the United States by, among other things, actively inducing the use, offering for sale, selling, or importation of at least the '848 Accused Products. Samsung's customers who purchase devices and components thereof and operate such devices and components in accordance with Samsung's instructions directly infringe one or more claims of the '848 Patent in violation of 35 U.S.C. § 271. Samsung instructs its customers through at least user guides or websites, such as those located at:

https://downloadcenter.samsung.com/content/UM/202302/20230207045923682/SAM_S911_S916_S918_EN_UM_OS13_020223_FINAL.pdf,

https://downloadcenter.samsung.com/content/UM/202204/20220413011651769/SAM_X700_X800_X808_X900_EN_UM_OS12_012422_FINAL_AC.pdf,

https://www.samsung.com/levant/support/mobile-devices/how-to-use-samsung-video-editor/,

and https://www.samsung.com/us/support/answer/ANS00079026/.

85. For example, as shown above Samsung instructs its customers to "Use the Gallery app on your Galaxy phone or tablet," "View and edit pictures and videos," "Create an album that will automatically update to include pictures of people that you select," "Tap to select a video to edit," "How to select and view only the albums you want to see in Galaxy gallery." *See* https://www.samsung.com/us/support/answer/ANS00079026/; *see also* https://www.samsung.com/levant/support/mobile-devices/how-to-use-samsung-video-editor/;

https://www.samsung.com/sg/support/mobile-devices/how-to-select-and-view-only-the-albums-you-want-to-see-in-galaxy-gallery/.

86. Samsung is thereby liable for infringement of the '848 Patent pursuant to 35 U.S.C. § 271(b).

87. Samsung has indirectly infringed at least claim 84 of the '848 Patent, by, among other things, contributing to the direct infringement of others, including customers of the '848 Accused Products by making, offering to sell, or selling, in the United States, or importing a component of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in infringement of the '848 Patent, and not a staple article or commodity of commerce suitable for substantial non-infringing use.

88. For example, the '848 Accused Products each includes hardware and software for implementing picture and video recording, displaying, and editing functions by Samsung Gallery. These are components of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process. Furthermore, these components are a material part of the invention and upon information and belief are not a staple article or commodity of commerce suitable for substantial non-infringing use. Thus, Samsung is liable for infringement of the '848 Patent pursuant to 35 U.S.C. § 271(c).

89. Samsung has been on notice of the '848 Patent since, at least, July 7, 2021, based on correspondence directed to Mr. I. Lee of SEC from Mr. T. Yamamoto of Maxell. *See* Letter from T. Yamamoto to I. Lee dated July 7, 2021. *See* Exhibit 2. Samsung was further provided notice of the successful reexamination of the '848 Patent in follow-up correspondence directed to Mr. D. Jeon from Mr. T. Hirabayashi, dated December 29, 2021. *See* Exhibit 5. This

correspondence set forth Maxell's belief that Samsung makes, uses, sells, offers to sell, or imports products that infringe certain of Maxell's patents, and specifically identified the '848 Patent as well as exemplary claims and exemplary accused products for that patent. By the time of trial, Samsung will thus have known and intended (since receiving such notice), that its continued actions would actively induce and contribute to actual infringement of at least claim 84 of the '848 Patent.

90. Samsung undertook and continued its infringing actions despite an objectively high likelihood that such activities infringed the '848 Patent, which has been duly issued by the USPTO, and is presumed valid. For example, since at least July 7, 2021, Samsung has been aware of an objectively high likelihood that its actions constituted and continue to constitute infringement of the '848 Patent, and that the '848 Patent is valid. On information and belief, Samsung could not reasonably, subjectively believe that its actions do not constitute infringement of the '848 Patent, nor could it reasonably, subjectively believe that the '848 Patent is invalid. Despite that knowledge and subjective belief, and the objectively high likelihood that its actions constitute infringement, Samsung continued its infringing activities. As such, Samsung has willfully infringed and continues to willfully infringe the '848 Patent.

91. Maxell has been and continues to be damaged by Samsung's infringement of the '848 Patent.

COUNT 4 - INFRINGEMENT OF U.S. PATENT NO. 11,223,757

92. Maxell incorporates paragraphs 1-91 above by reference.

93. U.S. Patent No. 11,223,757 (the "'757 Patent," attached hereto at Exhibit 8) duly issued on January 11, 2022 and is entitled *Video Recording Device And Camera Function Control Program*.

94. Maxell is the owner by assignment of the '757 Patent and possesses all rights under the '757 Patent, including the exclusive right to recover for past and future infringement.

95. Some estimates indicate that there are 92 million "selfies" being taken on a daily basis. The '757 Patent is directed to providing an apparatus with improved techniques to capturing these images. In particular, the '757 Patent is directed to an image recording device configured to execute a plurality of different photographing processes using multiple cameras and a touch interface. Specifically, the '757 Patent discloses an apparatus with an "audio input interface," "a touch display," "a first camera arranged on a same side of the touch display," "a second camera arranged on an opposite side of the touch display, "a recorder," and "a controller" such that these components work in conjunction to implement a plurality of different photographing processes including taking pictures based on voice input and touch input including after elapse of a first standby time and a second standby time, to allow a user with time to compose themselves to before the camera to capture a perfect photo.

96. Samsung has directly infringed one or more claims of the '757 Patent in this District and elsewhere in Texas, including at least claim 1 literally and/or under the doctrine of equivalents, by or through making, using, importing, offering for sale and/or selling its consumer electronic devices, including at least Samsung products having materially similar functionality while implementing multiple cameras, a touch screen, the "Gallery" application, the "Camera" application, and its voice assistant "Bixby" in Samsung smartphones and tablets. For example, Samsung has literally and/or under the doctrine of equivalents directly infringed at least claim 1 of the '757 Patent in this District and elsewhere in Texas by or through making, using, importing, offering for sale and/or selling at least the following: **smartphones** including Galaxy A Quantum, Galaxy A03s, Galaxy A04s, Galaxy A10s, Galaxy A11, Galaxy A12, Galaxy A12s (aka Nacho),

Galaxy A13, Galaxy A13 5G, Galaxy A14, Galaxy A14 5G, Galaxy A20, Galaxy A20e, Galaxy A20s, Galaxy A21, Galaxy A21s, Galaxy A22, Galaxy A22s 5G, Galaxy A23, Galaxy A23 5G, Galaxy A24 4G, Galaxy A30, Galaxy A30s, Galaxy A32, Galaxy A32 5G, Galaxy A33 5G, Galaxy A34, Galaxy A40, Galaxy A42 5G, Galaxy A50, Galaxy A50s, Galaxy A51, Galaxy A51 5G, Galaxy A51 5G UW, Galaxy A52, Galaxy A52 5G, Galaxy A53 5G, Galaxy A54, Galaxy A60, Galaxy A70, Galaxy A70s, Galaxy A71, Galaxy A71 5G, Galaxy A71 5G UW, Galaxy A72, Galaxy A73 5G, Galaxy A8, Galaxy 8+, Galaxy A80, Galaxy A90 5G, Galaxy Fold, Galaxy Fold 5G, Galaxy Note10, Galaxy Note10 5G, Galaxy Note10 Lite, Galaxy Note10+, Galaxy Note10+ 5G, Galaxy Note20, Galaxy Note20 5G, Galaxy Note20 Ultra, Galaxy Note20 Ultra 5G, Galaxy Note9, Galaxy S10, Galaxy S10 5G, Galaxy S10 Lite, Galaxy S10+, Galaxy S10e, Galaxy S20, Galaxy S20 5G, Galaxy S205G UW, Galaxy S20 FE, Galaxy S20 FE 5G, Galaxy S20 Ultra, Galaxy S20 Ultra 5G, Galaxy S20+, Galaxy S20+ 5G, Galaxy S21 5G, Galaxy S21 FE 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22 5G, Galaxy S22 Ultra 5G, Galaxy S22+ 5G, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy S9, Galaxy S9+, Galaxy Xcover FieldPro, Galaxy Xcover Pro, Galaxy Xcover6 Pro, Galaxy Z Flip, Galaxy Z Flip 5G, Galaxy Z Flip3 5G, Galaxy Z Flip4, Galaxy Z Flip5, Galaxy Z Fold2 5G, Galaxy Z Fold3 5G, Galaxy Z Fold4, Galaxy Z Fold5; **tablets** including Galaxy Tab Active Pro, Galaxy Tab Active3, Galaxy Tab Active4 Pro, Galaxy Tab S5e, Galaxy Tab S6, Galaxy Tab S6 5G, Galaxy Tab S7, Galaxy Tab S7+, Galaxy Tab S8, Galaxy Tab S8 Ultra, Galaxy Tab S8+, Galaxy Tab S9, Galaxy Tab S9 Ultra, Galaxy Tab S9+; and other Samsung devices with the multiple cameras and Samsung's Gallery and Bixby applications (collectively, "the '757 Accused Products"). *See* https://www.samsung.com/us/support/answer/ANS00079026/; *see also* https://www.samsung.com/us/support/answer/ANS00089063/;

https://www.samsung.com/us/apps/bixby/. Maxell reserves the right to discover and pursue any additional infringing devices that incorporate infringing functionalities. For the avoidance of doubt, the '757 Accused Products are identified to describe Samsung's infringement and in no way limit the discovery and infringement allegations against Samsung concerning other devices that incorporate the same or reasonably similar functionalities.

97. Each of the '757 Accused Products include an audio input interface such as a microphone to recognize commands via Bixby. Further, each of the '757 Accused Products include a touch display and multiple cameras with the Samsung Camera application such that the cameras and the Samsung Camera application can be operated based on a user providing an audio command via Bixby or a touch command via the touch display. In addition, each of the '757 Accused Products also include a recorder to record the images captured in response to the voice or touch instructions and a controller that coordinates the functions of Bixby and the Camera applications such that the pictures are recorded based on a first standby time and a second standby time.

98. For example, the following excerpts from Samsung's websites provides non-limiting examples of the '757 Accused Products infringing at least claim 1 of the '757 Patent:

Camera modes and settings on Galaxy phones and tablets



The cameras on **Galaxy phones** and **tablets** come with a variety of shooting modes and camera settings that make it easy to capture and add flair to your pictures and videos. AR Doodle, Super slow-mo, Director's view, and Portrait mode are just a few of the things the camera has to offer. You can take things a step further by adjusting the camera's available settings, such as changing the video size or adding grid lines.

Selfies

- Use wide angle for group selfies: Automatically switches to wide-angle when there are two or more people in the selfie.
- Save selfies as previewed: Save selfies as they appear in the preview without flipping them.
- Selfie color tone: Set the color tone for your selfies to Natural or Bright.

- **Voice commands:** Take pictures by saying certain key words.

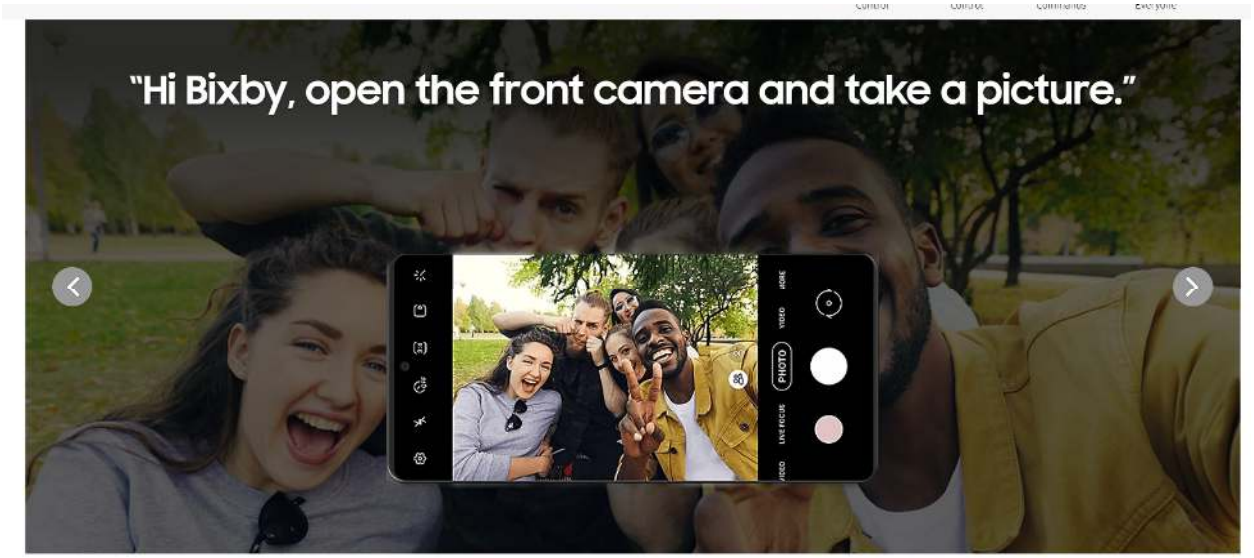
https://www.samsung.com/us/support/answer/ANS00089063/

Use the Gallery app on your Galaxy phone or tablet



Leave that bulky photo album at home and use your **phone** or **tablet** instead to relive all those precious memories. With the Gallery app, you can view, edit, and manage your pictures, videos, and albums right on your Galaxy device.

https://www.samsung.com/us/support/answer/ANS00079026/



https://www.samsung.com/us/apps/bixby/



"Timer shot"

Open the camera

Set camera timer to ten seconds

Take a picture

https://www.samsung.com/us/apps/bixby/

99. The foregoing features and capabilities of the '757 Accused Products and Samsung's description and/or demonstration thereof, including in user manuals and advertising, reflect Samsung's direct infringement by satisfying every element of at least claim 1 of the '757 Patent, under 35 U.S.C. § 271(a).

100. Samsung has indirectly infringed at least claim 1 of the '757 Patent in this District and elsewhere in the United States by, among other things, actively inducing the use, offering for sale, selling, or importation of at least the '757 Accused Products. Samsung's customers who purchase devices and components thereof and operate such devices and components in accordance with Samsung's instructions directly infringe one or more claims of the '757 Patent in violation of 35 U.S.C. § 271. Samsung instructs its customers through at least user guides or websites, such as those located at:

https://downloadcenter.samsung.com/content/UM/202302/20230207045923682/SAM_S911_S916_S918_EN_UM_OS13_020223_FINAL.pdf, https://downloadcenter.samsung.com/content/UM/202204/20220413011651769/SAM_X700_X800_X808_X900_EN_UM_OS12_012422_FINAL_AC.pdf, https://www.samsung.com/us/support/answer/ANS00089063/, and https://www.samsung.com/us/apps/bixby/.

101. For example, as shown above, Samsung instructs its customers to "Take photos and allow the camera to determine the ideal settings for pictures," "Use wide angle for group selfies," "Take pictures by saying certain key words," "Tap to select a video to edit," "Do more with Bixby," "Hi Bixby, take a selfie," "Hi Bixby, open the front camera and take a picture," "Timer shot." *See* https://www.samsung.com/us/support/answer/ANS00089063/; *see also* https://www.samsung.com/us/apps/bixby/.

102. Samsung is thereby liable for infringement of the '757 Patent pursuant to 35 U.S.C. § 271(b).

103. Samsung has indirectly infringed at least claim 1 of the '757 Patent, by, among other things, contributing to the direct infringement of others, including customers of the '757 Accused Products by making, offering to sell, or selling, in the United States, or importing a component of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in infringement of the '757 Patent, and not a staple article or commodity of commerce suitable for substantial non-infringing use.

104. For example, the '757 Accused Products include hardware and software for implementing picture recording, voice and touch photo capture, Bixby, and picture recording

functions by Samsung Camera application. These are components of a patented machine, manufacture, combination, or apparatus for use in practicing a patented process. Furthermore, these components are a material part of the invention and upon information and belief are not a staple article or commodity of commerce suitable for substantial non-infringing use. Thus, Samsung is liable for infringement of the '757 Patent pursuant to 35 U.S.C. § 271(c).

105. Samsung has been on notice of the '757 Patent since, at least, December 29, 2021, based on correspondence directed to Mr. D. Jeon from Mr. T. Hirabayashi. *See* Exhibit 5. This correspondence set forth Maxell's belief that Samsung makes, uses, sells, offers to sell, or imports products that infringe certain of Maxell's patents, and specifically identified the allowed patent application that issued as the '757 Patent as well as exemplary allowed claims and exemplary accused products for that patent. By the time of trial, Samsung will thus have known and intended (since receiving such notice), that its continued actions would actively induce and contribute to actual infringement of at least claim 1 of the '757 Patent.

106. Samsung undertook and continued its infringing actions despite an objectively high likelihood that such activities infringed the '757 Patent, which has been duly issued by the USPTO, and is presumed valid. For example, since at least December 29, 2021, Samsung has been aware of an objectively high likelihood that its actions constituted and continue to constitute infringement of the '757 Patent, and that the '757 Patent is valid. On information and belief, Samsung could not reasonably, subjectively believe that its actions do not constitute infringement of the '757 Patent, nor could it reasonably, subjectively believe that the patent is invalid. Despite that knowledge and subjective belief, and the objectively high likelihood that its actions constitute infringement, Samsung continued its infringing activities. As such, Samsung has willfully infringed and continues to willfully infringe the '757 Patent.

107. Maxell has been and continues to be damaged by Samsung's infringement of the '757 Patent.

COUNT 5 - INFRINGEMENT OF U.S. PATENT NO. 11,017,815

108. Maxell incorporates paragraphs 1-107 above by reference.

109. U.S. Patent No. 11,017,815 (the "'815 Patent," attached hereto at Exhibit 9) duly issued on May 25, 2021 and is entitled *Editing Method And Recording And Reproducing Device*.

110. Maxell is the owner by assignment of the '815 Patent and possesses all rights under the '815 Patent, including the exclusive right to recover for past and future infringement.

111. The '815 Patent is directed to an information processing apparatus, and related methods, that manages digital data and reproduce video content associated with user profiles in a specific manner that enables improved video management, storage, and the presentation of groups of video information. In conventional video information management systems at the time, attention was not paid to scenarios where a plurality of users desire to generate, select, and manage favorite play list(s) of video information. For example, techniques did not exist for a user of such systems to select some arbitrary play lists from among a plurality of play lists and manage them at the device. The claims of the '815 Patent solved this problem by providing a recording and reproducing device in which the user can select and manage arbitrary play lists in a particular manner using hierarchical levels of information management. Since the play lists are subject to unified management, it becomes possible for the user to arbitrarily alter the display sequence of play lists. This is true even in the case where a plurality of users share a single recording medium, each user can manage favorite reproduction contents. Therefore, each user can manage favorite reproduction contents, resulting in improved usage of these systems.

112. More specifically, the claimed inventions are directed to a hierarchical management interface with different areas and classifications associated with different user information, association, and/or behavior. For example, one of the claimed inventions contains "first area" and a "second area." The first area includes a "first character" associated with a "first group" of video information for a "first classification" and a "second character" that is associated with a "second group" of video information for a "second classification." The second area displays a first or second group of thumbnails configured upon user selection of the first and second characters. Both groups of video information are stored as part of the plurality of stored video information, and the first group of video information is configured to allow a user to edit. Finally, when one video information is deleted from the first group it continues to be included in the second group and a thumbnail corresponding to the video information is displayed as one of the second group of thumbnails. The inventions disclosed in the '815 Patent are directed to improving the usability and manageability of recording and reproducing video information by providing specific user interfaces with various areas and characters that allow a user to manage the recorded video content. Even in the case where a plurality of users share a single recording medium, each user can manage the storage and reproduction of their video content without effecting the recorded data of another user.

113. Samsung has directly infringed one or more claims of the '815 Patent in this District and elsewhere in Texas, including at least claims 1-8 literally and/or under the doctrine of equivalents, by or through making, using, importing, offering for sale and/or selling its consumer electronic devices, including at least Samsung products having materially similar functionality while implementing a Samsung Quick Share to receive video data, a recording medium to record the received video data, a display and a processor that all work in conjunction to provide specific

IPR2025-01307; Samsung
Ex. 1024 - Page 61

user interfaces in Samsung's Gallery application to manage storage of various video information in a hierarchical manner in Albums and/or "My Files," allowing a user to remove video content from one location without effecting the content from another location, and allowing a user to playback selected video content in a sequence based on manipulation of thumbnails.

114. For example, Samsung has literally and/or under the doctrine of equivalents directly infringed at least claims 1-8 of the '815 Patent in this District and elsewhere in Texas by or through making, using, importing, offering for sale and/or selling at least the following: **smartphones** including Galaxy A Quantum, Galaxy A03s, Galaxy A04s, Galaxy A10s, Galaxy A11, Galaxy A12, Galaxy A12s (aka Nacho), Galaxy A13, Galaxy A13 5G, Galaxy A14, Galaxy A14 5G, Galaxy A20, Galaxy A20e, Galaxy A20s, Galaxy A21, Galaxy A21s, Galaxy A22, Galaxy A22s 5G, Galaxy A23, Galaxy A23 5G, Galaxy A24 4G, Galaxy A30, Galaxy A30s, Galaxy A32, Galaxy A32 5G, Galaxy A33 5G, Galaxy A34, Galaxy A40, Galaxy A42 5G, Galaxy A50, Galaxy A50s, Galaxy A51, Galaxy A51 5G, Galaxy A51 5G UW, Galaxy A52, Galaxy A52 5G, Galaxy A53 5G, Galaxy A54, Galaxy A60, Galaxy A70, Galaxy A70s, Galaxy A71, Galaxy A71 5G, Galaxy A71 5G UW, Galaxy A72, Galaxy A73 5G, Galaxy A8, Galaxy 8+, Galaxy A80, Galaxy A90 5G, Galaxy Fold, Galaxy Fold 5G, Galaxy Note10, Galaxy Note10 5G, Galaxy Note10 Lite, Galaxy Note10+, Galaxy Note10+ 5G, Galaxy Note20, Galaxy Note20 5G, Galaxy Note20 Ultra, Galaxy Note20 Ultra 5G, Galaxy Note9, Galaxy S10, Galaxy S10 5G, Galaxy S10 Lite, Galaxy S10+, Galaxy S10e, Galaxy S20, Galaxy S20 5G, Galaxy S205G UW, Galaxy S20 FE, Galaxy S20 FE 5G, Galaxy S20 Ultra, Galaxy S20 Ultra 5G, Galaxy S20+, Galaxy S20+ 5G, Galaxy S21 5G, Galaxy S21 FE 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22 5G, Galaxy S22 Ultra 5G, Galaxy S22+ 5G, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy S9, Galaxy S9+, Galaxy Xcover FieldPro, Galaxy Xcover Pro, Galaxy Xcover6 Pro, Galaxy Z Flip, Galaxy Z Flip

5G, Galaxy Z Flip3 5G, Galaxy Z Flip4, Galaxy Z Flip5, Galaxy Z Fold2 5G, Galaxy Z Fold3 5G, Galaxy Z Fold4, Galaxy Z Fold5; **tablets** including Galaxy Tab Active Pro, Galaxy Tab Active3, Galaxy Tab Active4 Pro, Galaxy Tab S5e, Galaxy Tab S6, Galaxy Tab S6 5G, Galaxy Tab S7, Galaxy Tab S7+, Galaxy Tab S8, Galaxy Tab S8 Ultra, Galaxy Tab S8+, Galaxy Tab S9, Galaxy Tab S9 Ultra, Galaxy Tab S9+; and other Samsung devices with Samsung Quick Share and Samsung's Gallery application (collectively, "the '815 Accused Products"). *See* https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/; https://www.samsung.com/us/support/answer/ANS00076845/; https://www.youtube.com/watch?v=8tSWKaAeUQg ("Samsung Care" channel); https://www.samsung.com/us/support/answer/ANS00079026/. Maxell reserves the right to discover and pursue any additional infringing devices that incorporate infringing functionalities. For the avoidance of doubt, the '815 Accused Products are identified to describe Samsung's infringement and in no way limit the discovery and infringement allegations against Samsung concerning other devices that incorporate the same or reasonably similar functionalities.

115. Each of the '815 Accused Products include a network interface such as a Wi-Fi chipset to receive video information via Samsung Quick Share. Further, each of the '815 Accused Products include a recording medium to record video information, a display, and a processor that work in conjunction to display specific user interfaces for the Samsung Gallery application to improve the performance and usability of Samsung's Gallery application's recording and management of video information including video information that is associated with a user profile and that is favorited by a user in Samsung's Gallery application.

116. For example, the following excerpts from Samsung's websites provides non-limiting examples of the '815 Accused Products infringing at least claims 1-8 of the '815 Patent:

How to use Quick Share feature on Galaxy device

Last Update date : Jul 15. 2022

Quick Share is a new sharing service for sending photos, videos, and files with your friends and family. is available on previous Galaxy series when upgraded to Android 10. File sharing has never been so easy on a Galaxy.

Before you try the recommendations below, be sure to check if your device's software and related apps are updated to the latest version. To update your mobile device's software, follow these steps:

Step 1. Go to **Settings > Software update.**

Step 2. Tap on **Download and install.**

Step 3. Follow the on-screen instructions.

Quick Share feature highlights

https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/

Use the Gallery app on your Galaxy phone or tablet



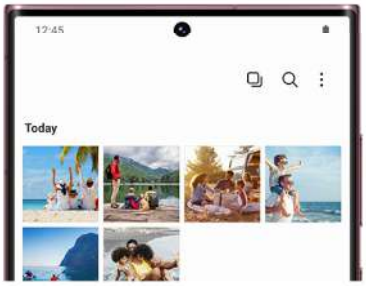
Leave that bulky photo album at home and use your **phone** or **tablet** instead to relive all those precious memories. With the Gallery app, you can view, edit, and manage your pictures, videos, and albums right on your Galaxy device.

https://www.samsung.com/us/support/answer/ANS00079026/

View and edit pictures and videos

If you spent an hour trying to take that perfect selfie or video, you can look back at your hard work by viewing it in Gallery. You can also edit your image or video using **different filters, effects, and styles**!

1. Navigate to and open **Gallery**, and then tap the **Pictures** tab. To search for a specific picture or video, tap the **Search** icon in the upper right corner. You can search by its tag, album name, or other details.

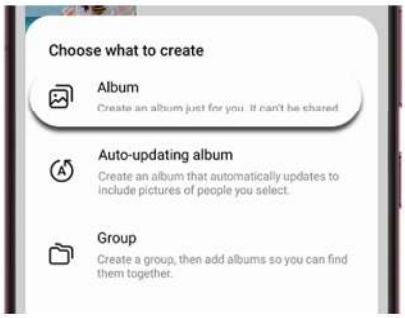


https://www.samsung.com/us/support/answer/ANS00079026/

Create albums

With so many photos and videos, your Gallery can get a little disorganized. Just create an album to get rid of the clutter.

1. From **Gallery**, tap the **Albums** tab, and then tap **Add** (the plus sign). You can select from the following album types:



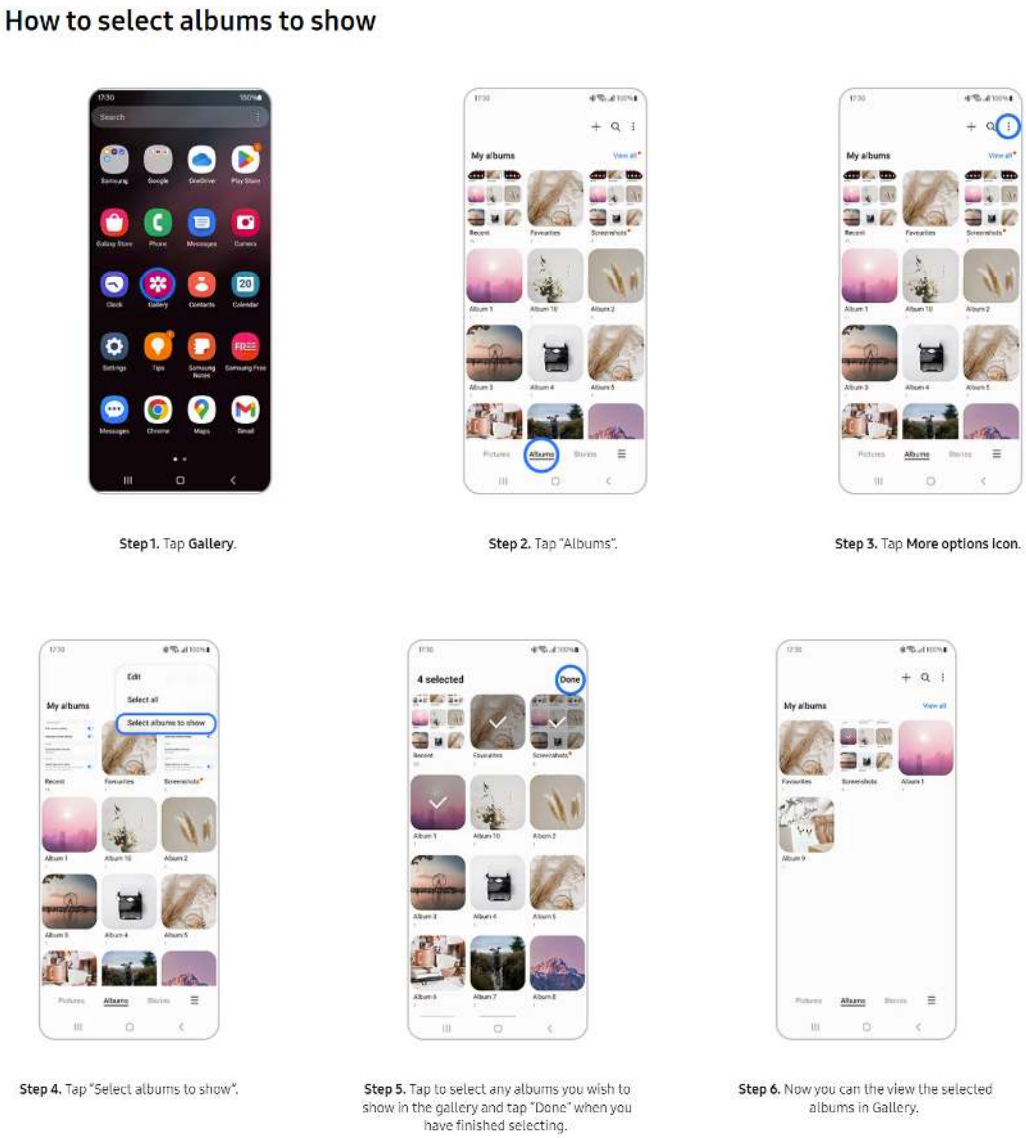
- **Album:** Create a standard album.
- **Auto-updating album:** Create an album that will automatically update to include pictures of people that you select.

https://www.samsung.com/us/support/answer/ANS00079026/

How to select and view only the albums you want to see in Galaxy gallery

Last Update date : Jan 13. 2023

Photos saved on the phone are automatically added and displayed in the Gallery app. The select albums to show feature lets you view only the albums you want. This is supported in Android 13 or higher.



https://www.samsung.com/sg/support/mobile-devices/how-to-select-and-view-only-the-albums-you-want-to-see-in-galaxy-gallery/

117. The foregoing features and capabilities of the '815 Accused Products and Samsung's description and/or demonstration thereof, including in user manuals and advertising, reflect Samsung's direct infringement by satisfying every element of at least claims 1-8 of the '815 Patent, under 35 U.S.C. § 271(a).

118. Samsung has indirectly infringed at least claims 1-8 of the '815 Patent in this District and elsewhere in the United States by, among other things, actively inducing the use, offering for sale, selling, or importation of at least the '815 Accused Products. Samsung's customers who purchase devices and components thereof and operate such devices and components in accordance with Samsung's instructions directly infringe one or more claims of the '815 Patent in violation of 35 U.S.C. § 271. Samsung instructs its customers through at least user guides or websites, such as those located at: https://downloadcenter.samsung.com/content/UM/202302/20230207045923682/SAM_S911_S916_S918_EN_UM_OS13_020223_FINAL.pdf, https://downloadcenter.samsung.com/content/UM/202204/20220413011651769/SAM_X700_X800_X808_X900_EN_UM_OS12_012422_FINAL_AC.pdf, https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/, https://www.samsung.com/us/support/answer/ANS00079026/, https://www.samsung.com/sg/support/mobile-devices/how-to-select-and-view-only-the-albums-you-want-to-see-in-galaxy-gallery/.

119. For example, as shown above Samsung instructs its customers to "How to use Quick Share feature on Galaxy device," "Use the Gallery app on your Galaxy phone or tablet," "View and edit pictures and videos," "Create albums," "How to select and view only the albums you want to see in Galaxy gallery." *See* https://www.samsung.com/us/support/answer/ANS00079026/; *see also* https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/; https://www.samsung.com/sg/support/mobile-devices/how-to-select-and-view-only-the-albums-you-want-to-see-in-galaxy-gallery/.

120. Samsung is thereby liable for infringement of the ’815 Patent pursuant to 35 U.S.C. § 271(b).

121. Samsung has indirectly infringed at least claims 1-8 of the ’815 Patent, by, among other things, contributing to the direct infringement of others, including customers of the ’815 Accused Products by making, offering to sell, or selling, in the United States, or importing a component of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in infringement of the ’815 Patent, and not a staple article or commodity of commerce suitable for substantial non-infringing use.

122. For example, the ’815 Accused Products each include hardware and software for implementing Samsung Quick Share and Samsung’s Gallery application for receiving, recording, and managing stored videos associated with a user profile. These are components of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process. Furthermore, these components are a material part of the invention and upon information and belief are not a staple article or commodity of commerce suitable for substantial non-infringing use. Thus, Samsung is liable for infringement of the ’815 Patent pursuant to 35 U.S.C. § 271(c).

123. Samsung has been on notice of the ’815 Patent since, at least, July 7, 2021, based on correspondence directed to Mr. I. Lee from Mr. T. Yamamoto of Maxell. *See* Exhibit 2. This correspondence set forth Maxell’s belief that Samsung makes, uses, sells, offers to sell, or imports products that infringe certain of Maxell’s patents, and specifically identified the allowed patent application that issued as the ’815 Patent as well as exemplary allowed claims and exemplary accused products for that patent. After issuance of the allowed claims of the ’815 Patent, Samsung was again provided similar notice on December 29, 2021, based on correspondence directed to

Mr. D. Jeon from Mr. T. Hirabayashi. *See* Exhibit 5. By the time of trial, Samsung will thus have known and intended (since receiving this notice), that its continued actions would actively induce and contribute to actual infringement of at least claims 1-8 of the ’815 Patent.

124. Samsung undertook and continued its infringing actions despite an objectively high likelihood that such activities infringed the ’815 Patent, which has been duly issued by the USPTO, and is presumed valid. For example, since at least July 7, 2021, Samsung has been aware of an objectively high likelihood that its actions constituted and continue to constitute infringement of the ’815 Patent, and that the ’815 Patent is valid. On information and belief, Samsung could not reasonably, subjectively believe that its actions do not constitute infringement of the ’815 Patent, nor could it reasonably, subjectively believe that the patent is invalid. Despite that knowledge and subjective belief, and the objectively high likelihood that its actions constitute infringement, Samsung continued its infringing activities. As such, Samsung has willfully infringed and continues to willfully infringe the ’815 Patent.

125. Maxell has been and continues to be damaged by Samsung’s infringement of the ’815 Patent.

COUNT 6 - INFRINGEMENT OF U.S. PATENT NO. 10,129,590

126. Maxell incorporates paragraphs 1-125 above by reference.

127. U.S. Patent No. 10,129,590 (the “’590 Patent,” attached hereto as Exhibit 10) duly issued on November 13, 2018 and is entitled *Display Apparatus and Video Processing Apparatus*.

128. Maxell is the owner by assignment of the ’590 Patent and possesses all rights under the ’590 Patent, including the exclusive right to recover for past and future infringement.

129. The ’590 Patent was subject to an *ex parte reexamination* No. 90/014,651, filed January 12, 2021, on behalf of third party requester Apple Inc. On November 15, 2021, the USPTO

completed the reexamination and issued an *ex parte reexamination* certificate (attached hereto as Exhibit 11) confirming the patentability and validity of the '590 Patent.

130. Altogether, four USPTO Examiners—Primary Examiner Amy Hsu, Primary Examiner My Trang Ton, Primary Examiner Kenneth Whittington, and Supervisory Patent Reexamination Specialist Andrew J. Fischer—have confirmed the validity of the '590 Patent's claims.

131. The '590 Patent is directed to techniques for establishing multiple connections between a plurality of device wirelessly via three radio communication circuits in order to transmit video information over one radio communication circuit while connecting to the Internet via another radio communication circuit.

132. For example, prior to the '590 Patent, conventional techniques connected video processing devices with each other by establishing analog connections for video and audio signals. But with the widespread use of digital videos and the ability of devices to perform multiple tasks at the same time, there arose a need to implement additional techniques of transmitting video information while also ensuring that the device could continue to be used for additional functions during video transfer.

133. The inventors of the '590 Patent solved this problem by creating and configuring devices with a novel arrangement of hardware components, including "a first radio communication circuit," "a second radio communication circuit," "a third radio communication circuit," "an imaging circuit," "a compression circuit," "an input device," "an accumulation circuit," and "a controller" that work in conjunction to allow a video processing apparatus to do things that it could not previously do: simultaneously transmit video information and connect to the internet or home network using a particular types of transmission frequencies and modulation schemes.

134. Samsung has directly infringed one or more claims of the '590 Patent in this District and elsewhere in Texas, including at least claim 1 literally and/or under the doctrine of equivalents, by or through making, using, importing, offering for sale and/or selling its consumer electronic devices, including at least Samsung products having materially similar functionality while transmitting video using Samsung Quick Share, connecting to the Internet over cellular networks, and implementing Samsung Wallet using Samsung smartphones.

135. For example, Samsung has literally and/or under the doctrine of equivalents directly infringed at least claim 1 of the '590 Patent in this District and elsewhere in Texas by or through making, using, importing, offering for sale and/or selling at least the following smartphones including Galaxy A03, Galaxy A04e, Galaxy A04s, Galaxy A13, Galaxy A14, Galaxy A14 5G, Galaxy A23, Galaxy A23 5G, Galaxy A24 4G, Galaxy A33 5G, Galaxy A34, Galaxy A53 5G, Galaxy A54, Galaxy A73 5G, Galaxy S21 FE 5G, Galaxy S22 5G, Galaxy S22 Ultra 5G, Galaxy S22+ 5G, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy XCover6 Pro, Galaxy Z Flip4, Galaxy Z Flip5, Galaxy Z Fold4, Galaxy Z Fold5; and other Samsung devices with the ability to perform video transfer via Samsung Quick share while connecting to the Internet over cellular networks and implementing Samsung Pay (collectively, "the '590 Accused Products"). *See* https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/; *see also* https://www.samsung.com/us/support/answer/ANS00087283/; https://www.samsung.com/us/support/answer/ANS00083184/; and https://www.samsung.com/us/samsung-wallet/. Maxell reserves the right to discover and pursue any additional infringing devices that incorporate infringing functionalities. For the avoidance of doubt, the '590 Accused Products are identified to describe Samsung's infringement and in no way

limit the discovery and infringement allegations against Samsung concerning other devices that incorporate the same or reasonably similar functionalities.

136. The ’590 Accused Products implement Samsung Quick Share confirming that they include a first radio communication circuit capable of transmitting information using a first transmission frequency band and a first modulation scheme. Further, each of the ’590 Accused Products connect to the Internet using a second radio communication circuit implementing a second modulation scheme and second transmission frequency band. In addition, each of the ’590 Accused Products also include Samsung Wallet that uses a third radio communication circuit to transmit information using a third transmission frequency band. Each of the ’590 Accused Products further include a camera for recording video information, a compression circuit for compressing the recorded video, a memory for accumulating the compressed recorded video, and a touch screen for providing a user indication. Further, each of the ’590 Accused Products include a controller (*e.g.*, CPU) that controls the radio communication circuits such that video can be transmitted via Samsung Quick Share while the device is connected to the Internet over cellular networks and information is transmitted via NFC while implementing Samsung Wallet.

137. For example, the following excerpts from Samsung’s websites provides non-limiting examples of the ’590 Accused Products infringing at least claim 1 of the ’590 Patent:

Share files from your Galaxy phone or tablet



When you want to share photos and files with your friends, text and email chains can get pretty long, assuming the files aren't too big to even send at all. So what if you could easily share to compatible devices with no emails or messages required? You can! With Nearby Share on Galaxy **phones** and **tablets**, you can easily send media to people around you. Quick Share is also available, which is similar and can be used with other Galaxy phone models.

https://www.samsung.com/us/support/answer/ANS00087283/

Send and receive files with Quick Share

Note: The Quick Share feature does not support sharing videos with TVs or with SmartThings supported devices, however you can share photos. To share videos to your TV, you can use the **Smart View** feature.

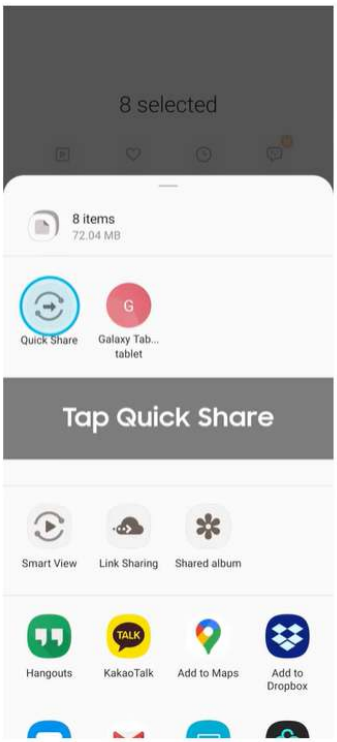
Trying to share those awesome vacation photos with your friends? Use Quick Share to quickly and easily distribute your photography. Keep in mind that you cannot use Quick Share if you're using a mobile hotspot, Wi-Fi Direct, or Smart View.

1. First, make sure the Quick Share feature is turned on for both phones. To do this, open the Quick settings panel by swiping down from the top of the screen using two fingers, and then tap the **Quick Share** icon. It will be blue when it's activated.
   Note: If the Quick Share icon does not appear in your Quick settings panel, you may need to **add it**.
2. Navigate to a file you'd like to share. Tap the **Share** icon, and then tap **Quick Share**.



3. Your phone will begin looking for another device. If you are using a Note20 Ultra or S21 Ultra, point it at the receiving device.
4. If you're having trouble connecting to another device, swipe down from the top of your screen to open the Quick settings panel, and then touch and hold the Quick Share icon. Tap the switch next to Show my position to others to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled.
   Note: The "Show my position to others" option is only available on select models.
5. When the other device appears, tap its name to send the file. The other phone may require permission before it can receive the file. On your phone, "Sent" will appear under the other device's name when the transfer is complete.

https://www.samsung.com/us/support/answer/ANS00087283/



Share your files with Quick Share on your Galaxy phone | Samsung US

Samsung Care
199K subscribers
Subscribe
204
Share

https://www.youtube.com/watch?v=DxmuPYgP3MI ("Samsung Care" Channel)

Bring more. Carry Less.

Samsung Wallet is a mobile wallet solution that lets you carry your essentials conveniently and securely in your Galaxy phone. Add your payments cards, digital ID, boarding passes and more.

https://www.samsung.com/us/samsung-wallet/

Samsung Pay is now part of Samsung Wallet

Samsung Pay is now part of just got even better with Samsung Wallet. Upgrade your Pay app to Samsung Wallet now to experience all the great new features.

LEARN MORE

Pay where you want.

The latest Samsung devices work at all your favorite places, making Samsung Pay the most accepted mobile payment.

https://www.samsung.com/us/samsung-pay/

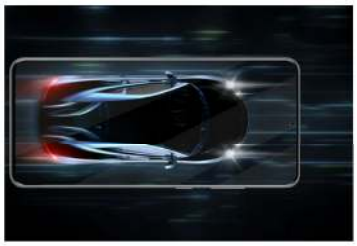
How to connect your Galaxy device to the internet

Last Update date : Apr 23. 2021

Sharing, streaming, gaming. Almost everything that we do on our smartphones is better with the internet. There are many different ways of connecting to the internet. You can either connect to a wi-fi network, mobile data, or mobile hotspot.

https://www.samsung.com/ph/support/mobile-devices/how-to-connect-your-galaxy-device-to-the-internet/

Use 5G on Galaxy phones and tablets



With 5G starting to roll out across the U.S., it won't be long before the whole country is connected to a better mobile network. If you have a 5G phone, you'll be able to enjoy faster downloads, instant streaming, and much more. But 5G is more than a mere boost in speed; it's literally the foundation of autonomous cars, augmented reality, and other new and exciting wireless technology. Compare our 5G phones and tablets on Samsung.com and **find the one that's right for you**.

https://www.samsung.com/us/support/answer/ANS00083184/

138. The foregoing features and capabilities of the ’590 Accused Products and Samsung’s description and/or demonstration thereof, including in user manuals and advertising, reflect Samsung’s direct infringement by satisfying every element of at least claim 1 of the ’590 Patent, under 35 U.S.C. § 271(a).

139. Samsung has indirectly infringed at least claim 1 of the '590 Patent in this District and elsewhere in the United States by, among other things, actively inducing the use, offering for sale, selling, or importation of at least the '590 Accused Products. Samsung's customers who purchase devices and components thereof and operate such devices and components in accordance with Samsung's instructions directly infringe one or more claims of the '590 Patent in violation of 35 U.S.C. § 271. Samsung instructs its customers through at least user guides or websites, such as those located at:

https://downloadcenter.samsung.com/content/UM/202302/20230207045923682/SAM_S911_S916_S918_EN_UM_OS13_020223_FINAL.pdf,

https://downloadcenter.samsung.com/content/UM/202204/20220413011651769/SAM_X700_X800_X808_X900_EN_UM_OS12_012422_FINAL_AC.pdf,

https://www.samsung.com/us/support/answer/ANS00087283/,

https://www.youtube.com/watch?v=DxmuPYgP3MI ("Samsung Care" Channel),

https://www.samsung.com/us/samsung-wallet/, https://www.samsung.com/us/samsung-pay/, and https://www.samsung.com/us/support/answer/ANS00083184/ .

140. For example, as shown above Samsung instructs its customers to "Send and receive files with Quick Share," "Add your payments cards, digital ID, boarding passes and more [to Samsung Wallet]," "Add your favorite payment cards to your phone. Just swipe up from the bottom of your phone's home screen to access them. Check out in-store, in-app, or online," and "Use 5G on Galaxy phones and tablets . . . you'll be able to enjoy faster downloads, instant streaming, and much more." *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.youtube.com/watch?v=DxmuPYgP3MI ("Samsung Care" Channel);

https://www.samsung.com/us/samsung-wallet/; https://www.samsung.com/us/samsung-pay/; and https://www.samsung.com/us/support/answer/ANS00083184/.

141. Samsung is thereby liable for infringement of the '590 Patent pursuant to 35 U.S.C. § 271(b).

142. Samsung has indirectly infringed at least claim 1 of the '590 Patent, by, among other things, contributing to the direct infringement of others, including customers of the '590 Accused Products by making, offering to sell, or selling, in the United States, or importing a component of a patented machine, manufacture, combination, or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in infringement of the '590 Patent, and not a staple article or commodity of commerce suitable for substantial non-infringing use.

143. For example, the '590 Accused Products include hardware and software for implementing Samsung Quick Share, cellular data services, and Samsung Wallet. These are components of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process. Furthermore, these components are a material part of the invention and upon information and belief are not a staple article or commodity of commerce suitable for substantial non-infringing use. Thus, Samsung is liable for infringement of the '590 Patent pursuant to 35 U.S.C. § 271(c).

144. Samsung has been on notice of the '590 Patent since, at least, July 7, 2021, based on correspondence directed to Mr. I. Lee from Mr. T. Yamamoto of Maxell. *See* Exhibit 2. Samsung was further provided notice of the successful reexamination of the '590 Patent in follow-up correspondence directed to Mr. D. Jeon of SEC from Mr. T. Hirabayashi of Maxell, dated December 29, 2021. *See* Exhibit 5. This correspondence set forth Maxell's belief that Samsung

makes, uses, sells, offers to sell, or imports products that infringe certain of Maxell's patents, and specifically identified the '590 Patent as well as exemplary claims and exemplary accused products for that patent. By the time of trial, Samsung will thus have known and intended (since receiving this notice), that its continued actions would actively induce and contribute to actual infringement of at least claim 1 of the '590 Patent.

145. Samsung undertook and continued its infringing actions despite an objectively high likelihood that such activities infringed the '590 Patent, which has been duly issued by the USPTO, and is presumed valid. For example, since at least July 7, 2021, Samsung has been aware of an objectively high likelihood that its actions constituted and continue to constitute infringement of the '590 Patent, and that the '590 Patent is valid. On information and belief, Samsung could not reasonably, subjectively believe that its actions do not constitute infringement of the '590 Patent, nor could it reasonably, subjectively believe that the patent is invalid. Despite that knowledge and subjective belief, and the objectively high likelihood that its actions constitute infringement, Samsung continued its infringing activities. As such, Samsung has willfully infringed and continues to willfully infringe the '590 Patent.

146. Maxell has been and continues to be damaged by Samsung's infringement of the '590 Patent.

COUNT 7 - INFRINGEMENT OF U.S. PATENT NO. 11,445,241

147. Maxell incorporates paragraphs 1-146 above by reference.

148. U.S. Patent No. 11,445,241 (the "'241 Patent," attached hereto at Exhibit 12) duly issued on September 13, 2022 and is entitled *Information Processing Apparatus And Information Processing Method*. The '241 Patent belongs to the same family as the '590 Patent.

149. Maxell is the owner by assignment of the ’241 Patent and possesses all rights under the ’241 Patent, including the exclusive right to recover for past and future infringement.

150. The ’241 Patent is directed to a techniques for establishing multiple connections between a plurality of device wirelessly via three radio communication circuits in order to transmit video information over one radio communication circuit while connecting to the Internet via another radio communication circuit.

151. For example, prior to the ’241 Patent, conventional techniques connected video processing devices with each other by establishing analog connections for video and audio signals. But with the widespread use of digital videos and the ability of devices to perform multiple tasks at the same time, there arose a need to implement additional techniques of transmitting video information while also ensuring that the device could continue to be used for additional functions during video transfer.

152. The inventors of the ’241 Patent solved this problem by creating and configuring devices with a novel arrangement of hardware components, including “a first radio communication circuit,” “a second radio communication circuit,” “a third radio communication circuit,” “an imaging circuit,” “a compression circuit,” “an accumulation circuit,” and “a controller” that work in conjunction to allow a video processing apparatus to do things that it could not previously do: transmit video information while connecting to the internet or home network using a particular types of transmission frequencies and modulation schemes with different circuits.

153. Samsung has directly infringed one or more claims of the ’241 Patent in this District and elsewhere in Texas, including at least claim 1 literally and/or under the doctrine of equivalents, by or through making, using, importing, offering for sale and/or selling its consumer electronic devices, including at least Samsung products having materially similar functionality while

transmitting video using Samsung Quick Share, connecting to the Internet over cellular networks, and implementing Samsung Wallet using Samsung smartphones.

154. For example, Samsung has literally and/or under the doctrine of equivalents directly infringed at least claim 1 of the '241 Patent in this District and elsewhere in Texas by or through making, using, importing, offering for sale and/or selling at least the following smartphones including Galaxy A03s, Galaxy A04s, Galaxy A12s (aka Nacho), Galaxy A13, Galaxy A13 5G, Galaxy A14, Galaxy A14 5G, Galaxy A22, Galaxy A22s 5G, Galaxy A23, Galaxy A23 5G, Galaxy A24 4G, Galaxy A30, Galaxy A30s, Galaxy A32, Galaxy A32 5G, Galaxy A33 5G, Galaxy A34, Galaxy A52, Galaxy A52 5G, Galaxy A53 5G, Galaxy A54, Galaxy A73 5G, Galaxy Note20, Galaxy Note20 5G, Galaxy Note20 Ultra, Galaxy Note20 Ultra 5G, Galaxy S20, Galaxy S20 5G, Galaxy S205G UW, Galaxy S20 FE, Galaxy S20 FE 5G, Galaxy S20 Ultra, Galaxy S20 Ultra 5G, Galaxy S20+, Galaxy S20+ 5G, Galaxy S21 5G, Galaxy S21 FE 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22 5G, Galaxy S22 Ultra 5G, Galaxy S22+ 5G, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy S9, Galaxy S9+, Galaxy Xcover FieldPro, Galaxy Xcover Pro, Galaxy Xcover6 Pro, Galaxy Z Flip3 5G, Galaxy Z Flip4, Galaxy Z Flip5, Galaxy Z Fold2 5G, Galaxy Z Fold3 5G, Galaxy Z Fold4, Galaxy Z Fold5; and other Samsung devices with the ability to perform video transfer via Samsung Quick share while connecting to the Internet over cellular networks and implementing Samsung Pay (collectively, "the '241 Accused Products"). *See* https://www.samsung.com/ph/support/mobile-devices/how-to-use-quickshare-feature-on-galaxy-mobile-device/; *see also* https://www.samsung.com/us/support/answer/ANS00087283/; https://www.samsung.com/us/support/answer/ANS00083184/; and https://www.samsung.com/us/samsung-wallet/. Maxell reserves the right to discover and pursue any additional infringing devices that incorporate infringing functionalities. For the avoidance of

doubt, the '241 Accused Products are identified to describe Samsung's infringement and in no way limit the discovery and infringement allegations against Samsung concerning other devices that incorporate the same or reasonably similar functionalities.

155. The '241 Accused Products implement Samsung Quick Share confirming that they include a first radio communication circuit capable of transmitting information using a first transmission frequency band and a first modulation scheme. Further, each of the '241 Accused Products connect to the Internet using a second radio communication circuit implementing a second modulation scheme and second transmission frequency band. In addition, each of the '241 Accused Products also include Samsung Wallet that uses a third radio communication circuit to transmit information using a third transmission frequency band. Each of the '241 Accused Products further include a camera for recording video information, a compression circuit for compressing the recorded video, a memory for accumulating the compressed recorded video, and a touch screen for providing a user indication. Further, each of the '241 Accused Products include a controller (*e.g.*, CPU) that controls the radio communication circuits such that video can be transmitted via Samsung Quick Share while the device is connected to the Internet over cellular networks and information is transmitted via NFC while implementing Samsung Wallet.

156. For example, the following excerpts from Samsung's websites provides non-limiting examples of the '241 Accused Products infringing at least claim 1 of the '241 Patent:

Share files from your Galaxy phone or tablet



When you want to share photos and files with your friends, text and email chains can get pretty long, assuming the files aren't too big to even send at all. So what if you could easily share to compatible devices with no emails or messages required? You can! With Nearby Share on Galaxy **phones** and **tablets**, you can easily send media to people around you. Quick Share is also available, which is similar and can be used with other Galaxy phone models.

https://www.samsung.com/us/support/answer/ANS00087283/

Send and receive files with Quick Share

Note: The Quick Share feature does not support sharing videos with TVs or with SmartThings supported devices, however you can share photos. To share videos to your TV, you can use the **Smart View** feature.

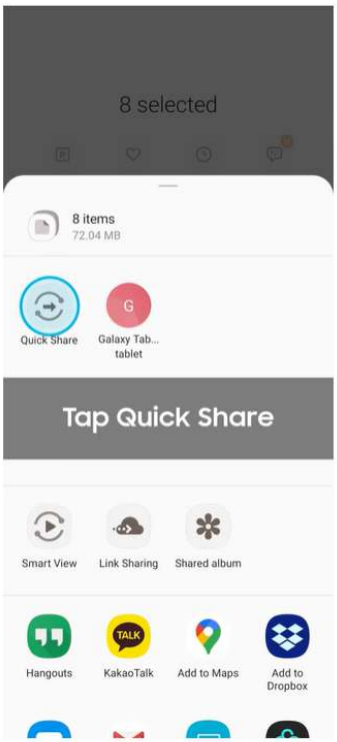
Trying to share those awesome vacation photos with your friends? Use Quick Share to quickly and easily distribute your photography. Keep in mind that you cannot use Quick Share if you're using a mobile hotspot, Wi-Fi Direct, or Smart View.

1. First, make sure the Quick Share feature is turned on for both phones. To do this, open the Quick settings panel by swiping down from the top of the screen using two fingers, and then tap the **Quick Share** icon. It will be blue when it's activated.
   Note: If the Quick Share icon does not appear in your Quick settings panel, you may need to **add it**.
2. Navigate to a file you'd like to share. Tap the **Share** icon, and then tap **Quick Share**.



3. Your phone will begin looking for another device. If you are using a Note20 Ultra or S21 Ultra, point it at the receiving device.
4. If you're having trouble connecting to another device, swipe down from the top of your screen to open the Quick settings panel, and then touch and hold the Quick Share icon. Tap the switch next to Show my position to others to let nearby devices see your device when they are using Quick Share. This option will only show if Quick Share is enabled.
   Note: The "Show my position to others" option is only available on select models.
5. When the other device appears, tap its name to send the file. The other phone may require permission before it can receive the file. On your phone, "Sent" will appear under the other device's name when the transfer is complete.

https://www.samsung.com/us/support/answer/ANS00087283/



Share your files with Quick Share on your Galaxy phone | Samsung US

Samsung Care
199K subscribers
Subscribe
204
Share

https://www.youtube.com/watch?v=DxmuPYgP3MI ("Samsung Care" Channel)

Bring more. Carry Less.

Samsung Wallet is a mobile wallet solution that lets you carry your essentials conveniently and securely in your Galaxy phone. Add your payments cards, digital ID, boarding passes and more.

https://www.samsung.com/us/samsung-wallet/

Samsung Pay is now part of Samsung Wallet

Samsung Pay is now part of just got even better with Samsung Wallet. Upgrade your Pay app to Samsung Wallet now to experience all the great new features.

LEARN MORE

Pay where you want.

The latest Samsung devices work at all your favorite places, making Samsung Pay the most accepted mobile payment.

https://www.samsung.com/us/samsung-pay/

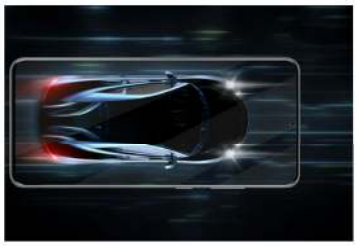
How to connect your Galaxy device to the internet

Last Update date : Apr 23. 2021

Sharing, streaming, gaming. Almost everything that we do on our smartphones is better with the internet. There are many different ways of connecting to the internet. You can either connect to a wi-fi network, mobile data, or mobile hotspot.

https://www.samsung.com/ph/support/mobile-devices/how-to-connect-your-galaxy-device-to-the-internet/

Use 5G on Galaxy phones and tablets



With 5G starting to roll out across the U.S., it won't be long before the whole country is connected to a better mobile network. If you have a 5G phone, you'll be able to enjoy faster downloads, instant streaming, and much more. But 5G is more than a mere boost in speed; it's literally the foundation of autonomous cars, augmented reality, and other new and exciting wireless technology. Compare our 5G phones and tablets on Samsung.com and **find the one that's right for you**.

https://www.samsung.com/us/support/answer/ANS00083184/

157. The foregoing features and capabilities of the ’241 Accused Products and Samsung’s description and/or demonstration thereof, including in user manuals and advertising, reflect Samsung’s direct infringement by satisfying every element of at least claim 1 of the ’241 Patent, under 35 U.S.C. § 271(a).

158. Samsung has indirectly infringed at least claim 1 of the '241 Patent in this District and elsewhere in the United States by, among other things, actively inducing the use, offering for sale, selling, or importation of at least the '241 Accused Products. Samsung's customers who purchase devices and components thereof and operate such devices and components in accordance with Samsung's instructions directly infringe one or more claims of the '241 Patent in violation of 35 U.S.C. § 271. Samsung instructs its customers through at least user guides or websites, such as those located at:

https://downloadcenter.samsung.com/content/UM/202302/20230207045923682/SAM_S911_S916_S918_EN_UM_OS13_020223_FINAL.pdf,

https://downloadcenter.samsung.com/content/UM/202204/20220413011651769/SAM_X700_X800_X808_X900_EN_UM_OS12_012422_FINAL_AC.pdf,

https://www.samsung.com/us/support/answer/ANS00087283/,

https://www.youtube.com/watch?v=DxmuPYgP3MI ("Samsung Care" Channel),

https://www.samsung.com/us/samsung-wallet/, https://www.samsung.com/us/samsung-pay/, and https://www.samsung.com/us/support/answer/ANS00083184/ .

159. For example, as shown above Samsung instructs its customers to "Send and receive files with Quick Share," "Add your payments cards, digital ID, boarding passes and more [to Samsung Wallet]," "Add your favorite payment cards to your phone. Just swipe up from the bottom of your phone's home screen to access them. Check out in-store, in-app, or online," and "Use 5G on Galaxy phones and tablets . . . you'll be able to enjoy faster downloads, instant streaming, and much more." *See* https://www.samsung.com/us/support/answer/ANS00087283/; *see also* https://www.youtube.com/watch?v=DxmuPYgP3MI ("Samsung Care" Channel);

https://www.samsung.com/us/samsung-wallet/; https://www.samsung.com/us/samsung-pay/; and https://www.samsung.com/us/support/answer/ANS00083184/.

160. Samsung is thereby liable for infringement of the '241 Patent pursuant to 35 U.S.C. § 271(b).

161. Samsung has indirectly infringed at least claim 1 of the '241 Patent, by, among other things, contributing to the direct infringement of others, including customers of the '241 Accused Products by making, offering to sell, or selling, in the United States, or importing a component of a patented machine, manufacture, combination, or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in infringement of the '241 Patent, and not a staple article or commodity of commerce suitable for substantial non-infringing use.

162. For example, the '241 Accused Products include hardware and software for implementing Samsung Quick Share, cellular data services, and Samsung Wallet. These are components of a patented machine, manufacture, or combination, or an apparatus for use in practicing a patented process. Furthermore, these components are a material part of the invention and upon information and belief are not a staple article or commodity of commerce suitable for substantial non-infringing use. Thus, Samsung is liable for infringement of the '241 Patent pursuant to 35 U.S.C. § 271(c).

163. Samsung will be on notice of the '241 Patent since at least the filing of this complaint. By the time of trial, Samsung will thus have known and intended (since receiving such notice), that its continued actions would actively induce and contribute to actual infringement of at least claim 1 of the '241 Patent.

IPR2025-01307; Samsung
Ex. 1024 - Page 86

164. Samsung undertook and continued its infringing actions despite an objectively high likelihood that such activities infringed the ’241 Patent, which has been duly issued by the USPTO, and is presumed valid. For example, since at least the filing of this complaint, Samsung has been aware of an objectively high likelihood that its actions constituted and continue to constitute infringement of the ’241 Patent, and that the ’241 Patent is valid. On information and belief, Samsung could not reasonably, subjectively believe that its actions do not constitute infringement of the ’241 Patent, nor could it reasonably, subjectively believe that the patent is invalid. Despite that knowledge and subjective belief, and the objectively high likelihood that its actions constitute infringement, Samsung continued its infringing activities. As such, Samsung has willfully infringed and continues to willfully infringe the ’241 Patent.

165. Maxell has been and continues to be damaged by Samsung’s infringement of the ’241 Patent.

PRAYER FOR RELIEF

WHEREFORE, Maxell prays for relief as follows:

166. A judgment declaring that Samsung has infringed and is infringing one or more claims of ’161, ’086, ’848, ’757, ’815, ’590, and ’241 Patents,

167. A judgment awarding Maxell compensatory damages as a result of Samsung’s infringement of one or more claims of the ’161, ’086, ’848, ’757, ’815, ’590, and ’241 Patents, together with interest and costs, consistent with lost profits and in no event less than a reasonable royalty,

168. A judgment awarding Maxell treble damages and pre-judgment interest under 35 U.S.C. § 284 as a result of Samsung’s willful and deliberate infringement of one or more claims of the ’161, ’086, ’848, ’757, ’815, ’590, and ’241 Patents,

169. A judgment declaring that this case is exceptional and awarding Maxell its expenses, costs, and attorneys' fees in accordance with 35 U.S.C. §§ 284 and 285 and Rule 54(d) of the Federal Rules of Civil Procedure,

170. A grant of preliminary and permanent injunctions enjoining Defendants from further acts of infringement of one or more claims of '161, '086, '848, '757, '815, '590, and '241 Patents.

171. Such other and further relief as the Court deems just and proper.

JURY TRIAL DEMANDED

Maxell hereby demands a trial by jury.

Dated: September 7, 2023

By: */s/ Geoffrey Culbertson*

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IPR2025-01307; Samsung
Ex. 1024 - Page 88

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Counsel for Plaintiff Maxell, Ltd.

IPR2025-01307; Samsung
Ex. 1024 - Page 89

JS 44 (Rev. 04/21)

CIVIL COVER SHEET

The JS 44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. *(SEE INSTRUCTIONS ON NEXT PAGE OF THIS FORM.)*

I. (a) PLAINTIFFS

Maxell, Ltd.

(b) County of Residence of First Listed Plaintiff Japan
(EXCEPT IN U.S. PLAINTIFF CASES)

(c) Attorneys *(Firm Name, Address, and Telephone Number)*
Geoff Culbertson
Patton, Tidwell & Culbertson, LLP
2800 Texas Blvd., Texarkana, TX 75505; 903-792-7080

DEFENDANTS

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.

County of Residence of First Listed Defendant
(IN U.S. PLAINTIFF CASES ONLY)

NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE TRACT OF LAND INVOLVED.

Attorneys *(If Known)*

II. BASIS OF JURISDICTION *(Place an "X" in One Box Only)*

- ☐ 1 U.S. Government Plaintiff
- ☒ 3 Federal Question *(U.S. Government Not a Party)*
- ☐ 2 U.S. Government Defendant
- ☐ 4 Diversity *(Indicate Citizenship of Parties in Item III)*

III. CITIZENSHIP OF PRINCIPAL PARTIES *(Place an "X" in One Box for Plaintiff and One Box for Defendant)*
(For Diversity Cases Only)

	PTF	DEF		PTF	DEF
Citizen of This State	☐ 1	☐ 1	Incorporated *or* Principal Place of Business In This State	☐ 4	☐ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated *and* Principal Place of Business In Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. NATURE OF SUIT *(Place an "X" in One Box Only)*

Click here for: Nature of Suit Code Descriptions.

CONTRACT
- ☐ 110 Insurance
- ☐ 120 Marine
- ☐ 130 Miller Act
- ☐ 140 Negotiable Instrument
- ☐ 150 Recovery of Overpayment & Enforcement of Judgment
- ☐ 151 Medicare Act
- ☐ 152 Recovery of Defaulted Student Loans (Excludes Veterans)
- ☐ 153 Recovery of Overpayment of Veteran's Benefits
- ☐ 160 Stockholders' Suits
- ☐ 190 Other Contract
- ☐ 195 Contract Product Liability
- ☐ 196 Franchise

REAL PROPERTY
- ☐ 210 Land Condemnation
- ☐ 220 Foreclosure
- ☐ 230 Rent Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All Other Real Property

TORTS

PERSONAL INJURY
- ☐ 310 Airplane
- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Federal Employers' Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
- ☐ 350 Motor Vehicle
- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury
- ☐ 362 Personal Injury - Medical Malpractice

PERSONAL INJURY
- ☐ 365 Personal Injury - Product Liability
- ☐ 367 Health Care/ Pharmaceutical Personal Injury Product Liability
- ☐ 368 Asbestos Personal Injury Product Liability

PERSONAL PROPERTY
- ☐ 370 Other Fraud
- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

CIVIL RIGHTS
- ☐ 440 Other Civil Rights
- ☐ 441 Voting
- ☐ 442 Employment
- ☐ 443 Housing/ Accommodations
- ☐ 445 Amer. w/Disabilities - Employment
- ☐ 446 Amer. w/Disabilities - Other
- ☐ 448 Education

PRISONER PETITIONS

Habeas Corpus:
- ☐ 463 Alien Detainee
- ☐ 510 Motions to Vacate Sentence
- ☐ 530 General
- ☐ 535 Death Penalty

Other:
- ☐ 540 Mandamus & Other
- ☐ 550 Civil Rights
- ☐ 555 Prison Condition
- ☐ 560 Civil Detainee - Conditions of Confinement

FORFEITURE/PENALTY
- ☐ 625 Drug Related Seizure of Property 21 USC 881
- ☐ 690 Other

LABOR
- ☐ 710 Fair Labor Standards Act
- ☐ 720 Labor/Management Relations
- ☐ 740 Railway Labor Act
- ☐ 751 Family and Medical Leave Act
- ☐ 790 Other Labor Litigation
- ☐ 791 Employee Retirement Income Security Act

IMMIGRATION
- ☐ 462 Naturalization Application
- ☐ 465 Other Immigration Actions

BANKRUPTCY
- ☐ 422 Appeal 28 USC 158
- ☐ 423 Withdrawal 28 USC 157

INTELLECTUAL PROPERTY RIGHTS
- ☐ 820 Copyrights
- ☒ 830 Patent
- ☐ 835 Patent - Abbreviated New Drug Application
- ☐ 840 Trademark
- ☐ 880 Defend Trade Secrets Act of 2016

SOCIAL SECURITY
- ☐ 861 HIA (1395ff)
- ☐ 862 Black Lung (923)
- ☐ 863 DIWC/DIWW (405(g))
- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

FEDERAL TAX SUITS
- ☐ 870 Taxes (U.S. Plaintiff or Defendant)
- ☐ 871 IRS—Third Party 26 USC 7609

OTHER STATUTES
- ☐ 375 False Claims Act
- ☐ 376 Qui Tam (31 USC 3729(a))
- ☐ 400 State Reapportionment
- ☐ 410 Antitrust
- ☐ 430 Banks and Banking
- ☐ 450 Commerce
- ☐ 460 Deportation
- ☐ 470 Racketeer Influenced and Corrupt Organizations
- ☐ 480 Consumer Credit (15 USC 1681 or 1692)
- ☐ 485 Telephone Consumer Protection Act
- ☐ 490 Cable/Sat TV
- ☐ 850 Securities/Commodities/ Exchange
- ☐ 890 Other Statutory Actions
- ☐ 891 Agricultural Acts
- ☐ 893 Environmental Matters
- ☐ 895 Freedom of Information Act
- ☐ 896 Arbitration
- ☐ 899 Administrative Procedure Act/Review or Appeal of Agency Decision
- ☐ 950 Constitutionality of State Statutes

V. ORIGIN *(Place an "X" in One Box Only)*

☒ 1 Original Proceeding ☐ 2 Removed from State Court ☐ 3 Remanded from Appellate Court ☐ 4 Reinstated or Reopened ☐ 5 Transferred from Another District *(specify)* ☐ 6 Multidistrict Litigation - Transfer ☐ 8 Multidistrict Litigation - Direct File

VI. CAUSE OF ACTION

Cite the U.S. Civil Statute under which you are filing ***(Do not cite jurisdictional statutes unless diversity)***:
35 U.S.C. § 271 et seq.

Brief description of cause:
Patent Infringement

VII. REQUESTED IN COMPLAINT:

☐ CHECK IF THIS IS A **CLASS ACTION** UNDER RULE 23, F.R.Cv.P.

DEMAND $

CHECK YES only if demanded in complaint:
JURY DEMAND: ☒ Yes ☐ No

VIII. RELATED CASE(S) IF ANY *(See instructions):*

JUDGE _____ DOCKET NUMBER _____

DATE
9/7/2023

SIGNATURE OF ATTORNEY OF RECORD
/s/ Geoff Culbertson

FOR OFFICE USE ONLY

RECEIPT # _____ AMOUNT _____ APPLYING IFP _____ JUDGE _____ MAG. JUDGE _____

EXHIBIT 1

US008037161B2

(12) **United States Patent**
Moribe et al.

(10) **Patent No.: US 8,037,161 B2**
(45) **Date of Patent: Oct. 11, 2011**

(54) **NETWORK SYSTEM, NETWORK DEVICE, AND NETWORK BELONGING JUDGMENT METHOD**

(75) Inventors: **Hirotaka Moribe**, Yokohama (JP); **Nobuaki Kohinata**, Yokohama (JP); **Mika Mizutani**, Tokyo (JP)

(73) Assignee: **Hitachi, Ltd.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1197 days.

(21) Appl. No.: **11/688,616**

(22) Filed: **Mar. 20, 2007**

(65) **Prior Publication Data**

US 2007/0226329 A1 Sep. 27, 2007

(30) **Foreign Application Priority Data**

Mar. 23, 2006 (JP) 2006-080462

(51) **Int. Cl.**
G06F 15/173 (2006.01)

(52) **U.S. Cl.** **709/223**

(58) **Field of Classification Search** 709/223
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,765,603	B2 *	7/2010	Tanaka	726/28
7,778,927	B2 *	8/2010	Kawakami	705/59
7,788,271	B2 *	8/2010	Soma et al.	707/758
7,844,818	B2 *	11/2010	Park	713/168

FOREIGN PATENT DOCUMENTS

JP	2005-301633	10/2005

OTHER PUBLICATIONS

Jon Postel; Internet Protocol; RFC: 791; USC/Information Sciences Institute; Sep. 1981; p. 1-45.

* cited by examiner

Primary Examiner — Larry Donaghue

(74) *Attorney, Agent, or Firm* — Antonelli, Terry, Stout & Kraus, LLP.

(57) **ABSTRACT**

The present invention improves user-friendliness and protect content with increased reliability when judging whether network devices belong to the same home network. While the connection to a network is established, each network device uses a peripheral device information collection unit to collect peripheral device information indicating which ones of devices are connected to the network, and store the collected information in a peripheral device information storage unit as home network information. When the belonging of a remote device is to be judged, the home network information stored in the remote device is received. A peripheral device information collation unit collates the received home network information with the home network information stored in the peripheral device information storage unit to judge whether the remote device belongs to the same network as the local device.

10 Claims, 6 Drawing Sheets

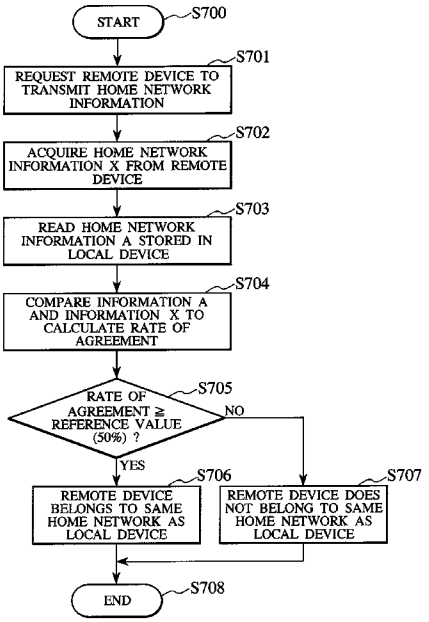


FIG.1

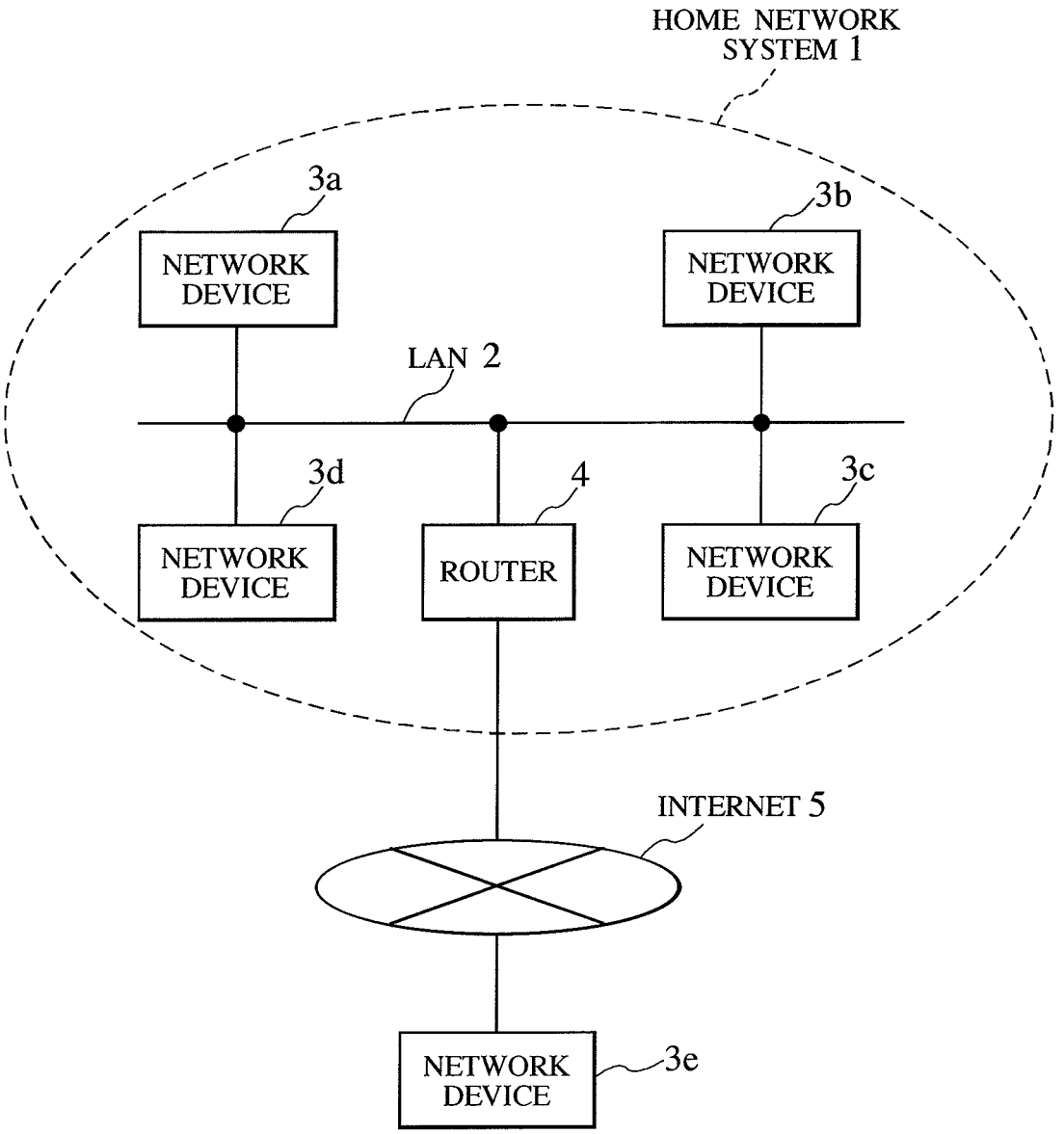

HOME NETWORK SYSTEM 1
3a
NETWORK DEVICE
3b
NETWORK DEVICE
LAN 2
3d
NETWORK DEVICE
4
ROUTER
3c
NETWORK DEVICE
INTERNET 5
NETWORK DEVICE
3e

FIG.2

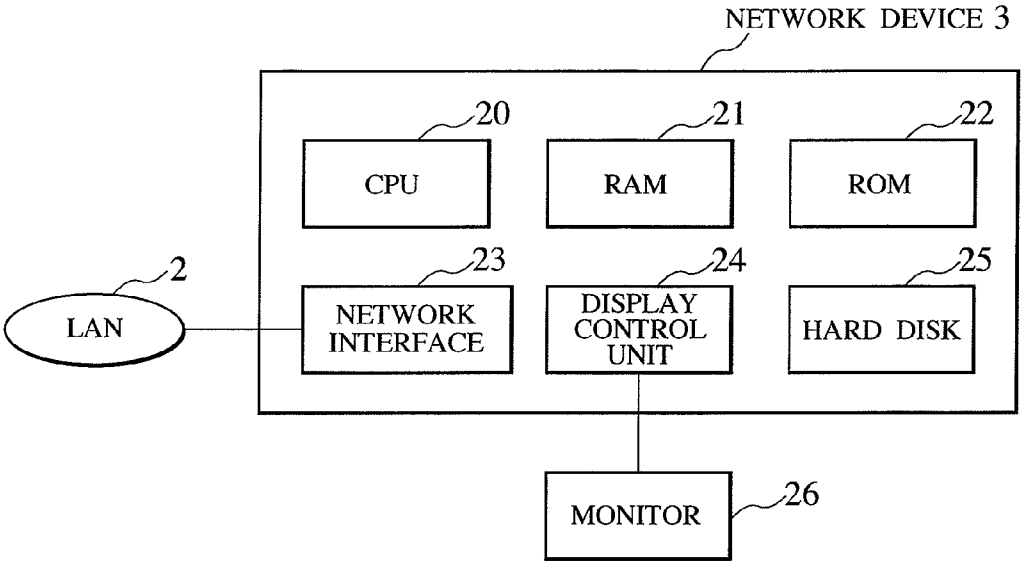

NETWORK DEVICE 3
20
CPU
21
RAM
22
ROM
2
LAN
23
NETWORK INTERFACE
24
DISPLAY CONTROL UNIT
25
HARD DISK
MONITOR
26

FIG.3

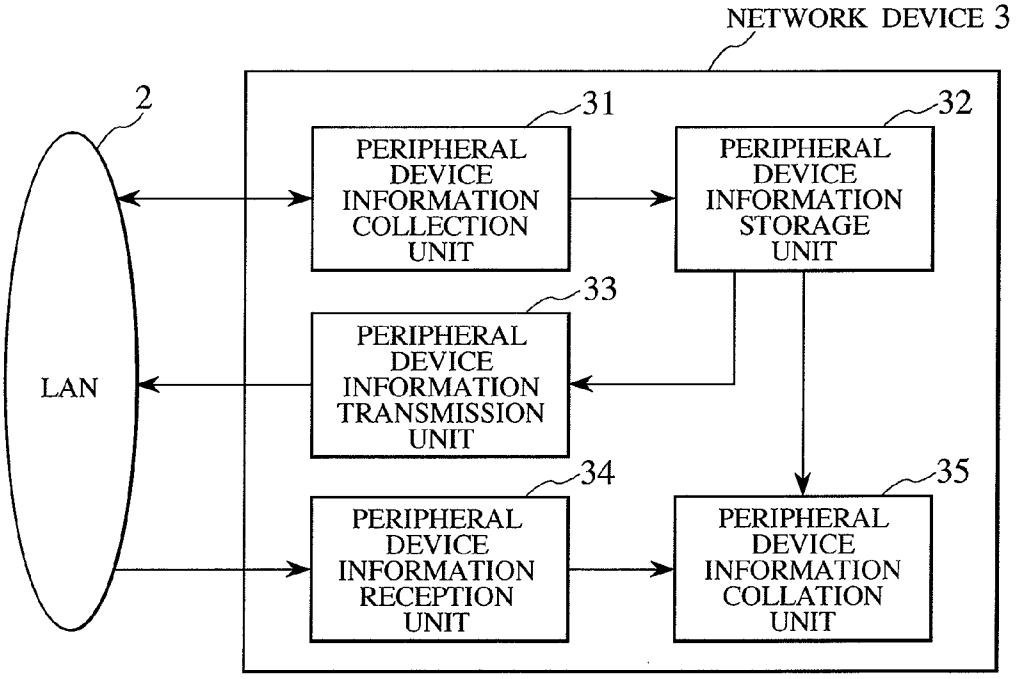

NETWORK DEVICE 3
2
LAN
31
PERIPHERAL DEVICE INFORMATION COLLECTION UNIT
32
PERIPHERAL DEVICE INFORMATION STORAGE UNIT
33
PERIPHERAL DEVICE INFORMATION TRANSMISSION UNIT
34
PERIPHERAL DEVICE INFORMATION RECEPTION UNIT
35
PERIPHERAL DEVICE INFORMATION COLLATION UNIT

FIG.4

HOME NETWORK INFORMATION 40

41 42

CHRONO-LOGICAL ORDER #	UNIQUE DEVICE NAME (UDN)
1	uuid: JPN–CO–HI–DVDH1000W–200000001
2	uuid: JPN–CO–HI–DH73N–200000123
3	uuid: JPN–CO–HI–W32H– 400056329
4	uuid: JPN–CO–HI–DZGX25M–500001458
5	uuid: JPN–CO–HI–DVDH1000W–200000001
6	uuid: JAN–CO–HI–DH73N–200000123
7	uuid: JPN–CO–HI–W32H– 400056329
8	uuid: JPN–CO–HI–DZGX25M–500001458
9	uuid: JPN–CO–HI–DVDH1000W–200000001
10	uuid: JPN–CO–HI–DH73N–200000123
11	uuid: JPN–CO–HI–W32H– 400056329
12	uuid: JPN–CO–HI–DVDH1000W–200000001
13	uuid: JAN–CO–HI–DH73N–200000123
14	uuid: JPN–CO–HI–W32H– 400056329
15	uuid: JPN–CO–HI–DVDH1000W–200000001
16	uuid: JPN–CO–HI–DH73N–200000123
17	uuid: JAN–CO–HI–W32H– 400056329

FIG.5

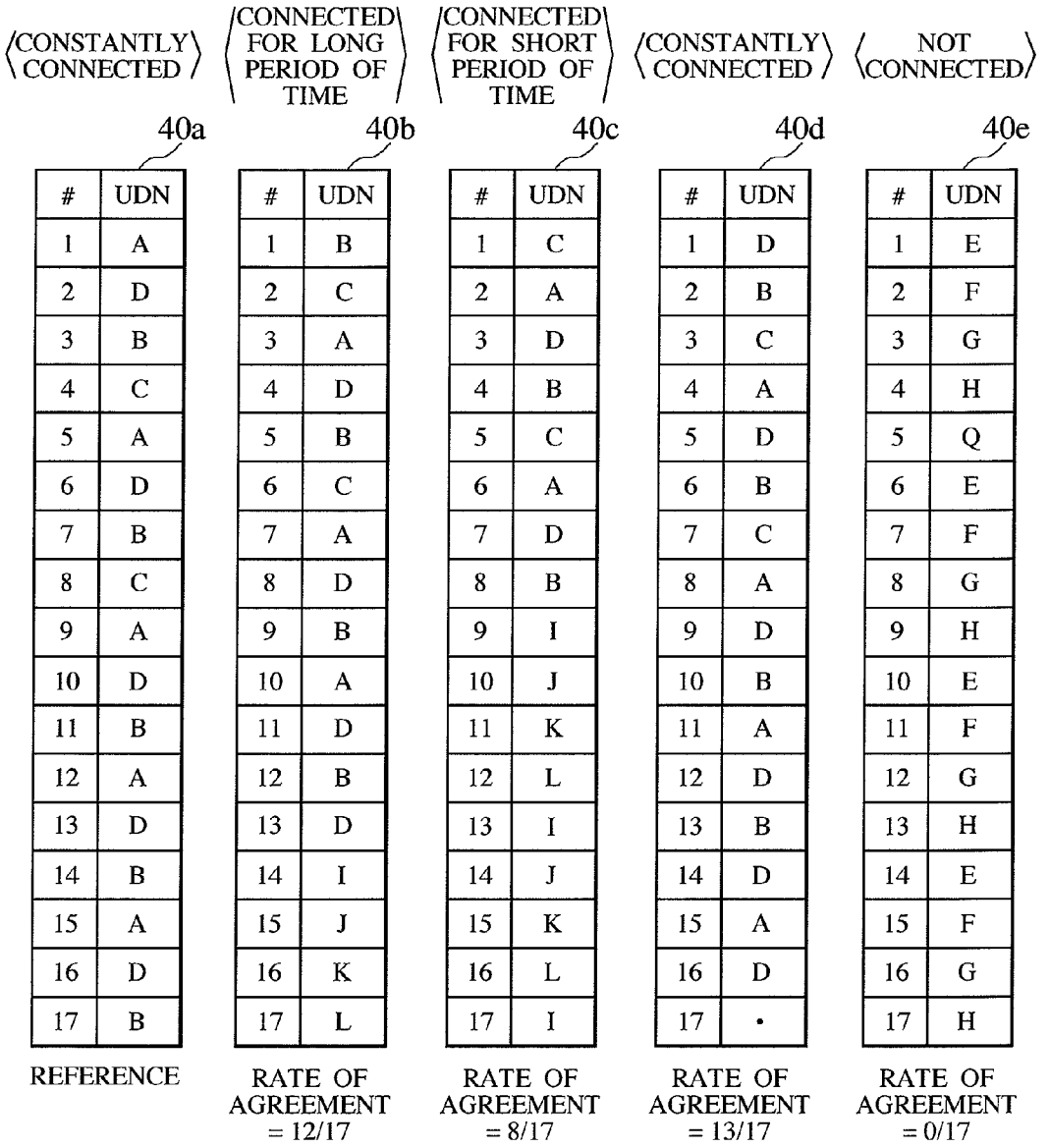

CONSTANTLY CONNECTED
CONNECTED FOR LONG PERIOD OF TIME
CONNECTED FOR SHORT PERIOD OF TIME
CONSTANTLY CONNECTED
NOT CONNECTED
40a
40b
40c
40d
40e
UDN
1 A
2 D
3 B
4 C
5 A
6 D
7 B
8 C
9 A
10 D
11 B
12 A
13 D
14 B
15 A
16 D
17 B
UDN
1 B
2 C
3 A
4 D
5 B
6 C
7 A
8 D
9 B
10 A
11 D
12 B
13 D
14 I
15 J
16 K
17 L
UDN
1 C
2 A
3 D
4 B
5 C
6 A
7 D
8 B
9 I
10 J
11 K
12 L
13 I
14 J
15 K
16 L
17 I
UDN
1 D
2 B
3 C
4 A
5 D
6 B
7 C
8 A
9 D
10 B
11 A
12 D
13 B
14 D
15 A
16 D
17 •
UDN
1 E
2 F
3 G
4 H
5 Q
6 E
7 F
8 G
9 H
10 E
11 F
12 G
13 H
14 E
15 F
16 G
17 H
REFERENCE
RATE OF AGREEMENT = 12/17
RATE OF AGREEMENT = 8/17
RATE OF AGREEMENT = 13/17
RATE OF AGREEMENT = 0/17

FIG.6

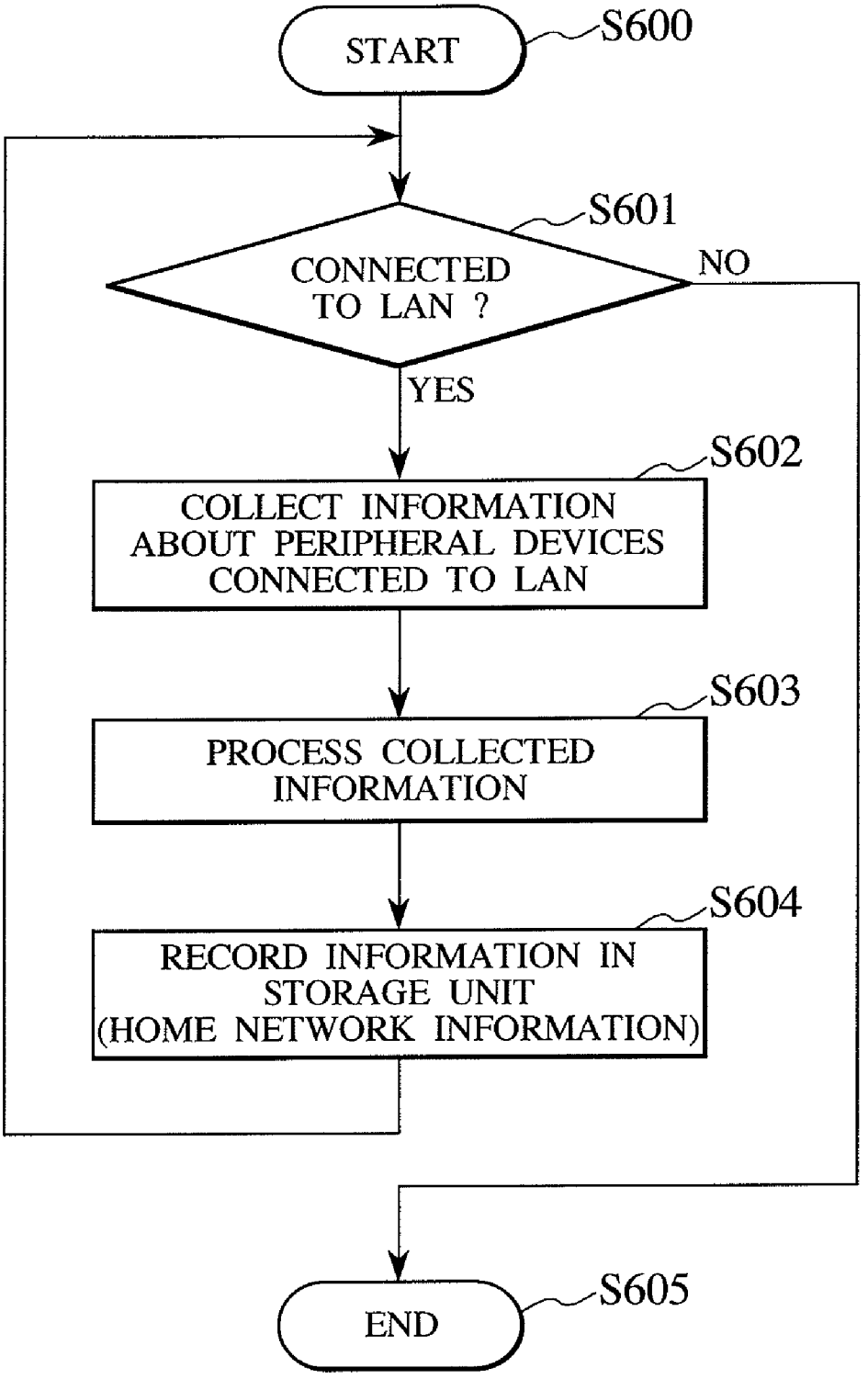
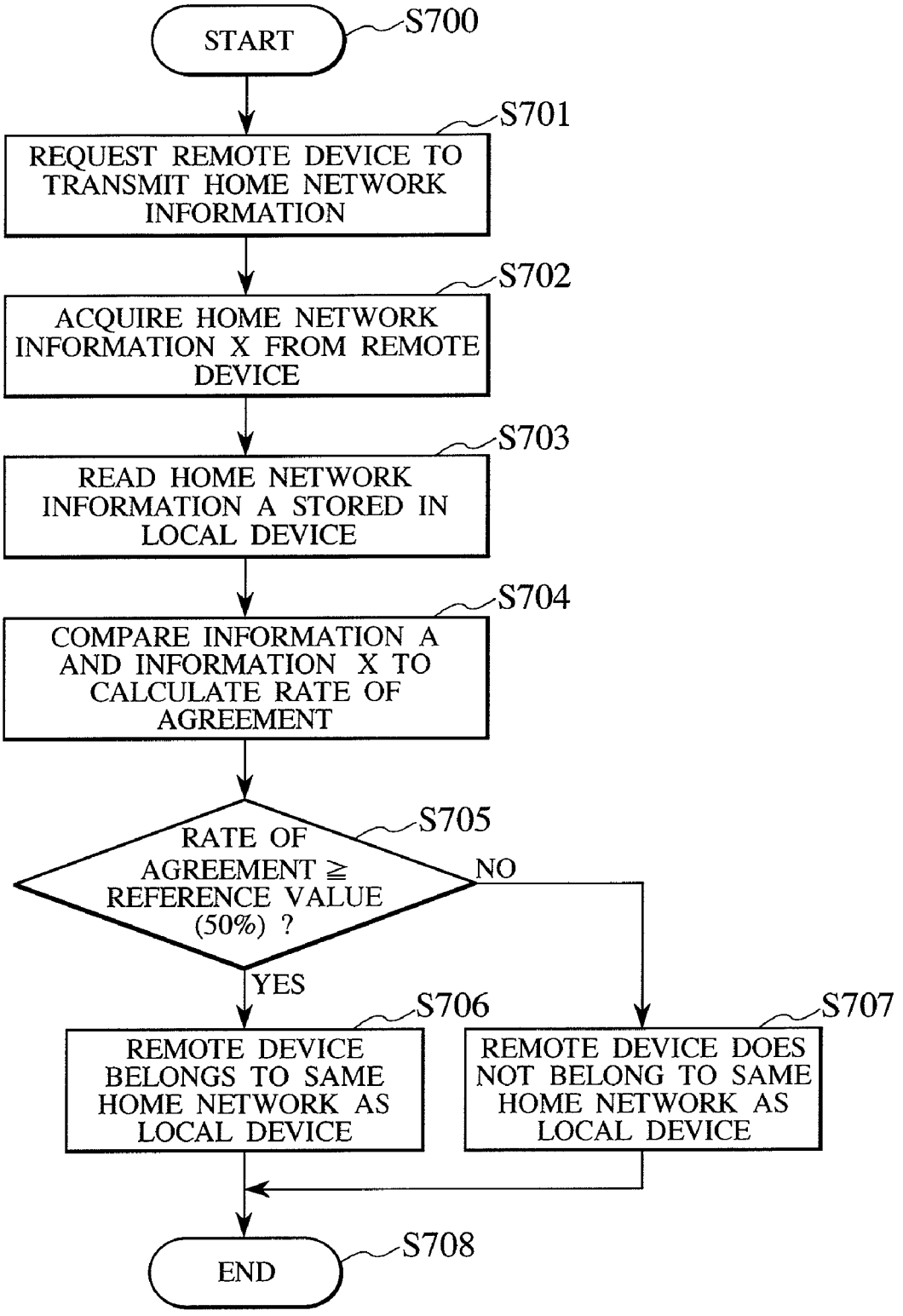

START
S600
S601
CONNECTED TO LAN ?
NO
YES
S602
COLLECT INFORMATION ABOUT PERIPHERAL DEVICES CONNECTED TO LAN
S603
PROCESS COLLECTED INFORMATION
S604
RECORD INFORMATION IN STORAGE UNIT (HOME NETWORK INFORMATION)
END
S605

FIG.7


START
S700
REQUEST REMOTE DEVICE TO TRANSMIT HOME NETWORK INFORMATION
S701
ACQUIRE HOME NETWORK INFORMATION X FROM REMOTE DEVICE
S702
READ HOME NETWORK INFORMATION A STORED IN LOCAL DEVICE
S703
COMPARE INFORMATION A AND INFORMATION X TO CALCULATE RATE OF AGREEMENT
S704
RATE OF AGREEMENT ≧ REFERENCE VALUE (50%) ?
S705
NO
YES
REMOTE DEVICE BELONGS TO SAME HOME NETWORK AS LOCAL DEVICE
S706
REMOTE DEVICE DOES NOT BELONG TO SAME HOME NETWORK AS LOCAL DEVICE
S707
END
S708

NETWORK SYSTEM, NETWORK DEVICE, AND NETWORK BELONGING JUDGMENT METHOD

CLAIM OF PRIORITY

The present application claims priority from Japanese application Ser. No. JP 2006-080462, filed on Mar. 23, 2006, the content of which is hereby incorporated by reference into this application.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to a network system, network device, and network belonging judgment method that are capable of judging whether a plurality of network-connected devices belong to the same home network.

(2) Description of the Related Art

As the number of information devices used at home is increased, a home network system is commercialized. In the home network system, a LAN (Local Area Network) to which various devices are connected and mutually exchange content is established. When information devices use copyright-protected digital content, illegal duplication or use of such content is prohibited such as posting of content on the Internet to be accessed or acquired by the general public. Meanwhile, there is a proposal in which digital content is permitted to be copied and to be distributed into a device inserted in a home network within the scope of private use, which is a limited scope of the home network and the like, from a perspective of flexible management of digital content. It is also conceivable that the devices belonging to the same home network may be entitled to receive specific services in addition to the use of digital content.

To establish and properly manage such a home network as described above, it is necessary to determine the network to which various information devices belong. Further, when a plurality of devices exchange content, it is necessary to accurately judge whether the devices belong to the same home network. Methods for defining the network belonging of each device are described below.

A first method formulates a definition by using an IP packet TTL (Time To Live) value in an IP network that is disclosed by Non-patent Document 1 (RFC791, Internet Protocol, J. Postel, September 1981). For example, the TTL value is set to 1 to limit content distribution to a range that is not beyond a router. More specifically, this method defines a home network as a single physical network, and judges that devices physically connected to the same physical network belong to the home network.

A second method uses a group management server that is disclosed by Patent Document 1 (Japanese Patent Laid-open No. 2005-301633). This method defines devices registered in the group management server as devices that belong to the same home network. Content is permitted to be privately used within the same home network. Further, the content can be distributed and played back under separately stipulated content playback permission conditions or the like.

SUMMARY OF THE INVENTION

The home network to be managed at home may be configured in various manners. Therefore, it is preferred that a device management method be capable of handling various configurations in a flexible manner. However, the following problems arise when the aforementioned techniques are used.

The method disclosed by Non-patent Document 1 gives a fixed TTL value to define the scope of a home network physically or uniformly. When this method is used, a device that is usually connected to a specific home network for use is not recognized as a device that belongs to the network if it is not physically connected to the network at present. This corresponds to a situation where, for instance, a terminal device is used at an outside location and connected to the home network through another network for the purpose of accessing another device that is connected to the home network. In this instance, the terminal device, which is currently away from home, cannot receive services offered to the devices that belong to the home network. This situation is inconvenient for the user. To prove that the terminal device, which is currently away from home, is entitled to receive the services, it is necessary to use a separate authentication means.

On the other hand, the method disclosed by Patent Document 1 can allow a desired device to join the home network by registering it in the group management server. In such an instance, a device that has illegally joined in the home network might steal content, which is private information distributed within the network, depending on management exercised by an administrator who permits registration.

To solve the above problems, it is necessary to devise a new method for judging whether devices belong to the same home network. An object of the present invention is to improve user-friendliness and provide a device belonging judgment method for use in a home network to protect content with increased reliability.

According to one aspect of the present invention, there is provided a network system in which a plurality of network devices are connected to a network, wherein each network device includes a peripheral device information collection unit which collects peripheral device information indicating which ones of network devices are connected to the network while the connection to the network is established; a peripheral device information storage unit which stores home network information, which is a chronological list of network devices connected to the network, in accordance with the collected peripheral device information; a peripheral device information transmission unit which transmits the home network information stored in the peripheral device information storage unit in compliance with a request from another network device; a peripheral device information reception unit which requests another network device to deliver the home network information stored therein and receives the delivered home network information; and a peripheral device information collation unit which collates the home network information received from another network device through the peripheral device information reception unit with the home network information stored in the peripheral device information storage unit and judges whether the other network device belongs to the same network as the local network device.

According to another aspect of the present invention, there is provided a network belonging judgment method for judging whether a first network device and a second network device, which are connectable to a network, belongs to the same network, wherein each network device collects peripheral device information indicating which ones of network devices are connected to the network while the connection to the network is established, and stores home network information, which is a chronological list of network devices connected to the network, in accordance with the collected peripheral device information. When the belonging of the second network device is to be determined, the first network device receives the home network information stored in the second network device, collates the received home network

information with the home network information stored in the first network device, and determines in accordance with the collation result whether the second network device belongs to the same network as the first network device.

When a plurality of devices are to be used through a home network, the present invention provides improvement of user-friendliness and protect content in a more flexible manner.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, objects and advantages of the present invention will become more apparent from the following description when taken in conjunction with the accompanying drawings.

FIG. **1** is an overall block diagram illustrating a home network system **1** according to an embodiment of the present invention.

FIG. **2** shows a hardware configuration of a network device **3** according to an embodiment of the present invention.

FIG. **3** shows functional blocks of the network device **3** shown in FIG. **2**.

FIG. **4** shows an example of home network information that is recorded in a peripheral device information storage unit **32**.

FIG. **5** shows examples of home network information **40***a*-**40***e* that is stored in each of network devices **3***a*-**3***e*.

FIG. **6** is a flowchart illustrating how a network device **3***a* collects the information about peripheral devices.

FIG. **7** is a flowchart illustrating how a network device **3***a* operates to judge whether another network device **3***x* belongs to the same home network.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **1** is an overall block diagram illustrating a home network system **1** according to an embodiment of the present invention. The home network system **1** includes a LAN (Local Area Network) **2**, a plurality of network devices **3** connected to the LAN, and a router **4**. Further, the home network system **1** is connected to the Internet **5** via the router **4**. The LAN **2** is established, for instance, with an Ethernet (registered trademark), telephone line, power line, radio transmission, infrared light, or another communication line. The network devices **3** may be personal computers, HDD recorders having a communication function, mobile players that are excellent in portability and can play back video and audio, or cellular phones or other mobile terminals. These network devices **3** are interconnected via the LAN **2** and allowed to exercise their communication functions. Further, the network devices **3** connected to the LAN **2** are capable of communicating with an external device via the router **4** and the Internet **5**. Here the term "connected" means that the devices are not only physically connected but also capable of communicating with each other.

Here it is assumed that the network devices **3** are used in five different styles (**3***a*-**3***e*) described below. The network devices **3***a* and **3***d* are constantly connected to the LAN **2** for use. The network device **3***b* is a mobile device that is excellent in portability and connected to various networks for use. Most of the time, however, the network device **3***b* is connected to the LAN **2**. The network device **3***c* is also a mobile device that is connected to various networks for use. However, the network device **3***c* is connected to the LAN **2** for a limited period of time. The network device **3***e* is an external device that is connected to the Internet **5**. However, the network device **3***e* is never connected to the LAN **2**. As described above, the network devices differ in the period of time during which (in the frequency with which) they are connected to the LAN **2** for use.

The present embodiment is characterized by the fact that it is whether the devices belong to the network system **1** using, as an index, the period of time during which (the frequency with which) the devices share the LAN **2**. More specifically, the present embodiment judges that the network devices **3***a* and **3***d*, which are constantly connected to the LAN **2**, belong to the home network system **1**, and judges that the network device **3***e*, which is never connected to the LAN **2**, does not belong to the home network system **1**. The network device **3***e* is a device that belongs to another home network system or a device that does not belong to any home network system. The present embodiment judges that the network device **3***b*, which is a mobile device and connected to the LAN **2** for a long period of time, belongs to the home network system **1**. While network device **3***b* is used at an outside location, the present embodiment judges that the network device **3***b* belongs to the home network system **1** although it is not connected to the LAN **2** during such a period. Conversely, the present embodiment judges that the network device **3***c*, which is a mobile device and connected to the LAN**2** for a limited period of time, does not belong to the home network system **1**. Even if the network device **3***c* is connected to the LAN **2** in a certain situation, the present embodiment judges that the network device **3***c* does not belong to the home network system **1**. As described above, the present embodiment defines whether a network device belongs to the home network system **1** by noting the period of time during which (the frequency with which) the network device has been connected to the LAN **2**. The above definition is formulated without regard to the current connection between the network device and the LAN or the Internet.

FIG. **2** shows a hardware configuration of the network device **3** according to the present embodiment. The network device may be, for instance, a personal computer or a HDD recorder having a communication function. The network device **3** includes a CPU **20**, which provides overall control over the network device **3**; a RAM (Random Access Memory) **21** and a ROM (Read Only Memory) **22**, which store data and programs; a network interface **23**, which exchanges data with the other network devices via the LAN **2**; a display control unit **24**, which exercises control to display information on an externally connected monitor **26**; and a hard disk **25**, which records data and content. The hard disk **25** may be substituted by another recording medium (e.g., optical disk or semiconductor memory). Further, the monitor **26** may be built in the network device **3**. The CPU **20** reads a program stored in the ROM **22**, loads the read program into the RAM **21**, and executes various functions, which are described later.

FIG. **3** shows functional blocks of the network device **3** shown in FIG. **2**. The network device **3** includes a peripheral device information collection unit **31**, a peripheral device information storage unit **32**, a peripheral device information transmission unit **33**, a peripheral device information reception unit **34**, and a peripheral device information collation unit **35**. This figure shows functions necessary for network belonging judgment and excludes the other device-specific functions (e.g., content transmission/reception, processing, recording, and display functions). In the following description, the functional blocks possessed by the network devices **3***a*, **3***b*, and so on are designated, for instance, by **31***a*, **31***b*, and so on.

The peripheral device information collection unit **31** collects, through the LAN **2**, the device information about the other network devices (hereinafter referred to as the periph-

eral devices) and the information indicating, for instance, whether the peripheral devices have participated in or departed from the LAN **2**. These items of information are hereinafter referred to as the "peripheral device information." When a peripheral device has participated in the LAN **2**, it means that the peripheral device has started connecting with the LAN **2** or is being connected with the LAN **2**. When a peripheral device has departed from the LAN **2**, it means that the peripheral device has been disconnected with the LAN **2** or is being disconnected from the LAN **2**. Although the peripheral device information can be collected by using various existing technologies, it is assumed that UPnP (Universal Plug and Play) is used. When UPnP is used, the devices connected to the LAN **2** can mutually transmit device information to and receive device information from each other at fixed time intervals. Further, since each device can receive the information about itself, the term "peripheral devices" includes the local device as well. The information to be collected includes the information contained in a device description or service description possessed by the peripheral devices and the information indicating the participation of the peripheral devices in the LAN **2** and the departure of the peripheral devices from the LAN **2**, which can be grasped by SSDP (Simple Service Discovery Protocol).

The peripheral device information storage unit **32** records and stores the peripheral device information that was collected by the peripheral device information collection unit **31**. In such an instance, the collected information may be processed before being recorded. As mentioned earlier, the peripheral device information to be recorded includes the device information about the peripheral devices connected to the LAN **2** and the information indicating the participation of the peripheral devices in the LAN **2** and the departure of the peripheral devices from the LAN **2**. To collect and record the aforementioned information, it is necessary that the local device be connected to the LAN **2**. If the local device is departed from the LAN **2** for a certain period, the peripheral device information about that period cannot be collected and would be missing. Therefore, the peripheral device information stored in each device is unique because it reflects the participation/departure history of each device.

The peripheral device information stored in each network device can be mutually transmitted to and received from the devices. In response to a request from a remote peripheral device, the device information transmission unit **33** reads the peripheral device information recorded in the peripheral device information storage unit **32** and transmits it to the remote peripheral device through the LAN **2**. Conversely, the peripheral device information reception unit **34** requests a remote peripheral device to transmit the peripheral device information stored in the peripheral device and receives the peripheral device information from the remote peripheral device through the LAN **2**. In the above instance, a one-to-one authentication means may be used between the device information transmission unit **33** of the device at a transmitting end and the device information reception unit **34** of the device at a receiving end to judge whether the devices are legal and entitled to exchange information. Although the device information reception unit **34** is functionally separate from the peripheral device information collection unit **31**, they can be implemented by common hardware.

The peripheral device information collation unit **35** collates the peripheral device information stored in the peripheral device information storage unit **32** of the local device with the peripheral device information stored in a remote device, which was received by the device information reception unit **34**. Further, the peripheral device information collation unit **35** judges whether the local device and remote device belong to the same home network by checking whether the collated sets of peripheral device information are identical with each other, determining the degree of agreement between the collated sets of peripheral device information, or by checking whether the collated sets of peripheral device information exhibit the same tendency. When the two devices have participated in the LAN **2** for a long period of time, the peripheral device information about one device is similar to the peripheral device information about the other device. In this instance, the peripheral device information collation unit **35** judges that the two devices belong to the same home network. However, if either of the two devices has participated in the LAN **2** for a short period of time, the peripheral device information about one device is different from the peripheral device information about the other device. In this instance, the peripheral device information collation unit **35** judges that the two devices do not belong to the same home network. The algorithm employed for judgment purposes calculates the rate of agreement between the two devices and checks whether the calculated value is not smaller than a reference value. Here it is assumed that when the calculated value is equal to or larger than a predetermined value (e.g., 50%), the peripheral device information collation unit **35** judges that the two devices belong to the same home network. The peripheral device information is used to judge the belonging to the home network as described above, and is hereinafter referred to as the "home network information" for explanation purposes.

FIG. **4** shows an example of home network information (peripheral device information) that is recorded in the peripheral device information storage unit **32**. In accordance with information that the peripheral device information collection unit **31** has collected from the peripheral devices at fixed time intervals, the peripheral device information storage unit **32** (which corresponds to the RAM **21** or hard disk **25**) records and stores home network information **40**. The home network information **40** is log information about a list of network devices that are currently connected to the LAN **2** or were found to be connected to the LAN **2**. The list of network devices contains log information indicating that the local device is connected to the LAN **2**.

For example, a friendly name derived from the device description of a network device, a UDN (Unique Device Name), which is a unique identifier, a manufacturer name, a serial number, and other device information and the time information about an SSDP alive packet received from the network device can be recorded. For the sake of brevity, FIG. **4** lists log information that indicates device names (UDNs) **42** in plain text format in chronological order **41** in which SSDP alive packets were received. The home network information **40** may be encrypted or otherwise processed before being written so that it will not be falsified.

FIG. **5** shows examples of home network information **40***a*-**40***e* that is stored in various network devices **3***a*-**3***e*. This figure shows log information (history) that has been recorded in each device for a fixed period of time. For the sake of brevity, however, alphabetical letters (A, B, C, . . .) are used to represent device names (UDNs). The home network information may be written to indicate the #-and-UDN relationship representing a connection status of each of network devices connected with the network at a particular point of time instead of history records.

The following home network information about the devices will be described on the assumption that it reflects the connection status (connection time) of each of the devices described with reference to FIG. **1**. More specifically, infor-

mation **40***a* and information **40***d* relate to devices that are constantly connected to the LAN **2** for use; information **40***b* relates to a mobile device that is connected to the LAN **2** for a long period of time; information **40***c* relates to a mobile device that is connected to the LAN **2** for a short period of time; and information **40***e* relates to a device that is never connected to the LAN **2**.

The home network information shown in FIG. **5** will now be used to describe in detail an operation that is performed to judge whether two devices belong to the same home network. Basically, the degree of agreement between the UDN columns of the home network information about the devices is calculated to make a judgment. In such an instance, the entire home network information stored in the devices may be referenced. Practically, however, only the information collected during an appropriate period (e.g., during the last one-month period) should be referenced. Two extracted UDN columns are then compared. While the UDN columns are shifted in chronological direction, the rate of agreement is determined when the number of matching UDNs is maximized. When the rate of agreement is equal to or larger than a predetermined value (e.g., 50%), it is judged that the two devices belong to the same home network.

Here it is necessary to note which device is referenced for judgment purposes. The reason is that when, for instance, content is to be distributed, it is necessary that the device that transmits the content judge whether the device that receives the content belongs to the same home network. On the contrary, if the device that receives the content judges whether the device that transmits the content belongs to the same home network, the obtained judgment result is meaningless. When the rate of agreement is to be calculated, the total number of UDN columns on the judging side (of the transmitting device) is given as a population parameter. The judging side may differ from the judged side in the total number of UDN columns. If the judging side and judged side are interchanged, a different rate of agreement may be obtained.

In the following examples, it is assumed that network device **3***a* is a transmitting device whereas network devices **3***b* to **3***e* are receiving devices. The examples are used to illustrate operations that are performed to judge whether the devices belong to the same home network.

<Devices **3***a* and **3***b*>

A comparison between home network information **40***a* and home network information **40***b* reveals that twelve UDN columns (B, C, A, . . . B) for listings #**3** to #**14** of information **40***a* and listings #**1** to #**12** of information **40***b* agree with each other. The rate of agreement is 12/17=71% because the list length of information **40***a* is 17. Since the rate of agreement is more than half the list length of the transmitting end (not less than 50%), the judgment reference is satisfied. Thus, it is judged that the receiving device **3***b* belongs to the same home network as the transmitting device **3***a*. As a result, it is judged that device **3***b*, which is a mobile device connected to the LAN**2** for a long period of time, belongs to the same home network even when it is used at an outside location, and device **3***b* can receive content and the like from device **3***a*.

<Devices **3***a* and **3***c*>

A comparison between the home network information **40***a* and the home network information **40***c* reveals that eight UDN columns (C, A, D, . . . B) for listings #**4** to #**11** of the information **40***a* and listings #**1** to #**8** of the information **40***c* agree with each other. The rate of agreement is 8/17=47% because the list length of information **40***a* is 17. It is therefore judged that the device **3***c* does not belong to the same home network as the device **3***a*. As a result, it is judged that the device **3***c*, which is a mobile device connected to the LAN**2** for a short period of time, does not belong to the same home network even when it is currently connected to the LAN **2**. Thus, the device **3***a* refuses to transmit content and the like to the device **3***c*. Consequently, it is possible to inhibit content from being transmitted to devices that have been connected to the LAN **2** for a short period of time, thereby improving copyright protection.

<Devices **3***a* and **3***d*>

A comparison between the home network information **40***a* and the home network information **40***d* reveals that thirteen UDN columns (D, B, C, . . . B) for listings #**2** to #**14** of the information **40***a* and listings #**1** to #**13** of the information **40***d* agree with each other. The rate of agreement is 13/17=76% because the list length of information **40***a* is 17. It is therefore judged that the device **3***d* belongs to the same home network as the device **3***a*.

<Devices **3***a* and **3***e*>

A comparison between the home network information **40***a* and the home network information **40***e* reveals that no UDN columns agree with each other. Since the rate of agreement is 0%, it is judged that the device **3***e* does not belong to the same home network as the device **3***a*.

The same judgment process as described above can be performed between the other devices. However, the description of such a judgment process is omitted. If the judging side device and judged side device are interchanged, a different rate of agreement may be obtained. Therefore, a different judgment result may be produced.

As described above, the present embodiment judges that a mobile device (device **3***b* in the above example) which has been connected to the LAN for a long period of time belongs to the same home network as the device **3***a* even when the mobile device is disconnected from the LAN and used at an outside location. This provides improvement of user-friendliness. On the contrary, the present embodiment judges that a mobile device (device **3***c* in the above example) which has been connected to the LAN for a short period of time does not belong to the same home network as device **3***a* even when the mobile device is currently connected to the LAN. This inhibits the mobile device from receiving content and the like, thereby improving content protection.

In the above example, it is assumed that the two devices belong to the same home network when the rate of agreement is equal to or higher than 50%. However, it goes without saying that the required rate of agreement may be changed depending on the situation. Further, the above example determines the rate of agreement on condition that UDN columns consecutively agree with each other. Alternatively, however, the rate of agreement may be determined in a flexible manner when, for instance, nonconsecutive UDNs agree with each other while one or more intermediate UDNs disagree with each other.

A network device belonging judgment method for use in the home network system according to the present embodiment will now be described with reference to a flowchart.

FIG. **6** is a flowchart illustrating how the network device **3***a* performs a process (S**600**) for collecting the information about peripheral devices.

The device **3***a* is connected to the LAN (step S**601**). If the device **3***a* is not connected to the LAN, the following collection process cannot be performed. When the device **3***a* is connected to the LAN, peripheral devices (the other devices such as devices **3***b* and **3***c*) that are connected to the same LAN transmit connection information at fixed time intervals, and the peripheral device information collection unit **31** collects the transmitted connection information (step S**602**). More specifically, the peripheral device information collec-

tion unit **31** collects the device information about the peripheral devices connected to the LAN, which can be obtained by using UPnP, and receives participation/departure information, which the peripheral devices transmit by using SSDP. Step S**603** is then performed to process the collected information as needed. For example, the collected information is thinned out or encrypted to obtain home network information **40***a*. However, step S**603** may be skipped. Peripheral device information storage unit **32***a* records and stores home network information **40***a* in the RAM **21** or on the hard disk **25** (step S**604**). The device **3***a* repeats the above information collection process to accumulate and store the home network information **40***a*.

The information collection process is also repeatedly performed in like manner with respect to the other network devices (e.g., devices **3***b* and **3***c*), and home network information **40***b* and home network information **40***c* are accumulated and stored in peripheral device information storage units **32***b* and **32***c*.

FIG. **7** is a flowchart illustrating a process (S**700**) that network device **3***a* performs to judge whether another network device (hereinafter referred to as network device **3***x*) belongs to the same home network as the network device **3***a*.

The device **3***a* requests device **3***x*, which is a device targeted for belonging judgment, to transmit home network information **40***x*, which is stored in the device **3***x* (step S**701**). The device **3***x* then transmits the home network information **40***x*, which is stored in peripheral device information storage unit **32***x*, to the device **3***a*. The device **3***a* uses peripheral device information reception unit **34***a* to acquire the transmitted information (step S**702**). Further, the device **3***a* reads the home network information **40***a*, which is stored in the local peripheral device information storage unit **32***a* (step S**703**).

Next, the device **3***a* uses peripheral device information collation unit **35***a* to compare the two pieces of home network information **40***a*, **40***x* that were obtained in steps S**702** and S**703**. In this instance, the device **3***a* determines the degree of agreement between the two pieces of home network information (step S**704**). More specifically, the device **3***a* performs calculations to determine the rate of agreement in UDN column between the information **40***a* and the information **40***x*. Step S**705** is then performed to judge whether the rate of agreement in UDN column is equal to or higher than a judgment reference (50% in the current example). If the determined rate of UDN column agreement is equal to or higher than the judgment reference, the device **3***a* judges that the device **3***x* belongs to the same home network as the device **3***a* (step S**706**). If, on the other hand, the determined rate of UDN column agreement is smaller than the judgment reference, the device **3***a* judges that the device **3***x* does not belong to the same home network as the device **3***a* (step S**707**).

An operation that the network device **3***a* performs to judge whether the network device **3***b* belongs to the same home network as the network device **3***a* will now be described as a concrete example of the steps indicated in FIGS. **6** and **7**. Here, the network device **3***a* is constantly connected to the LAN **2** for the home network system **1**, and the network device **3***b* is excellent in portability and is connected to the LAN **2** most of the time during which it is connected to a network.

First of all, the network devices **3***a* and **3***b* start performing the information collection process (S**600**) independently. While the network devices **3***a* and **3***b* are connected to the LAN **2** (when the query in step S**601** is answered "Yes"), the network devices **3***a* and **3***b* uses peripheral device information collection units **31***a* and **31***b*, respectively, to collect UPnP-based peripheral device information that is transmitted from the network devices (peripheral devices) connected to the LAN **2** (step S**602**). The network devices **3***a* and **3***b* process the collected information in a predetermined manner to obtain home network information (step S**603**), and record the obtained home network information in their respective peripheral device information storage units **32***a*, **32***b* (step S**604**). The collection and recording steps are repeatedly performed so that peripheral device information storage units **32***a* and **32***b* store the home network information (UDN columns) **40***a*, **40***b* as indicated in FIG. **7**. The network device **3***a* collects and stores the whole peripheral device information because it is constantly connected to the LAN **2**. On the other hand, the network device **3***b* is of a portable type and cannot collect the peripheral device information while it is not connected to the LAN. Therefore, the information for a period during which the network device **3***b* is not connected is not included.

A belonging judgment process will now be described. Here it is assumed that network device **3***b* is currently departed from the LAN **2** and connected with the Internet **5**, and makes a request for a service (e.g., content distribution service) that is offered by network device **3***a* which is connected to the LAN **2**. In this instance, the network device **3***a*, which is a service provider, judges whether the network device **3***b*, which has made a request, belongs to the same home network as the network device **3***a*. The network device **3***a* first requests the network device **3***b* to transmit the home network information **40***b*, which is stored in the peripheral device information storage unit **32***b*, and acquires the home network information **40***b* (steps S**701** and S**702**). The information is transmitted through the peripheral device information transmission unit **33***b* of the network device **3***b*, the Internet **5**, the LAN **2**, and the peripheral device information reception unit **34***a* of the network device **3***a*. Further, the network device **3***a* reads the home network information **40***a*, which is stored in the local peripheral device information storage unit **32***a* (step S**703**).

The network device **3***a* uses the peripheral device information collation unit **35***a* to compare the two pieces of the home network information **40***a*, **40***b*, and calculates the rate of information agreement (the rate at which their UDN columns consecutively match). In the example shown in FIG. **5**, the rate of agreement, which is calculated in step S**704**, is 71%. This means that the network devices **3***a* and **3***b* share 71% of their LAN connection time. If the judgment made in step S**705** is based on a judgment reference indicating that the two network devices belong to the same home network when the rate of agreement is not lower than 50%, the network device **3***a* judges that the network device **3***b* belongs to the same home network as the network device **3***a* (step S**706**). In accordance with the obtained judgment result, the network device **3***a* gives service to the network device **3***b*, for instance, by distributing requested content to the network device **3***b*.

When the network device targeted for judgment is changed, the above judgment process is performed on a targeted network device to judge whether it belongs to the same home network.

Further, when the device **3***a* receives the home network information **40***b* from the device **3***b* in Step **702**, increased safety can be achieved if a mutual authentication and encryption of information to be exchanged are performed between the devices.

The present embodiment, which has been described above, may be modified in various manners as described below.

The present embodiment assumes that the network device **3***a* includes the peripheral device information storage unit **32***a*. However, the peripheral device information storage unit **32***a* may be provided in another network device such as the

network device **3***b*. When such an alternative configuration is employed, the peripheral device information collected by the network device **3***a* is transferred to the network device **3***b* to be recorded. Further, the present embodiment assumes that the network device **3***a* includes the peripheral device information collation unit **35***a*. However, the peripheral device information collation unit **35***a* may be similarly provided in another network device such as the network device **3***b*.

When judging whether a remote network device belongs to the same home network as a local network device, the present embodiment applies the same rule in all the above examples (e.g., assumes that the required rate of agreement is not lower than 50%). Alternatively, however, the rule to be applied may be changed in accordance with the characteristics of individual network devices.

The present embodiment assumes that the belonging judgment process is performed between the network device **3***a*, which provides a service, and the network device **3***b*, which receives service, that is, between the two parties concerned. Alternatively, however, a substitute network device may make a belonging judgment. For example, the network device **3***d*, which belongs to the same home network as the network device **3***a*, may be employed as a substitute for network device **3***a* so that the belonging judgment process is performed between the network devices **3***d* and **3***b*. In accordance with the obtained judgment result, the network device **3***a* may determine whether it can give a service to the network device **3***b*.

The present embodiment assumes that the peripheral device information collation unit **35** performs the belonging judgment process by using the device information history of network device connections to the LAN **2**. Alternatively, however, the network device connection status prevailing at a particular point of time may be used instead of the history.

While we have shown and described several embodiments in accordance with our invention, it should be understood that disclosed embodiments are susceptible of changes and modifications without departing from the scope of the invention. Therefore, we do not intend to be bound by the details shown and described herein but intend to cover all such changes and modifications that fall within the ambit of the appended claims.

What is claimed is:

1. A network system in which a plurality of network devices are connected to a network,

wherein each of the plurality of network devices includes:

a peripheral device information collection unit which collects peripheral device information indicating which ones of the network devices are connected to the network while the connection to the network is established;

a peripheral device information storage unit which stores home network information, which is a chronological list of network devices connected to the network, in accordance with the collected peripheral device information;

a peripheral device information transmission unit which transmits the home network information stored in the peripheral device information storage unit in compliance with a request from another network device;

a peripheral device information reception unit which requests the other network device to deliver the home network information stored therein and receives the delivered home network information; and

a peripheral device information collation unit which collates the home network information received from the other network device through the peripheral device information reception unit with the home network information stored in the peripheral device information storage unit and judges whether the other network device belongs to the same network as the local network device.

2. The network system according to claim **1**, wherein, when the rate of agreement of device listings contained in the two pieces of the home network information is not lower than a predetermined value, the peripheral device information collation unit judges that the other network device belongs to the same network as the local network device.

3. A network device which is one of a plurality of network devices connectable to a network, the network device comprising:

a peripheral device information collection unit which collects peripheral device information indicating which ones of the network devices are connected to the network while the connection to the network is established;

a peripheral device information storage unit which stores home network information, which is a chronological list of network devices connected to the network, in accordance with the collected peripheral device information;

a peripheral device information transmission unit which transmits the home network information stored in the peripheral device information storage unit in compliance with a request from another network device;

a peripheral device information reception unit which requests the other network device to deliver the home network information stored therein and receives the delivered home network information; and

a peripheral device information collation unit which collates the home network information received from the other network device through the peripheral device information reception unit with the home network information stored in the peripheral device information storage unit and judges whether the other network device belongs to the same network as the local network device.

4. The network device according to claim **3**, wherein, when the rate of agreement of device listings contained in the two pieces of the home network information is not lower than a predetermined value, the peripheral device information collation unit judges that the other network device belongs to the same network as the local network device.

5. The network device according to claim **4**, wherein the peripheral device information collation unit calculates the rate of agreement of device listings contained in the two pieces of home network information from the number of device listings that agree with each other consecutively in a chronological direction.

6. A network belonging judgment method for judging whether a first network device and a second network device, which are connectable to a network, belong to the same network, the network belonging judgment method comprising the steps of:

causing each of the network devices to collect peripheral device information indicating which ones of the network devices are connected to the network while the connection to the network is established;

causing each of the network devices to store home network information, which is a chronological list of network devices connected to the network, in accordance with the collected peripheral device information;

causing the first network device to receive the home network information stored in the second network device and collate the received home network information with the home network information stored in the first network device when judging the belonging of the second network device; and

judging in accordance with the collation result whether the second network device belongs to the same network as the first network device.

7. The network belonging judgment method according to claim **6**, wherein, when the rate of agreement of device listings contained in the two pieces of the home network information is not lower than a predetermined value, it is judged that the second network device belongs to the same network as the first network device.

8. The network belonging judgment method according to claim **7**, wherein the rate of agreement of device listings contained in the two pieces of home network information is calculated from the number of device listings that agree with each other consecutively in chronological direction.

9. The network belonging judgment method according to claim **6**, wherein, when the first network device is constantly connected to the network and the second network device is connected to the network for a long period of time, it is judged that the second network device belongs to the same network as the first network device even if the second network device is not connected to the network at the time of belonging judgment.

10. The network belonging judgment method according to claim **6**, wherein, when the first network device is constantly connected to the network and the second network device is connected to the network for a short period of time, it is judged that the second network device does not belong to the same network as the first network device even if the second network device is connected to the network at the time of belonging judgment.

* * * * *

EXHIBIT 2

July 7, 2021

VIA COURIER

Maxell, Ltd.
IP Innovation Business Unit

Yokohama Business Park (YBP)
North Square III
134 Godocho, Hodogaya-ku
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Samsung Electronics Co., Ltd.
Intellectual Property Center
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33, Seongchon-gil, Seocho-gu,
Seoul, 06765, Korea
Attn: Corporate EVP / Head of Center
Tel +82-2-6147-8120

Re: Maxell's Smartphones, Tablets, Smartwatches, Streaming Devices, and Television Related Patents

Dear Mr. Injung Lee,

I am Tatsuya Yamamoto, General Manager of IP Innovation Business Unit of Maxell, Ltd., and I oversee, among other matters, all patent licensing and litigation for Maxell, Ltd. ("Maxell"). This letter is to invite you to discuss a mutually beneficial intellectual property transaction between Samsung and Maxell to build on the prior dealings.

Maxell currently owns Smartphone and TV patent portfolio and succeeded the portfolio which were previously owned by Hitachi Consumer Electronics Co., Ltd. ("HCE") in July 2013. As a prior TV patent licensee, and a prior purchaser of patents from Maxell's smartphone portfolio, Samsung obviously appreciates the value of Maxell's patents and unique portfolios as they related to Samsung's smartphone and TV business units. For example, and as Samsung is aware, Maxell maintains and develops intellectual property assets related to various fields of technologies including but not limited to smartphones, tablets, smartwatches, and televisions. As a result, Maxell owns a large portfolio of patents related to such technologies, and our analysis of Samsung Electronics, Inc. ("Samsung") line of smartphones (*e.g.*, Galaxy A or S series, Galaxy Note Series, Galaxy Z Fold Series), tablets (*e.g.*, Galaxy Tab), smartwatches (*e.g.*, Galaxy Watch), and televisions demonstrates that Samsung makes, uses, sells, offers to sell, or imports products in the U.S. that might benefit from a license to certain of Maxell's patents. Indeed, Samsung and HCE entered into a license agreement in March 2013 licensing certain Maxell's patents directed to televisions. That agreement expired in 2018 and certain Maxell patents in the television portfolio are still not licensed to Samsung as Lifetime Licensed Patents. Similarly, Samsung and HCE entered into a patent purchase agreement in 2011, in which Samsung purchased certain HCE's patents directed to feature phones and obtained a license to other current Maxell patents. That agreement expired in 2016 and a large number of Maxell patents directed to the smartphone/tablet/smartwatches portfolio are still not licensed to Samsung. Since the parties' prior agreements, the value of Maxell's patents has increased substantially as more devices, such as Samsung's line of smartphones and smart TVs, have adopted more and more

features and functionalities covered by Maxell's patents. This has borne out in through Maxell's recent licensing and litigation successes, which Samsung is surely aware of.

Building on the prior agreements, Maxell would welcome the opportunity to open negotiations with Samsung and enter into constructive discussions to determine whether the parties can agree to a mutually acceptable patent license agreements covering one or more of Maxell's patent portfolios identified below.

I. Maxell's Television Patent Portfolio

While Maxell continues to review its patent portfolio, we specifically call your attention to the following U.S. patents in Maxell's Television Patent Portfolio:

No.	U.S. Pat. No.	Claims	Samsung Products
1	10,555,042	1, 2, 6, 10	Neo QLED 8K SmartTVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
2	10,129,580	1-5	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD

			Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
3	10,638,189	1	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
4	10,659,833	1	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart

			TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
5	10,321,186	1, 3, 4	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
6	10,425,681	1, 3	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
7	9,930,397	1, 2, 7, 8	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs,

			Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
8	9,743,034	1, 2, 3, 5, 6, 7, 8	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
9	10,678,843	1, 6, 7	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED

			4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
10	10,306,295	1, 3	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
11	10,735,801	1, 4, 7, 10	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K

			UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
12	9,613,580	1, 11, 17	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
13	10,015,558	1, 9	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart

			TVs, Smart Full HD TVs, HD TVs
14	10,109,035	1, 4, 6, 10	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
15	10,225,613	1, 2, 4, 7, 8, 9, 10, 13, 14	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
16	10,237,454	1, 10, 14	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs,

			QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
17	10,321,206	1, 2, 3, 4, 5, 7, 8, 9, 10. 11, 12, 13, 15, 16, 17	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
18	7,738,041	1, 2, 6, 7, 12	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs,

			QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
19	7,986,858	1, 4, 7, 10	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
20	8,203,650	1, 4, 7	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs,

			Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
21	8,952,881	1, 2, 10, 13, 14	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
22	9,380,189	1, 8, 17	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart

			TVs, Smart Full HD TVs, HD TVs
23	9,626,919	1, 2, 5, 6, 8	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
24	9,966,022	1, 2, 6, 8	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
25	10,078,989	1-14	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs,

			QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
26	10,192,498	1, 2, 4, 5, 7, 10, 11, 14, 15, 16	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
27	8,224,110	1, 9	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs,

			QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs
28	9,025,903	1, 2, 3, 8, 12	Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, HD TVs

These patents are directed to technologies including TV-phone interface, image processing including performance and image quality improvements, user experience including user settings and image presentation control and, streaming and viewing angles. Copies of each of these patents may be found by visiting the United States Patent and Trademark office website, www.uspto.gov. We would also like to bring to your attention the recent resolution of the matter between Maxell and Hisense (*Maxell, Ltd. v. Hisense Co., Ltd. et al*, 5:19-cv-00156 (EDTX)), establishing the value of Maxell's portfolio.

While Samsung is aware of many of these patents from prior dealings, we encourage you to examine these patents again and think you will agree that a non-exclusive license is needed under each of the patents identified. In particular, at least the identified patents in the above

chart are believed to be practiced by Samsung's Neo QLED 8K Smart TVs, Neo QLED 4K Smart TVs, Frame QLED 4K Smart TVs, QLED 4K Smart TVs, Frame QLED 4K UHD HDR Smart TVs, Terrace QLED 4K UHD HDR Smart TVs, Sero QLED 4K UHD HDR Smart TVs, QLED 4K UHD HDR Smart TVs, QLED 8K UHD HDR Smart TVs, QLED 8K UHD Smart TVs, Serif QLED 4K UHD HDR Smart TVs, Crystal UHD 4K Smart TVs, 4K Crystal UHD HDR Smart TVs, Crystal UHD Smart TVs, QLED 4K UHD Smart TVs, Smart Full HD TVs, and HD TVs.

II. Maxell's Smartphone Patent Portfolio

Further, we specifically call your attention to the following U.S. patents in Maxell's Smartphone Patent Portfolio:

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
1	7,139,533	1, 18	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, Book series tablets	**73**	10,529,372	1-6, 16-21, 31-36	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, Book series tablets
2	10,349,030	15-28	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, Book series tablets	**74**	8,037,161	1, 3, 6	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, Book series tablets, SmartThings
3	6,612,488	1-5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X,	**75**	10,389,978	1, 2, 8	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
			Book series tablets, Galaxy Watch, Active, Fit smartwatches, Samsung Pay				
4	10,244,284	1-20	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**76**	10,854,237	1-7, 14, 19, 27, 32	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
5	7,104,444	1, 3	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets, Galaxy Watch, Active, Fit smartwatches, Samsung Pay	**77**	8,130,284	1-8	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
6	7,403,226	1-2, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**78**	8,170,394	1-5, 7-8	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
7	7,447,241	1, 3-4, 5, 17, 21	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**79**	8,214,459	1-2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
8	7,047,052	2	Galaxy A, S, Z, Note series phones; Galaxy Tab A,	**80**	8,311,389	3-4, 7-8	Galaxy A, S, Z, Note series phones; Galaxy Tab

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
			Tab X, Book series tablets				A, Tab X, Book series tablets
9	10,264,456	1-3, 5-20	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets, Galaxy Watch, Active, Fit smartwatches	**81**	7,362,952	1, 10, 14	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
10	7,577,417	1, 2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**82**	8,477,850	1, 16, 17, 18, 20	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
11	7,054,649	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets, Galaxy Watch, Active, Fit smartwatches	**83**	8,504,544	1-2	smartphones Galaxy Tab A, Tab X, Book series tablets
12	7,187,374	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**84**	8,549,109	1-5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
13	6,816,444	4, 10	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**85**	8,644,684	1-2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X,

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
							Book series tablets
14	8,156,077	1, 10, 15, 20	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**86**	8,654,093	1-7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
15	8,112,503	1, 9	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**87**	10,911,719	1-14	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
16	10,176,848	8-11, 13-20	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**88**	8,892,688	1-8	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
17	6,913,194	1-4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets Galaxy Watch, Active, Fit smartwatches, Samsung Pay	**89**	8,982,086	1-4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
18	9,099,154	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**90**	9,083,942	1, 4, 7, 10, 13, 16, 19, 22	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
19	6,928,292	1-2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**91**	10,210,904	1, 7, 12, 18	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
20	6,928,306	2, 5-6, 12-15	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**92**	9,124,758	1-4, 6-17	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
21	6,940,494	1-11	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**93**	9,197,917	9-16, 25-48	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
22	6,954,583	1, 3	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**94**	9,313,295	1, 5-10, 13-14, 17-18	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
23	10,685,681	1, 8, 14, 21	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**95**	8,255,679	1, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
24	6,983,140	1-5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**96**	9,418,704	1-10	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X,

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
							Book series tablets
25	10,423,769	1-15	Galaxy A, S, Z, Note series phones; Galaxy Watch, Active, Fit smartwatches	**97**	9,420,212	1-6	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
26	10,298,737	1, 3	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**98**	9,432,618	1-8	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
27	7,113,909	1, 2, 6-7, 12-13	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets, Galaxy Watch, Active, Fit smartwatches, SmartThings	**99**	6,987,978	1, 5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets, Galaxy Watch, Active, Fit smartwatches
28	7,116,438	1-7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**100**	9,489,985	1-12	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
29	7,190,833	1-20	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**101**	7,158,770	1, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets,

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
							Galaxy Watch, Active, Fit smartwatches
30	7,199,821	1, 4, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**102**	9,661,101	1-12	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
31	8,289,450	2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**103**	9,743,129	1-8	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
32	7,203,517	9-10	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**104**	9,773,522	13-14, 16-17, 19-20, 22-23	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
33	7,245,293	1-3	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**105**	9,818,449	1-16	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
34	7,248,743	1, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**106**	9,159,368	1-5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
35	10,679,674	1, 9, 17, 23	Galaxy A, S, Z, Note series	**107**	16/883,124 (allowed)	1, 9, 16, 21	Galaxy A, S, Z, Note series

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
			phones; Galaxy Tab A, Tab X, Book series tablets				phones; Galaxy Tab A, Tab X, Book series tablets
36	7,312,791	1-7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**108**	8,005,960	1, 3	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
37	7,324,487	1-5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**109**	6,484,034	1, 8-9	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
38	7,952,645	1, 3, 4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**110**	7,072,673	1-4, 9, 15	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
39	7,464,170	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**111**	9,723,268	1-4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
40	7,457,529	1-41	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**112**	10,084,991	1-16	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
41	7,509,139	1, 7-14	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**113**	9,066,058	1, 2, 4, 5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
42	7,515,810	1, 2, 6	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**114**	9,369,761	1, 2, 5-6, 9	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
43	7,551,209	1-6	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**115**	8,571,392	1-6	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
44	7,613,383	1-4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**116**	10,057,371	1-12	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
45	7,626,498	1-22	Galaxy Watch, Active, Fit smartwatches	**117**	10,070,099	1, 6	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
46	7,671,901	1-2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**118**	10,129,590	1-10	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X,

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
							Book series tablets
47	7,689,201	1-4, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**119**	10,212,586	1-3, 6-11, 13-20	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets, Galaxy Watch, Active, Fit smartwatches
48	7,508,760	2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**120**	10,418,069	1, 6-12	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
49	8,334,933	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**121**	7,584,431	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
50	7,293,294	17-20	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**122**	10,645,424	1, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
51	10,747,832	1	Galaxy A, S, Z, Note series phones; Galaxy Watch, Active, Fit smartwatches	**123**	10,199,072	1, 6, 11, 16	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
52	7,084,757	1, 5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**124**	7,719,417	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
53	9,032,438	2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**125**	7,562,231	1-3	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
54	8,180,198	1, 6	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**126**	8,526,791	1, 8, 15	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
55	15/898,351 (allowed)	1, 5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**127**	9,942,483	1, 8	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
56	8,059,177	1-2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**128**	9,704,389	1, 5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets; SmartThings
57	9,774,776	1, 3, 4, 5, 7-10	Galaxy A, S, Z, Note series phones; Galaxy Tab A,	**129**	10,511,757	1-8	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X,

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
			Tab X, Book series tablets				Book series tablets
58	9,721,462	1, 9, 11	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets; SmartThings	**130**	7,084,880	1, 14, 16	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
59	8,111,263	1, 12	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**131**	7,421,188	1-9	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
60	10,783,228	1-6, 12-17	Galaxy A, S, Z, Note series phones; Galaxy Watch, Active, Fit smartwatches	**132**	10,462,278	1-17	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
61	10,812,646	1-8, 13-20	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**133**	7,639,706	1, 2, 4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
62	10,834,459	1-13	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**134**	10,915,220	1, 7	Galaxy Watch, Active, Fit smartwatches
63	10,757,344	1, 3	Galaxy A, S, Z, Note series phones; Galaxy Tab A,	**135**	8,599,244	1, 8, 14	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X,

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
			Tab X, Book series tablets				Book series tablets
64	9,503,648	1-8	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**136**	8,724,962	1, 2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
65	7,391,964	1, 9, 11, 19	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**137**	8,139,927	1-4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
66	10,728,362	1, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**138**	8,566,890	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
67	9,154,545	1, 4, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**139**	9,154,003	1, 7, 14, 15	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets; wireless charging pads
68	10,050,474	1, 4, 5, 6, 11	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets; wireless charging pads	**140**	8,099,136	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
69	7,283,671	1, 19	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**141**	9,591,261	1, 5, 10	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
70	10,726,159	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**142**	16/080,313 (allowed)	1	Galaxy Watch, Active, Fit smartwatches
71	10,467,515	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**143**	10,635,962	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
72	16/260,879 (allowed)	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets				

In addition, we also call your attention to the following expired U.S. patents in Maxell's Smartphone Patent Portfolio, which may be applicable to Samsung's products in view of the method claims included in these patents and/or Samsung's prior knowledge of these patents in view of Samsung's prior purchase agreement:

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
1	5,396,443	1-5, 7-8, 11, 12, 14-16, 22-24	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X,	**15**	7,196,986	1, 3, 4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X,

			Book series tablets				Book series tablets
2	6,243,340	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**16**	7,295,767	1-18	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets, SmartThings
3	6,329,794	1-3, 5-14	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**17**	7,995,897	1-12	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
4	6,347,068	1-2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets, laptops	**18**	6,917,823	1-7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
5	6,408,193	1-7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets,	**19**	8,098,695	1, 4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets, laptops
6	6,424,795	1-7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets,	**20**	8,339,493	1, 4-6, 10	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X,

							Book series tablets
7	6,430,498	1-13	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets; Galaxy Watch, Active, Fit smartwatches	**21**	8,417,088	1-4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
8	6,580,999	1-6	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets; Galaxy Watch, Active, Fit smartwatches	**22**	8,736,729	1,2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
9	6,754,440	1-8	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**23**	9,100,604	1-5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
10	6,765,616	13-15, 18	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**24**	9,451,229	1-12	9,451,229
11	6,816,491	1-2, 7-9	Galaxy A, S, Z, Note series phones; Galaxy Tab	**25**	9,544,517	1-11	Galaxy A, S, Z, Note series phones;

			A, Tab X, Book series tablets, laptops				Galaxy Tab A, Tab X, Book series tablets
12	6,856,760	1, 3-4, 6-7, 9-10, 12-13, 15	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**26**	6,697,563	1, 3, 5, 7, 9, 10	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets
13	6,973,334	1,3-4, 6	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets	**27**	6,898,078	1-11	Galaxy Book
14	7,068,503	1-29	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series tablets				

The patents in Maxell's smartphone portfolio are directed to technologies, including imaging/camera components, image processor, proximity sensors, touch screen, power management, wireless communications including Bluetooth, WiFi, NFC, and cellular communications, biometric authentication, positioning, user interfaces, content management incorporated in Samsung's smartphones, tablets, smartwatches and related hardware and software sold in the United States. Copies of each of these patents may be found by visiting the United States Patent and Trademark office website, www.uspto.gov.

As with the TV patents, we encourage you to examine these patents again, considering of course the significant advancements in Samsung smartphones since 2013. We are confident you will agree a nonexclusive license is needed under each of the patents identified. In particular, at least the identified claims in the above chart are believed to be practiced by the identified Samsung products. Further, many of these patents were the subject of various litigations, including, for example, *Maxell, Ltd. v. Huawei Devices USA, Inc., et al*., C.A. Nos. 5:16-CV-00178-RWS (E.D. Tex.) and 5:18-CV-00033-RWS (E.D. Tex); *Maxell, Ltd. v. ZTE Corp., et al*., C.A. Nos. 5:16-CV-00179-RWS (E.D. Tex.) and 5:18-CV-00034 (E.D. Tex.); *Maxell, Ltd. v. ASUSTeK*

Computer, Inc., C.A. No. 3:18-CV-01788 (N.D. Cal.); *Maxell, Ltd. v. Blu Products, Inc*., C.A. No. 1:18-CV-21231 (S.D. Fla.); *Maxell, Ltd. v. Blackberry Corp., et al*., C.A. No. 1:17-CV-01446 (D. Del.); *Maxell, Ltd. v. Olympus Corp., et al.,* C.A. No. 1:18-CV-00310-JFB-SRF (D.Del.); *Maxell, Ltd. v. Apple Inc.,* C.A. No. 5:19-CV-00036-RWS (E.D. Tex.); *Maxell, Ltd. v. Apple Inc.,* C.A. No. 6:21-CV-00158-ADA (W.D. Tex.); I*n the Matter of Certain Mobile Electronic Devices And Laptop Computers*, Inv. No. 337-TA-1215; and numerous foreign proceedings in Germany and Japan. Each of these litigations has now concluded with very favorable results for Maxell. For example, the ZTE litigation resulted in a $43.3 million verdict on seven patents in its portfolio, including U.S. Patent Nos. 6,748,317 ("'317 Patent"); 8,339,493 ("'493 Patent"); 8,736,729 ("'729 Patent"); 6,408,193 ("'193 Patent"); 6,329,794 ("'794 Patent"); 6,816,491 ("'491 Patent"); and 8,098,695 ("'695 Patent") and the Apple litigation resulted in a settlement shortly after jury selection. In addition to the litigation successes, we also note that numerous patents in Maxell's Smartphone portfolio have been subject to IPR petitions that were not instituted by the PTAB. We encourage you to review these matters. Because Samsung's infringing products operate in substantially the same manner as the products accused of infringement in these case, additional detail regarding Samsung's infringing activities can be gained from reviewing the complaints and allegations in these matters.

Maxell is focused on addressing these issues without the need for costly and protracted litigation, and it would welcome the opportunity to have constructive discussions with Samsung to determine whether a mutually acceptable patent license agreement can be reached. Maxell is prepared to commence discussions with you or your representative at your earliest convenience, at which time Maxell can set forth its basic terms for renewal for your consideration. Maxell looks forward to your reply and the opportunity to discuss these matters with you or your representative.

Sincerely yours,



Tatsuya YAMAMOTO
General Manager
IP Innovation Business Unit
Maxell, Ltd.
(email to: t-yamamoto@maxell.co.jp)

EXHIBIT 3

US008982086B2

(12) **United States Patent**
Yamada

(10) **Patent No.: US 8,982,086 B2**
(45) **Date of Patent: Mar. 17, 2015**

(54) **INFORMATION PROCESSING APPARATUS**

(71) Applicant: **Hitachi Consumer Electronics Co., Ltd.**, Tokyo (JP)

(72) Inventor: **Masaaki Yamada**, Yokohama (JP)

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/154,993**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**

G06F 3/041	(2006.01)
G09G 5/10	(2006.01)
G06F 3/0484	(2013.01)
G06F 1/16	(2006.01)
G06F 3/0488	(2013.01)
G06F 21/31	(2013.01)

(52) **U.S. Cl.**

CPC ***G06F 3/04842*** (2013.01); ***G06F 1/1626*** (2013.01); ***G06F 3/0416*** (2013.01); ***G06F 3/0488*** (2013.01); ***G06F 21/31*** (2013.01); ***G06F 3/0412*** (2013.01); *G06F 2221/2109* (2013.01); *G06F 2221/2117* (2013.01)

USPC **345/173**; 345/691

(58) **Field of Classification Search**

USPC 345/173, 175, 178, 650, 690

See application file for complete search history.

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Office Action Chinese Serial No. 2014062700460410 dated Jul. 2, 2014.

* cited by examiner

Primary Examiner — Michael Faragalla

(74) *Attorney, Agent, or Firm* — McDermott Will & Emery LLP

(57) **ABSTRACT**

An information processing apparatus includes a touch panel which displays pieces of identification information including letters, figures, and symbols and detects a contact of the panel with a finger of a user or other object. When the touch panel detects the contact of the panel, a detection unit specifies identification information of one or more of the multiple pieces of identification information displayed on the touch panel, indicated by a position at which the contact in question occurred. The detection unit also detects an area of part of the panel where the contact occurred. A storage unit stores reference identification information and a reference area range. A control unit performs particular processing upon matching of the detected identification information with the stored reference identification information and the area of the contact detected by the detection unit falling within the stored reference area range.

4 Claims, 17 Drawing Sheets

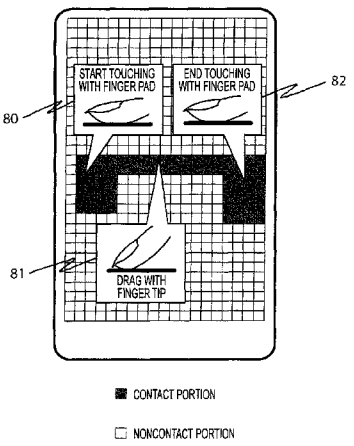


FIG. 1A

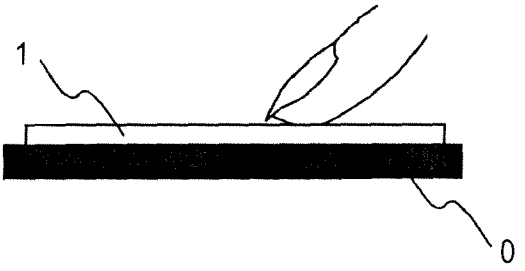


FIG. 1B

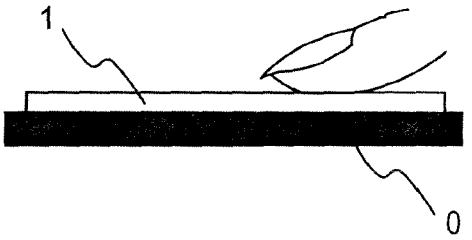


FIG. 2

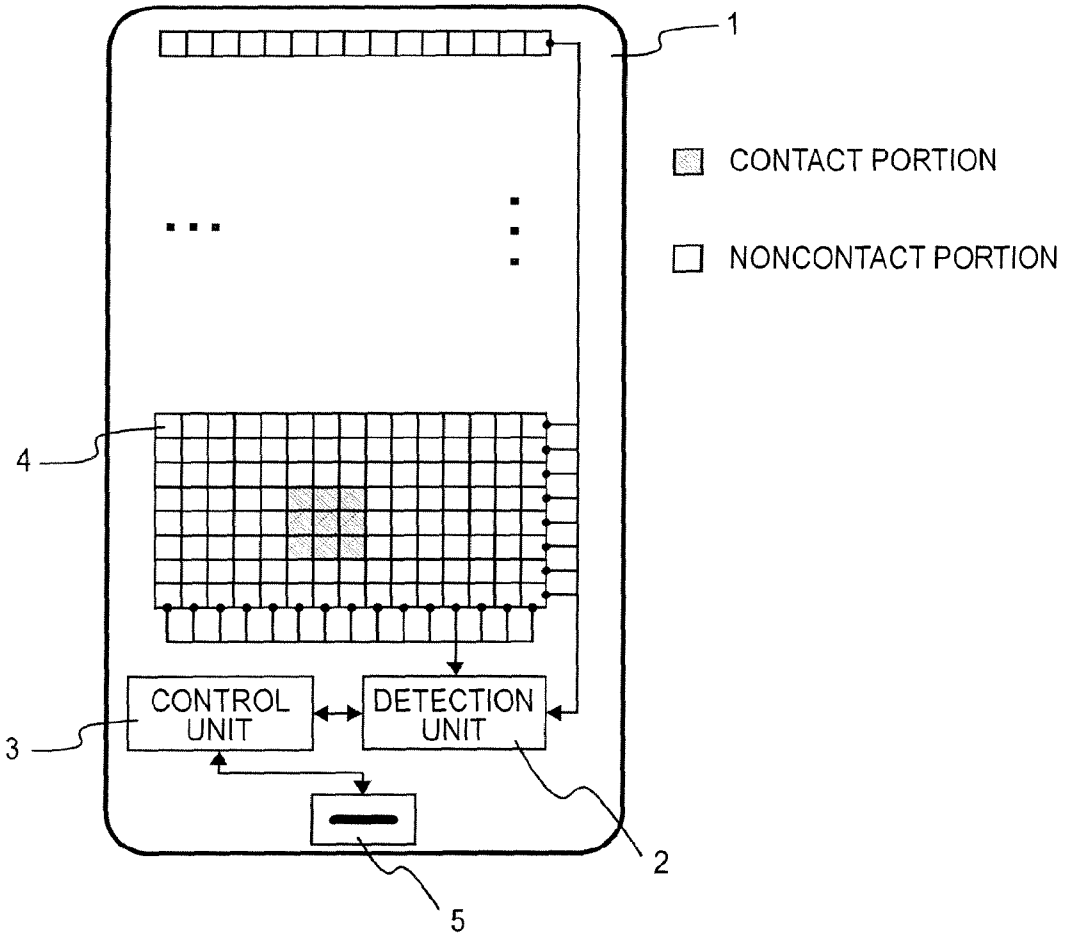

1
CONTACT PORTION
NONCONTACT PORTION
4
CONTROL UNIT
DETECTION UNIT
3
2
5

FIG. 3

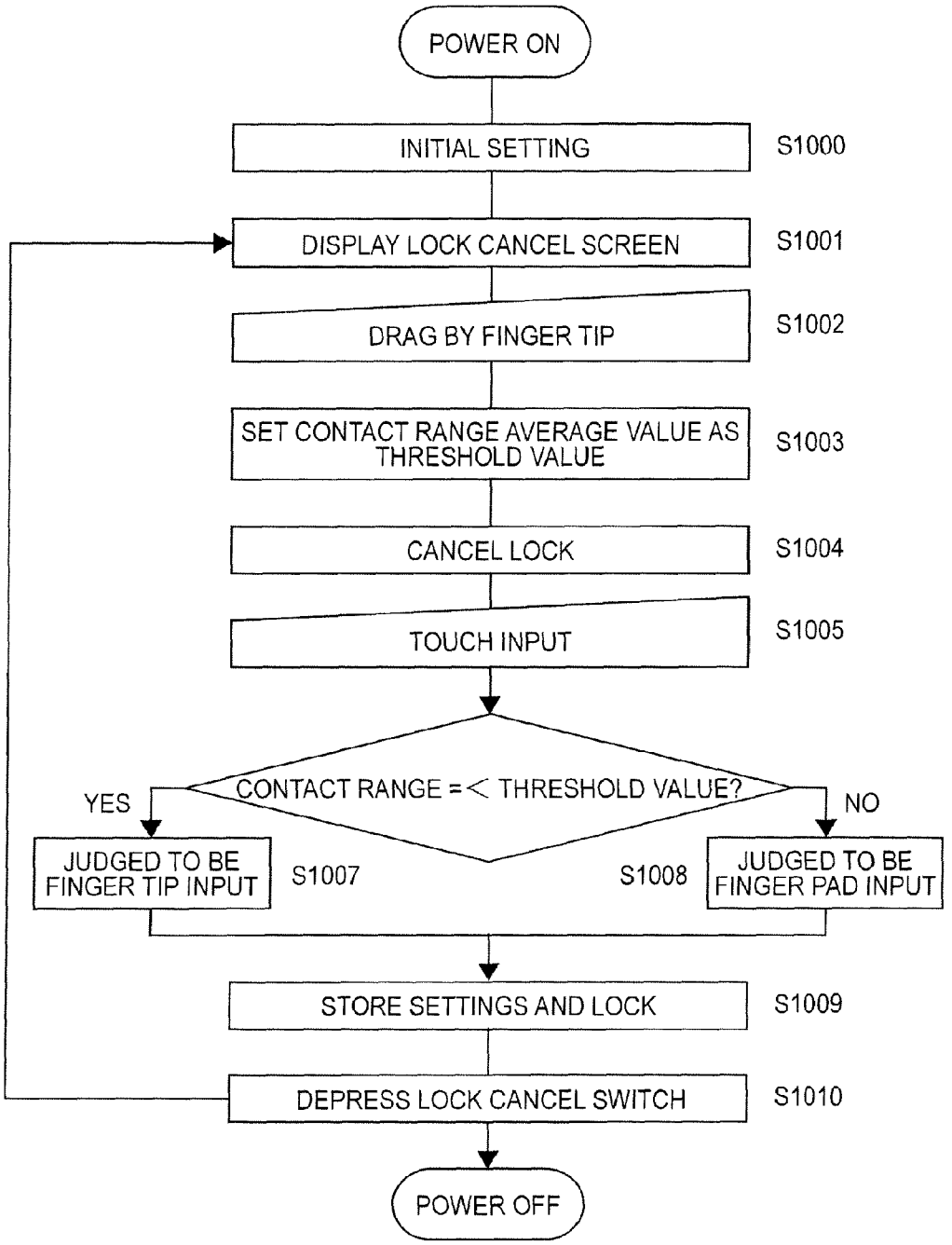

POWER ON
INITIAL SETTING
S1000
DISPLAY LOCK CANCEL SCREEN
S1001
DRAG BY FINGER TIP
S1002
SET CONTACT RANGE AVERAGE VALUE AS THRESHOLD VALUE
S1003
CANCEL LOCK
S1004
TOUCH INPUT
S1005
CONTACT RANGE =< THRESHOLD VALUE?
YES
NO
JUDGED TO BE FINGER TIP INPUT
S1007
S1008
JUDGED TO BE FINGER PAD INPUT
STORE SETTINGS AND LOCK
S1009
DEPRESS LOCK CANCEL SWITCH
S1010
POWER OFF

FIG. 4B

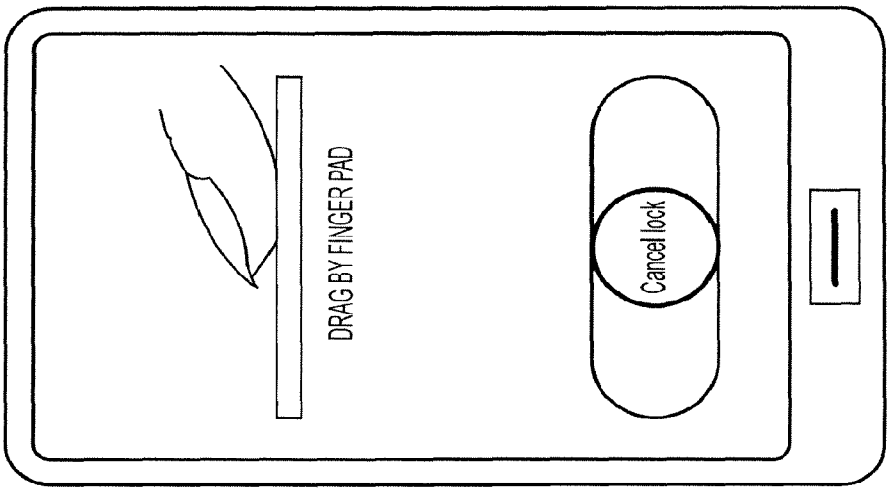

DRAG BY FINGER PAD
Cancel lock

FIG. 4A

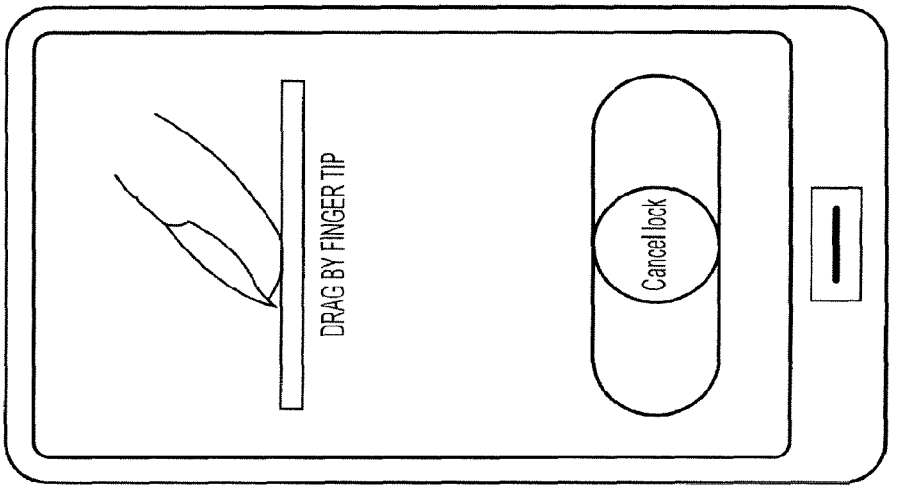

DRAG BY FINGER TIP
Cancel lock

FIG. 5A

FIG. 5B

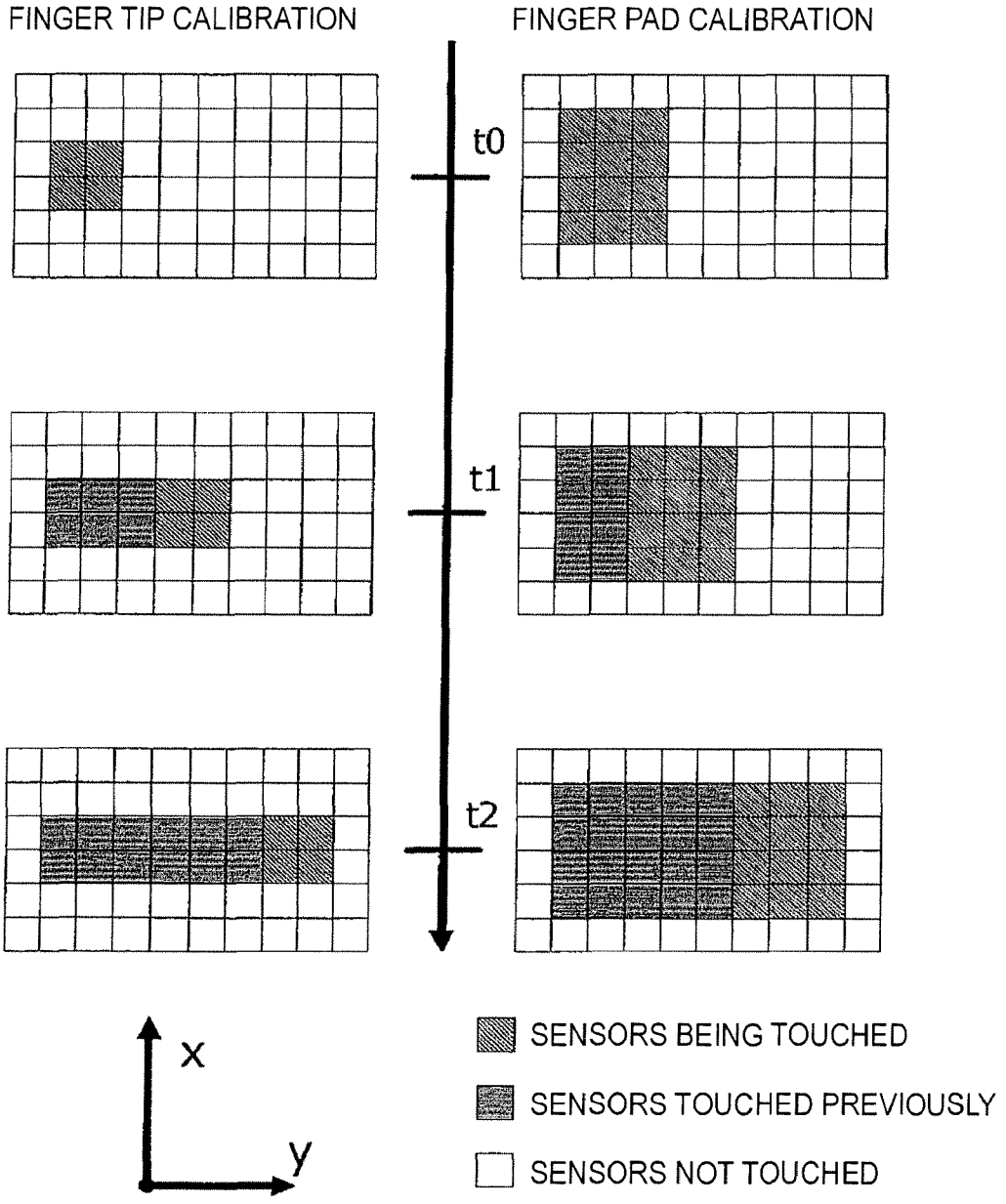

FINGER TIP CALIBRATION
FINGER PAD CALIBRATION
t0
t1
t2
x
y
SENSORS BEING TOUCHED
SENSORS TOUCHED PREVIOUSLY
SENSORS NOT TOUCHED

FIG. 6A

FIG. 6B

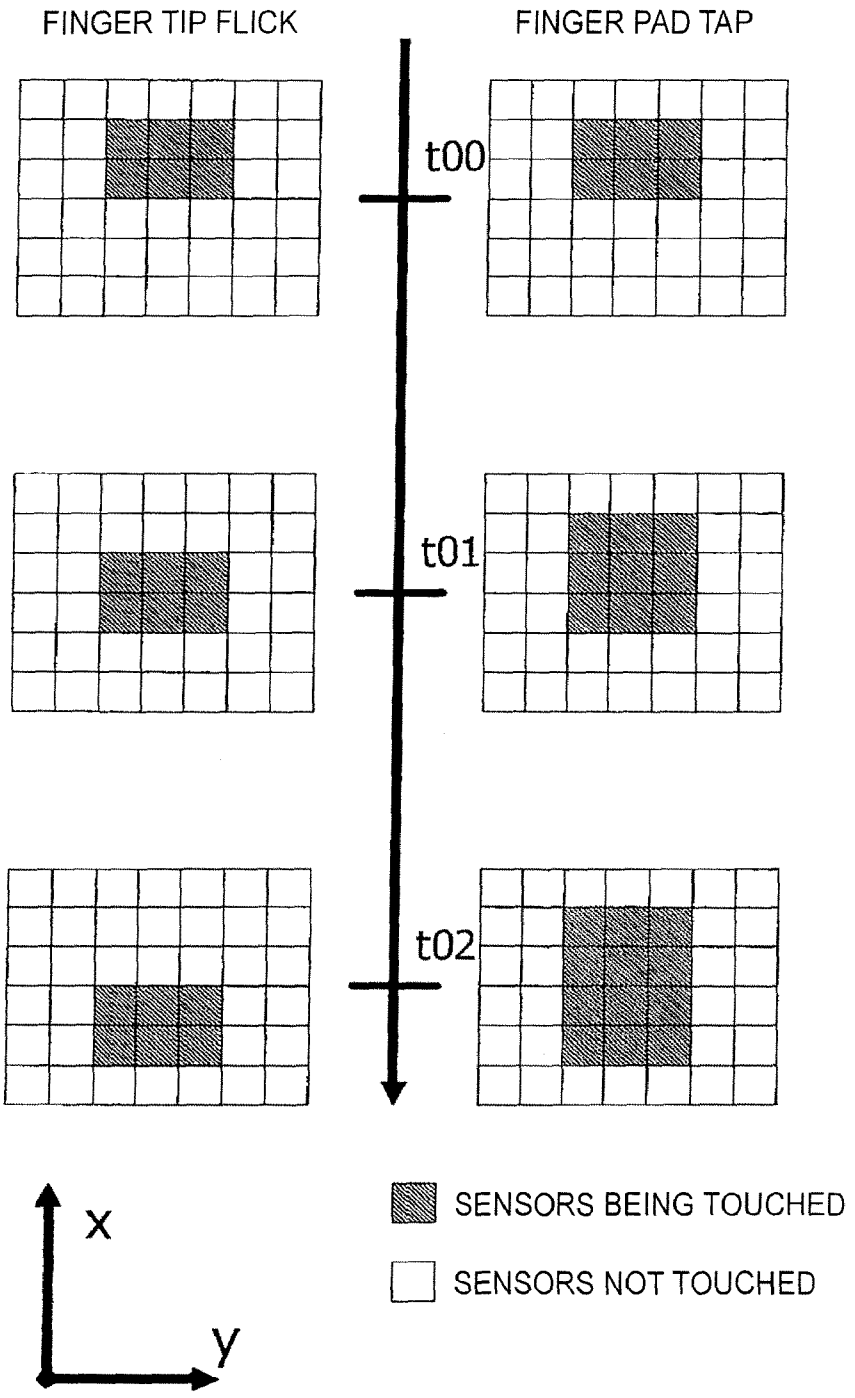

FINGER TIP FLICK
FINGER PAD TAP
t00
t01
t02
x
y
SENSORS BEING TOUCHED
SENSORS NOT TOUCHED

FIG. 7B

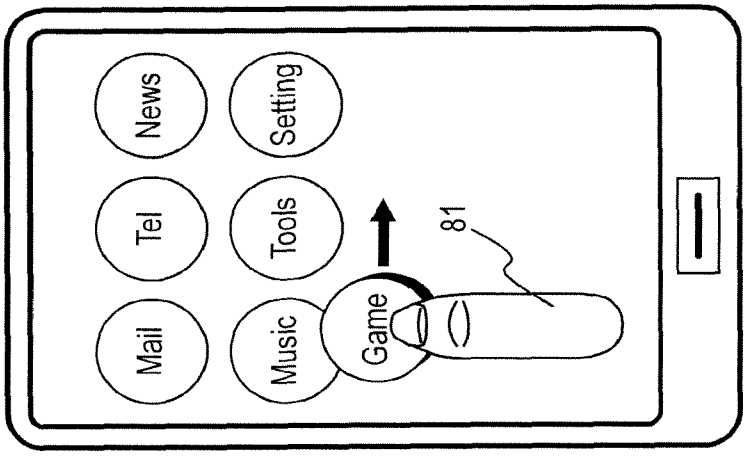

News
Setting
Tel
Tools
Mail
Music
Game
81

FIG. 7A

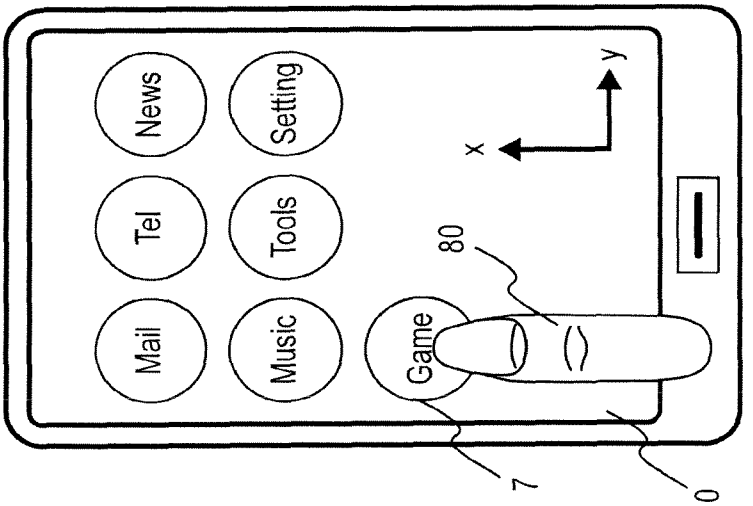

News
Setting
Tel
Tools
Mail
Music
Game
x
y
80
7
0

FIG. 7C

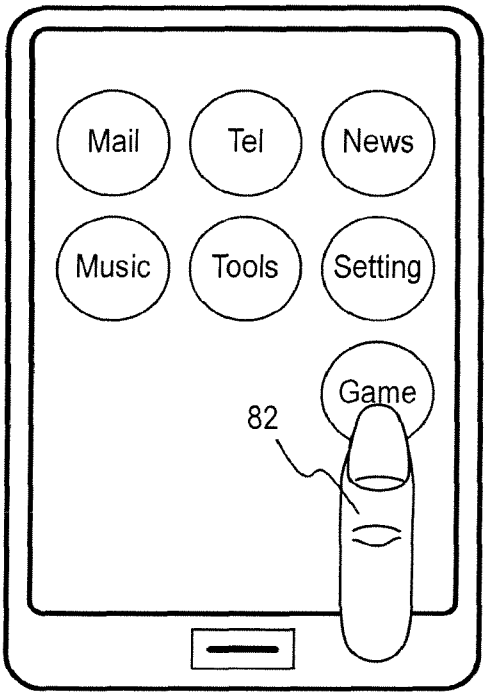


FIG. 8

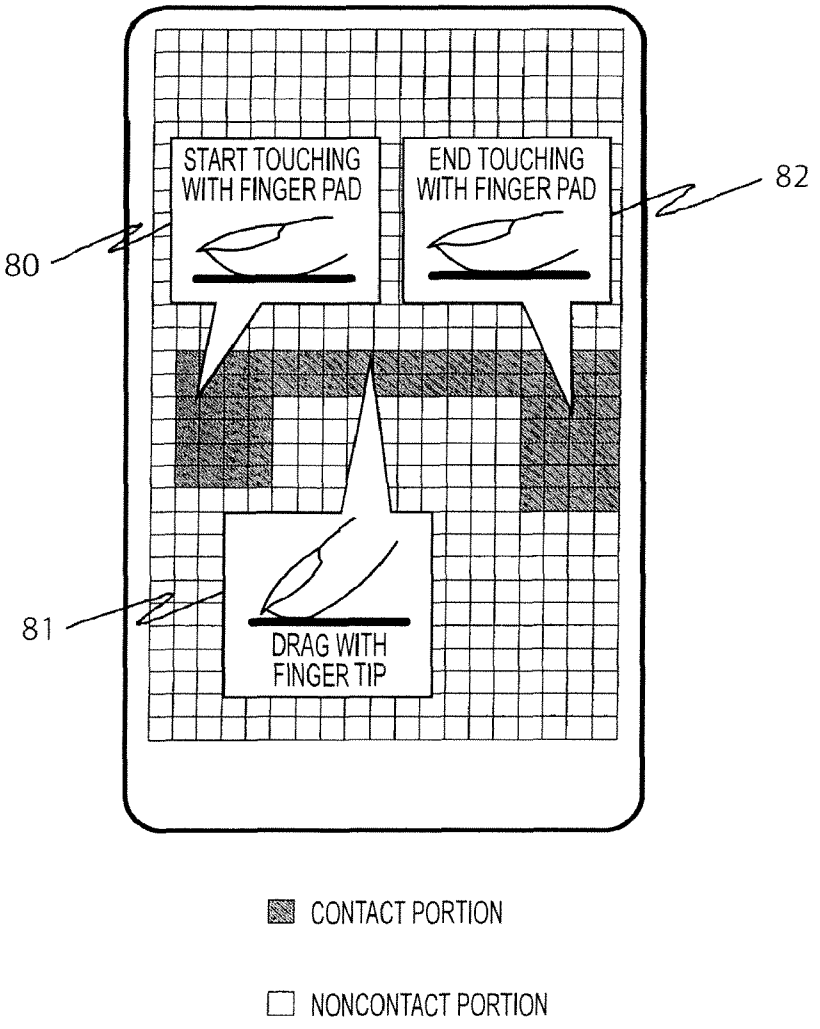

START TOUCHING WITH FINGER PAD
END TOUCHING WITH FINGER PAD
82
80
81
DRAG WITH FINGER TIP
CONTACT PORTION
NONCONTACT PORTION

FIG. 9

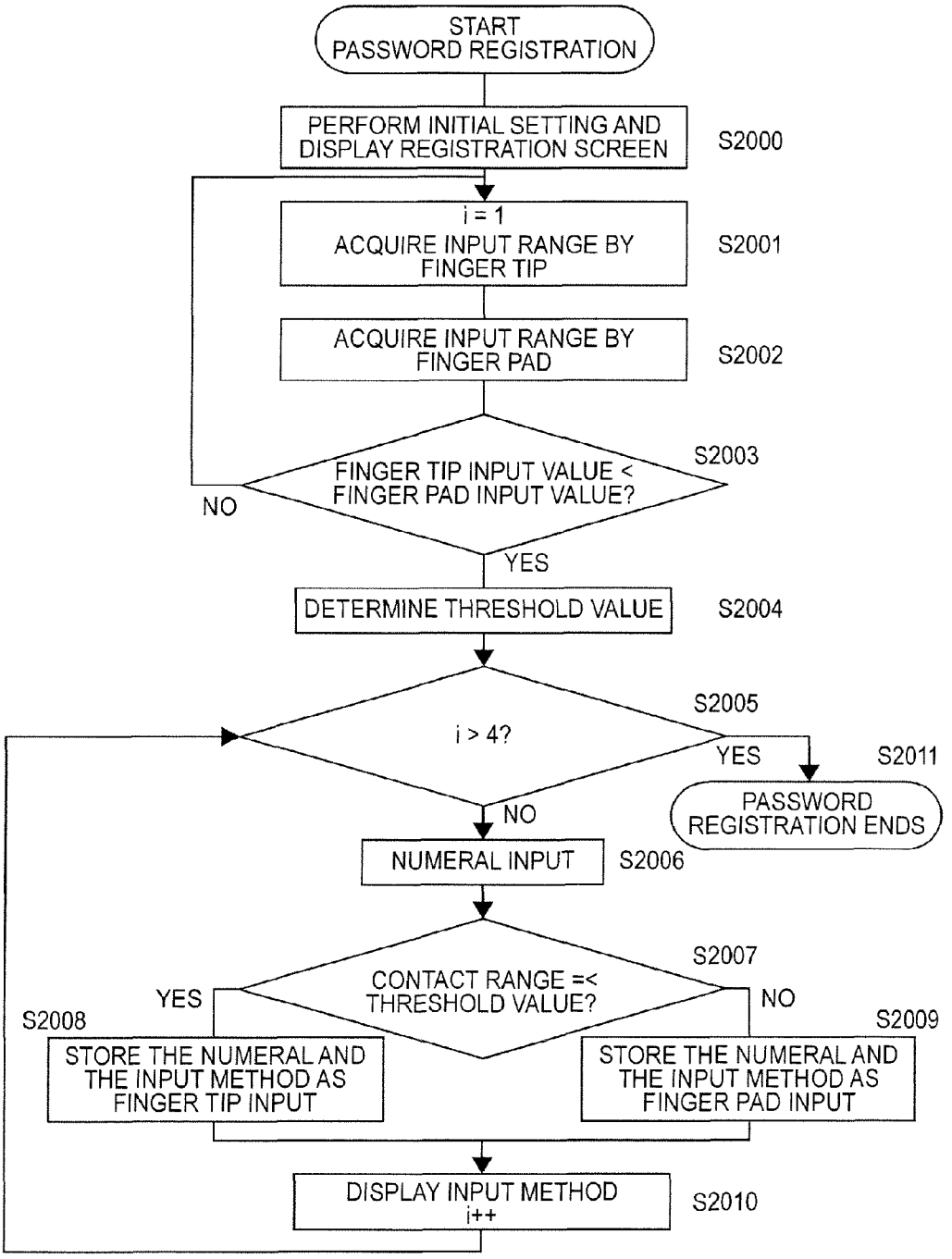

START
PASSWORD REGISTRATION
PERFORM INITIAL SETTING AND DISPLAY REGISTRATION SCREEN
S2000
i = 1
ACQUIRE INPUT RANGE BY FINGER TIP
S2001
ACQUIRE INPUT RANGE BY FINGER PAD
S2002
FINGER TIP INPUT VALUE < FINGER PAD INPUT VALUE?
S2003
NO
YES
DETERMINE THRESHOLD VALUE
S2004
i > 4?
S2005
YES
S2011
PASSWORD REGISTRATION ENDS
NO
NUMERAL INPUT
S2006
CONTACT RANGE =< THRESHOLD VALUE?
S2007
YES
NO
S2008
S2009
STORE THE NUMERAL AND THE INPUT METHOD AS FINGER TIP INPUT
STORE THE NUMERAL AND THE INPUT METHOD AS FINGER PAD INPUT
DISPLAY INPUT METHOD
i++
S2010

FIG. 10B

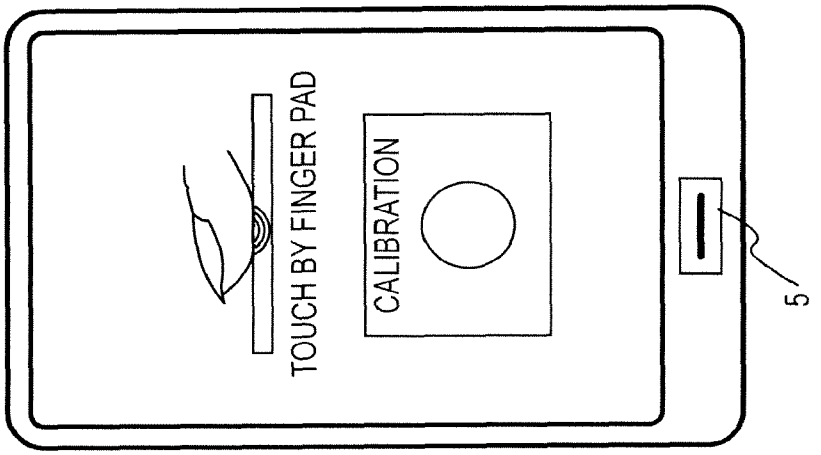


FIG. 10A

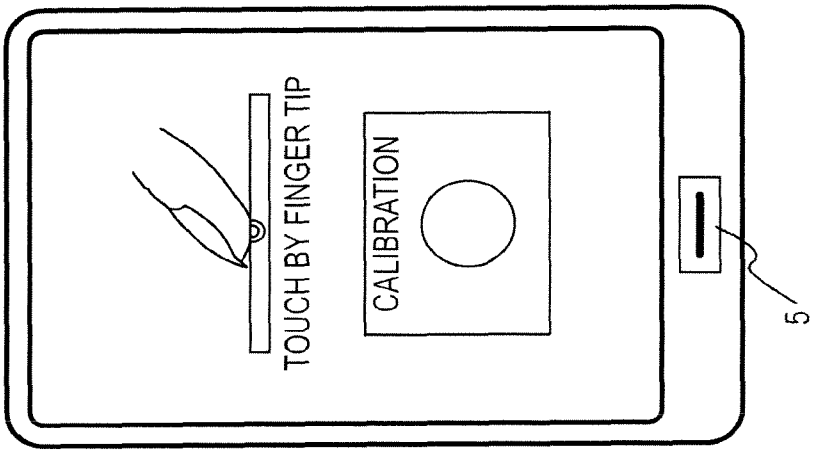


FIG. 11A

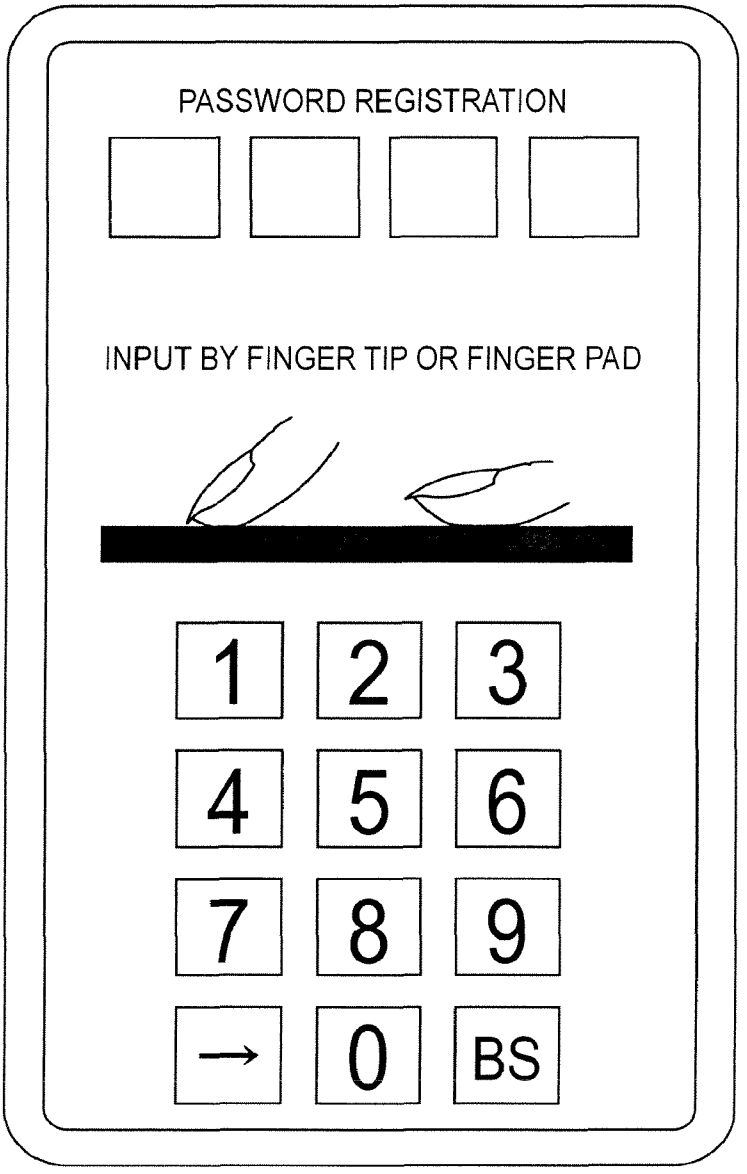

PASSWORD REGISTRATION
INPUT BY FINGER TIP OR FINGER PAD
1
2
3
4
5
6
7
8
9
→
0
BS

FIG. 11B

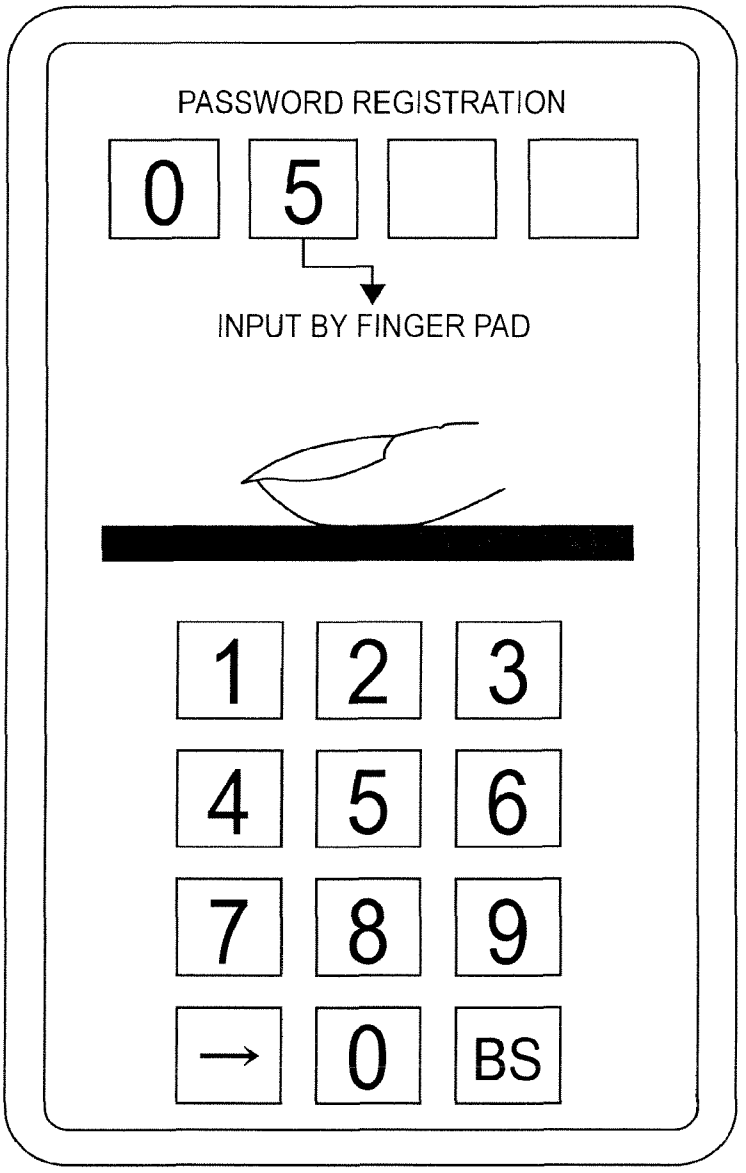

PASSWORD REGISTRATION
0
5
INPUT BY FINGER PAD
1
2
3
4
5
6
7
8
9
→
0
BS

FIG. 11C

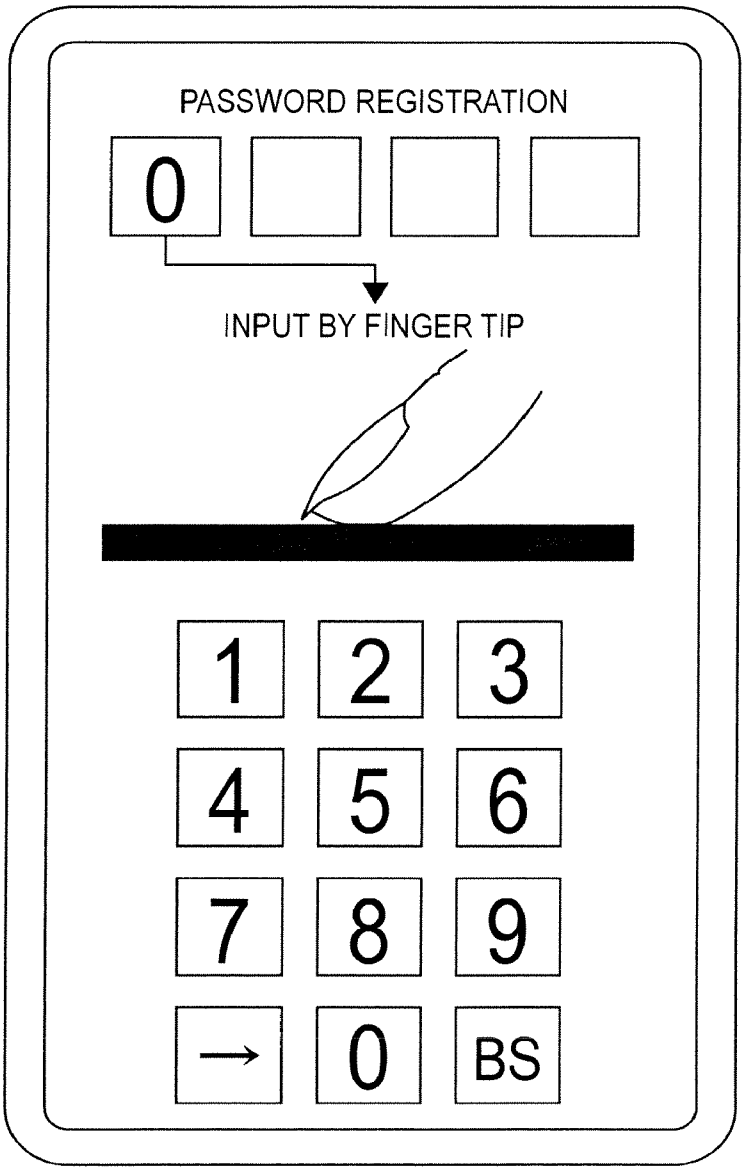


FIG. 12A

DIGIT	1	2	3	4
PASSWORD	0	5	2	8
INPUT METHOD	FINGER TIP	FINGER PAD	FINGER PAD	FINGER PAD

FIG. 12B

DIGIT		1	2	3	4	OPERATION
PASSWORD		0	5	2	8	—
INPUT METHOD	1	FINGER TIP	FINGER PAD	FINGER PAD	FINGER PAD	WAITING SCREEN
	2	FINGER TIP	FINGER TIP	FINGER TIP	FINGER TIP	MAIL CREATING SCREEN
	3	FINGER PAD	FINGER TIP	FINGER PAD	FINGER TIP	APPLICATION STARTING

FIG. 13

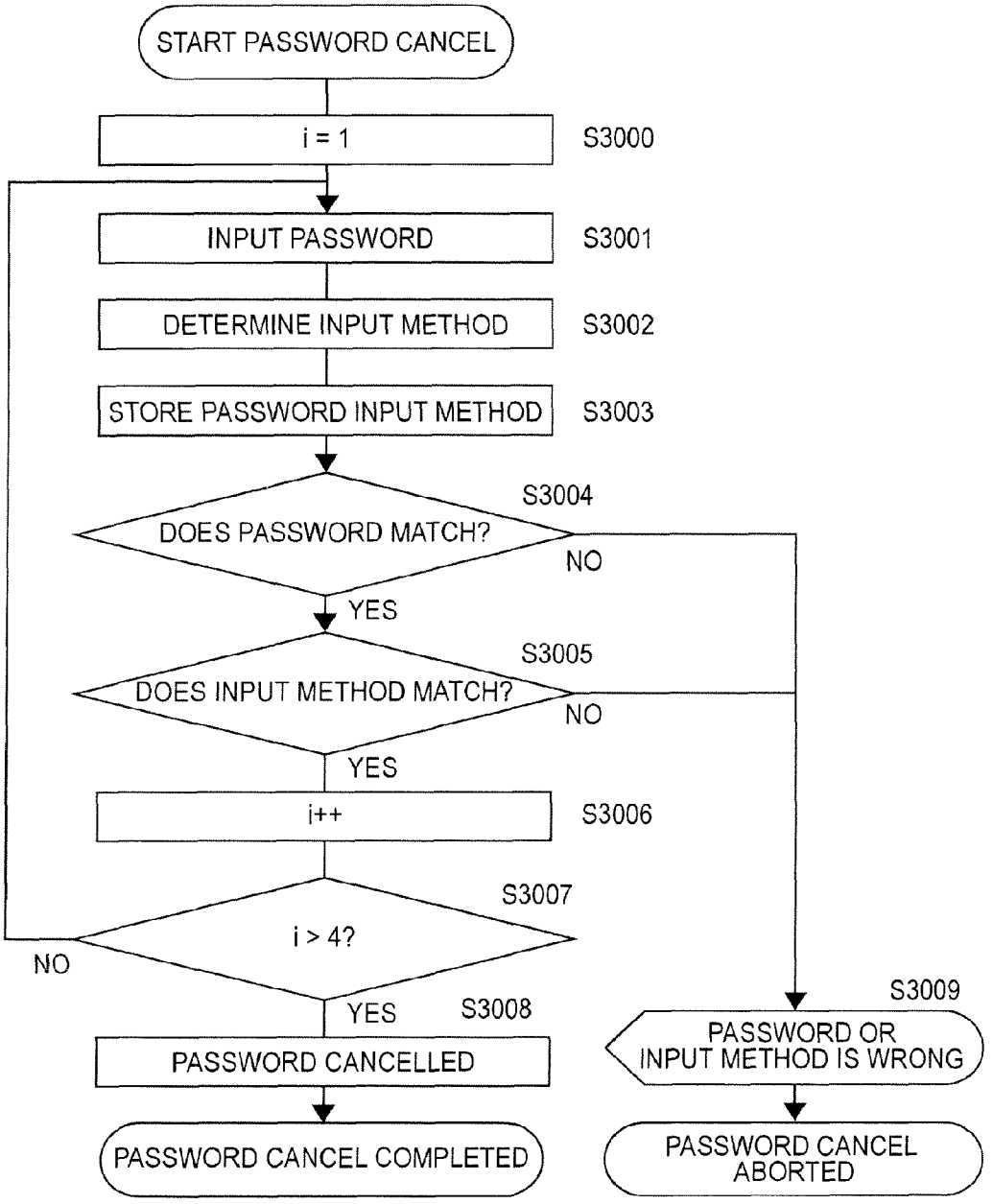
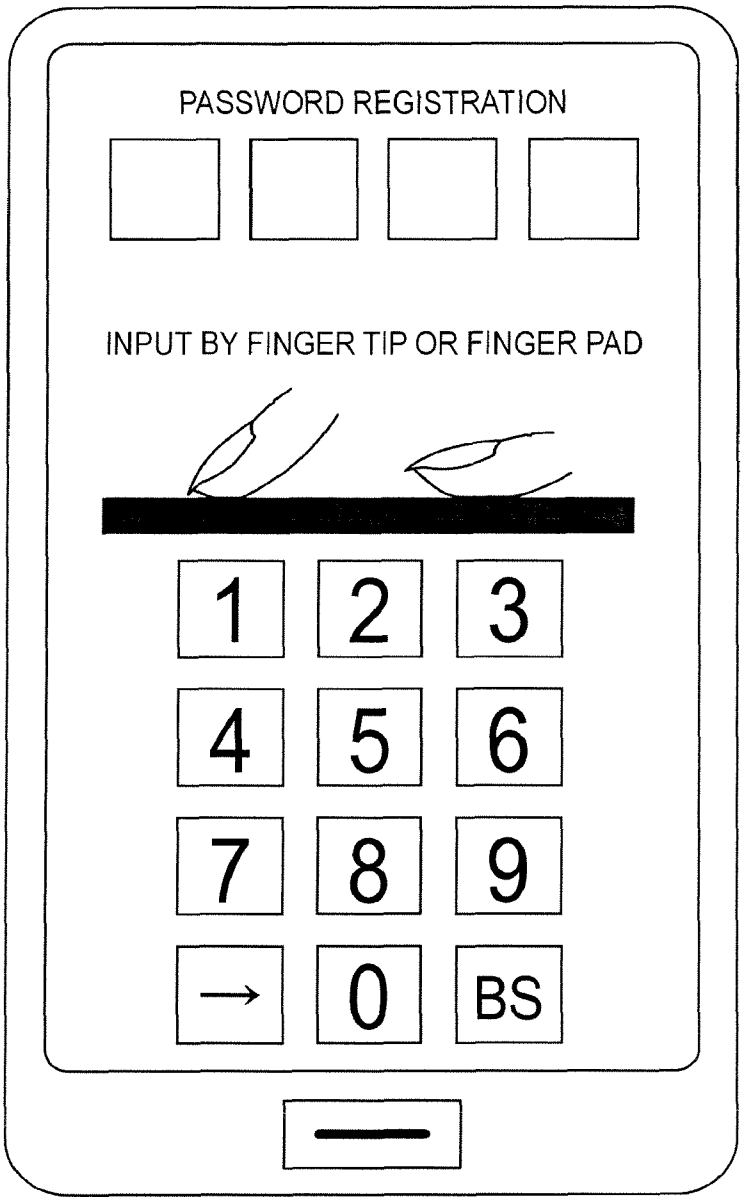

START PASSWORD CANCEL
i = 1
S3000
INPUT PASSWORD
S3001
DETERMINE INPUT METHOD
S3002
STORE PASSWORD INPUT METHOD
S3003
S3004
DOES PASSWORD MATCH?
NO
YES
S3005
DOES INPUT METHOD MATCH?
NO
YES
i++
S3006
S3007
i > 4?
NO
YES
S3008
PASSWORD CANCELLED
PASSWORD CANCEL COMPLETED
S3009
PASSWORD OR INPUT METHOD IS WRONG
PASSWORD CANCEL ABORTED

FIG. 14


PASSWORD REGISTRATION
INPUT BY FINGER TIP OR FINGER PAD
1
2
3
4
5
6
7
8
9
→
0
BS

INFORMATION PROCESSING APPARATUS

CLAIMS OF PRIORITY

This application is the Continuation of U.S. application Ser. No. 13/366,983, filed on Feb. 6, 2012, now U.S. Pat. No. 8,654,093, which claims the benefit of Japanese patent application serial no. JP2011-025576, filed on Feb. 9, 2011, the disclosures of which Applications are incorporated by reference herein.

BACKGROUND OF THE INVENTION

The present invention relates to information processing apparatuses.

JP-A-05-100809 discloses art related to the technical field of the present invention. The publication describes "An information processing apparatus including a touch panel device at least comprising: a physical type of an object; display position information on a display; file information where a status of the object is set; a display information table 1 storing display data of the object that includes a name of a file in a normal state and a name of the file in a special state (reversed display); and touch panel information 2 including a touch position coordinate and touch pressure information. A physical operation decided by a corresponding relation between physical information indicated by the display information table 1 and physical information indicated by the touch panel information 2 is given to the object to display it."

Recently, information processing apparatuses for portable usage have become multi-functioned and ease of use thereof is particularly required.

An object of the present invention is to provide an information processing apparatus that offers improved convenience to users.

SUMMARY OF THE INVENTION

To solve the foregoing problem, an aspect of the present invention provides an information processing apparatus comprising: a touch panel which displays a plurality of pieces of identification information including letters, figures, and symbols, and for detecting a contact of the panel with a finger of a user or other objects; a detection unit, when the touch panel detects a contact of the panel with the object, which species identification information indicated by a position of the contact at which the contact in question occurred, of the multiple pieces of identification information displayed on the touch panel, and which detects an area of part where the contact occurred; a storage unit which stores reference identification information and a reference area range; a determination unit which determines whether the identification information detected by the detection unit matches the reference identification information stored in the storage unit and whether the area of the contact detected by the detection unit falls within the reference area range stored in the storage unit; and a control unit which performs particular processing when the determination unit determines that the identification information detected by the detection unit matches the reference identification information stored in the storage unit and the area of the contact detected by the detecting unit falls within the reference area range stored in the storing unit.

By employing such system, an information processing apparatus including a touch panel can be improved in usability.

BRIEF DESCRIPTION OF DRAWINGS

The present invention will be described hereinafter with reference to the accompanying drawings.

FIG. **1**A is a schematic illustration of a user touching a touch panel **1** with a finger tip to make an input.

FIG. **1**B is a schematic illustration of a user touching the touch panel **1** with a finger pad to make an input.

FIG. **2** is an illustration showing an example of the internal configuration of a portable terminal **0** including the touch panel **1**.

FIG. **3** is a flow chart showing a lock cancellation process of the portable terminal **0**.

FIG. **4**A is an illustration showing a typical screen image displayed during when the portable terminal **0** is to be unlocked by dragging with a finger tip.

FIG. **4**B is an illustration showing a typical screen image displayed during when the portable terminal **0** is to be unlocked by dragging with a finger pad.

FIGS. **5**A and **5**B are illustrations showing schematically states of sensors **4** at various timing during lock cancellation.

FIGS. **6**A and **6**B are illustrations showing a method for distinguishing between a finger tip flicking and a finger pad tapping.

FIG. **7**A is an illustration showing one state during an icon being moved; the state before the move has started.

FIG. **7**B is an illustration showing one state during the icon being moved; the state when the icon is being moved.

FIG. **7**C is an illustration showing one state during the icon being moved; the state after the move has finished.

FIG. **8** is an illustration showing schematically the sensors **4** when the icon is moved.

FIG. **9** is a flow chart for password registration.

FIG. **10**A is an illustration showing a typical screen image displayed during calibration to prompt the user to make a finger tip contact.

FIG. **10**B is an illustration showing a typical screen image displayed during calibration to prompt the user to make a finger pad contact.

FIG. **11**A is an illustration showing a screen that prompts the user to register a password.

FIG. **11**B is an illustration showing a screen displayed during password registration to inform the user that a finger pad input has been made.

FIG. **11**C is an illustration showing a screen displayed during password registration to inform the user that a finger tip input has been made.

FIG. **12**A is a table showing data composed of a password and a corresponding input method.

FIG. **12**B is a table showing data composed of one password and a plurality of corresponding input methods.

FIG. **13** is a flow chart for password cancellation.

FIG. **14** is an illustration showing a screen that prompts the user to cancel a password.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

First Embodiment

Preferred embodiments of the present invention will be described below with reference to the accompanying drawings.

FIGS. **1**A and **1**B are illustrations showing methods by which a user makes a desired input in a portable terminal **0** according to a first preferred embodiment of the present invention. The portable terminal **0** shown in FIGS. **1**A and **1**B

includes a touch panel **1** having a touch sensor function. FIG. **1**A is an image of a user making input by touching the touch panel **1** with his or her finger tip. The input using one's finger tip is characterized in that an area of contact (hereinafter referred also to as a "contact range") between the finger of the user and the touch panel **1** is small. This operation by the user will hereinafter be referred to as a finger tip input. FIG. **1**B schematically shows an image of a user making input by touching the touch panel **1** with his or her finger pad. The input using one's finger pad is characterized in that the contact range of the finger and the touch panel **1** is wider than that of the finger tip input. This operation by the user will hereinafter be referred to as a finger pad input.

FIG. **2** is an illustration showing a typical internal arrangement of the portable terminal **0**. Reference numeral **1** denotes a touch panel that includes a group of sensors or a sensor **4**, a liquid crystal panel, and a glass panel. When the user's finger contacts with the touch panel, capacitance of the sensor **4** changes and the sensor **4** outputs a signal according to the change. The liquid crystal panel displays numerals, letters, and the like. The glass panel is for protecting the sensor **4**, etc. Reference numeral **2** denotes a contact range detection unit that detects the position and the contact range of a contact based on the signal output from the sensor **4**. Reference numeral **3** denotes a control unit for controlling elements of the touch panel **1**. The control unit **3** includes an arithmetic section, a counter, a determination unit which determines condition in accordance with input information into the control unit **3**, and a storage unit which stores various types of data. Reference numeral **4** denotes, as mentioned, a group of sensors or a sensor whose capacitance varies upon contact with the user's finger. Portions shaded with diagonal lines represent sensors **4** that are responding to the contact with the finger. The blank portions represent sensors **4** that are not contacting with the finger and not responding. Reference numeral **5** denotes a button switch which the user pushes for various operations such as standby release or returning, advancing.

The way of calibration and the usage method for cancelling the lock or unlocking the portable terminal **0** according to the first embodiment will be described below with reference to FIG. **3** showing a flow chart, FIGS. **4**A and **4**B showing lock cancellation display screens, and FIGS. **5**A and **5**B showing states of the sensor **4** at various timing during lock cancellation.

Among types of operation performed by the user on the portable terminal **0** are tapping, dragging, flicking, and pinching. Tapping is an operation which the user touches one point of the screen with a finger for a moment on the touch panel **1**. Dragging is an operation which the user moves his or her finger over the screen of the touch panel **1** while the finger is in contact therewith. Flicking is an operation which the user quickly slides his or her finger on the screen of the touch panel **1** while touching it. Pinching is an operation which the user touches two points of the screen of the touch panel **1** with two fingers and changes the distance between the two points.

A series of operations from start-up of the portable terminal **0**, calibration, and to turn-off of the portable terminal **0** will be next described. The term calibration used herein refers to an operation of setting a threshold value that is used for determining a contact range.

The power of the portable terminal turns on by pressing the button switch for a certain time. Then, the control unit **3** starts a program, adjusts the sensors, initializes the threshold value, and performs initial settings for screen display and other factors (S**1000**). After the initial setting procedure, the control unit **3** performs control to display lock cancel screen on the touch panel **1** (S**1001**). As can be seen in FIG. **4**A, a lock cancel icon is present in the lock cancel screen which can be dragged in a y direction and a −y direction with a finger tip. The control unit **3** holds until the user drags the lock cancel icon with a finger tip (S**1002**).

FIG. **5**A is a schematic view showing states of the sensor **4** at various timing during when the user drags the icon with a finger tip in the y direction for unlocking. In FIG. **5**A, portions shaded with diagonal lines denote sensors **4** that are responding to the contact with a user's finger and portions shaded with horizontal lines denote sensors **4** that have responded in previous. The blank portions denote sensors **4** that have not been contacted and have not responded. The icon is first touched at time t**0**, and is dragged at time t**1**, and the dragging ends at time t**2** to thus cancel the lock. The control unit **3** calculates the average value '2' of the number of columns of sensors **4** that responded to the contact with the finger and adds a correction value '1' to the average, thereby defining a threshold value '3'. The threshold value is stored in the control unit **3**.

FIG. **4**B shows another method for unlocking the terminal using the finger pad input. As can been seen in FIG. **4**B, a lock cancel icon is displayed in the lock cancel screen that can be dragged in a y direction and a −y direction with a finger pad. FIG. **5**B is a schematic view showing states of the sensor **4** at various timing during when the user drags the icon for cancelling the lock with a finger pad in the y direction for unlocking. The icon is first touched at time t**0**, then dragged at time t**1**, and the dragging ends at time t**2** to thus cancel the lock. The control unit **3** calculates the average value '4' of the number of columns of sensors **4** that responded to the contact with the finger and subtracts a correction value '1' therefrom, thereby defining a threshold value '3'. The threshold value is stored in the control unit **3**.

The threshold value used for determining the contact range is defined as above by using the average value of the number of columns of sensors **4** that responded to the contact with the finger during unlocking (S**1003**). In other words, the threshold value for determining the contact range can be obtained, calibration can be made), simultaneously with unlocking operation.

The control unit **3** unlocks the portable terminal **0** (S**1004**) and waits until the user makes various inputs by way of the touch panel **1** (S**1005**). Receiving an input with a contact range equal to or narrower than the threshold value (specifically, "3" or less) (S**1006**), the control unit **3** determines that a finger tip input is made (S**1007**). Receiving an input with a contact range wider than the threshold value (specifically, "4" or more) (S**1006**), the control unit **3** determines that a finger pad input is made (S**1008**). After that, various operations are performed following the order of the input.

When no input is made for a predetermined period, several minutes for example, the control unit **3** stores the time and date of calibration, the threshold value, and other setting values, and then locks the portable terminal **0** (S**1009**). The control unit **3** displays the lock cancel screen (S**1001**) when a lock cancel switch assigned to the button switch **5** is pushed (S**1010**). When the button switch **5** is pressed for a certain time while the power of the portable terminal **0** is on, the power turns off.

As described heretofore, regardless of difference with individuals in contact ranges of finger tip input, the calibration allows accuracy of contact range determination to be improved. The first embodiment of the present invention uses the average of the number of columns of the sensors **4** that responded to the contact with the finger as the threshold value. However, this is not the only possible way for setting the

threshold. For example, the threshold value may be corrected by adding an appropriate value to, or subtracting any value from, the average of the number of columns of the sensors **4** that responded to a contact with a finger. The threshold value does not need to be an integer and instead a capacitance value may be used. Further, the threshold value used for determining the contact range may be discarded upon locking, and calibration can be performed to update threshold value every time the terminal is unlocked. Instead of performing calibration upon unlocking, calibration may be performed only at the first time the portable terminal **0** is turned on. It may also be performed by selecting a function for calibration from a setting menu or the like. Furthermore, the first embodiment of the present invention performed calibration on the basis of the contact range of either the finger tip input or the finger pad input. Alternatively, the contact ranges of both the finger tip input and the finger pad input may be obtained to set a plurality of threshold values.

A method for distinguishing the fingertip input and the finger pad input will be described in more details below. FIGS. **6**A and **6**B show a method for distinguishing flicking by finger tip input and tapping by finger pad input. FIG. **6**A shows conditions of sensors **4** responding to a finger tip flicking in a −x direction. FIG. **6**B shows conditions of sensors **4** responding to a finger pad tapping. At time t**00** which is the time a contact starts, the number of sensors responding to the contact is same in FIGS. **6**A and **6**B. The control unit **3** stores the time t**00** at which the contact is started. If the number of sensors responding to the contact range would not change at the subsequent time t**01** and time t**02**, the control unit **3** determines the contact as a finger tip flicking. If the number of sensors responding increases as time elapses as the time t**01** and the time t**02**, the control unit **3** determines the contact as a finger pad tapping. In brief, the control unit **3** distinguishes the finger tip flicking and the finger pad tapping by comparing the number of sensors that responded at the time too to the number of sensors responding at the time t**02**. Since the determination is not done at the instance of a user touching the touch panel **1**, a finger pad input will not be misdetected as a finger tip input even when the initial contact range is narrow.

A way of moving an icon utilizing the difference between contact ranges of the finger tip input and the finger pad input will be described in detail below. FIGS. **7**A to **7**C show states of an icon **7** moved rightwardly (in a y direction) by the user using finger tip input and finger pad input. FIG. **8** is a schematic view showing the sensors **4** that responded during the icon movement and the manner of finger movement. Reference numerals **80** and **82** represent fingers making finger pad input with a wide contact range and reference numeral **81** represents a finger making finger tip input with a narrow contact range. First, a user touches the icon **7** desired to be moved with the finger pad input **80**. When the contact range is equivalent to or larger than the threshold value, the control unit **3** determines that the input is the finger pad input **80** and sets the icon **7** as a moving object (FIG. **7**A). The user then shifts from the finger pad input **80** to the finger tip input **81** while keeping his or her finger in contact with the panel. As the contact range becomes equal to or less than the threshold value, the control unit **3** renders the icon **7** as the moving object movable (FIG. **7**B). The user drags the icon **7** to a desired position and then shifts from the finger tip input **81** to the finger pad input **82**. As the contact range becomes equivalent to or larger than the threshold value, the control unit **3** determines that the input is the finger pad input **82** and validates the position of the icon **7** (FIG. **7**C).

As described above, the first embodiment allows the user to make more intuitive input. The contact range described herein may be the number of sensors responded or the maximum number of the columns of sensors responded. When an application for finger pad input with a wide contact area is not set or applied to the terminal, the process of determining contact area can be omitted and contact operation may be performed uniformly.

Second Embodiment

A second embodiment of the present invention relates to a portable terminal **0** using a password. The second embodiment is characterized in that it stores not only a numeric password but also a difference in the contact range with the aim of enhancing security. A description is made for an example of the enhanced security function that incorporates a four-digit password and a difference in the contact range with reference to; FIG. **9** showing a flow chart of password registration, FIGS. **10**A and **10**B showing typical screen images displayed during calibration, FIGS. **11**A to **11**C showing screen images for prompting a user to register a password, and FIGS. **12**A and **12**B showing data consisting of a password and a set of corresponding input method. The portable terminal **0** according to the second embodiment has the same configuration as that of the portable terminal **0** according to the first embodiment unless otherwise specified.

The process for password registration will be first described with reference to the flow chart of FIG. **9**. After initial settings such as counter reset is done, an image as shown in FIG. **10**A is displayed to prompt the user to make a finger tip contact (S**2000**). A control unit **3** records the contact range of the finger tip input (S**2001**). Next, an image as shown in FIG. **10**B is displayed to prompt the user to make a finger pad contact. The control unit **3** records the contact range of the finger pad input (S**2002**). Contact ranges are detected at the timing when a button switch **5** is pushed following the contact with finger tip or finger pad. When the contact range of the finger pad input is larger than that of the finger tip input, the control unit **3** authorizes the input as a correct input (S**2003**: Yes). The contact range of the finger tip input is determined as a threshold value and the value is stored (S**2004**). When the contact range of the finger pad input is smaller than that of the finger tip input (S**2003**: No), the control unit **3** prompts the user to make a finger tip input again (S**2001**). Completing the determination of a threshold value, the control unit **3** next checks the counter value. When the counter is 4 or less (S**2005**: No), the control unit **3** displays a message to inform the user that a password can be input by either the finger tip input or the finger pad input (FIG. **11**A). Registration of the numbers is then authorized.

The user selects and touches any numbers among numbers 0 to 9 displayed on a touch panel **1** by either the finger tip input or the finger pad input. The selected numbers are registered as input numerals (S**2006**). Then, the control unit **3** compares the contact range with the threshold value. When the contact range is equal to or smaller than the threshold value (S**2007**: Yes), the control unit **3** stores the input numeral in association with the finger tip input (S**2008**). A message as shown in FIG. **11**C is displayed to inform the user that the numeral has been registered by finger tip input. When the contact range is larger than the threshold value (S**2007**: No), the control unit **3** stores the input numeral in association with the finger pad input (S**2009**).

The control unit **3** displays a message as shown in FIG. **11**B to inform the user that the numeral has been registered by finger pad input. The control unit **3** then increments the

counter and proceeds to the next password input (S**2010**). When the counter is greater than **4** (S**2005**: Yes), a numeric string of four input numerals is registered as the password as shown in FIG. **12**A. In addition, the input method of either the finger tip input or the finger pad input corresponding to the numeral is stored for each input numeral. The password registration thus terminates (S**2011**).

A method for cancelling or unlocking the password will be next described below with reference to FIG. **13** showing a flow chart of a password cancel process and FIG. **14** showing a password cancel screen.

As can be seen in FIG. **14**, the control unit **3** displays a password cancel screen including a ten-key pad with a plurality of numerals in order to prompt the user to input a numeral. At the same time, the control unit **3** performs initial settings such as counter reset (S**3000**). The control unit **3** waits until a user inputs a numeral (S**3001**). Upon the user touching the touch panel **1**, the control unit **3** specifies the number according to a position of the contact. The contact range of the contact is compared with a threshold value to thereby determine whether the input is a finger tip input or a finger pad input (S**3002**). The control unit **3** stores the numeral input and the input method used (S**3003**). When the number of the input and the password registered earlier matches, (S**3004**: Yes) and the input methods thereof matches as well (S**3005**: Yes), the control unit **3** increments the counter (S**3006**). When the counter is not greater than **4** (S**3007**: No), the control unit **3** proceeds to the step for inputting the next password number. When the counter is greater than **4** (S**3007**: Yes), the password is authenticated (S**3008**) and the lock is canceled. Meanwhile, in cases where the number of input and a password do not match (S**3004**: No), or in cases where the number of input and a password match but their input methods do not match (S**3005**: No), the control unit **3** displays a message to inform the password or the input method is wrong (S**3009**). The password cancellation thus terminates.

It is to be noted that a plurality of input methods may be registered for one password. For example, in the case shown in FIG. **12**B, three types of input methods are registered for one password and a specific operation is assigned for each of them: input method **1** is for displaying a normal standby screen, input method **2** is for displaying a mail creating screen, and input method **3** is for starting an application. A user can start a desired operation easily by way of unlocking the password, thus contributing to improved convenience. Not to mention, a plurality of input methods may be registered for a plurality of passwords as well.

Using the above system, a user can complicate cancellation of a lock by making a simple input to enhance security. The portable terminal **0** can thus handle user's highly confidential information, which makes the terminal more useful.

Security can be enhanced by only storing, in addition to the password registered, the input method for each of the password numbers. An increase in storage capacity can be sufficiently suppressed.

From the view of a user, the user only needs to remember the input method for each password number to unlock the portable terminal **0**. Burdens on the user for memorization can thus be alleviated. It is also advantageous in that when a user has to tell others the way to unlock the portable terminal **0**, the user only needs to tell the password numbers and the input method for each of the password numbers.

Although the second embodiment employed a password composed of numerals only, the present invention is not limited to this. The password may be composed of alphabets, symbols, figures, patterns, colors, or other elements, or combinations thereof. In addition, the number of digits of a password is not limited to four and the number may instead be one, two, or a greater numeral.

The process for password registration (FIG. **9**) may be started when a predetermined condition is satisfied, such as when the user calls up a particular function from a setting menu.

In the embodiment of the present invention, calibration is performed by a user touching a single point. However, the present invention is not limited to this. For example, the calibration performed during unlocking as described for the first embodiment may be applied. The user may also start calibration by calling up a particular function from the setting menu. Incidentally, during the password cancellation, the message informing the fact that the difference in contact ranges are detected may be not shown (hidden), and when only the numbers are correct, a message may be displayed to inform that the difference in the contact range is also registered. Numerals and input methods may also be hidden and not shown during password input. While a threshold value is used for distinguishing the finger tip input and the finger pad input in the embodiment, the present invention is not limited to this. The determination of an input method may be conducted in a manner such that records both contact ranges of the finger tip input and the finger pad input, and when a input is made, compares the input contact range with the data, whereby selecting the closer one as the method of the particular input.

The operation of distinguishing the difference in the contact range may be omitted in particular situations of input. For example, the system may be adapted so that the classification based on a difference in contact ranges is not performed when the button switch is pressed or when more than two points are touched for multi-touch input.

What is claimed is:

1. An information processing apparatus comprising:

a touch panel configured to detect a contact of a finger of a user;

a detector configured to detect first information necessary for an identification of the user when the contact is detected between the touch panel and the finger of the user;

a first controller configured to control the information processing apparatus to operate into two operating modes: at least an identification mode and a registering mode, as the operating mode thereof;

memory that is configured to store second information relating to the identification of the user, which is stored in advance; and

a second controller configured to execute a specified process when said first information and said second information are coincident within said registering mode, wherein:

in said registering mode, there are provided a first registering mode for inputting input information by a pad of the finger, and a second registering mode for inputting input information by an end of the finger, and said second information relating to the identification of the user is produced upon basis of the input information, which is inputted at least in the first or second mode.

2. The information processing apparatus according to claim **1** wherein said first information includes a position and an area of the finger contacting with said touch panel.

3. The information processing apparatus according to claim **1**, wherein said first information includes a plurality of combinations of a position and an area of the finger contacting with said touch panel.

4. The information processing apparatus according to claim 1, wherein said specific process includes releasing of a lock of resting an operation of said information processing apparatus.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 8,982,086 B2
APPLICATION NO. : 14/154993
DATED : March 17, 2015
INVENTOR(S) : Masaaki Yamada

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

At Column 8, Claim 1, Line 17, delete “registering” and insert --identification--.

At Column 9, Claim 4, Line 2, delete “specific” and insert --specified--.

Signed and Sealed this
Twenty-eighth Day of May, 2019

Andrei Iancu
Director of the United States Patent and Trademark Office

EXHIBIT 4

US008982086C1

(12) EX PARTE REEXAMINATION CERTIFICATE (11921st)

United States Patent
Yamada

(10) **Number: US 8,982,086 C1**
(45) **Certificate Issued: Sep. 28, 2021**

(54) **INFORMATION PROCESSING APPARATUS**

(71) Applicant: **Hitachi Consumer Electronics Co., Ltd.**, Tokyo (JP)

(72) Inventor: **Masaaki Yamada**, Yokohama (JP)

(73) Assignee: **Maxell, Ltd.**

Reexamination Request:
No. 90/014,638, Dec. 23, 2020

Reexamination Certificate for:
Patent No.: **8,982,086**
Issued: **Mar. 17, 2015**
Appl. No.: **14/154,993**
Filed: **Jan. 14, 2014**

Certificate of Correction issued May 28, 2019

Related U.S. Application Data

(63) Continuation of application No. 13/366,983, filed on Feb. 6, 2012, now Pat. No. 8,654,093.

(30) **Foreign Application Priority Data**

Feb. 9, 2011 (JP) 2011-025576

(51) **Int. Cl.**

G06F 3/041	(2006.01)
G09G 5/10	(2006.01)
G06F 3/0484	(2013.01)
G06F 1/16	(2006.01)
G06F 3/0488	(2013.01)
G06F 21/31	(2013.01)

(52) **U.S. Cl.**
CPC ***G06F 1/1626*** (2013.01); ***G06F 3/0412*** (2013.01); ***G06F 3/0488*** (2013.01); ***G06F 3/04842*** (2013.01); ***G06F 21/31*** (2013.01); *G06F 2221/2109* (2013.01); *G06F 2221/2117* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

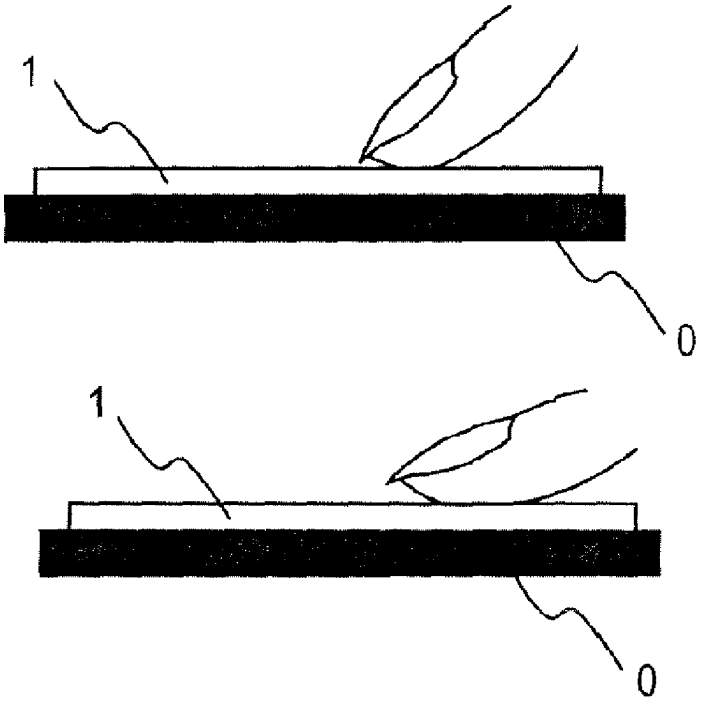
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/014,638, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — Robert L Nasser

(57) **ABSTRACT**

An information processing apparatus includes a touch panel which displays pieces of identification information including letters, figures, and symbols and detects a contact of the panel with a finger of a user or other object. When the touch panel detects the contact of the panel, a detection unit specifies identification information of one or more of the multiple pieces of identification information displayed on the touch panel, indicated by a position at which the contact in question occurred. The detection unit also detects an area of part of the panel where the contact occurred. A storage unit stores reference identification information and a reference area range. A control unit performs particular processing upon matching of the detected identification information with the stored reference identification information and the area of the contact detected by the detection unit falling within the stored reference area range.



EX PARTE REEXAMINATION CERTIFICATE

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **1-4** is confirmed.

New claims **5-15** are added and determined to be patentable.

5. The information processing apparatus according to claim 1, wherein the touch panel comprises a display screen configured to display a first image and first descriptive text associated with the first registering mode and a second image and second descriptive text associated with the second registering mode.

6. The information processing apparatus according to claim 1, wherein the touch panel includes one or more capacitive sensors, such that the contact of the finger is detected based on variations in capacitance of the one or more capacitive sensors in response to the contact.

7. The information processing apparatus according to claim 1, wherein the touch panel comprises a display screen configured to display information during the identification mode that informs the user to use a finger to execute an unlock operation of the information processing apparatus.

8. The information processing apparatus according to claim 1, wherein the touch panel comprises a display screen configured to display one or more images during the registering mode, wherein the one or more images include a shaded portion corresponding to a contact between the finger and the touch panel, and a non-shaded portion indicating the lack of contact between the finger and the touch panel.

9. The information processing apparatus according to claim 1, wherein the first controller is configured to execute one or more of tapping, dragging, flicking, and pinching operations based on the detection of contact of the finger.

10. The information processing apparatus according to claim 9, wherein the controller is configured to execute tapping operations, and the tapping operations include detection of contact of the finger for a first time period.

11. The information processing apparatus according to claim 9, wherein the controller is configured to execute dragging operations, and the dragging operations include the user moving the finger while maintaining contact for a first time period.

12. The information processing apparatus according to claim 9,

wherein the controller is configured to execute flicking operations, and the flicking operations include the user sliding the finger for a first time period, and

wherein the controller is configured to execute pinching operations, and the pinching operations include the user establishing two contacts and increasing the distance between the established two contacts.

13. The information processing apparatus according to claim 9,

wherein the controller is configured to execute said dragging operations, and the dragging operations include the user moving the finger while maintaining contact for a first time period, and

wherein the controller is configured to execute said flicking operations, and the flicking operations include the user sliding the finger for a second time period that is shorter than the first time period.

14. The information processing apparatus according to claim 1, wherein the touch panel comprises a display screen displaying a plurality of icons corresponding to applications being executed on the information processing apparatus, and the information processing apparatus is configured to execute an operation for moving at least one of the plurality of icons based on an operation that requires contact by a finger for a predetermined period of time.

15. The information processing apparatus according to claim 1,

wherein the first controller is configured to associate a numerical password with the first information, and

wherein the memory is configured to store an association between the numerical password and the first information.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 8,982,086 C1
APPLICATION NO. : 90/014638
DATED : September 28, 2021
INVENTOR(S) : Masaaki Yamada

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

In the EX PARTE REEXAMINATION CERTIFICATE:

Column 2, Line 2 (Claim 10):
After "*the*", insert --*first*--.

Column 2, Line 6 (Claim 11):
After "*the*", insert --*first*--.

Column 2, Line 7 (Claim 11):
Delete "*include*", and insert --*correspond to*--.

Column 2, Line 12 (Claim 12):
After "*the*", insert --*first*--.

Column 2, Line 13 (Claim 12):
Delete "*include*", and insert --*correspond to*--.

Column 2, Line 15 (Claim 12):
After "*the*", insert --*first*--.

Column 2, Line 16 (Claim 12):
Delete "*include*", and insert --*correspond to*--.

Column 2, Line 21 (Claim 13):
After "*the*", insert --*first*--.

Column 2, Line 22 (Claim 13):
Delete "*include*", and insert --*correspond to*--.

Signed and Sealed this
Fourth Day of January, 2022

Drew Hirshfeld
Performing the Functions and Duties of the
Under Secretary of Commerce for Intellectual Property and
Director of the United States Patent and Trademark Office

Column 2, Line 25 (Claim 13):
After "*the*", insert --*first*--.

Column 2, Line 26 (Claim 13):
Delete "*include*", and insert --*correspond to*--.

EXHIBIT 5

maxell

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December 29, 2021

VIA EMAIL

Samsung Electronics Co., Ltd.
IP Center
416, Maetan 3-dong, Yeongtong-gu
Suwon-si, Gyeonggi-do, 443-742, Korea
Attn: Daejin Jeon
daejin.jeon@samsung.com

Re: Maxell's Smartphones, Tablets, Smartwatches, Streaming Devices, and Television Related Patents

Dear Jeon-san,

We write to follow-up from our prior email exchange of August 2021 when we had completed execution of the NDA and decided to setup a time for a teleconference. As a next step to continue our discussions, Maxell would like to setup a teleconference with Samsung in early 2022 relating to discussions over a patent license agreement for Maxell's patent portfolio, which covers various features of Samsung's smartphones, tablets, watches, televisions, and related hardware and software products.

While we work together to schedule a time for a teleconference, Maxell would like to call to your attention the following U.S. patents and allowed patent application that we believe are also being infringed by Samsung's smartphones, tablets, smartwatches, and related hardware and software products. These are in addition to the patents we identified previously.

No.	U.S. Pat. No.	Claims	Accused Product(s)	No.	U.S. Pat. No.	Claims	Accused Product(s)
1	RE 48,830	1-5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets	**12**	10,878,456	1, 11	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets

2	11,017,815	1-27	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets	**13**	10,911,661	1-17	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets
3	11,094,350	1-10	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, Book series tablets, Galaxy Watch, Active, Fit smartwatches	**14**	8,319,848	1, 2	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets
4	11,159,853	1, 6, 11	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets	**15**	10,432,876	1, 5	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets
5	11,140,438	1, 9, 14	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series	**16**	16/072,498 (allowed claims 8-21)	Claims will issue as 1-14	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book

			tablets				series tablets
6	11,026,088	1, 14, 15	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets	**17**	16/855,012 (allowed claims 2-5)	Claims will issue as 1-4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets, Galaxy Watch, Active, and Fit smartwatches
7	10,887,441	4	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets	**18**	16/686,467 (allowed claims 1, 2, 9, 11)	Claims will issue as 1, 2, 9, 11	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets
8	11,165,715	1-7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets	**19**	11,159,830	1, 8, 15, 23	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets
9	10,582,134	1, 8, 15	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab	**20**	11,086,422	1, 6, 8, 9	Galaxy Watch, Active, and Fit smartwatches

			A, Tab X, and Book series tablets				
10	10,909,435	1, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets	**21**	10,915,220	1, 7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets, Galaxy Watch, Active, and Fit smartwatches
11	7,835,543	1, 11	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets	**22**	8,471,950	1	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets

Further, to demonstrate the strength of Maxell's patents, I bring the following patents to your attention again. These patents were subject to *ex parte* reexamination proceedings at the request of Apple. I had provided notice of these patents in my previous letter but the developments in the *ex parte* reexamination proceedings show that the USPTO examined these patents a second time and issued reexamination certificates along with, where applicable, new claims after consideration of all the prior art that had been cited by licensees in prior cases. We continue to believe that these patents and the claims are infringed by Samsung's smartphones, tablets, and related hardware and software products:

U.S. Pat. No.	Reexam No.	Ex Parte Certificate Issuance Date	Claims	Accused Product(s)
8,982,086	90/014,638	Sep. 28, 2021	1-15	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets
7,203,517	90/014,631	Oct. 25, 2021	9-44	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, Book series tablets, Galaxy Watch, Active, and Fit smartwatches.
6,408,193	90/014,632	Oct. 29, 2021	1-7	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets
10,129,590	90/014,651	Nov. 15, 2021	1-25	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets
8,339,493	90/014,628	Notice of Intent to Issue Certificate mailed Dec. 9, 2021	1-14	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets
10,176,848	90/014,641	Examiner has indicated confirmation of claims 11, 12, 16, 17, 19, and 20 and indication of allowable subject matter for remaining claims in Final Office Action mailed Nov. 24, 2021	1-7, 9, 11-12, 14, 16-17, 19-33, 51-100	Galaxy A, S, Z, Note series phones; Galaxy Tab A, Tab X, Book series Galaxy Tab A, Tab X, and Book series tablets

We look forward to scheduling our teleconference.

Sincerely yours,



Tomonori HIRABAYASHI
Senior Manager
IP Innovation Business Unit
Maxell, Ltd.

EXHIBIT 6

US010176848B2

(12) **United States Patent**
Yoshida

(10) **Patent No.: US 10,176,848 B2**
(45) **Date of Patent: *Jan. 8, 2019**

(54) **RECORDING AND REPRODUCING APPARATUS AND METHOD THEREOF**

(71) Applicant: **Maxell, Ltd.**, Kyoto (JP)

(72) Inventor: **Mari Yoshida**, Yokohama (JP)

(73) Assignee: **MAXELL, LTD.**, Kyoto (JP)

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(Continued)

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(Continued)

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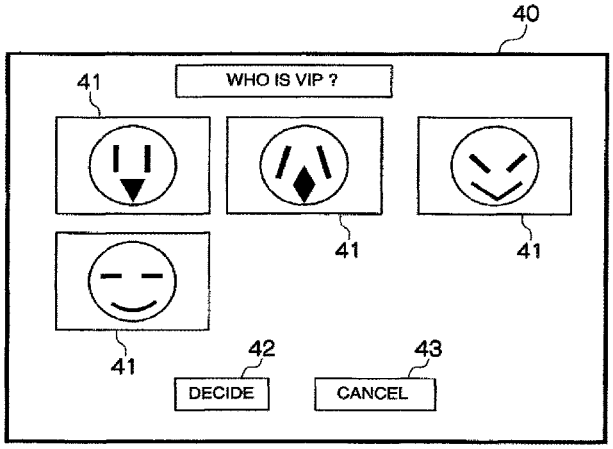
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Primary Examiner — Thai Q Tran
Assistant Examiner — Syed Hasan
(74) *Attorney, Agent, or Firm* — Mattingly & Malur, PC

(57) **ABSTRACT**

In a recording and reproducing apparatus and a recording and reproducing method for the recording and reproducing apparatus for recording and reproducing image information on a scene obtained through photographing, relative to a predetermined first recording medium and being capable of setting one or more chapters to each scene, a face recognizing process is executed for a photographed image based on the image information, an importance level of each chapter is set in accordance with a result of the face recognizing process for a very important person (VIP) set by a user, and each chapter having a relevant importance level among importance levels of respective chapters is selectively reproduced. A user can therefore find an object chapter and scene quickly and easily.

20 Claims, 12 Drawing Sheets



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H04N 5/78	(2006.01)
H04N 5/85	(2006.01)
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See application file for complete search history.

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FIG. 1

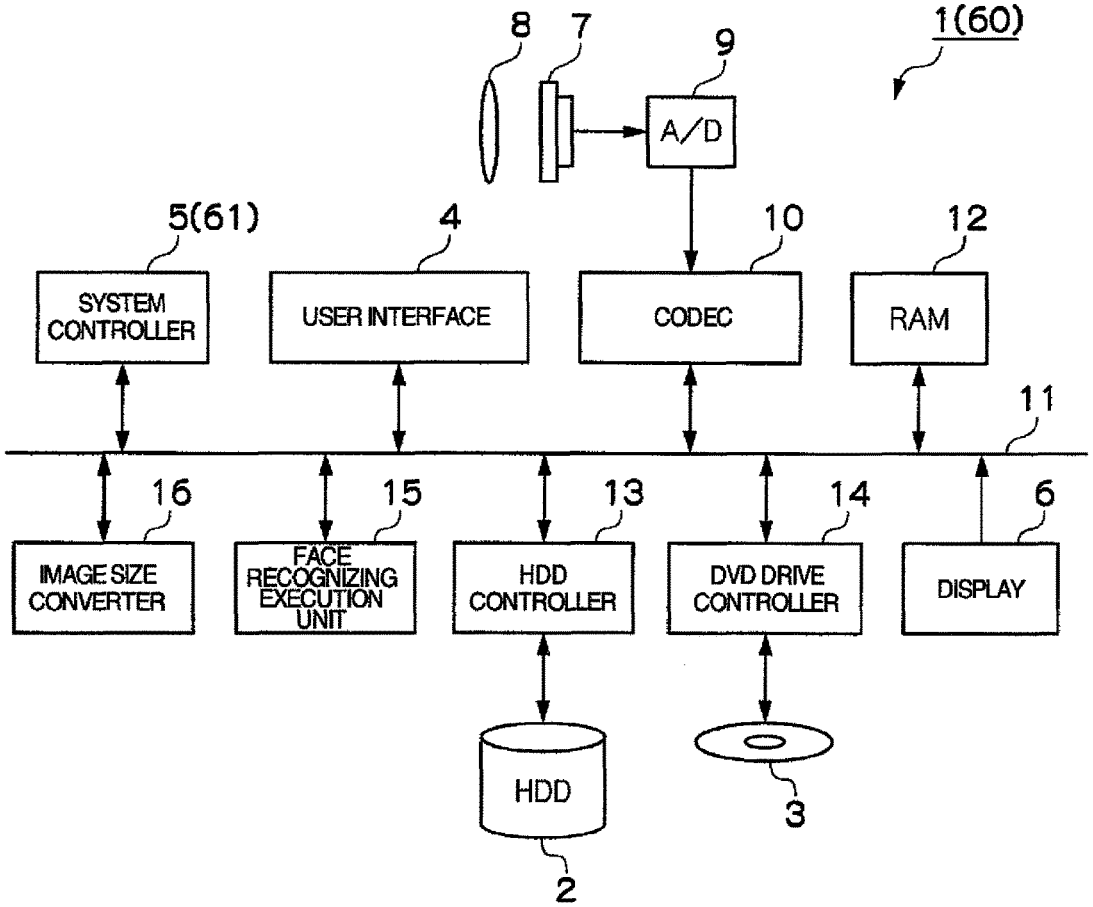

8
7
9
A/D
1(60)
5(61)
4
10
12
SYSTEM CONTROLLER
USER INTERFACE
CODEC
RAM
11
16
15
13
14
6
IMAGE SIZE CONVERTER
FACE RECOGNIZING EXECUTION UNIT
HDD CONTROLLER
DVD DRIVE CONTROLLER
DISPLAY
HDD
2
3

FIG. 2

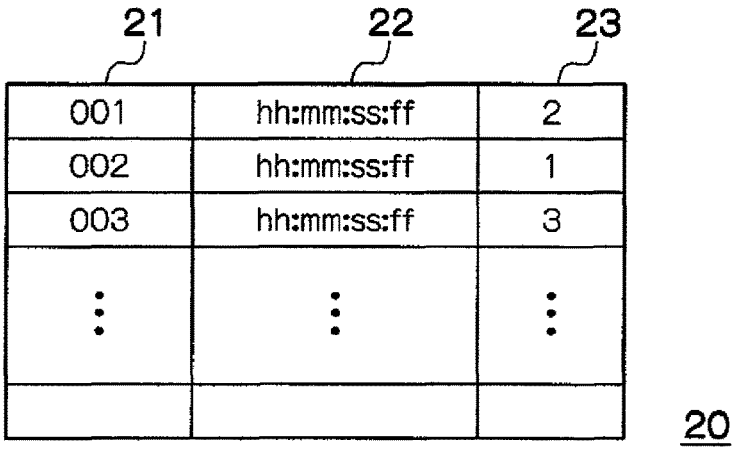

21
22
23
001
hh:mm:ss:ff
2
002
hh:mm:ss:ff
1
003
hh:mm:ss:ff
3
20

FIG. 3

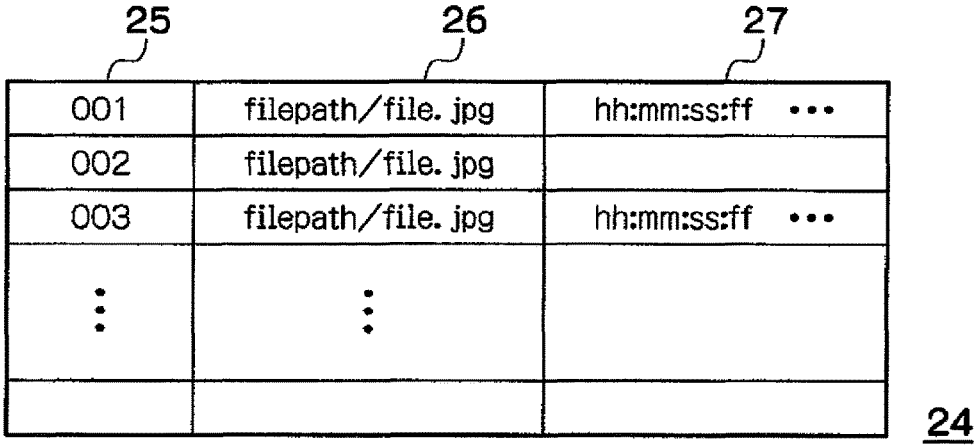

25
26
27
001
filepath/file. jpg
hh:mm:ss:ff
002
filepath/file. jpg
003
filepath/file. jpg
hh:mm:ss:ff
24

FIG. 4

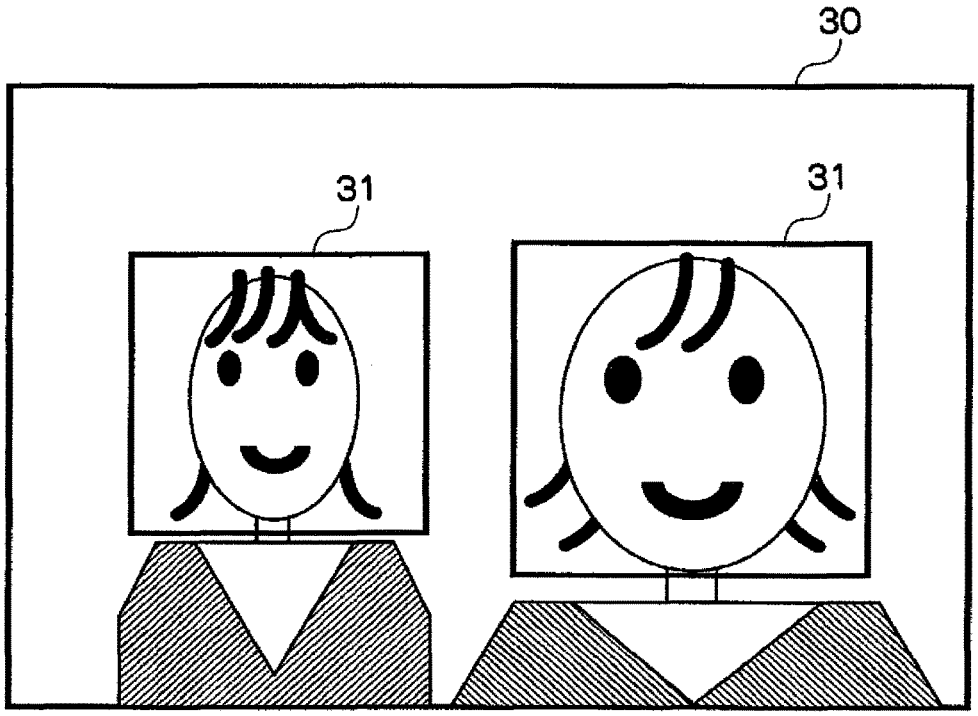


FIG. 5

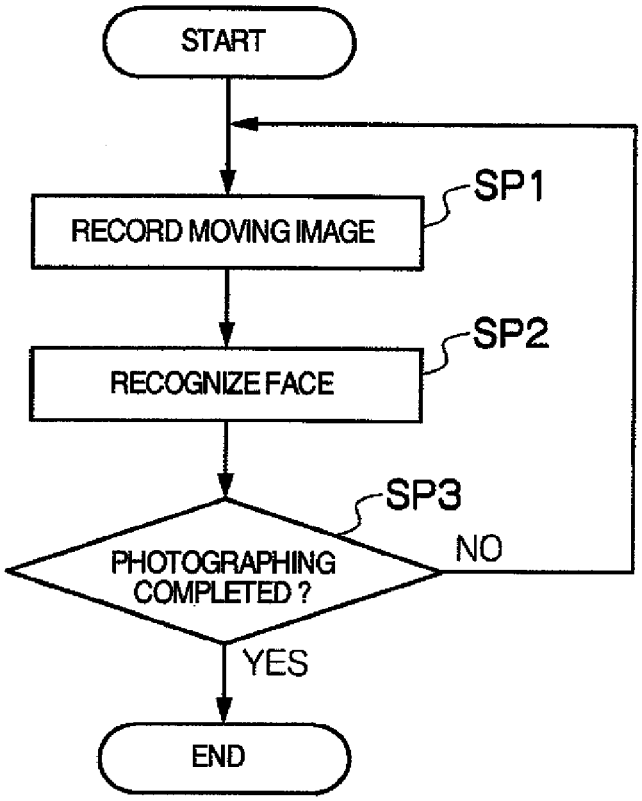

START
SP1
RECORD MOVING IMAGE
SP2
RECOGNIZE FACE
SP3
PHOTOGRAPHING COMPLETED ?
NO
YES
END

FIG. 6

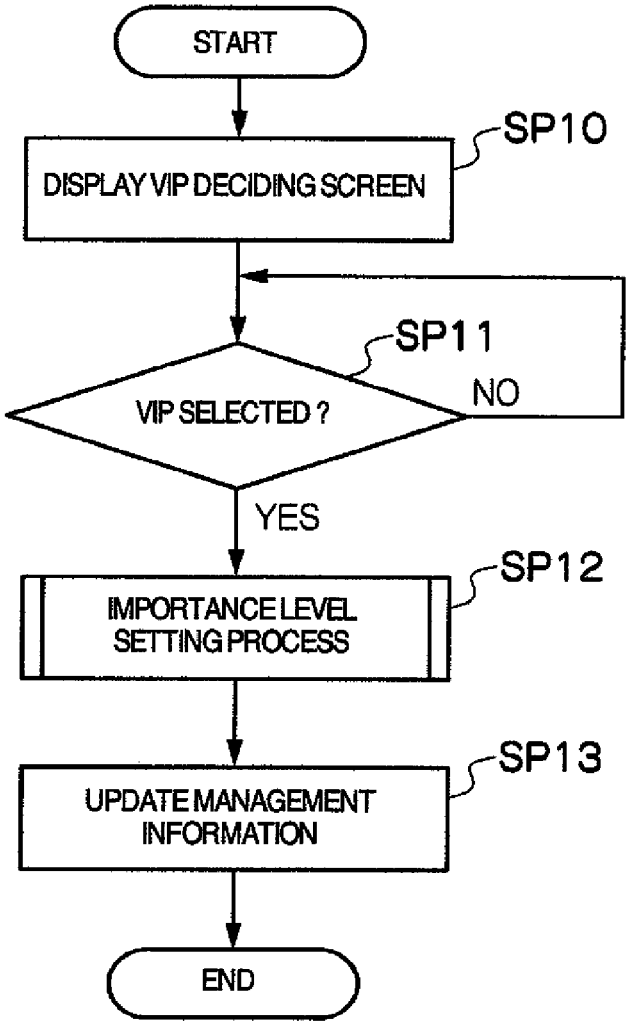

START
SP10
DISPLAY VIP DECIDING SCREEN
SP11
VIP SELECTED ?
NO
YES
SP12
IMPORTANCE LEVEL SETTING PROCESS
SP13
UPDATE MANAGEMENT INFORMATION
END

FIG. 7

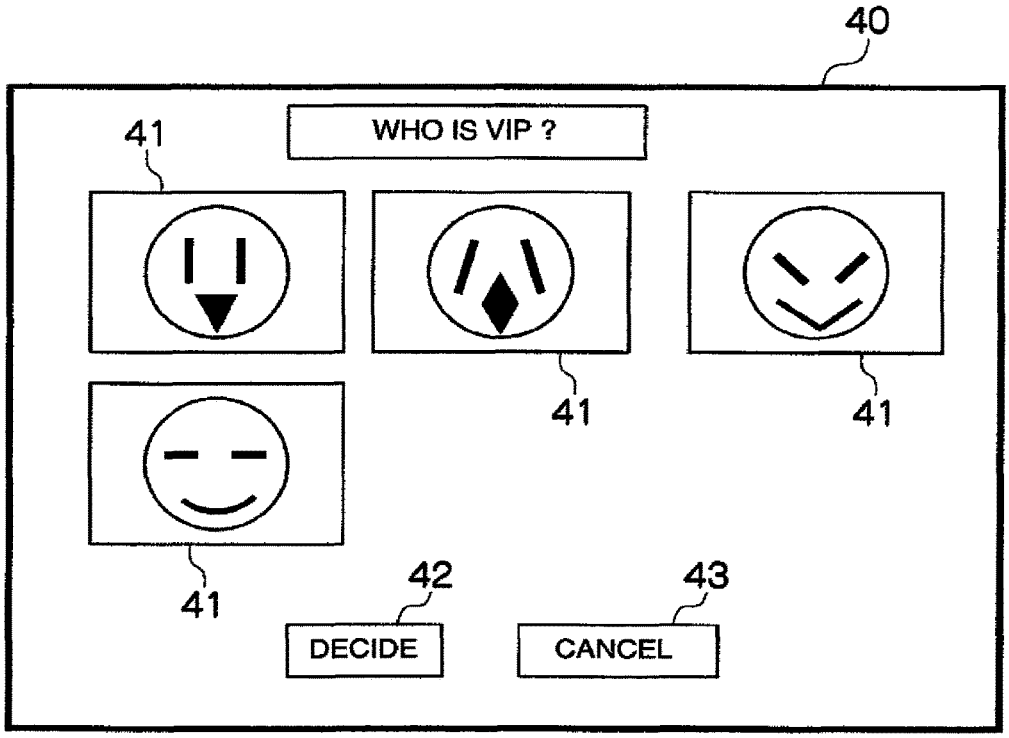


FIG. 8

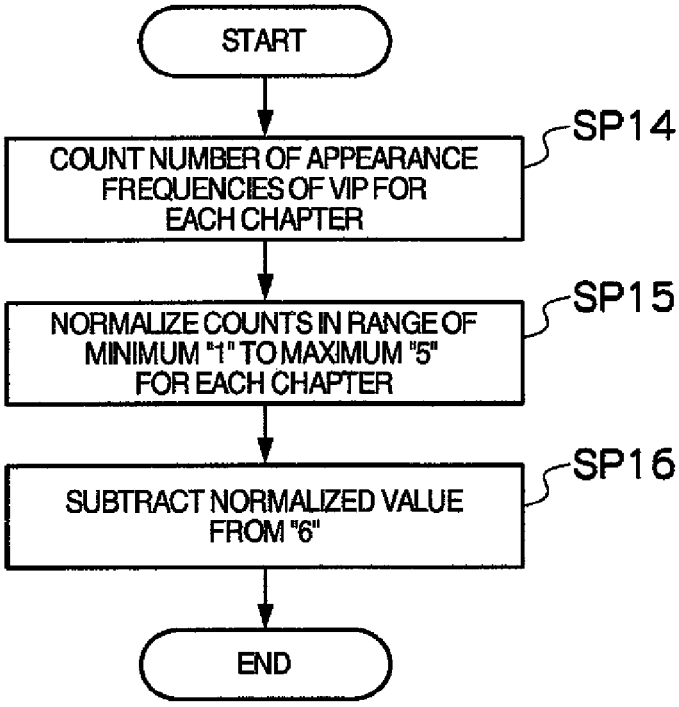


FIG. 9

CHAPTER ID	CHAPTER IMPORTANCE LEVEL
001	5
002	1
003	5
004	3
005	1
006	5
007	5
008	5
009	3

FIG. 10

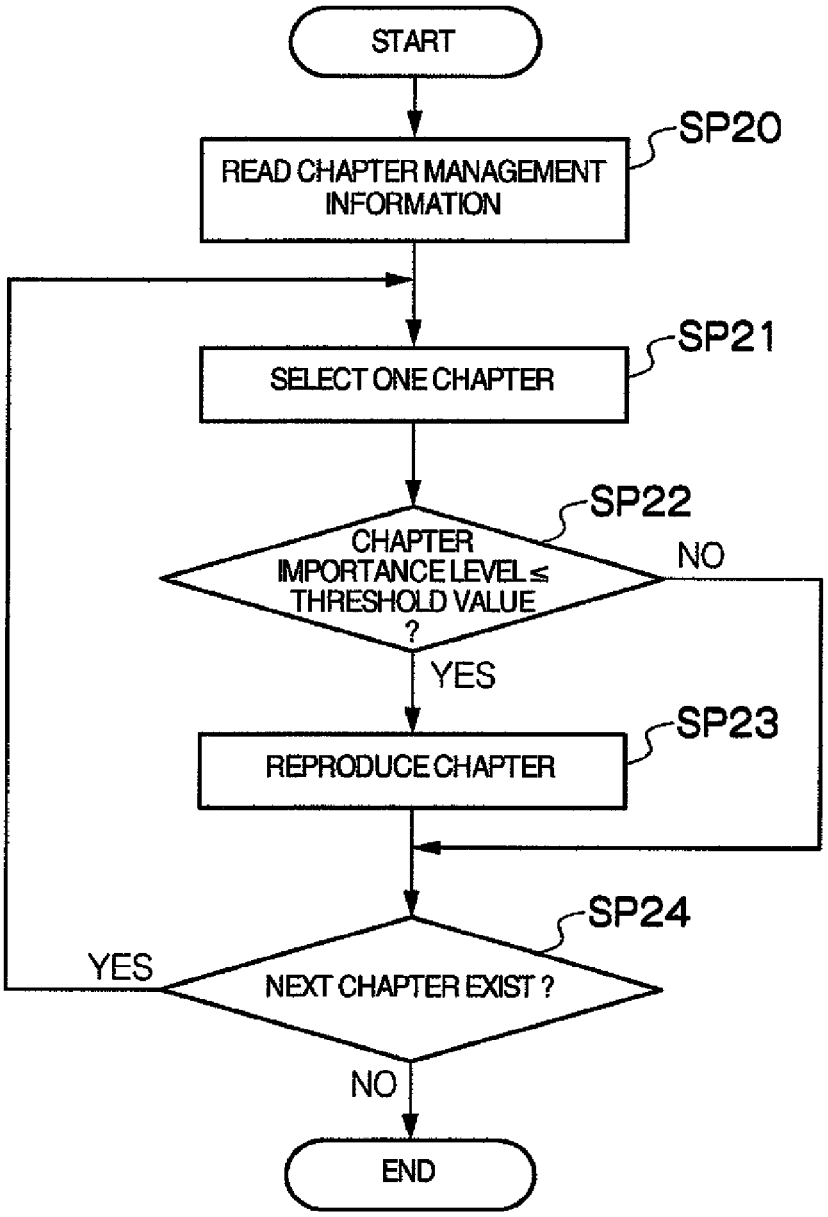

START
READ CHAPTER MANAGEMENT INFORMATION
SP20
SELECT ONE CHAPTER
SP21
CHAPTER IMPORTANCE LEVEL ≤ THRESHOLD VALUE ?
SP22
NO
YES
REPRODUCE CHAPTER
SP23
NEXT CHAPTER EXIST ?
SP24
YES
NO
END

FIG. 11

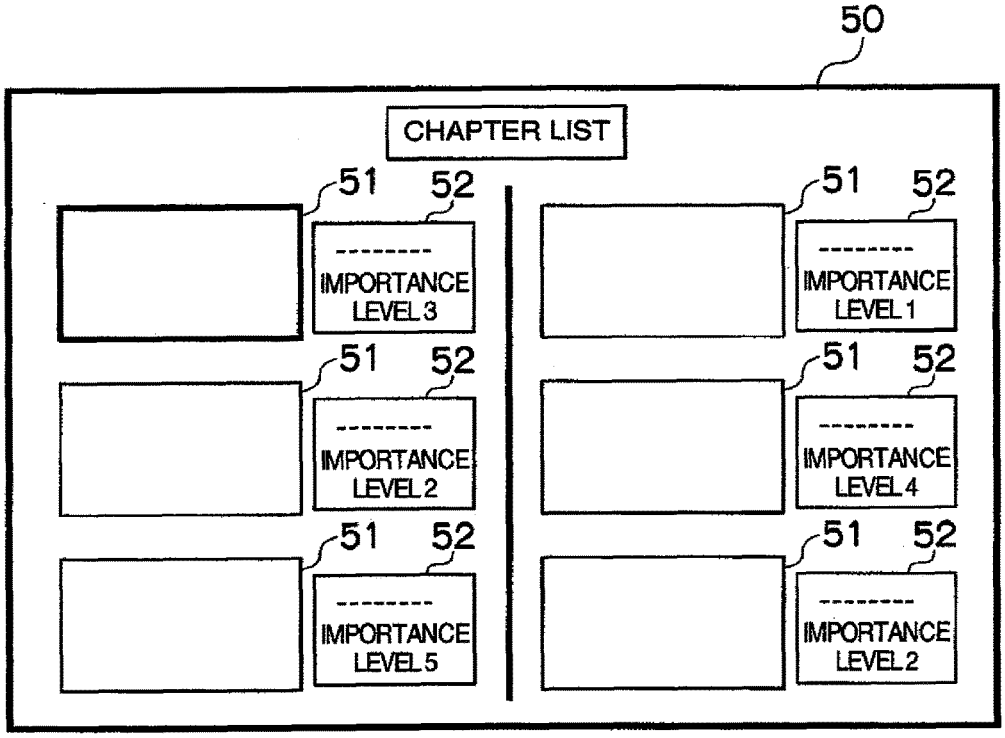

50
CHAPTER LIST
51
52
IMPORTANCE LEVEL 3
IMPORTANCE LEVEL 1
IMPORTANCE LEVEL 2
IMPORTANCE LEVEL 4
IMPORTANCE LEVEL 5
IMPORTANCE LEVEL 2

FIG. 12

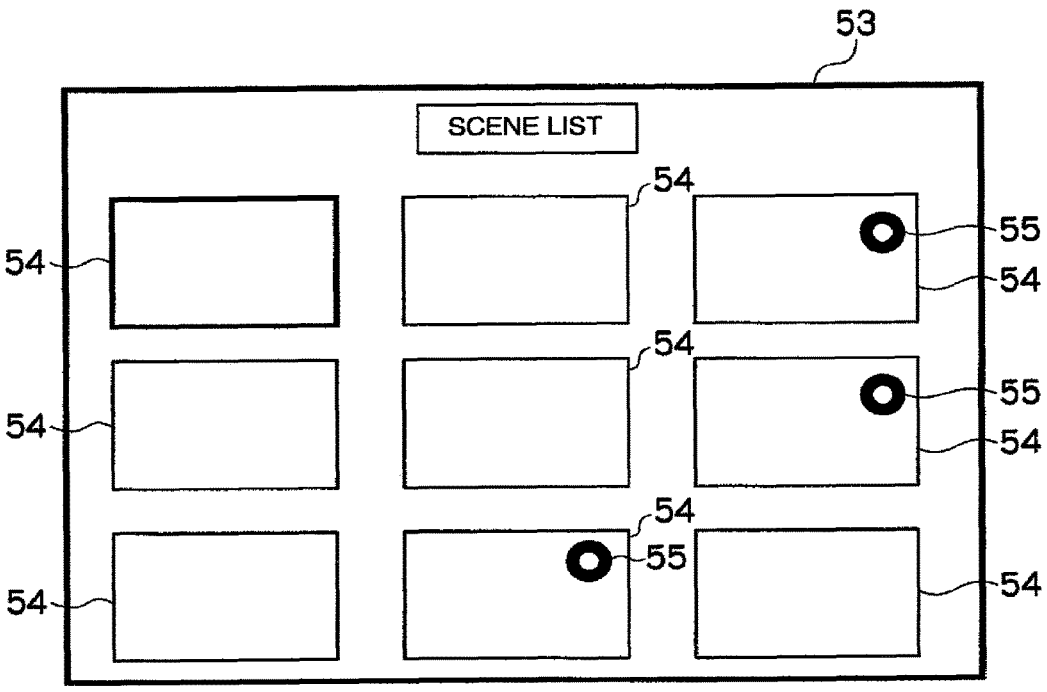


FIG. 13

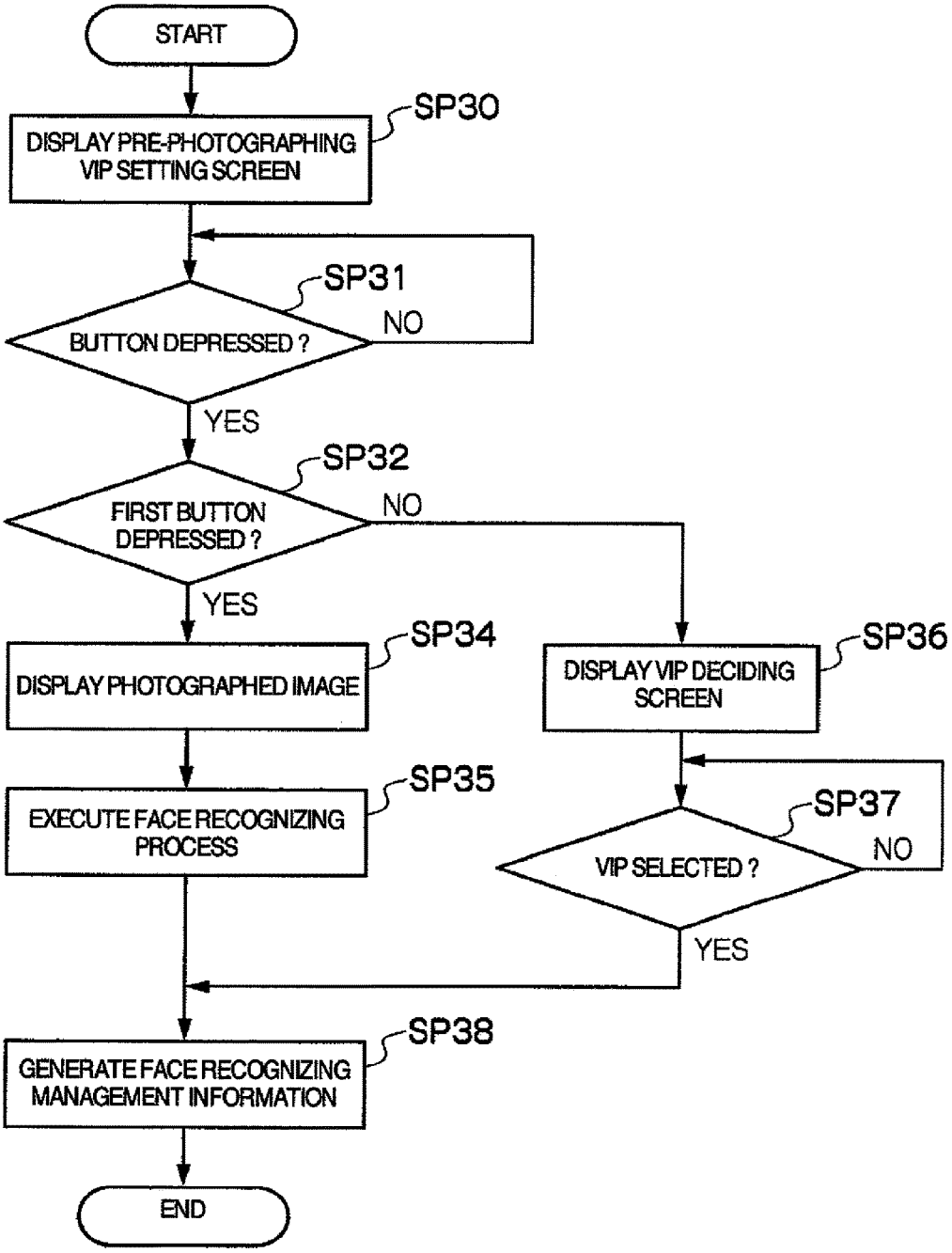

START
SP30
DISPLAY PRE-PHOTOGRAPHING VIP SETTING SCREEN
SP31
BUTTON DEPRESSED ?
NO
YES
SP32
FIRST BUTTON DEPRESSED ?
NO
YES
SP34
DISPLAY PHOTOGRAPHED IMAGE
SP35
EXECUTE FACE RECOGNIZING PROCESS
SP36
DISPLAY VIP DECIDING SCREEN
SP37
VIP SELECTED ?
NO
YES
SP38
GENERATE FACE RECOGNIZING MANAGEMENT INFORMATION
END

FIG. 14

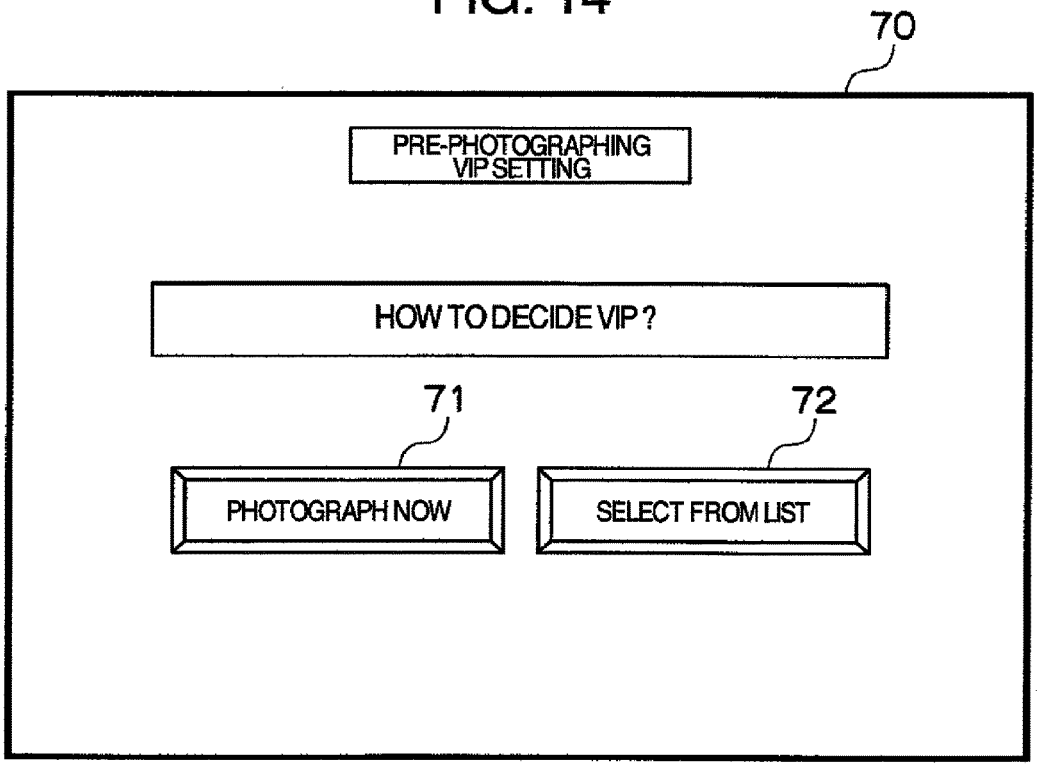
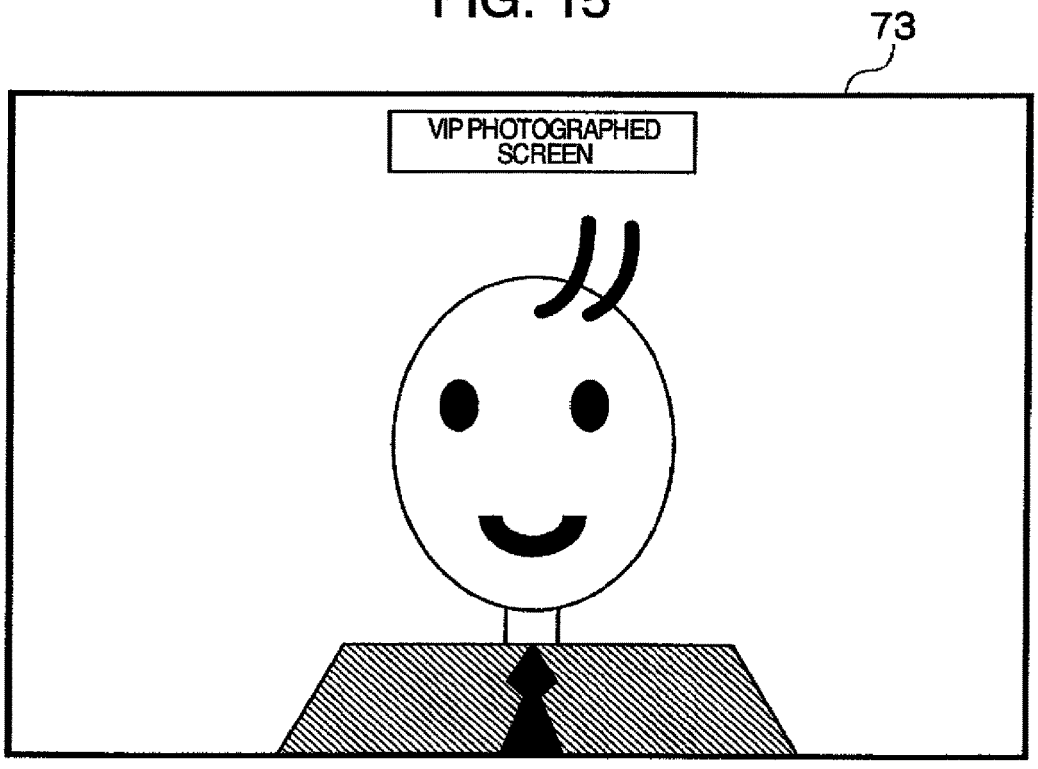

70
PRE-PHOTOGRAPHING VIP SETTING
HOW TO DECIDE VIP?
71
72
PHOTOGRAPH NOW
SELECT FROM LIST

FIG. 15


73
VIP PHOTOGRAPHED SCREEN

RECORDING AND REPRODUCING APPARATUS AND METHOD THEREOF

INCORPORATION BY REFERENCE

This application is a continuation of application Ser. No. 12/430,185, filed on Apr. 27, 2009, now pending, which claims the benefit of Japanese Application No. JP 2008-130678 filed on May 19, 2008, in the Japanese Patent Office, the disclosures of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates to a recording and reproducing apparatus and a recording and reproducing method, suitable for application to, e.g., a video camera.

In recent years, recording and reproducing apparatus are in widespread use which apparatus are compatible with randomly accessible recording media such as a digital versatile disc (DVD), a semiconductor memory and a hard disc drive (HDD). Such recording and reproducing apparatus can easily and quickly cue a photographed image recorded in a recording medium.

Of recording and reproducing apparatus of this type, for example, a general video camera manages generally video information of photographed images in the unit of scene, and cues each scene by using management information on each scene. A video camera of this type can set a plurality of chapters in one scene, and can cue each chapter.

A scene means a series of images recorded during a period from when a user depresses a record button to start photographing to when the user depresses again the record button to stop photographing. The number of scenes increases each time photographing is made upon depression of the record button. The chapter means a delimiter of images in one scene.

A user of a video camera can know quickly the contents of each scene by reproducing image information recorded in the recording medium by sequentially cuing each chapter.

However, if the number of chapters set in a scene is large, a user of the video camera is required to repeat a cue operation as many times as the number of chapters set in the scene, in order to confirm the contents to the last scene. There arises therefore a problem of much work and long time.

JP-A-06-165009 discloses techniques of efficiently knowing the contents of a scene by calculating a priority order of each frame from the type of button manipulation during photographing, and reproducing a frame having a higher priority order.

SUMMARY OF THE INVENTION

The capacity of a recording medium of a recent video camera is becoming large so that a scene photographed in a long time duration can be stored in the recording medium or scenes photographed a plurality of times can be stored in the recording medium. It is therefore difficult for a user to quickly find a target scene from a number of scenes recorded in the recording medium.

Some conventional recording and reproducing apparatus are equipped with a function of displaying a list of thumbnail images of scenes. However, this function displays only one thumbnail image per one scene so that a user feels difficult in some cases to know the whole contents of a scene photographed in a long time duration from one thumbnail image. Further, after a lapse of long time after photographing, it is difficult for a user to remember the whole contents of a scene from one corresponding thumbnail image.

If a user cannot remember the contents of a scene even if the thumbnail image is viewed, the user confirms the contents of the scene by reproducing the scene. If the contents of a long time scene is to be confirmed, it becomes necessary to provide a function of confirming quickly the whole contents of the scene by cuing each chapter. However, this function has not been proposed yet.

JP-A-06-165009 discloses techniques of calculating a priority order of each frame from the type of button manipulation during photographing, and when digest reproduction for knowing the contents of a scene is to be performed, reproducing a frame having a higher priority order. According to the techniques, however, a priority degree cannot be set to a scene photographed without button manipulation by a user. It cannot be said that the techniques are easy to use.

The present invention has been made in consideration of the above-described issues, and provides a recording and reproducing apparatus and a recording and reproducing method allowing a user to rapidly and easily find a target chapter or scene.

In order to settle these issues, the present invention provides a recording and reproducing apparatus capable of setting one or more chapters to each scene, comprising: a recording and reproducing unit for recording and reproducing image information on the scene obtained through photographing, relative to a predetermined first recording medium; a face recognizing execution unit for executing a face recognizing process for a photographed image based on the image information; an importance level setting unit for setting an importance level of each chapter in accordance with a result of the face recognizing process for a very important person (VIP) set by a user; and a control unit for controlling the recording and reproducing unit so as to selectively reproduce each chapter having a relevant importance level, among importance levels of respective chapters.

Accordingly, the recording and reproducing apparatus of the present invention can selectively reproduce a particular chapter in accordance with user settings, such as a chapter on which a VIP appears frequently.

The present invention provides further a recording and reproducing method for a recording and reproducing apparatus for recording and reproducing image information on a scene obtained through photographing, relative to a predetermined first recording medium and being capable of setting one or more chapters to each scene, the method comprising: a first step of executing a face recognizing process for a photographed image based on the image information; a second step of setting an importance level of each chapter in accordance with a result of the face recognizing process for a VIP set by a user; and a third step of selectively reproducing each chapter having a relevant importance level, among importance levels of respective chapters.

Accordingly, the recording and reproducing method of the present invention can selectively reproduce a particular chapter in accordance with user settings, such as a chapter on which a VIP appears frequently.

According to the present invention, a user can therefore find an object chapter and scene quickly and easily.

Other objects, features and advantages of the invention will become apparent from the following description of the embodiments of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram illustrating the structure of a video camera according to first and second embodiments.

FIG. **2** is a conceptual diagram illustrating an example of chapter management information.

FIG. **3** is a conceptual diagram illustrating an example of face recognizing management information.

FIG. **4** is a conceptual diagram illustrating an example of a photographed image when face recognizing is made valid.

FIG. **5** is a flow chart illustrating the sequence of a photographed image recording process.

FIG. **6** is a flow chart illustrating the sequence of a chapter importance level setting process.

FIG. **7** is a brief diagrammatic view illustrating an example of the layout of a VIP determining screen.

FIG. **8** is a flow chart illustrating the sequence of an importance level determining process.

FIG. **9** is a table illustrating an example of the chapter arrangement of an object scene and a chapter importance level set to each chapter.

FIG. **10** is a flow chart illustrating the sequence of a chapter selecting and reproducing process.

FIG. **11** is a brief diagrammatic view illustrating an example of the layout of a chapter list screen.

FIG. **12** is a brief diagrammatic view illustrating an example of the layout of a scene list screen.

FIG. **13** is a flow chart illustrating the sequence of a VIP setting process.

FIG. **14** is a brief diagrammatic view illustrating an example of a layout of a pre-photographing VIP setting screen.

FIG. **15** is a brief diagrammatic view illustrating an example of the layout of a VIP photographing screen.

DESCRIPTION OF THE EMBODIMENTS

Embodiments of the present invention will now be described with reference to the accompanying drawings.

(1) First Embodiment

(1-1) Structure of Recording and Reproducing Apparatus

In FIG. **1**, reference numeral **1** represents a video camera of the embodiment. The video camera **1** is a hybrid video camera equipped with a DVD drive (not shown) and a built-in hard disc drive **2**. A DVD **3** to be mounted on the DVD drive includes a plurality of types such as DVD-R, DVD-RW, DVD-RAM, DVD+R, DVD+RW and HD (High Definition)-DVD. The type of DVD **3** applicable to the video camera **1** is not specifically limited.

In the video camera **1**, a user interface **4** is constituted of various operation buttons, a touch panel adhered to a screen of a display **6** to be described later. In accordance with a user operation command input from the user interface **4**, a system controller **5** executes a corresponding control process to record a photographed image in the hard disc drive **2** and DVD **3** loaded in the DVD drive and to reproduce a photographed image recorded in the hard disc drive **2** and DVD **3** and display the reproduced image on the display **6**.

The system controller **5** is actually a microcomputer constituted of a central processing unit (CPU), an internal memory and the like. When a record button in the user interface **4** is depressed after a record mode is selected upon operation of the user interface **4**, the system controller **5** drives an image sensor **7** constituted of a charge coupled device (CCD), complementary metal oxide semiconductor (CMOS) transistors and the like.

An optical image of an object is converged by a lens **8** on an optical reception plane of the image sensor **7**. The image sensor **7** photoelectrically converts the optical image, and sends an obtained photographed image signal to an analog/digital converter **9**. The analog/digital converter **9** converts the analog photographed image signal into a digital image signal, and sends the obtained digital information to a compressor/decompressor (CODEC) **10**.

CODEC **10** transfers the supplied image information to the display **6** via a bus **11**. The display **6** may be a liquid crystal display, an organic EL display or the like, and displays a photographed image (through image) basing upon the supplied image information.

CODEC **10** encodes the supplied image information by a predetermined compression encoding method such as a Moving Picture Expert Group (MPEG) method, and stores the obtained encoded image information, and the image information not subjected to encoding, in a random access memory (RAM) **12** via the bus **11**.

Under control of the system controller **5**, the encoded image information stored in RAM **12** is thereafter read by a hard disc drive controller **13** or a DVD drive controller **14**, and recorded in the hard disc drive **2** or DVD **3**.

The image information stored in RAM **12** is read by a face recognizing execution unit **15**. The face recognizing execution unit **15** executes a predetermined face recognizing process for the photographed image corresponding to the image information, and supplies the recognition results to the hard disc drive controller **13** or DVD drive controller **14** storing the encoded image information, as face recognizing management information to be described later. In this manner, the face recognizing management information is recorded in the hard disc drive **2** or DVD **3**, in correspondence with the encoded image information.

When a reproduction button of the user interface **4** is depressed after a reproduction mode is selected upon operation of the user interface **4**, the system controller **5** controls a corresponding one of the hard disc drive controller **13** and DVD drive controller **14** to make the hard disc drive controller **13** or DVD drive controller **14** read and transmit the encoded image information to CODEC **10** via the bus **11**.

Under control of the system controller **5**, CODEC **10** executes a predetermined decoding process for the encoded image information supplied from the hard disc drive controller **13** or DVD drive controller **14**, and transmits the obtained reproduced image information to the display **6** via the bus **11**. In this manner, a reproduced image corresponding reproduced image information is displayed on the display **6**.

An image size converter **16** is also connected to the bus **11**. Under control of the system controller **5**, the image size converter **16** extracts image information on a start frame of each scene and image information on a start frame of each chapter, from the image information stored in RAM **12** and image information read from the hard disk drive **2** or DVD **3** and decoded by CODEC **10**, for example, during photographing. The image size converter **16** converts the extracted image information into image information on thumbnail images of predetermined sizes, and stores the image information on the thumbnail images of a start frame of the scene and a start frame of each chapter in the hard disc drive **2** or DVD **3** storing the encoded image information on the scene, in correspondence with the scene.

It is assumed that the video camera **1** has other hardware and functions of a general video camera, such as light emitting diodes (LED's) for turning on during power-on,

charging, access to the hard disc drive **2** or DVD **3**, or the like, and batteries for supplying power to each circuit or the like.

In the following description, it is assumed that a photographed image is recorded in the hard disc drive **2** during photographing, and the photographed image is dubbed in DVD **3** after photographing. However, a photographed image may be recorded in DVD **3** during photographing, and the photographed image is dubbed in the hard disc drive **2** after photographing.

(1-2) Scene Management Information

During photographing with the video camera **1**, encoded image information as well as management information of each scene (hereinafter called scene management information) is recorded in the hard disc drive **2**. The scene management information is constituted of information for managing a scene such as chapter management information and face recognizing management information. The chapter management information includes information on a position, length, importance level, summary and the like of a start frame of each chapter. The face recognizing management information includes information on a position of a frame on which a face recognized by the face recognizing execution unit appears during photographing, an expression and size of the face on the frame, and the like.

FIG. **2** illustrates an example of the chapter management information. The chapter management information **20** illustrated in FIG. **2** is constituted of chapter ID information **21**, start frame position information **22** and chapter importance level information **23**, respectively of each chapter set in a scene.

The chapter ID information **21** is information representative of a unique ID given to each chapter (hereinafter called a chapter ID), and the start frame position information **22** is information representative of a position (hour, minute, second and frame number) of a start frame of the corresponding chapter. The chapter importance level information **23** is information representative of an importance level set to the corresponding chapter (herein after called a chapter importance level). The details of the chapter importance level will be described later. Under control of the system controller **5**, the chapter management information **20** is stored in the hard disc drive **2** in correspondence with the encoded image information of the scene.

FIG. **3** illustrates an example of the face recognizing management information. The face recognizing management information **24** illustrated in FIG. **3** is constituted of face ID information **25** for each face recognized in the corresponding scene, path/file name information **26** and frame position information **27**.

The face ID information **25** is information representative of a unique ID given to each face recognized by the face recognizing execution unit **15** (hereinafter called a face ID), and the path/file name information **26** is information representative of a path to the image file of an image of a corresponding face (hereinafter called a face image) or a file name of the image file. A face image to be stored in the image file may be an image captured when the person is recognized first in a frame, or an image capturing the best expression of the person in the scene after distinguishing a good expression such as smile during the face recognizing process.

The frame position information **27** is information representative of a frame position (hour, minute, second and frame number) where a corresponding face is recognized. The frame position information **27** includes all frame positions on which a corresponding face appears. Therefore, the number of frame positions contained in the frame position information **27** becomes larger the larger the number of times when the face (person) appears on the scene. A type of a face expression in a frame may be recorded in correspondence with each frame position.

As described above, the face recognizing execution unit **15** stores the face recognizing management information **24** in the hard disc drive **2** in correspondence with the encoded image information of a photographed image recorded at that time.

(1-3) Chapter Importance Level Setting Method

FIG. **4** illustrates an example of an image photographed by setting a face recognizing function "valid" and displayed on the display **6**. As the face recognizing function of the video camera **1** is set "valid", a rectangular frame **31** is displayed in a photographed image **30** displayed on the display **6**, surrounding a face of a person detected by the face recognizing function. As the face recognizing function is set "invalid", this frame **31** is not displayed.

FIG. **5** illustrates the contents of a process (hereinafter called a photographed image recording process) of recording an image photographed by setting the face recognizing function "valid" in the hard disc drive **2**, to be executed by the system controller **5**. The system controller **5** executes the photographed image recording process illustrated in FIG. **5** in accordance with a corresponding control program stored in the internal memory.

More specifically, as the record button of the user interface **4** is depressed after the record mode is selected, the system controller **5** starts the photographed image recording process. First, the analog/digital converter **9** and CODEC **10** are controlled to store image information of the photographed image and encoded image information in RAM **12**, and the hard disc drive controller **13** is controlled to read the encoded image information of one frame from RAM **12** and store the read encoded image information in the hard disc drive **2** (Step SP**1**).

Next, the system controller **5** controls the face recognizing execution unit **15** to read from RAM **12** the image information of the same frame as the frame whose encoded image information was read from RAM **12** by the hard disc drive controller **13** at Step SP**1** and execute the face recognizing process for the photographed image corresponding to the image information (Step SP**2**).

In this case, for example, the face recognizing execution unit **15** executes the face recognizing process by template matching, for example, using an average face. However, if a user forms a VIP list registering VIP's before photographing, the face recognizing process may be executed by template matching using the VIP list. After the face recognizing process is completed, the face recognizing execution unit **15** reflects the results of the face recognizing process upon the face recognizing management information described with reference to FIG. **3** (updating the face recognizing management information).

Next, the system controller **5** judges whether encoded image information of all frames obtained through photographing has been recorded in the hard disc drive **2** (Step SP**3**). If this judgment is negated, the flow returns to step SP**1**, and the system controller **5** repeats similar processes (SP**1** to SP**3**, to SP**1**).

If the judgment is affirmed at Step SP**3** after the encoded image information of all frames obtained through photo-

graphing is recorded in the hard disc drive **2**, the system controller **5** terminates the photographed image recording process.

The face recognizing process at Step SP**2** of the photographed image recording process may be executed for each frame as described above, or may be executed once for several frames. As the face recognizing process is executed once for several frames, a process load on the face recognizing execution unit **15** can be reduced.

A function (hereinafter called a post-photographing face recognizing function) may be provided allowing a face recognizing process to be executed for an image already photographed by setting the face recognizing function "invalid", through operation of a menu or the like. The face recognizing management process similar to that illustrated in FIG. **3** can be obtained by this function. With this post-photographing face recognizing function, a chapter importance level can be set using the face recognizing function as will be described later, even for a scene photographed with another video camera without the face recognizing function. This is very convenient for a user.

Next, description will be made on a method of determining an importance level of each chapter in one scene in accordance with the results (face recognizing management information **24** (FIG. **3**)) of the face recognizing process obtained in the manner described above.

It is assumed in the following that at least one chapter is set in each scene. A chapter forming method includes a method of making a user manually determine the position of each chapter, a method of automatically setting the position of each chapter where a luminance change is large in the scene, a method of automatically setting chapters at equal pitch of several minutes to several ten minutes, and other methods. In this embodiment, a chapter may be set by any one of these methods.

FIG. **6** illustrates the process contents of the system controller **5** regarding a chapter importance level setting function of setting an importance level of each chapter in a scene. As the user interface **4** is operated and a first screen display request is input, the system controller **5** executes a chapter importance level setting process illustrated in FIG. **6**, in accordance with a corresponding program stored in the internal memory (not shown).

More specifically, upon input of the first screen display request, the system controller **5** reads first the chapter management information **20** (FIG. **2**) and face recognizing management information **24** (FIG. **3**), stored in the hard disc drive **2**, of a scene to be processed at that time (hereinafter called an object scene), and displays a VIP deciding screen **40** illustrated in FIG. **7** on the display **6**, by using the chapter management information **20** and face recognizing management information **24** (Step SP**10**).

The VIP deciding screen **40** is a screen to be used for a user to decide a VIP in the object scene. The VIP deciding screen **40** displays face images **41** of all persons recognized during photographing the object scene. Each face image **41** is displayed in accordance with image data read from the image file identified by a corresponding path/file name information **26** (FIG. **3**) in the face recognizing management information **24** described with reference to FIG. **3**.

A user can select a VIP from the face images **41** of persons displayed on the VIP deciding screen **40**. A plurality of VIP's may be selected. Faces of objects having a high appearance frequency such as family members may be registered beforehand in the video camera **1** as a VIP list, and the faces of only the registered persons are displayed on the VIP deciding screen **40**. In this manner, since the face of a person not associated with the object and photographed in the background is not displayed, it becomes easy for a user to decide a VIP.

After the face image **41** of the person desired to be set as a VIP is selected by a predetermined operation, the user depresses a "decide" button **42** to register the selected person as a VIP. If an operation of deciding the chapter importance level is desired to be terminated, a "cancel" button **43** is depressed. If it is arranged in such a manner that a user can set whether such a VIP list is always used or not, user-friendliness of the video camera **1** can be improved.

Next, the system controller **5** stands by until a VIP is decided using the VIP deciding screen **40** (Step SP**11**). As the user decides a VIP, an importance level of each chapter of the object scene is determined in accordance with the decided VIP (Step SP**12**).

The system controller **5** reflects the importance level of each chapter decided at Step SP**12** upon the chapter management information **20** described with reference to FIG. **2** (Step SP**13**), to thereafter terminate the chapter importance level setting process.

FIG. **8** illustrates the specific process contents of the system controller **5** in the chapter importance level setting process at Step SP**12**.

In the chapter importance level setting process at Step SP**12**, the system controller **5** starts the importance level setting process. First, the number of appearance frequencies of the VIP decided by the user using the VIP deciding screen **40** (FIG. **7**) is counted for each chapter of the object scene (Step SP**14**).

More specifically, the system controller **5** prepares counters corresponding in number to the number of chapters in the scene, on the inner memory of the system. The system controller **5** reads the positions of all frames on which the VIP decided by the user using the VIP deciding screen **40** appears, from the face recognizing management information **24** (FIG. **3**), by using a face ID of the VIP, and judges to which chapter each frame belongs, by referring to the chapter management information **20** (FIG. **2**). In accordance with the judgment results, the system controller **5** increments by "1" the count of the counter corresponding to the chapter to which the frame belongs, for each frame on which the VIP appears. The system controller **5** executes these processes for all VIP's decided by the user using the VIP deciding screen **40**.

Next, the system controller **5** normalizes the counts of the counters in a range from "1" to "5" (Step SP**15**), and decides a value obtained by subtracting each normalized value from "6", as an importance level of each chapter corresponding to the counter (Step SP**16**).

With these processes, the highest chapter importance level of "1" is set to the chapter on which the VIP appears most frequently, and the lowest chapter importance level of "5" is set to the chapter on which the VIP appears least frequently. Thereafter, the system controller **5** terminates this importance level deciding process and returns to the chapter importance level setting process.

If a user selects a plurality of VIP's on the VIP deciding screen **40**, the chapter importance levels may be weighted to allow the user to set more important persons. User-friendliness of the video camera **1** can therefore be improved further.

(1-4) Reproducing Method Using Chapter Importance Level

Next, description will be made on an object scene reproducing method basing upon the chapter importance level of

each chapter set in the manner described above. It is assumed in the following description that the chapter importance level is set in five steps, "1" being the highest chapter importance level, and "5" being the lowest chapter importance level. In the following, the chapter importance levels are distinguished for the purposes of convenience by calling the chapter importance level "1" superexpress, the chapter importance level "3" express, and the chapter importance level "5" standard.

FIG. **9** illustrates an example of the chapter structure of an object scene and a chapter importance level set to each chapter. In the example illustrated in FIG. **9**, the object scene is divided into nine chapters having chapter ID's of "001" to "009". The chapter importance level "1" is set to two chapters having the chapter ID's "002" and "005", the chapter importance level "3" is set to two chapters having the chapter ID's "004" and "009", and the chapter importance level "5" is set to the remaining chapters having the chapter ID's "001", "003", "006" to "008".

In this example, as reproduction is performed by selecting as a reproducing mode a "standard reproducing mode" from the menu, all chapters are sequentially reproduced in an order of smaller chapter ID, irrespective of the chapter importance level set to each chapter. Namely, in the "standard reproducing mode", the chapters having the chapter importance level "5" or smaller (the chapters having the chapter importance levels "1" to "5", i.e., all chapters) are reproduced in this mode of the embodiment.

Further, as a user starts reproducing by selecting as the reproducing mode an "express reproducing mode", the video camera **1** reproduces first the chapter having the chapter importance level "1" and chapter ID "002", then the chapter having the chapter importance level "3" and the chapter ID "004", and next the chapter having the chapter importance level "1" and the chapter ID "005". Lastly, the video camera **1** reproduces the chapter having the importance level **3** and the chapter ID "009" to thereafter terminate scene reproducing. Namely, in the express reproducing mode", only the chapters having the chapter importance level "3" or smaller (only the chapters having the importance levels "1" to "3") are reproduced. Therefore, as cue skipping is performed during reproducing in the "express reproducing mode", reproducing starts from the start frame of the next chapter having the chapter importance level "3" or smaller.

Furthermore, as a user starts reproducing by selecting as the reproducing mode a "superexpress reproducing mode", the video camera **1** reproduces first the chapter having the chapter importance level "1" and chapter ID "002", then the chapter having the chapter importance level "1" and the chapter ID "005" to thereafter terminate scene reproducing. Namely, in the "super express reproducing mode", only the chapters having the chapter importance level "1" are reproduced.

Therefore, the video camera **1** reproduces always the chapter having the chapter importance level "1" as any of the reproducing modes is selected, and each of other chapters is reproduced only when the reproducing mode is selected reproducing the chapter having the chapter importance level same as or smaller than that set to each of other chapters.

By utilizing this function (hereinafter called a chapter select reproducing function), the superexpress reproducing mode is used for confirming roughly the contents of the object scene, and at the stage when reproducing comes near the images whose contents are desired to be confirmed in detail, the reproducing mode is switched to the standard reproducing mode. In this manner, the contents of the object scene can be confirmed efficiently and conveniently. The superexpress reproducing mode is very convenient for a user desiring to confirm the contents of a scene in short time.

FIG. **10** illustrates the process contents of the system controller **5** regarding the chapter select reproducing function. The system controller **5** executes the chapter select reproducing process illustrated in FIG. **10** in accordance with a control program stored in the internal memory.

Namely, as a reproducing operation start command is input after the "standard reproducing mode", "express reproducing mode" or "superexpress reproducing mode" is selected, the system controller **5** starts the chapter select reproducing process to first read the chapter management information of the object scene from a corresponding hard disc drive **2** or DVD **3** (Step SP**20**).

Next, in accordance with the ID information contained in the chapter management information, the system controller **5** selects the first chapter (e.g., the chapter having the smallest chapter ID) (Step SP**21**), and judges whether the chapter importance level of the chapter is a predetermined threshold value or smaller set to the present reproducing mode (Step SP**22**). The threshold value is "5" if the "standard reproducing mode" is set, "3" if the "express reproducing mode" is set, and "1" if the "superexpress reproducing mode" is set.

If a judgment at Step SP**22** is negated, the flow advances to Step S**24**, whereas if the judgment is affirmed, the system controller **5** controls CODEC **10** to reproduce the chapter and display the reproduced image on the display (Step SP**23**).

Next, the system controller **5** refers to the chapter management information to judge whether the chapter next to the chapter selected at Step SP**21** exists (Step SP**24**). If this judgment is affirmed, the flow returns to Step SP**21** to repeat similar processes by sequentially switching the chapter to be selected at Step SP**21** (Steps SP**21** to SP**24**, to SP**21**).

As the processes at Steps SP**21** to SP**24** are completed for all chapters and the judgment at Step SP**24** is negated, the system controller **5** terminates the chapter select reproducing process.

Next, description will be made on an approach to making a user to easily confirm the chapter importance level set to each chapter in a scene.

FIG. **11** illustrates a chapter list screen **50** displayed on the display **6** by a user menu operation. For each chapter of an object scene, a thumbnail image **51** set to the chapter, and chapter management information **52** such as a lapse time from the scene start, a chapter importance level and the like, are displayed on the chapter list screen **50**.

More practically, when a display command for the chapter list screen **50** is input by operating the user interface **4**, the system controller **5** controls a corresponding hard disc drive controller **13** or DVD drive controller **14** to read from the hard disc drive **2** or DVD **3** the chapter management information **20** (FIG. **2**) of the object scene, and the image information on the thumbnail image **51** of the start frame of each chapter stored in correspondence with the object scene. Then, the system controller **5** operates to display the thumbnail image **51** of the start frame of each chapter on the chapter list screen **50** in accordance with the read image information, and display the management information **52** of each chapter based on the chapter management information **20**, on the chapter list screen **50**, in correspondence with the thumbnail image **51**.

In this manner, a user can know the chapter having a high chapter importance level from the chapter list screen **50**, and can find an important image quickly.

Next, description will be made on an approach to making a user easily confirm a scene set with a chapter importance level.

FIG. **12** illustrates a scene list screen displayed on the display by a user menu operation. A thumbnail image **54** of each scene stored in the hard disc drive **2** or DVD **3** is displayed on the scene list screen **53**.

More practically, when a display command for the scene list screen **53** is input by operating the user interface **4**, the system controller **5** controls a corresponding hard disc drive controller **13** or DVD drive controller **14** to read from the hard disc drive **2** or DVD **3** the image information on the thumbnail image **54** of the start frame of every scene stored in the hard disc drive **2** or DVD **3** designated by the user. Then, the system controller **5** operates to display the thumbnail image **54** of the start frame of each scene on the scene list screen **53**, in accordance with the read image information.

In this case, the system controller **5** refers to the chapter management information **20** (FIG. **2**) of each scene, and displays an icon **55** having a predetermined shape on the thumbnail image **54** of the scene set with the chapter importance level.

It is therefore possible for a user to judge from the icon **55** whether a chapter importance level is set to the scene for example, to be reproduced. The contents of the scene displayed with the icon **55** can be confirmed efficiently by immediately performing a reproducing operation by the reproducing method using the chapter importance level as described above. For the scene not displayed with the icon, the chapter importance level setting process is executed before the reproduction operation so that the reproducing operation by the above-described reproducing method can be performed.

(1-5) Scene Dubbing Process

Next, description will be made on a process of dubbing encoded image information recorded in the hard disc drive **2** into DVD **3**.

When the scene set with the chapter importance level is dubbed from the hard disc drive **2** into DVD **3** in the video camera **1**, the system controller **5** copies not only the encoded image information and scene management information (chapter management information **20** (FIG. **2**) and face recognizing management information **24** (FIG. **3**) but also an image file of face images of faces registered in the face recognizing management information **24** contained in the scene management information, into DVD **3**. Therefore, even if the encoded information in the hard disc drive **2** is erased, reproducing using a chapter importance level and re-setting a chapter importance level can be performed immediately.

(1-6) Effects of the Embodiment

According to the video camera of the embodiment described above, the chapter importance level of each chapter can be set basing upon the results of the face recognizing process executed during photographing. It is therefore possible for a user to quickly find a chapter on which an object person (VIP) appears frequently. Further, a chapter having a relevant chapter importance level is selectively reproduced, among chapter importance levels of respective chapters, so that a user can confirm the whole contents of the scene easily and in short time and can find an object scene quickly. In this manner, user-friendliness of the video camera **1** can be improved considerably.

(2) Second Embodiment

In FIG. **1**, reference numeral **60** represents a video camera of the second embodiment. The video camera **60** of the second embodiment is configured like the video camera **1** of the first embodiment, excepting that the chapter importance level setting method is different from that of the first embodiment.

Namely, in the first embodiment, a user decides a VIP by using the VIP deciding screen **40** (FIG. **7**) after photographing, and in accordance with the decision, a chapter importance level of each chapter is set. In contrast, in the second embodiment, the face recognizing process is executed only for a VIP decided by a user before photographing, and in accordance with the results of the face recognizing process, a chapter importance level of each chapter is set.

FIG. **13** illustrates the process contents of the system controller regarding a VIP setting process for a user to set a VIP before photographing, in the chapter importance setting method of the second embodiment. The system controller **61** executes the VIP setting process in accordance with a control program stored in the inner memory (not shown).

Namely, when a VIP setting mode is selected by operating the user interface **4**, the system controller **61** starts the VIP setting process to first display a pre-photographing VIP setting screen **70** illustrated in FIG. **14** on the display **6** (Step SP**30**).

Next, the system controller **61** stands by until one of first and second VIP deciding method select buttons **71** and **72** displayed on the pre-photographing VIP setting screen **70** (Step SP**31**) is depressed. The first VIP deciding method select button **71** is a button corresponding to a mode of preparing for photographing a VIP, and the second VIP deciding method select button **72** is a button corresponding to a mode of deciding a VIP among persons recognized during photographing already performed, similar to the first embodiment.

As one of the first and second VIP deciding method select buttons **71** and **72** is depressed, the system controller **61** judges whether the depressed button is the first VIP deciding method select button **71** (Step SP**32**).

As this judgment is affirmed, the system controller **61** drives the image sensor **7**, analog/digital converter **9** and CODEC **10** to display an image illustrated in FIG. **15** and photographed at that time by a user, on the display **6** (Step SP**34**). In this case, the user photographs a VIP to be registered with the video camera **60**.

Next, during photographing a VIP, the system controller **61** drives the face recognizing execution unit **15** to execute the face recognizing process for the VIP under photographing (Step SP**35**). After completion of the face recognizing process, the system controller **61** makes the face recognizing execution unit **15** form the face recognizing management information **24** (FIG. **3**) based upon the face recognizing process results, and store this information in the hard disc drive **2** (Step SP**38**). Thereafter, the system controller **61** terminates the VIP setting process.

If the judgment at Step SP**32** is negated (i.e., if the second VIP deciding method select button **72** is depressed), the system controller **61** displays the VIP display screen **40** described with reference to FIG. **7** on the display **6** (Step SP**36**).

Next, the system controller **61** stands by until a VIP is selected from the VIP display screen **40** (Step SP**37**). As a VIP is selected, the face recognizing execution unit **15** is instructed to form the face recognizing management information **24** illustrated in FIG. **3** registering only information on the selected VIP (Step SP**38**). Thereafter, the system controller **61** terminates the VIP setting process.

With this arrangement, the system controller **61** controls the face recognizing execution unit **15** to reflect only the results of the face recognizing process for the VIP registered in the manner described above, upon the face recognizing management information **24** (FIG. **3**), during photographing. Each time scene photographing is completed, the importance level setting process described with reference to FIG. **8** is executed to determine a chapter importance level of each chapter set in the scene, and in accordance with the determined chapter importance level, the chapter management information **20** (FIG. **2**) is updated.

As described above, the video camera **60** of the embodiment executes the face recognizing process only for a VIP decided before moving image photographing, and in accordance with the results of the face recognizing process, a chapter importance level of each chapter is set. It is therefore possible to facilitate setting of the chapter importance level of each chapter. Further, since the video camera **60** registers a VIP in advance as described above, it is possible to avoid the following phenomenon. Namely, in performing autofocus and autoexposure utilizing face recognition, if the face of another person photographed together with a VIP is recognized by chance, the optimum focus and exposure are set to this other person, and the object VIP is not photographed well.

(3) Other Embodiments

In the first and second embodiments, the present invention is applied to the video camera **1**, **60** configured as illustrated in FIG. **1**. The present invention is not limited thereto, but is also applicable to video cameras having various structures, apparatus other than video cameras such as DVD recorders, electronic still cameras and mobile phones provided with a moving image photographing function.

Further, in the first and second embodiments, although the hard disc drive **2** and DVD **3** are adopted as recording media for recording photographed images, the present invention is not limited thereto, but recording media other than the DVD and hard disc drive may also be adopted including a Blu-ray disc (BD), a compact disc (CD), a mini disc (MD), a semiconductor memory and the like.

Furthermore, in the first and second embodiments, although the hard disc drive **2** and a DVD drive as the recording/reproducing unit for recording and reproducing image information on photographed scenes relative to recording media are built in the video camera **1**, **60**, the present invention is not limited thereto, but may adopt an external mount type drive connected by USB (Universal Serial Bus), eSATA (External Serial Advanced Technology Attachment) and the like as the recording and reproducing unit.

Still further, in the first and second embodiments, although one system controller **5**, **61** is constituted of: an importance level setting unit for setting a chapter importance level of each chapter in accordance with the results of a face recognizing process for a VIP set by a user; a controller for controlling the hard disc drive **2** and DVD drive so as to selectively reproduce a chapter having a relevant importance level, among importance levels of respective chapters; and a VIP setting unit for setting as a VIP a person corresponding to a face image selected by a user from a list of face images displayed on the display, the present invention is not limited thereto, but the importance level setting unit, control unit and VIP setting unit may be structured discretely.

The present invention is widely applicable to various recording and reproducing apparatus such ad DVD recorders in addition to video cameras.

The preferred embodiments of the present invention have been described above. According to the present invention, a particular chapter can be selectively reproduced in accordance with user settings so that a user can find quickly a chapter on which a desired person appears. Further, since a particular chapter based on user settings can be selectively reproduced, a user can know the whole contents of a scene in short time and easily.

It should be further understood by those skilled in the art that although the foregoing description has been made on embodiments of the invention, the invention is not limited thereto and various changes and modifications may be made without departing from the spirit of the invention and the scope of the appended claims.

The invention claimed is:

1. A recording and reproducing apparatus for recording and reproducing video information, comprising:

a photographing unit for photographing an object and for generating video information;

a recording unit for recording the video information having been generated by the photographing unit into a recording medium;

a face-recognition processing unit executing a face-recognizing process on the video information to recognize a face;

a reproducing unit for reproducing the video information having been recorded by the recording unit from the recording medium;

a specific person setting unit setting one of a first setting mode and a second setting mode and executing a process of specifying a person with a face according to the set one of the first setting mode and the second setting mode, wherein, when the first setting mode is set, a person is specified with a face recognized by the face-recognition processing unit after the first setting mode is set and before the recording of the video information by the recording unit, and, when the second setting mode is set, a person is specified with a face in the video information in the recording medium that has previously been recorded and previously recognized by the face-recognition processing unit before the specific person setting unit sets the first setting mode or the second setting mode; and

a control unit for controlling the reproducing unit so as to selectively reproduce the video information from the recording medium which includes the specific person set by the specific person setting unit according to a result of the face-recognition processing unit.

2. The recording and reproducing apparatus according to claim **1**, further comprising:

a user interface unit by which a user selects one of operation modes including:

(1) a specific person setting mode having the first setting mode and the second setting mode,

(2) a recording mode in which the video information generated by the photographing unit are recorded in the recording medium, and

(3) a reproducing mode in which the video information is to be reproduced by the reproducing unit,

wherein the control unit controls the recording and reproducing apparatus according to the mode selected by the user interface unit.

3. The recording and reproducing apparatus according to claim **2**, wherein the specific person setting mode is configured to specify one or more persons, and the control unit is configured to control the reproducing unit so as to reproduce the video information of the specified one or more persons.

4. The recording and reproducing apparatus according to claim **2**, further comprising:

a displaying unit for displaying information of a face to which the face-recognizing processing has been conducted, in case that the recording mode is selected by the user interface.

5. The recording and reproducing apparatus according to claim **2**, wherein the reproducing mode selected by the user interface is for reproducing the video information of the specific person specified by the specific person setting unit by which one of a plurality of reproducing modes can be selected, each of the reproducing modes having a respective number of the video information of the specific person, and wherein the control unit controls the reproducing unit so as to reproduce the video information of the specific person according to the selected one of the reproducing modes.

6. The recording and reproducing apparatus according to claim **1**, wherein the controlling unit further controlling the reproducing unit to reproduce the video information in a reproducing mode set from one of a first reproducing mode and a second reproducing mode, and

wherein a reproducing time required for reproducing the video information under the first reproducing mode is shorter than a reproducing time required for reproducing the video information under the second reproducing mode, and the video information reproduced under the second mode includes the video information reproduced under the first reproducing mode in addition to other of the video information not reproduced under the first reproducing mode.

7. The recording and reproducing apparatus according to claim **6**, wherein the controlling unit further controlling the reproducing unit to reproduce the video information in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode, and

wherein a reproducing time required for reproducing the video information under the third reproducing mode is longer than the reproducing time required for reproducing the video information under the second reproducing mode.

8. A recording and reproducing apparatus for recording and reproducing image information, comprising:

a processor; and

a memory coupled to the processor and storing instructions that, when executed by the processor, cause the processor to:

capture a photograph and generate image information of the photograph;

record the image information in a recording medium;

execute a face-recognizing process on the image information to recognize a face;

reproduce the recorded image from the recording medium;

register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, a person with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person, and, when the second setting mode is selected, a person with a face in the image information is selected from a plurality of faces in the image information recorded in the recording medium and thereafter registered as the specific person; and

selectively reproduce the recorded image information which includes the registered specific person.

9. The recording and reproducing apparatus according to claim **8**,

wherein the image information to be selectively reproduced is the image information which is recognized as including the specific person before the recording of the image information.

10. The recording and reproducing apparatus according to claim **8**,

wherein the image information to be selectively reproduced is the image information having a relatively high importance level picked out among the image information recorded in the recording medium which includes the registered specific person.

11. The recording and reproducing apparatus according to claim **8**, wherein the memory further stores instructions that, when executed by the processor, cause the processor to:

control the reproduction of the image information in a reproducing mode set from one of a first reproducing mode and a second reproducing mode,

wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.

12. The recording and reproducing apparatus according to claim **11**, wherein the memory further stores instructions that, when executed by the processor, cause the processor to:

control the reproduction of the image information in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode,

wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.

13. A recording and reproducing apparatus for recording and reproducing image information, comprising:

a photographing sensor configured to photograph an object and generate image information;

a recorder configured to record the image information generated by the photographing sensor in a recording medium;

a reproducer configured to reproduce the image information recorded by the recorder;

processing circuitry configured to:

execute a face-recognizing process on the image information generated by the photographing sensor to recognize a face,

register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, a person with a face is obtained by newly photographing the person in a photographing

mode and thereafter registered as the specific person, and, when the second setting mode is selected, a person with a face in the image information is selected from a plurality of faces in the image information recorded in the recording medium and thereafter registered as the specific person,

firstly pick out image information which includes the registered specific person,

secondly pick out the image information based on a predetermined condition from among the picked-out image information which includes the registered specific person, the predetermined condition being set in accordance with an instruction by a user, and

control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition.

14. The recording and reproducing apparatus according to claim **13**,

wherein the image information to be selectively and sequentially reproduced is the image information which is recognized as including the specific person before the recording of the image information by the recorder.

15. The recording and reproducing apparatus according to claim **13**,

wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information having the predetermined condition including a relatively high importance level picked out from among the image information recorded in the recording medium which includes the registered specific person.

16. The recording and reproducing apparatus according to claim **13**, wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in a reproducing mode set from one of a first reproducing mode and a second reproducing mode, and

wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.

17. The recording and reproducing apparatus according to claim **16**, wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode, and

wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.

18. A recording and reproducing apparatus for recording and reproducing image information, comprising:

a photographing sensor configured to photograph an object and generate image information;

a recorder configured to record the image information generated by the photographing sensor in a recording medium;

a reproducer configured to reproduce the image information recorded by the recorder;

processing circuitry configured to:

execute a face-recognizing process on the image information generated by the photographing sensor to recognize a face;

register a person in the image information as a specific person, wherein a person with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person;

firstly pick out image information which includes the registered specific person,

secondly pick out the image information based on a predetermined condition from among the picked-out image information which includes the registered specific person, the predetermined condition being set in accordance with an instruction by a user, and

control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition.

19. The recording and reproducing apparatus according to claim **18**, wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in a reproducing mode set from one of a first reproducing mode and a second reproducing mode, and

wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.

20. The recording and reproducing apparatus according to claim **19**, wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode, and

wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 10,176,848 B2
APPLICATION NO. : 14/478020
DATED : January 8, 2019
INVENTOR(S) : Yoshida

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Column (15): Claim 8, Line 62 delete “reproduce the recorded image from” and insert --reproduce the recorded image information from--.

Signed and Sealed this
Sixteenth Day of July, 2019

Andrei Iancu
Director of the United States Patent and Trademark Office

EXHIBIT 7

US010176848C1

(12) EX PARTE REEXAMINATION CERTIFICATE (12015th)

United States Patent
Yoshida

(10) **Number: US 10,176,848 C1**
(45) **Certificate Issued: Mar. 18, 2022**

(54) **RECORDING AND REPRODUCING APPARATUS AND METHOD THEREOF**

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(73) Assignee: **Maxell, Ltd.**

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Related U.S. Application Data

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(30) **Foreign Application Priority Data**

May 19, 2008 (JP) 2008-130678

(51) **Int. Cl.**

G11B 27/34	(2006.01)
G11B 27/10	(2006.01)
H04N 21/434	(2011.01)
G06F 16/74	(2019.01)
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G06V 40/16	(2022.01)
G06V 20/40	(2022.01)
G06K 9/00	(2022.01)
G11B 27/034	(2006.01)
G11B 27/28	(2006.01)
G11B 27/30	(2006.01)
H04N 5/77	(2006.01)
H04N 5/781	(2006.01)
H04N 5/85	(2006.01)
H04N 9/804	(2006.01)

(52) **U.S. Cl.**
CPC ***G11B 27/34*** (2013.01); ***G06F 16/73*** (2019.01); ***G06F 16/745*** (2019.01); ***G06K 9/00*** (2013.01); ***G06V 20/40*** (2022.01); ***G06V 40/172*** (2022.01); ***G11B 27/034*** (2013.01); ***G11B 27/105*** (2013.01); ***G11B 27/28*** (2013.01); ***G11B 27/30*** (2013.01); ***H04N 5/77*** (2013.01); ***H04N 5/772*** (2013.01); ***H04N 5/781*** (2013.01); ***H04N 5/85*** (2013.01); ***H04N 9/8042*** (2013.01); *G11B 2220/455* (2013.01); *H04N 21/4347* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

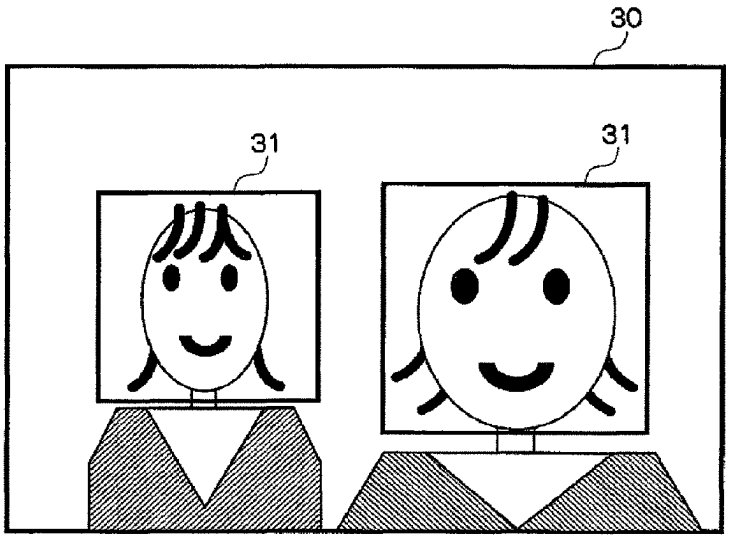
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/014,641, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — B. James Peikari

(57) **ABSTRACT**

In a recording and reproducing apparatus and a recording and reproducing method for the recording and reproducing apparatus for recording and reproducing image information on a scene obtained through photographing, relative to a predetermined first recording medium and being capable of setting one or more chapters to each scene, a face recognizing process is executed for a photographed image based on the image information, an importance level of each chapter is set in accordance with a result of the face recognizing process for a very important person (VIP) set by a user, and each chapter having a relevant importance level among importance levels of respective chapters is selectively reproduced. A user can therefore find an object chapter and scene quickly and easily.



EX PARTE REEXAMINATION CERTIFICATE

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **11**, **12**, **16**, **17**, **19** and **20** is confirmed.

Claims **8**, **10**, **13**, **15** and **18** are cancelled.

New claims **21-84** are added and determined to be patentable.

Claims **1-7**, **9** and **14** were not reexamined.

21. A recording and reproducing apparatus for recording and reproducing image information, comprising:

a processor; and

a memory coupled to the processor and storing instructions that, when executed by the processor, cause the processor to:

capture a photograph and generate image information of the photograph;

record the image information in a recording medium;

execute a face-recognizing process on the image information to recognize a face;

reproduce the recorded image from the recording medium;

register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, a person with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person, and, when the second setting mode is selected, a person with a face in the image information is selected from a plurality of faces in the image information recorded in the recording medium and thereafter registered as the specific person; and

selectively reproduce the recorded image information which includes the registered specific person,

wherein, in the first setting mode, the specific person is set before photographing the person with a face.

22. The recording and reproducing apparatus according to claim 21, wherein the image information to be selectively reproduced is the image information which is recognized as including the specific person before the recording of the image information.

23. The recording and reproducing apparatus according to claim 21, wherein the image information to be selectively reproduced is the image information having a relatively high importance level picked out among the image information recorded in the recording medium which includes the registered specific person.

24. The recording and reproducing apparatus according to claim 21, wherein the memory further stores instructions that, when executed by the processor, cause the processor to:

control the reproduction of the image information in a reproducing mode set from one of a first reproducing mode and a second reproducing mode,

wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.

25. The recording and reproducing apparatus according to claim 24, wherein the memory further stores instructions that, when executed by the processor, cause the processor to:

control the reproduction of the image information in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode,

wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.

26. The recording and reproducing apparatus according to claim 21, further comprising a touch panel adhered to a screen of a display.

27. The recording and reproducing apparatus according to claim 26, wherein the first setting mode and the second setting mode are each selected using the touch panel via a user interface.

28. The recording and reproducing apparatus according to claim 21, wherein the face-recognizing process is executed for a specific person that is set before photographing that specific person.

29. The recording and reproducing apparatus according to claim 21, wherein the recording medium is an external drive connected to the recording and reproducing apparatus via USB.

30. The recording and reproducing apparatus according to claim 21, wherein the recording and reproducing apparatus is a mobile phone.

31. The recording and reproducing apparatus according to claim 21, wherein the recording and reproducing apparatus is an electronic camera.

32. The recording and reproducing apparatus according to claim 21, further comprising a user interface including a first option and a second option,

wherein, when the first option is selected, the recording and reproducing apparatus enters a record mode to capture video information, and

wherein, when the second option is selected, the recording and reproducing apparatus enters a reproduction mode to reproduce and display recorded video information.

33. The recording and reproducing apparatus according to claim 21, further comprising

a video camera providing image data; and

a display, wherein, in response to the face-recognizing process recognizing that a face of a person is included in the image data, the display displays the image data with a frame surrounding at least a portion of the face of the person.

34. The recording and reproducing apparatus according to claim 33, wherein the frame is a rectangular frame.

35. The recording and reproducing apparatus according to claim 21, further comprising a display,

wherein the memory further stores instructions that, when executed by the processor, cause the processor to generate a thumbnail corresponding to the recorded image such that the thumbnail is displayed on the

display with an icon having a predetermined shape when an importance level is set for the recorded image via a user interface.

36. The recording and reproducing apparatus according to claim 35, wherein the icon is displayed on the thumbnail.

37. The recording and reproducing apparatus according to claim 21, wherein the memory further stores instructions that, when executed by the processor, cause the processor to:

capture video information corresponding to a scene;

automatically set a plurality of sections corresponding to the video information of the scene:

generate a plurality of thumbnails corresponding to the plurality of sections; and

display the plurality of thumbnails, wherein each of the plurality of thumbnails is associated with the same video information corresponding to the scene.

38. The recording and reproducing apparatus according to claim 37, wherein displaying the plurality of thumbnails includes displaying timing information indicating a lapse time of a particular section within the captured video information of the scene.

39. The recording and reproducing apparatus according to claim 21, further comprising a display,

wherein the display is configured to display a plurality of images,

wherein each image in the plurality of images includes a face of a different person, and

wherein displaying the plurality of images includes displaying faces without displaying objects included in the background of the plurality of images.

40. The recording and reproducing apparatus according to claim 21, wherein the memory further stores instructions that, when executed by the processor, cause the processor to execute the face-recognizing process on image information captured from an external camera not included in the recording and reproducing apparatus.

41. The recording and reproducing apparatus according to claim 21, further comprising:

an analog/digital converter, wherein the analog/digital converter is configured to convert an analog image signal corresponding to the captured photograph into a digital image signal; and

a codec for compressing the digital image signal using a predetermined compression encoding method and generating encoded image information,

wherein the encoded image information is stored in the memory.

42. The recording and reproducing apparatus according to claim 41, wherein the predetermined compression encoding method is an MPEG method.

43. A recording and reproducing apparatus for recording and reproducing image information, comprising:

a photographing sensor configured to photograph an object and generate image information;

a recorder configured to record the image information generated by the photographing sensor in a recording medium;

a reproducer configured to reproduce the image information recorded by the recorder;

processing circuitry configured to:

execute a face-recognizing process on the image information generated by the photographing sensor to recognize a face,

register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, a person with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person, and, when the second setting mode is selected, a person with a face in the image information is selected from a plurality of faces in the image information recorded in the recording medium and thereafter registered as the specific person,

firstly pick out image information which includes the registered specific person,

secondly pick out the image information based on a predetermined condition from among the picked-out image information which includes the registered specific person, the predetermined condition being set in accordance with an instruction by a user, and

control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition,

wherein, in the first setting mode, the specific person is set before photographing the person with a face.

44. The recording and reproducing apparatus according to claim 43, wherein the image information to be selectively and sequentially reproduced is the image information which is recognized as including the specific person before the recording of the image information by the recorder.

45. The recording and reproducing apparatus according to claim 43, wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information having the predetermined condition including a relatively high importance level picked out from among the image information recorded in the recording medium which includes the registered specific person.

46. The recording and reproducing apparatus according to claim 43,

wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in a reproducing mode set from one of a first reproducing mode and a second reproducing mode, and

wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.

47. The recording and reproducing apparatus according to claim 46,

wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode, and

wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.

48. The recording and reproducing apparatus of claim 26, further comprising a touch panel adhered to a screen of a display.

49. The recording and reproducing apparatus of claim 48, wherein the first setting mode and the second setting mode are each selected using the touch panel via a user interface.

50. The recording and reproducing apparatus according to claim 43, wherein the face-recognizing process is executed for a specific person that is set before photographing that specific person.

51. The recording and reproducing apparatus according to claim 43, wherein the recording medium is an external drive connected to the recording and reproducing apparatus via USB.

52. The recording and reproducing apparatus according to claim 43, wherein the recording and reproducing apparatus is a mobile phone.

53. The recording and reproducing apparatus according to claim 43, wherein the recording and reproducing apparatus is an electronic camera.

54. The recording and reproducing apparatus according to claim 43, further comprising a user interface including a first option and a second option,

wherein, when the first option is selected, the recording and reproducing apparatus enters a record mode to capture video information, and

wherein, when the second option is selected, the recording and reproducing apparatus enters a reproduction mode to reproduce and display recorded video information.

55. The recording and reproducing apparatus according to claim 43, further comprising:

a video camera providing image data; and

a display, wherein, in response to the face-recognizing process recognizing that a face of a person is included in the image data, the display displays the image data with a frame surrounding at least a portion of the face of the person.

56. The recording and reproducing apparatus according to claim 55, wherein the frame is a rectangular frame.

57. The recording and reproducing apparatus according to claim 43, further comprising a display,

wherein the processing circuitry is further configured to generate a thumbnail corresponding to the recorded image such that the thumbnail is displayed on the display with an icon having a predetermined shape when an importance level is set for the recorded image via a user interface.

58. The recording and reproducing apparatus according to claim 57, wherein the icon is displayed on the thumbnail.

59. The recording and reproducing apparatus according to claim 43, wherein the processing circuitry is further configured to:

capture video information corresponding to a scene;

automatically set a plurality of sections corresponding to the video information of the scene;

generate a plurality of thumbnails corresponding to the plurality of sections; and

display the plurality of thumbnails, wherein each of the plurality of thumbnails is associated with the same video information corresponding to the scene.

60. The recording and reproducing apparatus according to claim 59, wherein displaying the plurality of thumbnails includes displaying timing information indicating a lapse time of a particular section within the captured video information of the scene.

61. The recording and reproducing apparatus according to claim 43, further comprising a display,

wherein the display is configured to display a plurality of images,

wherein each image in the plurality of images includes a face of a different person, and

wherein displaying the plurality of images includes displaying faces without displaying objects included in the background of the plurality of images.

62. The recording and reproducing apparatus according to claim 43, wherein the processing circuitry is further configured to execute the face-recognizing process on image information captured from an external camera not included in the recording and reproducing apparatus.

63. The recording and reproducing apparatus according to claim 43, further comprising:

an analog/digital converter, wherein the analog/digital converter is configured to convert an analog image signal corresponding to the captured photograph into a digital image signal; and

a codec for compressing the digital image signal using a predetermined compression encoding method and generating encoded image information,

wherein the encoded image information is stored in the memory.

64. The recording and reproducing apparatus according to claim 63, wherein the predetermined compression encoding method is an MPEG method.

65. A recording and reproducing apparatus for recording and reproducing image information, comprising:

a photographing sensor configured to photograph an object and generate image information;

a recorder configured to record the image information generated by the photographing sensor in a recording medium;

a reproducer configured to reproduce the image information recorded by the recorder;

processing circuitry configured to:

execute a face-recognizing process on the image information generated by the photographing sensor to recognize a face;

register a person in the image information as a specific person, wherein a person with a face is obtained by newly photographing the person in a photographing mode and thereafter registered as the specific person;

firstly pick out image information which includes the registered specific person,

secondly pick out the image information based on a predetermined condition from among the picked-out image information which includes the registered specific person, the predetermined condition being set in accordance with an instruction by a user, and

control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition,

wherein the specific person is set before photographing the person with a face.

66. The recording and reproducing apparatus according to claim 65,

wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in a reproducing mode set from one of a first reproducing mode and a second reproducing mode, and

wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and the image information reproduced under

the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.

67. The recording and reproducing apparatus according to claim 65,

wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode, and

wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.

68. The recording and reproducing apparatus of claim 65, further comprising a touch panel adhered to a screen of a display.

69. The recording and reproducing apparatus according to claim 65, wherein the face-recognizing process is executed for a specific person that is set before photographing that specific person.

70. The recording and reproducing apparatus according to claim 65, wherein the recording medium is an external drive connected to the recording and reproducing apparatus via USB.

71. The recording and reproducing apparatus according to claim 65, wherein the recording and reproducing apparatus is a mobile phone.

72. The recording and reproducing apparatus according to claim 65, wherein the recording and reproducing apparatus is an electronic camera.

73. The recording and reproducing apparatus according to claim 65, further comprising a user interface including a first option and a second option,

wherein, when the first option is selected, the recording and reproducing apparatus enters a record mode to capture video information, and

wherein, when the second option is selected, the recording and reproducing apparatus enters a reproduction mode to reproduce and display recorded video information.

74. The recording and reproducing apparatus according to claim 65, further comprising:

a video camera providing image data; and

a display, wherein, in response to the face-recognizing process recognizing that a face of a person is included in the image data, the display displays the image data with a frame surrounding at least a portion of the face of the person.

75. The recording and reproducing apparatus according to claim 74, wherein the frame is a rectangular frame.

76. The recording and reproducing apparatus according to claim 65, further comprising a display,

wherein the processing circuitry is further configured to generate a thumbnail corresponding to the recorded image such that the thumbnail is displayed on the display with an icon having a predetermined shape when an importance level is set for the recorded image via a user interface.

77. The recording and reproducing apparatus according to claim 76, wherein the icon is displayed on the thumbnail.

78. The recording and reproducing apparatus according to claim 65, wherein the processing circuitry is further configured to:

capture video information corresponding to a scene;

automatically set a plurality of sections corresponding to the video information of the scene;

generate a plurality of thumbnails corresponding to the plurality of sections; and

display the plurality of thumbnails, wherein each of the plurality of thumbnails is associated with the same video information corresponding to the scene.

79. The recording and reproducing apparatus according to claim 78, wherein displaying the plurality of thumbnails includes displaying timing information indicating a lapse time of a particular section within the captured video information of the scene.

80. The recording and reproducing apparatus according to claim 65, further comprising a display,

wherein the display is configured to display a plurality of images,

wherein each image in the plurality of images includes a face of a different person, and

wherein displaying the plurality of images includes displaying faces without displaying objects included in the background of the plurality of images.

81. The recording and reproducing apparatus according to claim 65, wherein the processing circuitry is further configured to execute the face-recognizing process on image information captured from an external camera not included in the recording and reproducing apparatus.

82. The recording and reproducing apparatus according to claim 65, further comprising:

an analog/digital converter, wherein the analog/digital converter is configured to convert an analog image signal corresponding to the captured photograph into a digital image signal; and

a codec for compressing the digital image signal using a predetermined compression encoding method and generating encoded image information.

83. The recording and reproducing apparatus according to claim 82, wherein the predetermined compression encoding method is an MPEG method.

84. A recording and reproducing apparatus for recording and reproducing image information, comprising:

a processor;

a display displaying a first option and a second option, wherein when the first option is selected, the recording and reproducing apparatus enters a record mode to capture video information, and when the second option is selected, the recording and reproducing apparatus enters a reproduction mode to reproduce and display recorded video information;

a memory coupled to the processor and storing instructions that, when executed by the processor, cause the processor to:

capture a photograph and generate image information of the photograph; record the image information in a recording medium;

execute a face-recognizing process on the image information to recognize a face;

reproduce the recorded image from the recording medium;

register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, an image information of a person with a face is obtained by newly photographing the person with a face in a photographing mode and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person, and, when the second setting mode is selected, a person with a face in an image information of a person with a face is selected from

a plurality of faces in the image information recorded in the recording medium and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person;

selectively reproduce the recorded image information which includes the registered specific person; and

generate a thumbnail corresponding to the recorded image in the recording medium such that the thumbnail is displayed on the display with an icon having a predetermined shape when an importance level is set for the recorded image via a user interface;

a touch panel adhered to a screen of the display, wherein the first setting mode and the second setting mode are each selected using the touch panel;

a video camera providing video image data, wherein, in response to the face-recognizing process recognizing that a face of a person is included in the video image data, the display displays the video image data with a frame surrounding at least a portion of the face of the person;

an analog/digital converter, wherein the analog/digital converter is configured to convert analog image data corresponding to the captured photograph into a digital image signal; and

a codec for compressing the digital image signal using a predetermined compression encoding method and generating encoded image information, wherein the encoded image information is stored in the memory,

wherein the video camera captures video information corresponding to a scene and the processor:

automatically sets a plurality of sections corresponding to the video information of the scene; and

generates a plurality of thumbnails corresponding to the plurality of sections, wherein each of the plurality of thumbnails is associated with the same video information corresponding to the scene, and the display displays the plurality of thumbnails; and

wherein the display is configured to display at least a plurality of images recorded in the recording medium such that contents of each image in the plurality of images includes a face of a different person and background objects and displaying the plurality of images includes displaying the faces without displaying all of the background objects included in the contents of each image of the plurality of images.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 10,176,848 C1
APPLICATION NO. : 90/014641
DATED : March 18, 2022
INVENTOR(S) : Mari Yoshida

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Column 1, Lines 23-50, substitute Claim 21 with the following claim:
--21. A recording and reproducing apparatus for recording and reproducing image information, comprising:

a processor; and

a memory coupled to the processor and storing instructions that, when executed by the processor, cause the processor to:

capture a photograph and generate image information of the photograph;

record the image information in a recording medium;

execute a face-recognizing process on the image information to recognize a face;

reproduce the recorded image from the recording medium;

register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, an image information of a person with a face is obtained by newly photographing the person with a face in a photographing mode and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person, and, when the second setting mode is selected, a person with a face in an image information of a person with a face is selected from a plurality of faces in the image information recorded in the recording medium and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person; and

selectively reproduce the recorded image information which includes the registered specific person,

wherein, when a registered specific person is recognized during a capture of additional image information, autofocus and autoexposure are adjusted for the additional image information of the registered specific person.--

Column 1, Line 51 to Column 2, Line 9, substitute Claims 22, 23, and 24 with the following claims:
--22. The recording and reproducing apparatus according to claim 21, wherein, in the second

Signed and Sealed this
Third Day of May, 2022

Katherine Kelly Vidal

Katherine Kelly Vidal
Director of the United States Patent and Trademark Office

setting mode, the image information to be selectively reproduced is the image information which is recognized as including the specific person before the recording of the image information.

23. The recording and reproducing apparatus according to claim 21, wherein the image information to be selectively reproduced is the image information having a relatively high importance level picked out among the image information recorded in the recording medium which includes the registered specific person.

24. The recording and reproducing apparatus according to claim 21, wherein the memory further stores instructions that, when executed by the processor, cause the processor to:

control the reproduction of the image information in a reproducing mode set from one of a first reproducing mode and a second reproducing mode,

wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.--

Column 2, Lines 25 to 36, substitute Claims 25, 26, 27, 28, and 29 with the following claims:
--25. The recording and reproducing apparatus according to claim 24, wherein the memory further stores instructions that, when executed by the processor, cause the processor to:

control the reproduction of the image information in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode,

wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.

26. The recording and reproducing apparatus according to claim 21, further comprising a touch panel adhered to a screen of a display.

27. The recording and reproducing apparatus according to claim 26, wherein the first setting mode and the second setting mode are each selected using the touch panel via a user interface.

28. The recording and reproducing apparatus according to claim 21, wherein the face-recognizing process is executed for a specific person that is set before photographing that specific person.

29. The recording and reproducing apparatus according to claim 21, wherein the recording medium is an external drive connected to the recording and reproducing apparatus via USB.--

Column 2, Lines 37 to 61, substitute Claims 30, 31, 32, 33, and 34 with the following claims:
--30. The recording and reproducing apparatus according to claim 21, wherein the recording and reproducing apparatus is a mobile phone.

31. The recording and reproducing apparatus according to claim 21, wherein the recording and reproducing apparatus is an electronic camera.

32. The recording and reproducing apparatus according to claim 21, further comprising a user interface including a first option and a second option,

wherein, when the first option is selected, the recording and reproducing apparatus enters a record mode to capture video information, and

wherein, when the second option is selected, the recording and reproducing apparatus enters a reproduction mode to reproduce and display recorded video information.

33. The recording and reproducing apparatus according to claim 21, further comprising

a video camera providing image data; and

a display, wherein, in response to the face-recognizing process recognizing that a face of a person is included in the image data, the display displays the image data with a frame surrounding at least a portion of the face of the person.

34. The recording and reproducing apparatus according to claim 33, wherein the frame is a rectangular frame.--

Column 2, Line 62 to Column 3, Line 21, substitute Claims 35, 36, 37, and 38 with the following claims:

--35. The recording and reproducing apparatus according to claim 21, further comprising a display,

wherein the memory further stores instructions that, when executed by the processor, cause the processor to generate a thumbnail corresponding to the recorded image such that the thumbnail is displayed on the display with an icon having a predetermined shape when an importance level is set for the recorded image via a user interface.

36. The recording and reproducing apparatus according to claim 35, wherein the icon is displayed on the thumbnail.

37. The recording and reproducing apparatus according to claim 21, wherein the memory further stores instructions that, when executed by the processor, cause the processor to:

capture video information corresponding to a scene;

automatically set a plurality of sections corresponding to the video information of the scene;

generate a plurality of thumbnails corresponding to the plurality of sections; and

display the plurality of thumbnails, wherein each of the plurality of thumbnails is associated with the same video information corresponding to the scene.

38. The recording and reproducing apparatus according to claim 37, wherein displaying the plurality of thumbnails includes displaying timing information indicating a lapse time of a particular section within the captured video information of the scene.--

Column 3, Lines 22 to 50, substitute Claims 39, 40, 41, and 42 with the following claims:

--39. The recording and reproducing apparatus according to claim 21, further comprising a display,

wherein the display is configured to display a plurality of images,

wherein each image in the plurality of images includes a face of a different person, and

wherein displaying the plurality of images includes displaying faces without displaying objects included in the background of the plurality of images.

40. The recording and reproducing apparatus according to claim 21, wherein the memory further stores instructions that, when executed by the processor, cause the processor to execute the face-recognizing process on image information captured from an external camera not included in the recording and reproducing apparatus.

41. The recording and reproducing apparatus according to claim 21, further comprising:
an analog/digital converter, wherein the analog/digital converter is configured to convert analog image data corresponding to the captured photograph into a digital image signal; and
a codec for compressing the digital image signal using a predetermined compression encoding method and generating encoded image information,
wherein the encoded image information is stored in the memory.

42. The recording and reproducing apparatus according to claim 41, wherein the predetermined compression encoding method is an MPEG method.--

Column 3, Line 51 to Column 4, Line 20, substitute Claim 43 with the following claim:
--43. A recording and reproducing apparatus for recording and reproducing image information, comprising:
a photographing sensor configured to photograph an object and generate image information;
a recorder configured to record the image information generated by the photographing sensor in a recording medium;
a reproducer configured to reproduce the image information recorded by the recorder;
processing circuitry configured to:
execute a face-recognizing process on the image information generated by the photographing sensor to recognize a face,
register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, an image information of a person with a face is obtained by newly photographing the person with a face in a photographing mode and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person, and, when the second setting mode is selected, a person with a face in an image information of a person with a face is selected from a plurality of faces in the image information recorded in the recording medium, and thereafter, the image information of the person with a face is used to register the person with a face as the specific person,
firstly pick out image information which includes the registered specific person,
secondly pick out the image information based on a predetermined condition from among the picked-out image information which includes the registered specific person, the predetermined condition being set in accordance with an instruction by a user, and
control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition,
wherein, when a registered specific person is recognized during a capture of additional image information, autofocus and autoexposure are adjusted for the additional image information of the registered specific person.--

Column 4, Lines 21 to 64, substitute Claims 44, 45, 46, and 47 with the following claims:
--44. The recording and reproducing apparatus according to claim 43, wherein, in the second

setting mode, the image information to be selectively and sequentially reproduced is the image information which is recognized as including the specific person before the recording of the image information by the recorder.

45. The recording and reproducing apparatus according to claim 43, wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information having the predetermined condition including a relatively high importance level picked out from among the image information recorded in the recording medium which includes the registered specific person.

46. The recording and reproducing apparatus according to claim 43, wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in a reproducing mode set from one of a first reproducing mode and a second reproducing mode, and wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.

47. The recording and reproducing apparatus according to claim 46, wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode, and wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.--

Column 4, Line 65 to Column 5, Line 27, substitute Claims 48, 49, 50, 51, 52, 53, and 54 with the following claims:
--48. The recording and reproducing apparatus of claim 43, further comprising a touch panel adhered to a screen of a display.

49. The recording and reproducing apparatus of claim 48, wherein the first setting mode and the second setting mode are each selected using the touch panel via a user interface.

50. The recording and reproducing apparatus according to claim 43, wherein the face-recognizing process is executed for a specific person that is set before photographing that specific person.

51. The recording and reproducing apparatus according to claim 43, wherein the recording medium is an external drive connected to the recording and reproducing apparatus via USB.

52. The recording and reproducing apparatus according to claim 43, wherein the recording and reproducing apparatus is a mobile phone.

53. The recording and reproducing apparatus according to claim 43, wherein the recording and reproducing apparatus is an electronic camera.

54. The recording and reproducing apparatus according to claim 43, further comprising a user interface including a first option and a second option,

wherein, when the first option is selected, the recording and reproducing apparatus enters a record mode to capture video information, and

wherein, when the second option is selected, the recording and reproducing apparatus enters a reproduction mode to reproduce and display recorded video information.--

Column 5, Lines 28 to 58, substitute Claims 55, 56, 57, 58, and 59 with the following claims:

--55. The recording and reproducing apparatus according to claim 43, further comprising:

a video camera providing image data; and

a display, wherein, in response to the face-recognizing process recognizing that a face of a person is included in the image data, the display displays the image data with a frame surrounding at least a portion of the face of the person.

56. The recording and reproducing apparatus according to claim 55, wherein the frame is a rectangular frame.

57. The recording and reproducing apparatus according to claim 43, further comprising a display,

wherein the processing circuitry is further configured to generate a thumbnail corresponding to the recorded image such that the thumbnail is displayed on the display with an icon having a predetermined shape when an importance level is set for the recorded image via a user interface.

58. The recording and reproducing apparatus according to claim 57, wherein the icon is displayed on the thumbnail.

59. The recording and reproducing apparatus according to claim 43, wherein the processing circuitry is further configured to:

capture video information corresponding to a scene;

automatically set a plurality of sections corresponding to the video information of the scene;

generate a plurality of thumbnails corresponding to the plurality of sections; and

display the plurality of thumbnails, wherein each of the plurality of thumbnails is associated with the same video information corresponding to the scene.--

Column 5, Line 59 to Column 6, Line 24, substitute Claims 60, 61, 62, 63, and 64 with the following claims:

--60. The recording and reproducing apparatus according to claim 59, wherein displaying the plurality of thumbnails includes displaying timing information indicating a lapse time of a particular section within the captured video information of the scene.

61. The recording and reproducing apparatus according to claim 43, further comprising a display,

wherein the display is configured to display a plurality of images,

wherein each image in the plurality of images includes a face of a different person, and

wherein displaying the plurality of images includes displaying faces without displaying objects included in the background of the plurality of images.

62. The recording and reproducing apparatus according to claim 43, wherein the processing circuitry is further configured to execute the face-recognizing process on image information captured from an external camera not included in the recording and reproducing apparatus.

63. The recording and reproducing apparatus according to claim 43, further comprising:
an analog/digital converter, wherein the analog/digital converter is configured to convert analog image data corresponding to the captured photograph into a digital image signal; and
a codec for compressing the digital image signal using a predetermined compression encoding method and generating encoded image information,
wherein the encoded image information is stored in the memory.

64. The recording and reproducing apparatus according to claim 63, wherein the predetermined compression encoding method is an MPEG method.--

Column 6, Lines 25 to 54, substitute Claim 65 with the following claim:
--65. A recording and reproducing apparatus for recording and reproducing image information, comprising:
a photographing sensor configured to photograph an object and generate image information;
a recorder configured to record the image information generated by the photographing sensor in a recording medium;
a reproducer configured to reproduce the image information recorded by the recorder;
processing circuitry configured to:
execute a face-recognizing process on the image information generated by the photographing sensor to recognize a face;
register a person in the image information as a specific person, wherein an image information of a person with a face is obtained by newly photographing the person with a face in a photographing mode and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person;
firstly pick out an image information which includes the registered specific person,
secondly pick out an image information based on a predetermined condition from among the picked-out image information which includes the registered specific person, the predetermined condition being set in accordance with an instruction by a user, and
control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition,
wherein, when a registered specific person is recognized during a capture of additional image information, autofocus and autoexposure are adjusted for the additional image information of the registered specific person.--

Column 6, Line 55 to Column 7, Line 28, substitute Claims 66, 67, 68, 69, and 70 with the following claims:
--66. The recording and reproducing apparatus according to claim 65, wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in a reproducing

mode set from one of a first reproducing mode and a second reproducing mode, and wherein a reproducing time required for reproducing the image information under the first reproducing mode is shorter than a reproducing time required for reproducing the image information under the second reproducing mode, and the image information reproduced under the second mode includes the image information reproduced under the first reproducing mode and other of the image information not reproduced under the first reproducing mode.

67. The recording and reproducing apparatus according to claim 65, wherein the processing circuitry is further configured to control the reproducer to selectively and sequentially reproduce the image information picked out based on the predetermined condition in the reproducing mode set from one of the first reproducing mode, the second reproducing mode, and a third reproducing mode, and wherein a reproducing time required for reproducing the image information under the third reproducing mode is longer than the reproducing time required for reproducing the image information under the second reproducing mode.

68. The recording and reproducing apparatus of claim 65, further comprising a touch panel adhered to a screen of a display.

69. The recording and reproducing apparatus according to claim 65, wherein the face-recognizing process is executed for a specific person that is set before photographing that specific person.

70. The recording and reproducing apparatus according to claim 65, wherein the recording medium is an external drive connected to the recording and reproducing apparatus via USB.--

Column 7, Lines 29 to 59, substitute Claims 71, 72, 73, 74, 75, and 76 with the following claims:
--71. The recording and reproducing apparatus according to claim 65, wherein the recording and reproducing apparatus is a mobile phone.

72. The recording and reproducing apparatus according to claim 65, wherein the recording and reproducing apparatus is an electronic camera.

73. The recording and reproducing apparatus according to claim 65, further comprising a user interface including a first option and a second option,

wherein, when the first option is selected, the recording and reproducing apparatus enters a record mode to capture video information, and

wherein, when the second option is selected, the recording and reproducing apparatus enters a reproduction mode to reproduce and display recorded video information.

74. The recording and reproducing apparatus according to claim 65, further comprising:

a video camera providing image data; and

a display, wherein, in response to the face-recognizing process recognizing that a face of a person is included in the image data, the display displays the image data with a frame surrounding at least a portion of the face of the person.

75. The recording and reproducing apparatus according to claim 74, wherein the frame is a rectangular frame.

76. The recording and reproducing apparatus according to claim 65, further comprising a display, wherein the processing circuitry is further configured to generate a thumbnail corresponding to the recorded image such that the thumbnail is displayed on the display with an icon having a predetermined shape when an importance level is set for the recorded image via a user interface.--

Column 7, Line 60 to Column 8, Line 24, substitute Claims 77, 78, 79, 80, and 81 with the following claims:
--77. The recording and reproducing apparatus according to claim 76, wherein the icon is displayed on the thumbnail.

78. The recording and reproducing apparatus according to claim 65, wherein the processing circuitry is further configured to:

capture video information corresponding to a scene;

automatically set a plurality of sections corresponding to the video information of the scene;

generate a plurality of thumbnails corresponding to the plurality of sections; and

display the plurality of thumbnails, wherein each of the plurality of thumbnails is associated with the same video information corresponding to the scene.

79. The recording and reproducing apparatus according to claim 78, wherein displaying the plurality of thumbnails includes displaying timing information indicating a lapse time of a particular section within the captured video information of the scene.

80. The recording and reproducing apparatus according to claim 65, further comprising a display,

wherein the display is configured to display a plurality of images,

wherein each image in the plurality of images includes a face of a different person, and

wherein displaying the plurality of images includes displaying faces without displaying objects included in the background of the plurality of images.

81. The recording and reproducing apparatus according to claim 65, wherein the processing circuitry is further configured to execute the face-recognizing process on image information captured from an external camera not included in the recording and reproducing apparatus.--

Column 8, Lines 25 to 36, substitute Claims 82 and 83 with the following claims:
--82. The recording and reproducing apparatus according to claim 65, further comprising:

an analog/digital converter, wherein the analog/digital converter is configured to convert analog image data corresponding to the captured photograph into a digital image signal; and

a codec for compressing the digital image signal using a predetermined compression encoding method and generating encoded image information.

83. The recording and reproducing apparatus according to claim 82, wherein the predetermined compression encoding method is an MPEG method.--

Column 8, Line 37 to Column 9, Line 12, substitute a portion of Claim 84 with the following portion:
--84. A recording and reproducing apparatus for recording and reproducing image information, comprising:

a processor;

a display displaying a first option and a second option, wherein when the first option is selected, the recording and reproducing apparatus enters a record mode to capture video information, and when the second option is selected, the recording and reproducing apparatus enters a reproduction mode to reproduce and display recorded video information;

a memory coupled to the processor and storing instructions that, when executed by the processor, cause the processor to:

capture a photograph and generate image information of the photograph;

record the image information in a recording medium;

execute a face-recognizing process on the image information to recognize a face;

reproduce the recorded image from the recording medium;

register a person in the image information as a specific person in a mode selected from a first setting mode and a second setting mode, wherein, when the first setting mode is selected, an image information of a person with a face is obtained by newly photographing the person with a face in a photographing mode and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person, and, when the second setting mode is selected, a person with a face in an image information of a person with a face is selected from a plurality of faces in the image information recorded in the recording medium and, thereafter, the image information of the person with a face is used to register the person with a face as the specific person;

selectively reproduce the recorded image which includes the registered specific person; and

generate a thumbnail corresponding to the recorded image in the recording medium such that the thumbnail is displayed on the display with an icon having a predetermined shape when an importance level is set for the recorded image via a user interface;--

Column 9, Line 13 to Column 10, Line 23, substitute the remaining portion of Claim 84 with the following portion:

--a touch panel adhered to a screen of the display, wherein the first setting mode and the second setting mode are each selected using the touch panel;

a video camera providing video image data, wherein, in response to the face-recognizing process recognizing that a face of a person is included in the video image data, the display displays the video image data with a frame surrounding at least a portion of the face of the person;

an analog/digital converter, wherein the analog/digital converter is configured to convert analog image data corresponding to the captured photograph into a digital image signal; and

a codec for compressing the digital image signal using a predetermined compression encoding method and generating encoded image information, wherein the encoded image information is stored in the recording medium,

wherein the video camera captures video information corresponding to a scene and the processor:

automatically sets a plurality of sections corresponding to the video information of the scene; and

generates a plurality of thumbnails corresponding to the plurality of sections, wherein each of the plurality of thumbnails is associated with the same video information corresponding to the scene, and the display displays the plurality of thumbnails; and

wherein the display is configured to display at least a plurality of images recorded in the recording medium such that contents of each image in the plurality of images includes a face of a different person and background objects and displaying the plurality of images includes displaying the faces

without displaying all of the background objects included in the contents of each image of the plurality of images.--

EXHIBIT 8

US011223757B2

(12) **United States Patent**
Yoshizawa et al.

(10) **Patent No.: US 11,223,757 B2**
(45) **Date of Patent: *Jan. 11, 2022**

(54) **VIDEO RECORDING DEVICE AND CAMERA FUNCTION CONTROL PROGRAM**

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(72) Inventors: **Kazuhiko Yoshizawa**, Ibaraki (JP); **Hirohito Kuriyama**, Tokyo (JP)

(73) Assignee: **MAXELL, LTD.**, Kyoto (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **16/686,467**

(22) Filed: **Nov. 18, 2019**

(65) **Prior Publication Data**

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H04N 5/232 (2006.01)
H04N 5/765 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H04N 5/23203*** (2013.01); ***G03B 17/38*** (2013.01); ***H04N 5/2258*** (2013.01);
(Continued)

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CPC H04N 5/23245; H04N 5/765; H04N 5/23216; H04N 5/772; H04N 5/2258; H04N 5/91; H04N 5/23293; H04N 5/232; H04N 5/23203; H04N 5/77; G03B 17/38; G06F 3/167
(Continued)

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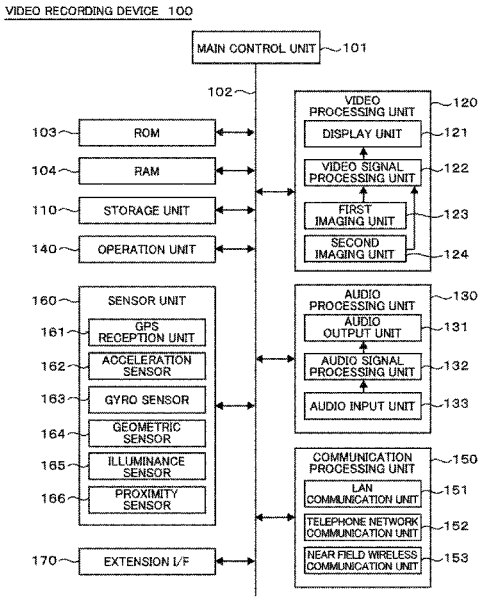
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Primary Examiner — Helen Shibru
(74) *Attorney, Agent, or Firm* — Mattingly & Malur, PC

(57) **ABSTRACT**

A video recording device includes: a first imaging unit (in camera) arranged on a same face as that of a display unit of a casing of the device; a second imaging unit (out camera) arranged on a face different from that of the display unit of the casing of the device; and an audio input unit that inputs a command voice giving an instruction for recording a video signal. A control unit sets a delay time until start of a recording process performed by the recording unit after input of the command voice to be different in accordance with the enabled imaging unit and sets a delay time of a case where the first imaging unit is enabled to be longer than a delay time of a case where the second imaging unit is enabled.

11 Claims, 12 Drawing Sheets



Related U.S. Application Data

continuation of application No. 14/917,586, filed as application No. PCT/JP2013/074728 on Sep. 12, 2013, now Pat. No. 9,774,776.

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G03B 17/38	(2021.01)
H04N 5/77	(2006.01)
H04N 5/225	(2006.01)
H04N 5/91	(2006.01)
G06F 3/16	(2006.01)

(52) **U.S. Cl.**

CPC ***H04N 5/23216*** (2013.01); ***H04N 5/23245*** (2013.01); ***H04N 5/232935*** (2018.08); ***H04N 5/232939*** (2018.08); ***H04N 5/765*** (2013.01); ***H04N 5/77*** (2013.01); ***H04N 5/772*** (2013.01); ***H04N 5/91*** (2013.01); *G06F 3/167* (2013.01)

(58) **Field of Classification Search**

USPC 386/225

See application file for complete search history.

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FIG. 1

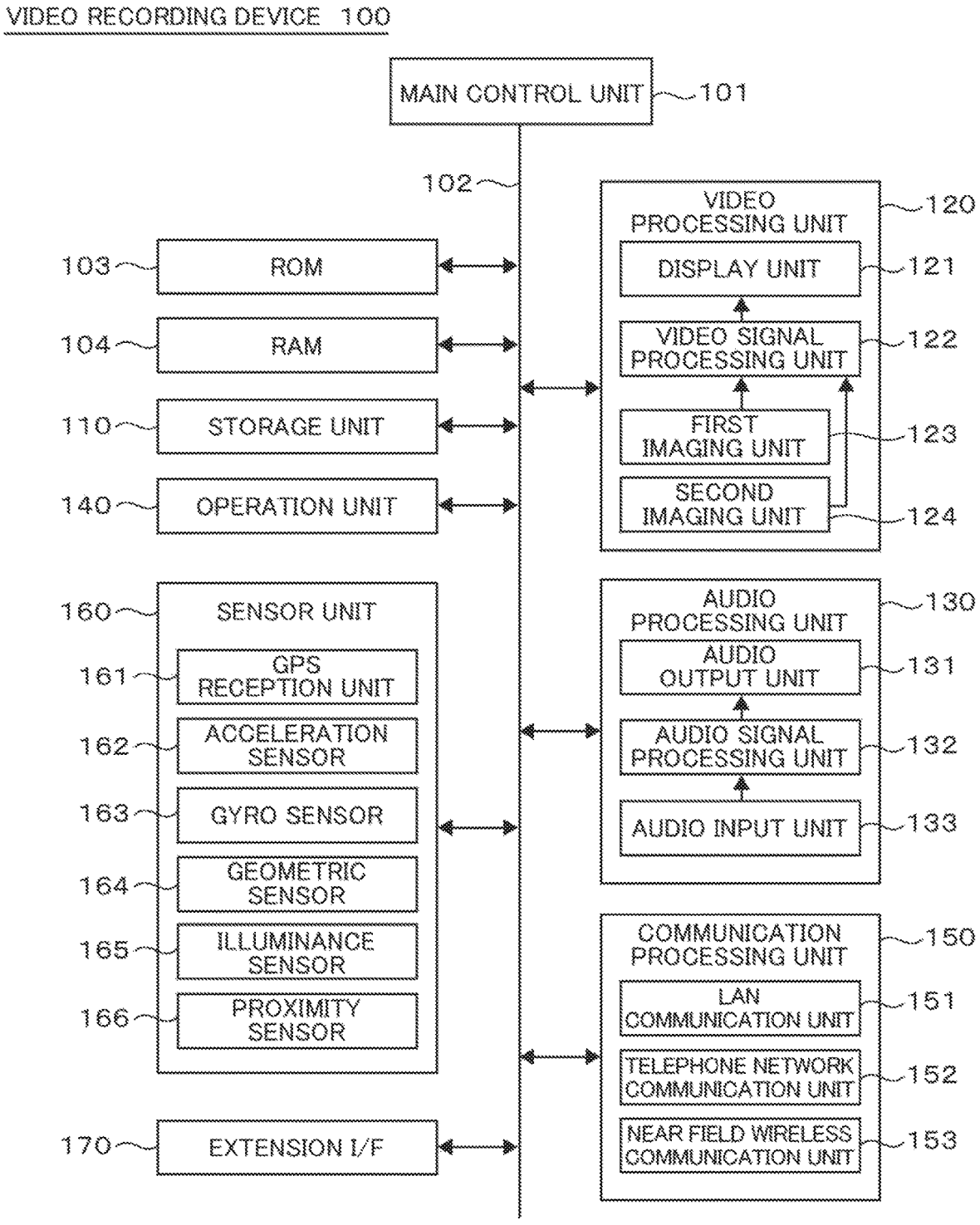

VIDEO RECORDING DEVICE 100
MAIN CONTROL UNIT
101
102
103
ROM
104
RAM
110
STORAGE UNIT
140
OPERATION UNIT
VIDEO PROCESSING UNIT
120
DISPLAY UNIT
121
VIDEO SIGNAL PROCESSING UNIT
122
FIRST IMAGING UNIT
123
SECOND IMAGING UNIT
124
160
SENSOR UNIT
161
GPS RECEPTION UNIT
162
ACCELERATION SENSOR
163
GYRO SENSOR
164
GEOMETRIC SENSOR
165
ILLUMINANCE SENSOR
166
PROXIMITY SENSOR
AUDIO PROCESSING UNIT
130
AUDIO OUTPUT UNIT
131
AUDIO SIGNAL PROCESSING UNIT
132
AUDIO INPUT UNIT
133
COMMUNICATION PROCESSING UNIT
150
LAN COMMUNICATION UNIT
151
TELEPHONE NETWORK COMMUNICATION UNIT
152
NEAR FIELD WIRELESS COMMUNICATION UNIT
153
170
EXTENSION I/F

FIG. 2

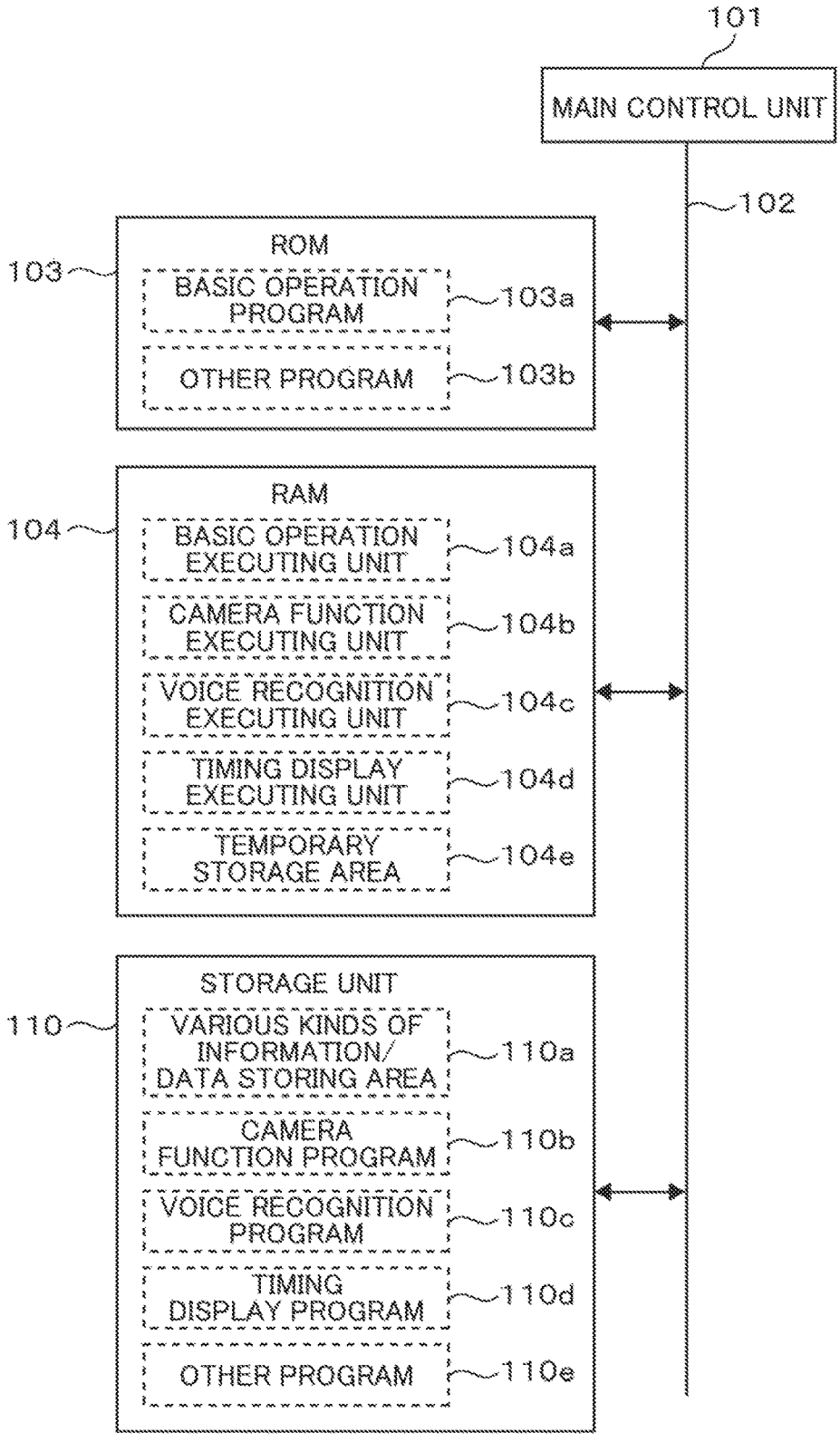

101
MAIN CONTROL UNIT
102
103
ROM
BASIC OPERATION PROGRAM
103a
OTHER PROGRAM
103b
104
RAM
BASIC OPERATION EXECUTING UNIT
104a
CAMERA FUNCTION EXECUTING UNIT
104b
VOICE RECOGNITION EXECUTING UNIT
104c
TIMING DISPLAY EXECUTING UNIT
104d
TEMPORARY STORAGE AREA
104e
110
STORAGE UNIT
VARIOUS KINDS OF INFORMATION/ DATA STORING AREA
110a
CAMERA FUNCTION PROGRAM
110b
VOICE RECOGNITION PROGRAM
110c
TIMING DISPLAY PROGRAM
110d
OTHER PROGRAM
110e

FIG. 3

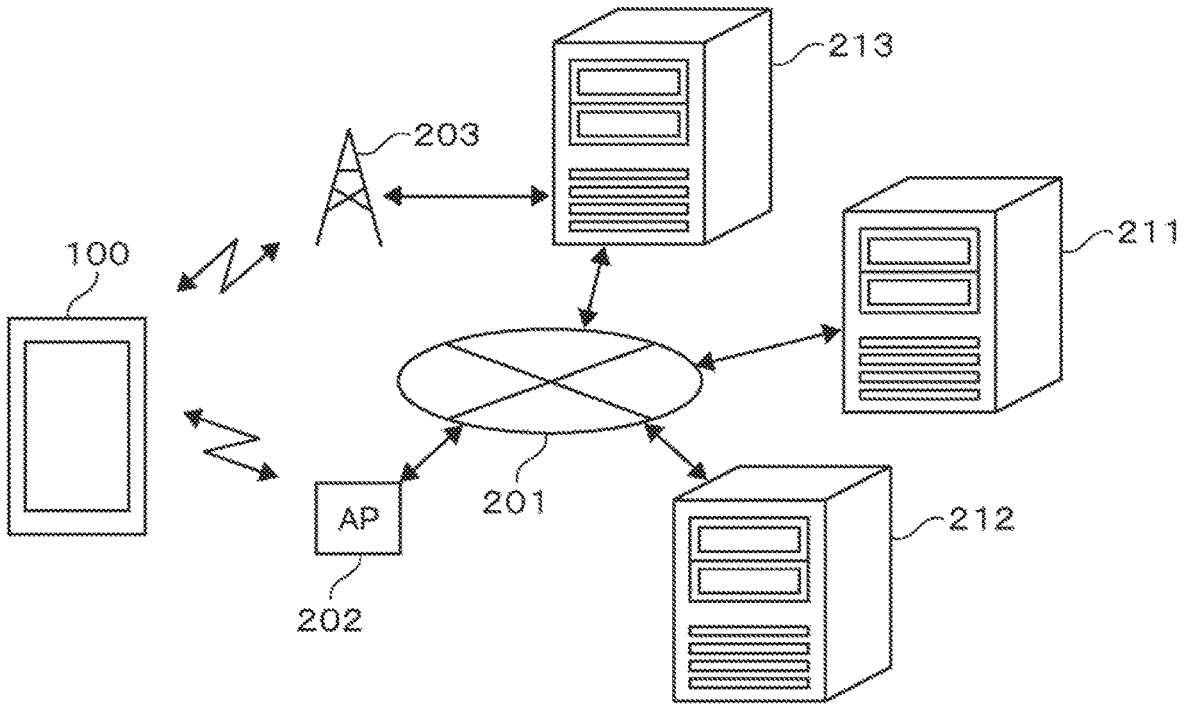


FIG. 4

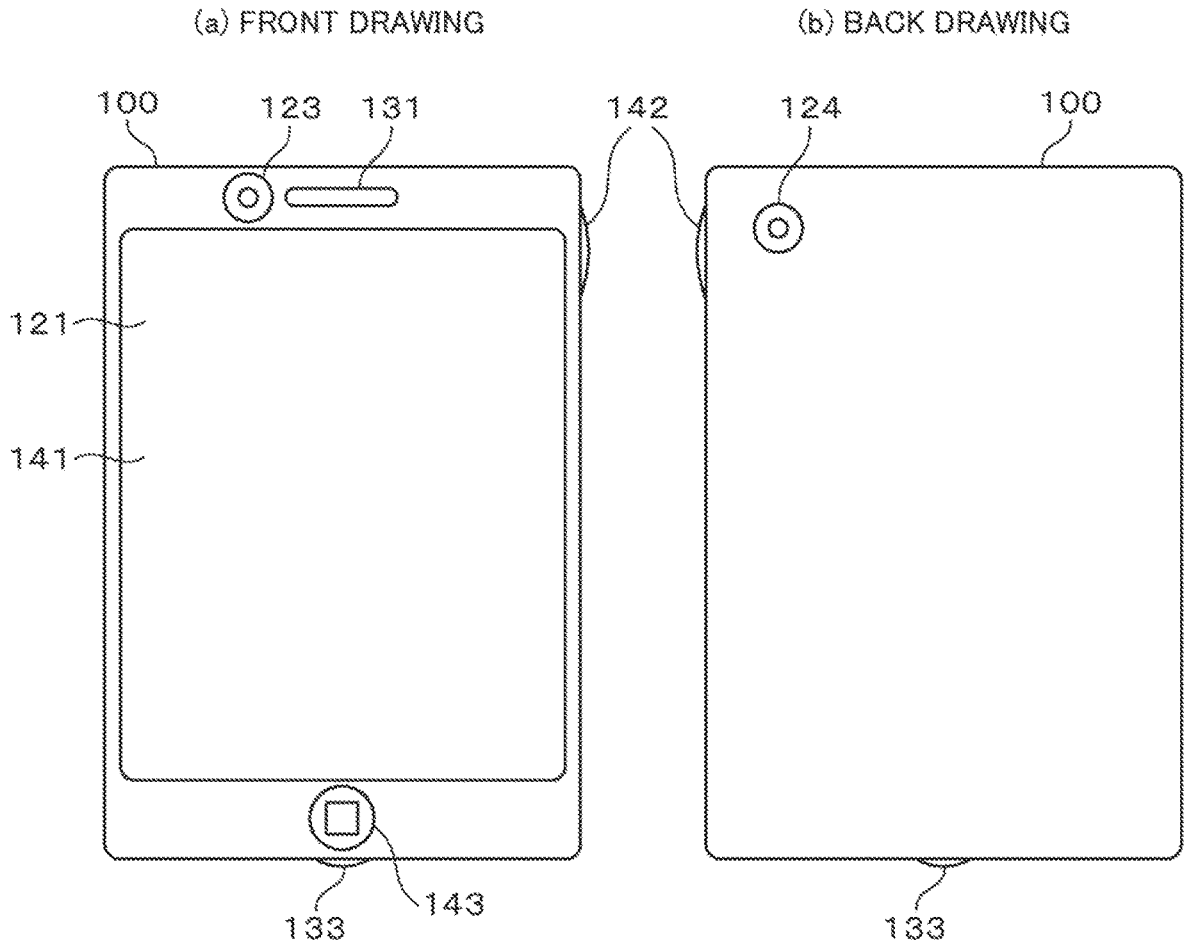

(a) FRONT DRAWING
(b) BACK DRAWING
100
123
131
142
124
100
121
141
133
143
133

FIG. 5

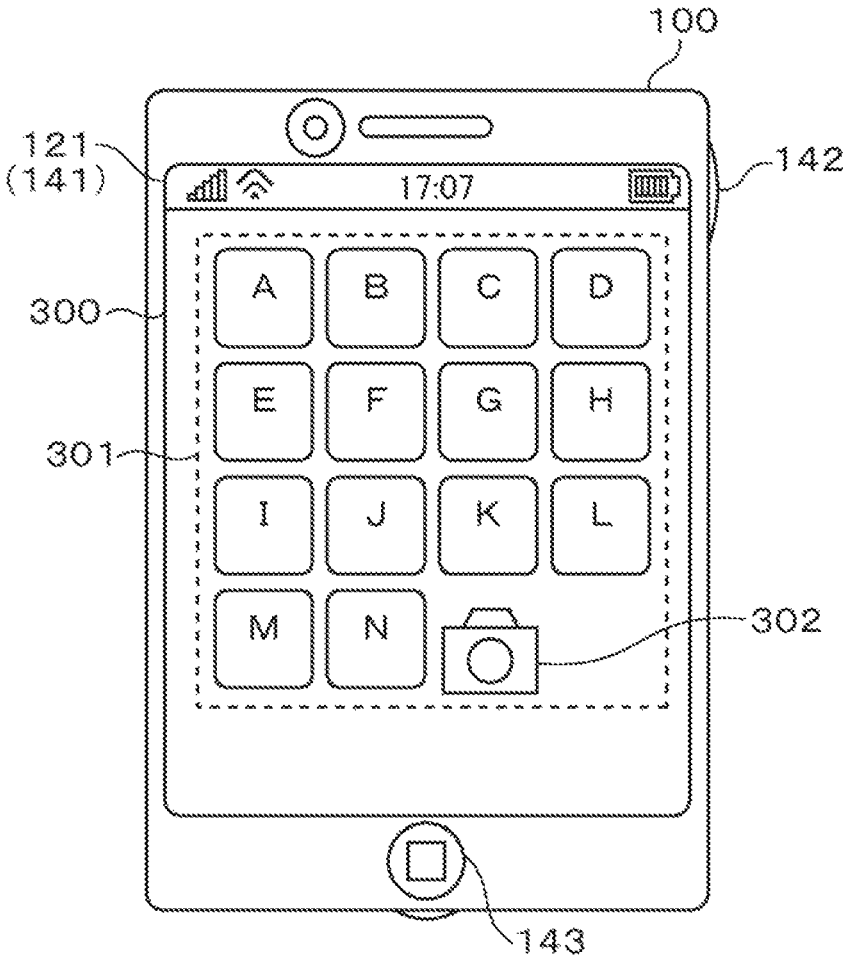


FIG. 6

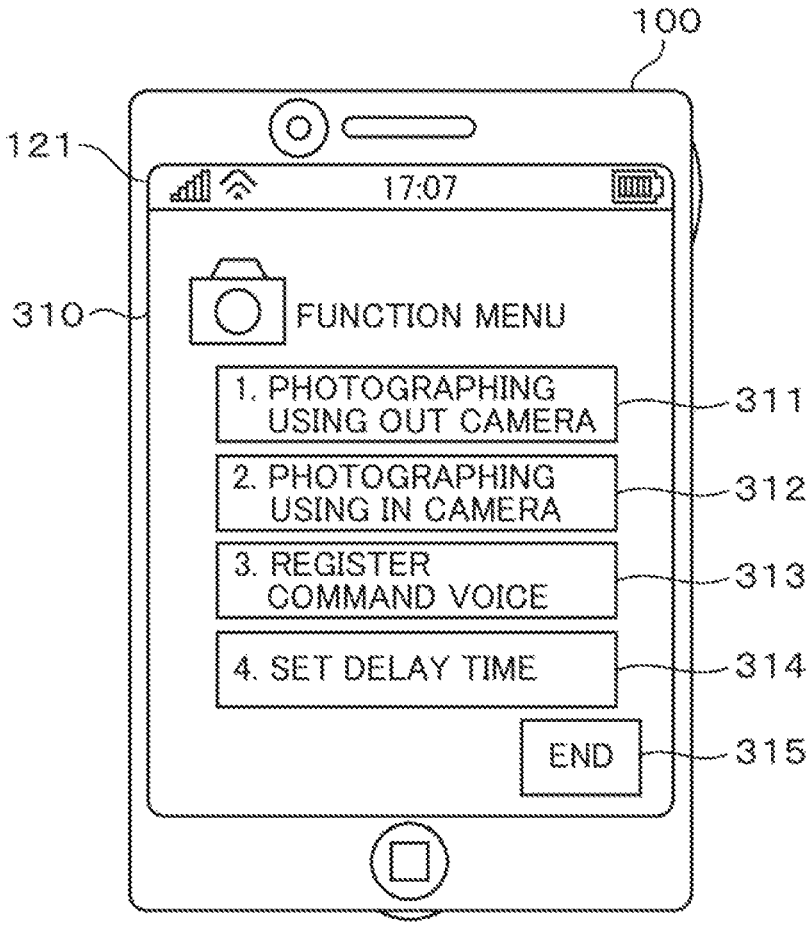

100
121
17:07
310
FUNCTION MENU
1. PHOTOGRAPHING USING OUT CAMERA
311
2. PHOTOGRAPHING USING IN CAMERA
312
3. REGISTER COMMAND VOICE
313
4. SET DELAY TIME
314
END
315

FIG. 7

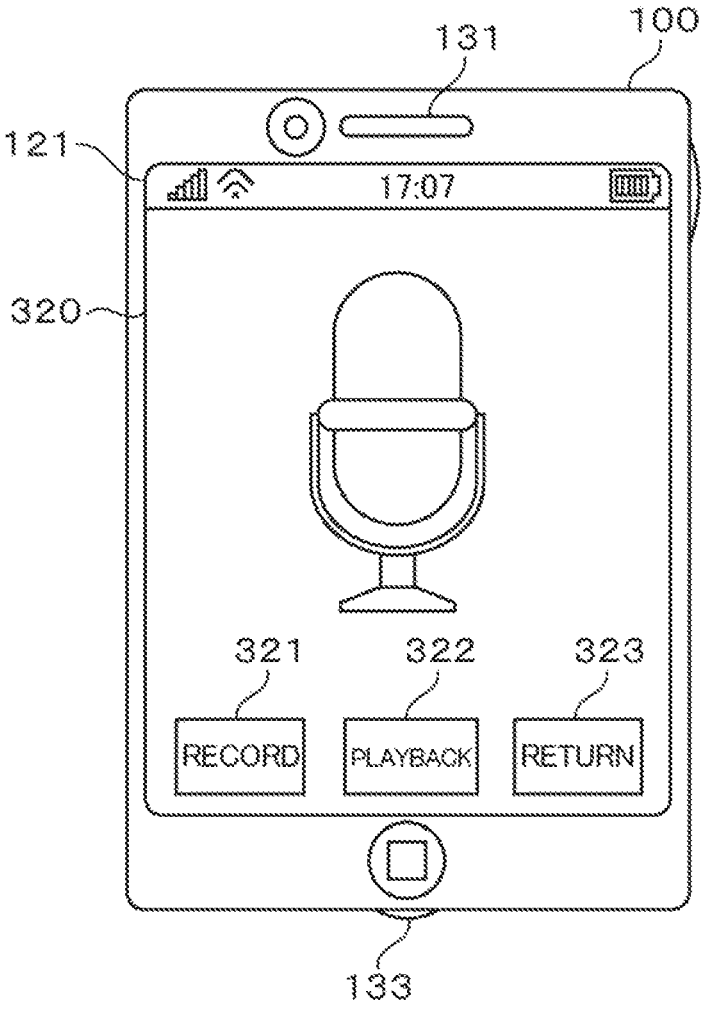


FIG. 8

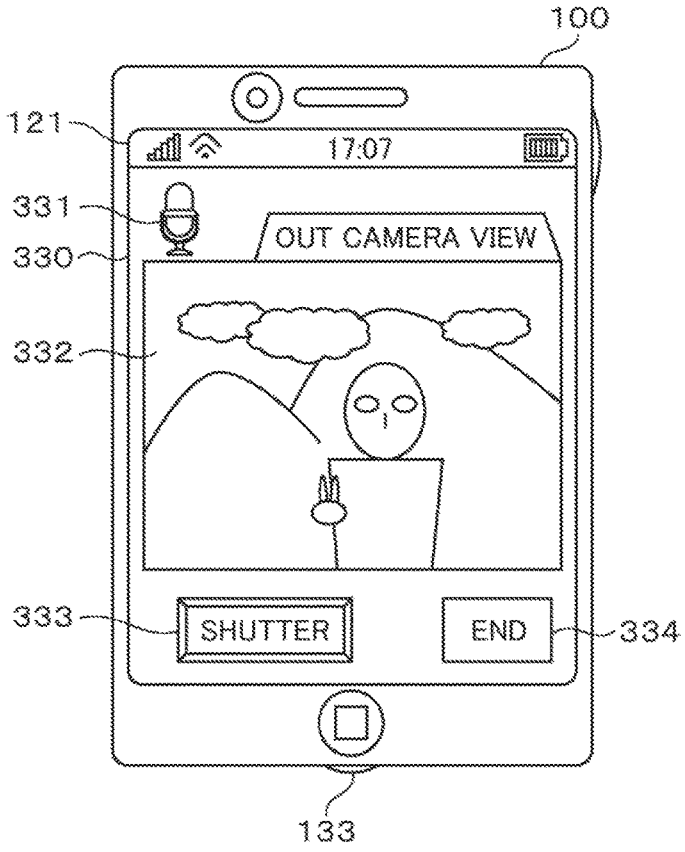

100
121
17:07
331
330
OUT CAMERA VIEW
332
333
SHUTTER
END
334
133

FIG. 9

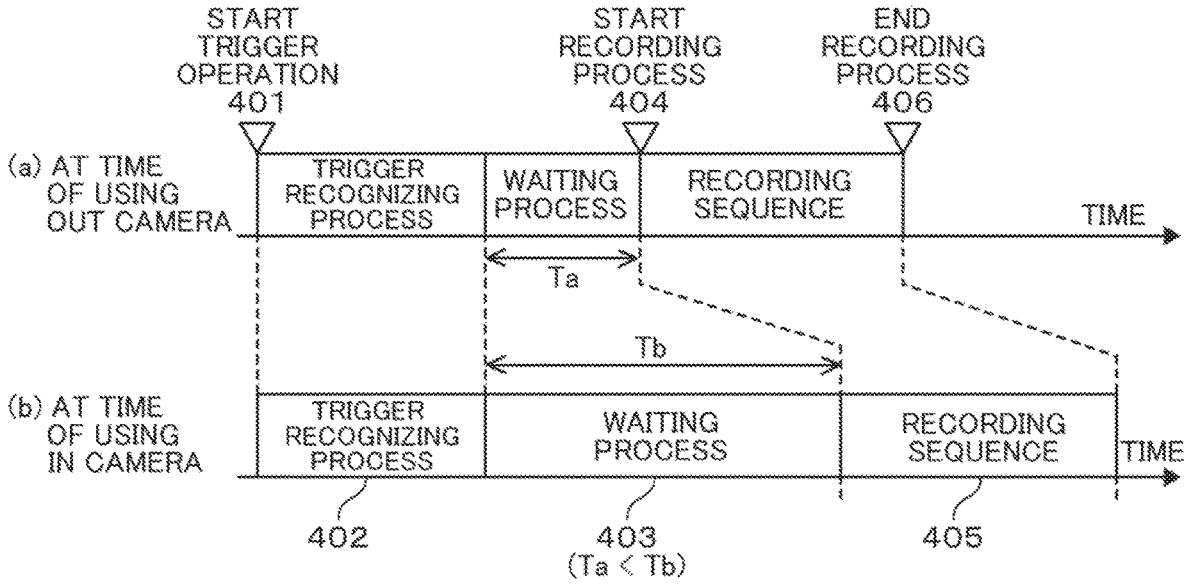

START TRIGGER OPERATION 401
START RECORDING PROCESS 404
END RECORDING PROCESS 406
(a) AT TIME OF USING OUT CAMERA
TRIGGER RECOGNIZING PROCESS
WAITING PROCESS
RECORDING SEQUENCE
TIME
Ta
Tb
(b) AT TIME OF USING IN CAMERA
TRIGGER RECOGNIZING PROCESS
WAITING PROCESS
RECORDING SEQUENCE
TIME
402
403
(Ta < Tb)
405

FIG. 10

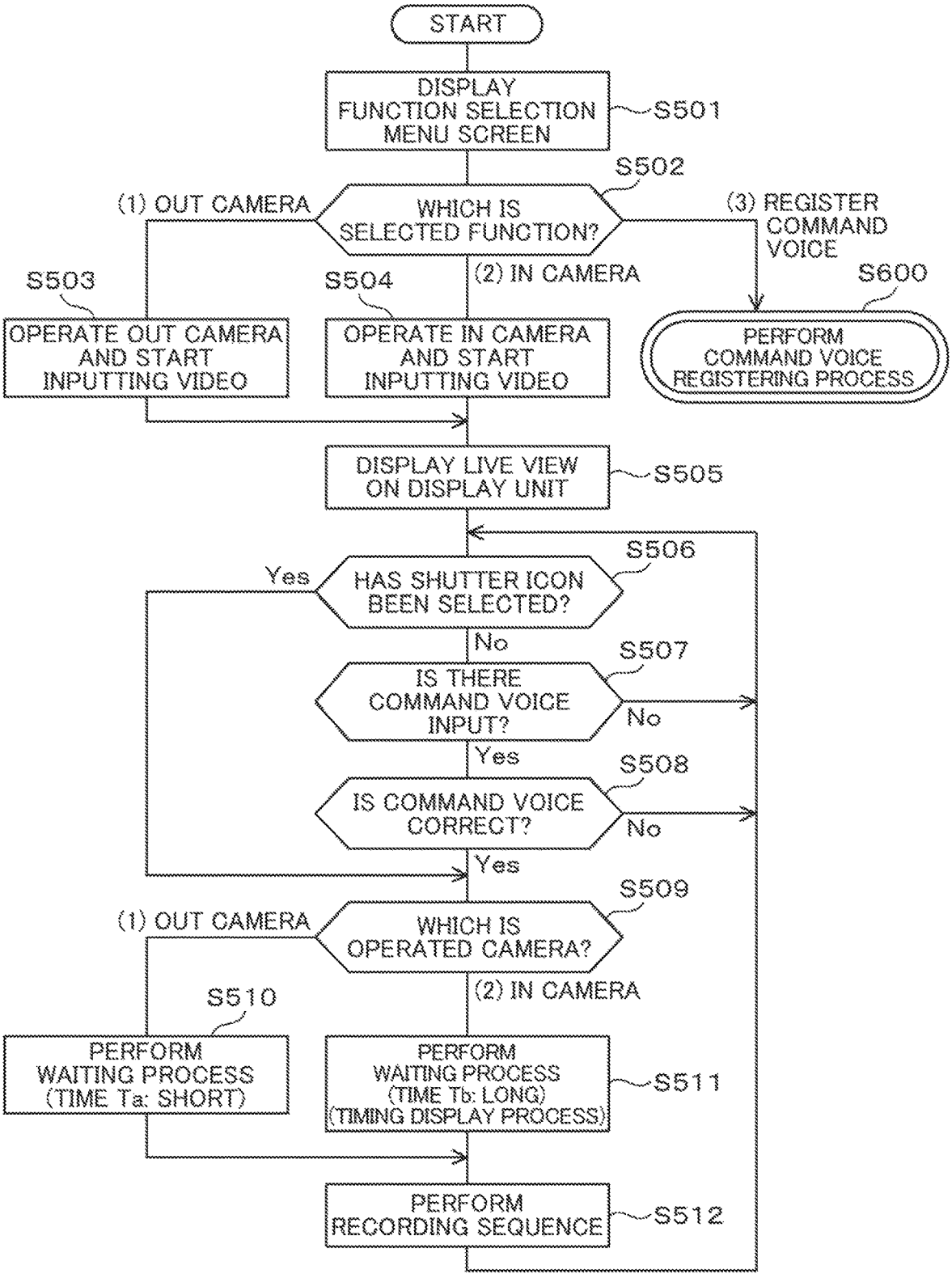

START
DISPLAY FUNCTION SELECTION MENU SCREEN
S501
S502
WHICH IS SELECTED FUNCTION?
(1) OUT CAMERA
(2) IN CAMERA
(3) REGISTER COMMAND VOICE
S503
S504
S600
OPERATE OUT CAMERA AND START INPUTTING VIDEO
OPERATE IN CAMERA AND START INPUTTING VIDEO
PERFORM COMMAND VOICE REGISTERING PROCESS
DISPLAY LIVE VIEW ON DISPLAY UNIT
S505
S506
HAS SHUTTER ICON BEEN SELECTED?
Yes
No
S507
IS THERE COMMAND VOICE INPUT?
No
Yes
S508
IS COMMAND VOICE CORRECT?
No
Yes
S509
WHICH IS OPERATED CAMERA?
(1) OUT CAMERA
(2) IN CAMERA
S510
PERFORM WAITING PROCESS (TIME Ta: SHORT)
PERFORM WAITING PROCESS (TIME Tb: LONG) (TIMING DISPLAY PROCESS)
S511
PERFORM RECORDING SEQUENCE
S512

FIG. 11

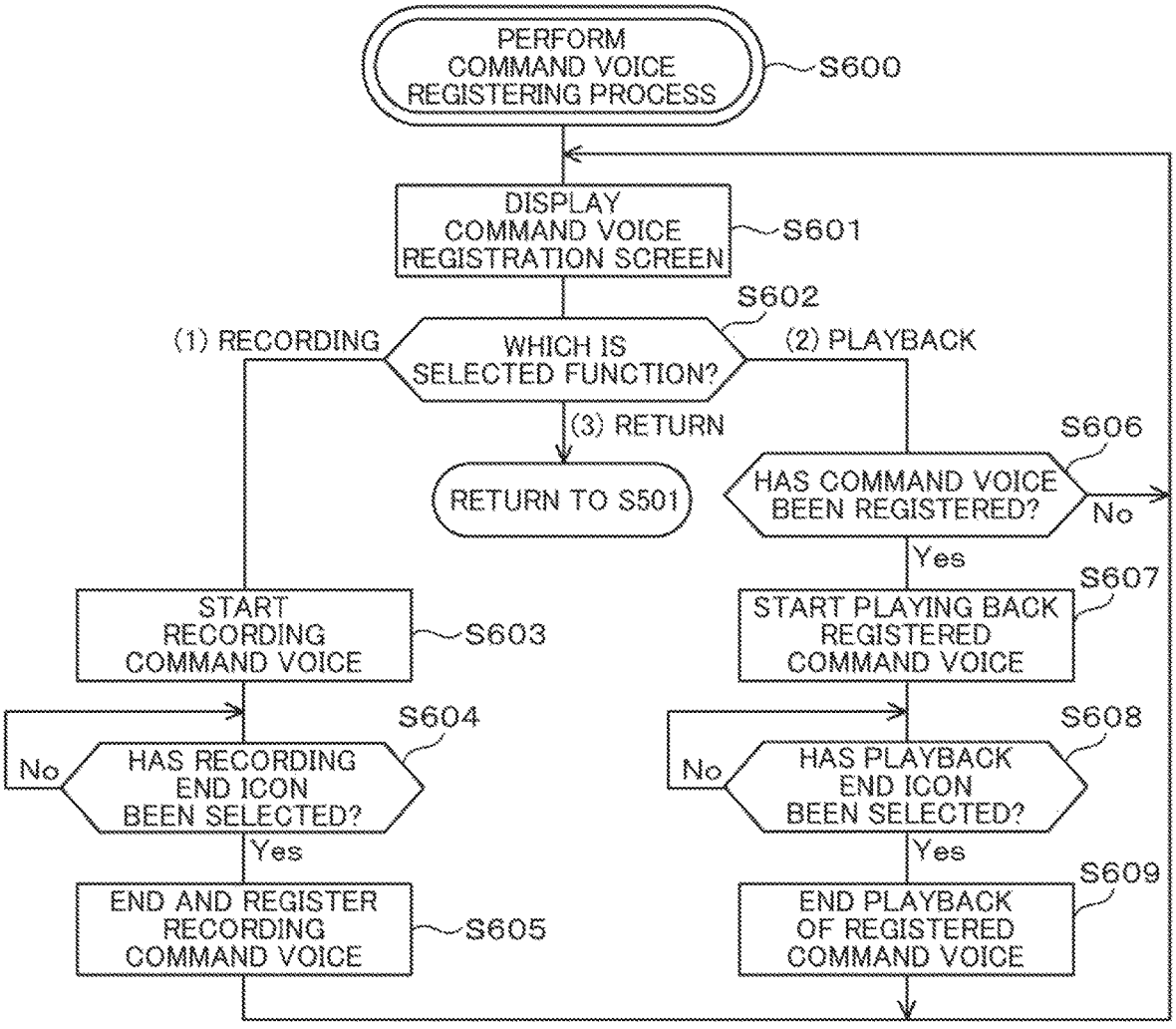

PERFORM COMMAND VOICE REGISTERING PROCESS
S600
DISPLAY COMMAND VOICE REGISTRATION SCREEN
S601
S602
WHICH IS SELECTED FUNCTION?
(1) RECORDING
(2) PLAYBACK
(3) RETURN
RETURN TO S501
S606
HAS COMMAND VOICE BEEN REGISTERED?
No
Yes
START RECORDING COMMAND VOICE
S603
S607
START PLAYING BACK REGISTERED COMMAND VOICE
S604
No
HAS RECORDING END ICON BEEN SELECTED?
Yes
S608
No
HAS PLAYBACK END ICON BEEN SELECTED?
Yes
END AND REGISTER RECORDING COMMAND VOICE
S605
S609
END PLAYBACK OF REGISTERED COMMAND VOICE

FIG. 12

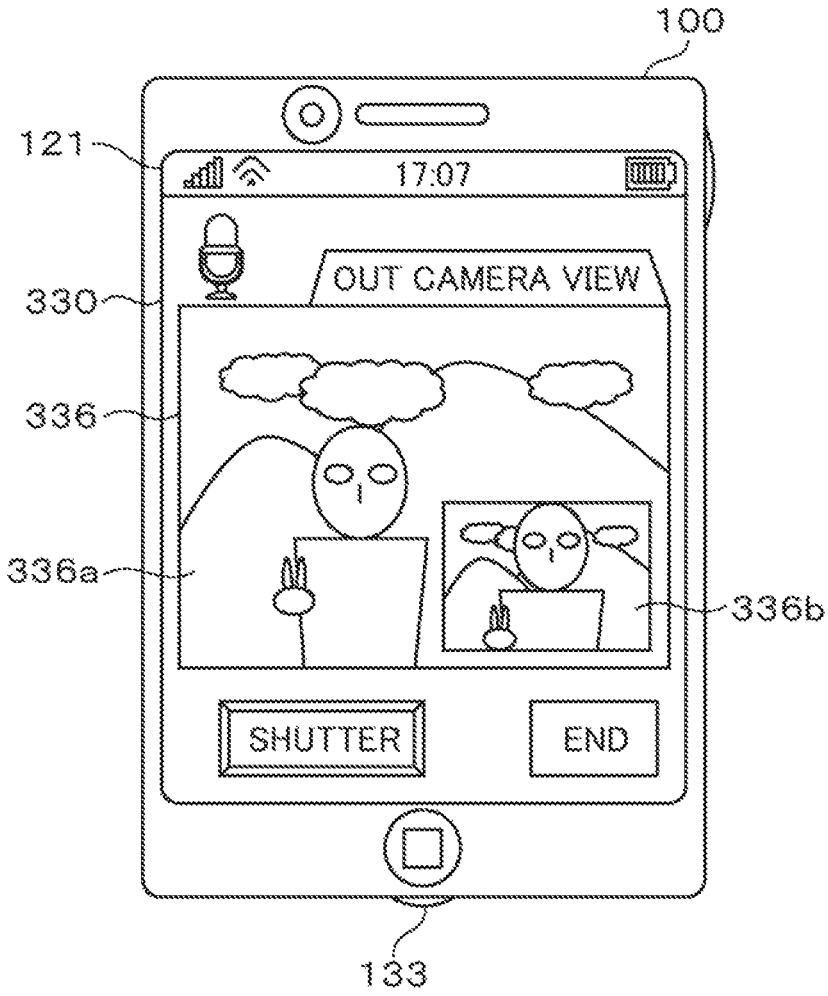
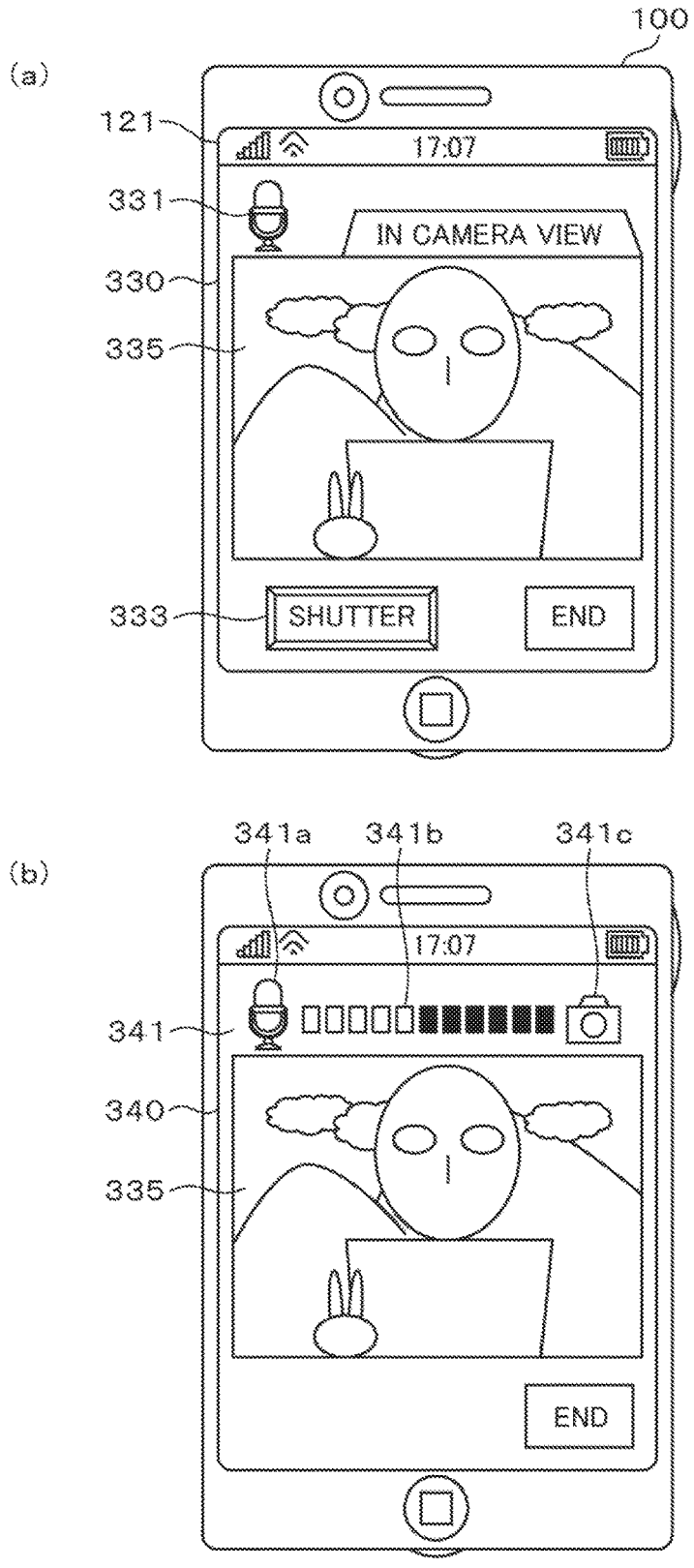

100
121
17:07
330
OUT CAMERA VIEW
336
336a
336b
SHUTTER
END
133

FIG. 13


(a)
100
121
17:07
331
IN CAMERA VIEW
330
335
333
SHUTTER
END
(b)
341a
341b
341c
17:07
341
340
335
END

VIDEO RECORDING DEVICE AND CAMERA FUNCTION CONTROL PROGRAM

TECHNICAL FIELD

The present invention relates to a video recording device including a plurality of imaging units and a camera function control program.

BACKGROUND ART

Digital cameras each converting a subject image into an electric signal using an electronic device such as a CCD (Charge Coupled Device) and recording the converted electric signal in a memory notably spread. Recently, commonly, the functions of such digital cameras are built in information terminal devices such as a mobile phone, a smartphone, and a tablet terminal.

In a digital camera, similar to a conventional silver halide camera, the start of a recording process is triggered frequently upon an operation of pressing a shutter button. Alternatively, in an information terminal device having a digital camera function, there are also cases where the start of a recording process is triggered upon a tap operation for a shutter icon or the like displayed on a monitor unit provided with a touch panel function. Any one of the operations described above may cause a so-called "camera shake". As a means for avoiding an occurrence of the "camera shake" described above, many technologies for performing a recording process to be triggered upon voice recognition have been disclosed.

As an example thereof, in Patent Document 1, a technology has been described in which, for the purpose of allowing a voice-recognition camera to perform photographing with a natural pose in accordance with the operation of a subject, two kinds of operations including an operation of immediately performing a photographing operation when a command voice is recognized and an operation of performing a photographing operation when a predetermined time elapses after recognition are provided, and, when the command voice of the latter case is recognized, the photographing operation performed by the camera is delayed by a time set in advance.

CITATION LIST

Patent Document

Patent Document 1: JP 1-191840 A

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

According to the technology disclosed in Patent Document 1, it is described that, a predetermined delay time between the recognition of a command voice in a voice recognition camera and the start of a photographing operation of the camera is arranged, and thus, photographing can be performed in a natural pose according to the operation of a subject. However, in a case where a plurality of command voices are registered in advance, and a command voice is selectively used according to a photographing purpose, the usability of the camera is degraded, and, in a case where a command voice is incorrectly selected, anticipated photographing timing is lost.

Recently, an information terminal device (video recording device) such as a camera-attached mobile phone or a smartphone includes two camera units, one camera unit is provided on the side of a same face (front face) as that of a monitor, and the other is provided on the side of a face (rear face) that is opposite to that of the monitor. In a case where a subject is photographed using such an information terminal device, a subject located in front of a user is photographed using the camera unit (out camera) provided on the face opposite to that of the monitor, and the monitor is used as a finder. On the other hand, in the case of photographing a self-image in which the user himself is a subject, the subject is photographed using the camera unit (in camera) provided on the same face as that of the monitor, and the monitor is used for checking the self-image.

In an information terminal device (video recording device) including such two camera units, a case will be considered in which the start of photographing (the start of recording) is triggered upon a voice uttered by a user. First, in a case where a subject located in front of a user is photographed using the out camera, when voice recognition is made, the photographing process is immediately started, and, generally, there is no problem. On the other hand, in a case where a self-image is photographed using the in camera, when voice recognition is made, and immediately the photographing process is started, there is a problem in that the user is photographed with the form of his mouth to be in a state immediately after the utterance of the command voice. In order to avoid this, it is necessary to delay the start of the photographing process after the voice recognition by a predetermined time.

In this way, in a case where a voice recognition function is applied to an information terminal device (video recording device) including two cameras of the out camera and the in camera, in order to photograph a subject in a natural pose, it is necessary to adjust photographing timing depending on which camera is used. Such problems have not been disclosed or suggested in conventional technologies including Patent Document 1.

An object of the present invention is to enable photographing of a subject with a natural pose using a video recording device including a plurality of imaging units such as an out camera and an in camera and improving the usability of the video recording device in consideration of the problems described above.

Solutions to Problems

As a means for solving the problems described above, technologies described in the claims are used. In other words, according to the present invention, there is provided a video recording device that includes an imaging unit, a display unit, and a recording unit, displays a video signal input from the imaging unit on the display unit, and records the video signal using the recording unit, the imaging unit including a first imaging unit that is arranged on a same face as that of the display unit of a casing of the device and a second imaging unit that is arranged on a face different from that of the display unit of the casing of the device, the video recording device including: an operation unit that selects one of the first imaging unit and the second imaging unit to be enabled; an audio input unit that inputs a command voice giving an instruction for recording the video signal; and a control unit that causes the recording unit to start a process of recording a video signal input from the imaging unit enabled by the operation unit in accordance with the command voice input to the audio input unit, the control unit

differently setting a delay time until start of the recording process performed by the recording unit after input of the command voice in accordance with the imaging unit enabled by the operation unit. Here, the control unit sets the delay time of a case where the first imaging unit is enabled by the operation unit to be longer than the delay time of a case where the second imaging unit is enabled.

Effects of the Invention

According to the present invention, photographing of a subject can be performed with a natural pose using a video recording device including a plurality of imaging units such as an out camera and an in camera, and the usability of the video recording device can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram that illustrates a video recording device according to one embodiment of the present invention.

FIG. **2** is a software configuration diagram of a video recording device **100**.

FIG. **3** is a diagram that illustrates the configuration of a communication system including the video recording device **100**.

FIG. **4** is a diagram that illustrates the external view of the video recording device **100**.

FIG. **5** is a diagram that illustrates an example of a basic screen displayed on a display unit **121**.

FIG. **6** is a diagram that illustrates an example of a camera function selection screen.

FIG. **7** is a diagram that illustrates an example of a command voice registration screen.

FIG. **8** is a diagram that illustrates an example of a live view display screen.

FIG. **9** is a diagram that illustrates a process of controlling switching between recording start delay times.

FIG. **10** is a flowchart that illustrates the flow of a camera operation of the video recording device **100**.

FIG. **11** is a flowchart that illustrates the flow of a command voice registration process (S**600**).

FIG. **12** is a diagram that illustrates an example of a screen on which two camera videos are composed and displayed.

FIG. **13** is a diagram that illustrates an example of a screen on which recording timing is displayed.

MODE FOR CARRYING OUT THE INVENTION

Hereinafter, embodiments of the present invention will be described with reference to the drawings. In description presented below, a device to which the present invention is applied will be referred to as a "video recording device" and may be a recording device that records video signals from a plurality of cameras (an out camera and an in camera) on a recording medium. More specifically, in addition to any one of a camera-attached mobile phone and a smartphone enabling a phone call with an external device using a telephone network communication unit, a tablet terminal, and the like, the device may be a digital still camera recording images by using one still image as a unit, a personal digital assistants (PDA) that transmits/receives information to/from an external device through wireless communication by using a wireless communication unit, or a notebook PC (personal computer). In addition, the device may be a video camera capable of capturing a moving image, a portable gaming device, or the like or any other portable digital device.

FIG. **1** is a block diagram that illustrates a video recording device according to one embodiment of the present invention. Here, a case where the video recording device **100** is a smartphone or a tablet terminal will be considered. The video recording device **100** includes: a main control unit **101**; a system bus **102**; a ROM **103**; a RAM **104**; a storage unit **110**; a video processing unit **120**; an audio processing unit **130**; an operation unit **140**; a communication processing unit **150**; a sensor unit **160**; and an extension interface unit **170**.

The main control unit **101** is a microprocessor unit that controls the overall operation of the video recording device **100** in accordance with a predetermined program. The system bus **102** is a data communication path used for performing data transmission/reception between the main control unit **101** and each unit arranged inside the video recording device **100**.

The ROM (Read Only Memory) **103** is a memory in which a basic operation program such as an operating system and other application programs are stored and, for example, a rewritable ROM such as an EEPROM (Electrically Erasable Programmable ROM) or a flash ROM is used. The RAM (Random Access Memory) **104** becomes a work area at the time of executing the basic operation program or any other application program. The ROM **103** and the RAM **104** may be integrally configured with the main control unit **101**.

The storage unit **110** stores still-image data, a moving-image data, or the like captured by the video recording device **100**. In addition, the storage unit **110** stores each operation setting value of the video recording device **100**, user information (command voice data) of the video recording device **100**, and the like. Furthermore, the storage unit **110** stores various programs used for realizing a camera function, and such programs are executed in the RAM **104**. The storage unit **110** needs to maintain stored information even in a state in which power is not supplied to the video recording device **100**, and thus, for example, a device such as a flash ROM, an SSD (Solid State Drive), or an HDD (Hard Disc Drive) is used.

The video processing unit **120** is configured by: a display unit **121**; a video signal processing unit **122**; a first imaging unit **123**; and a second imaging unit **124**. The display unit **121**, for example, is a display device such as a liquid crystal panel and provides video data processed by the video signal processing unit **122** for a user by displaying the video data. The video signal processing unit **122** includes a video RAM not illustrated in the diagram and displays input video data on the display unit **121**. In addition, the video signal processing unit **122** performs a format conversion, a superimposition process of a menu or any other OSD (On Screen Display) signal, and the like as is necessary. Each of the first imaging unit **123** and the second imaging unit **124** is an independent camera unit and acquires video data of a subject by converting light input from a lens using an electronic device such as a CCD or a CMOS (Complementary Metal Oxide Semiconductor) sensor into an electric signal. As will be described later, for example, the first imaging unit **123** used as an in camera photographing the user himself, and the second imaging unit **124** used as an out camera photographing a subject disposed on the periphery are selectively used. While a configuration including two imaging units is employed here, a plurality of imaging units may be included as long as two functions of the in camera and the out camera

are included therein. In addition, a configuration may be employed in which the second imaging unit **124** is configured as a unit that is separate from the video recording device **100** and is connected to the video recording device **100** through wired communication or wireless communication.

The audio processing unit **130** is configured by: an audio output unit **131**; an audio signal processing unit **132**; and an audio input unit **133**. The audio output unit **131** is a speaker and outputs an audio processed by the audio signal processing unit **132**. The audio input unit **133** is a microphone and inputs audio data by converting a command voice of a user and the like into the audio data. Here, a configuration may be employed in which the audio input unit **133** is configured as a unit that is separate from the video recording device **100** and is connected to the video recording device **100** through wired communication or wireless communication.

The operation unit **140** is a part to which a user's operation instruction for the video recording device **100** is input. For example, the operation unit **140** is configured by a touch panel that is arranged to be superimposed on the display unit **121** or operation keys in which button switches are aligned. As the function of the touch panel, a function included in the display unit **121** may be used. In addition, an operation may be performed using a keyboard connected to the extension interface unit **170** to be described later or the like. Furthermore, an operation may be performed using a separate information terminal device connected through wired communication or wired communication.

The communication processing unit **150** is configured by: a LAN (Local Area Network) communication unit **151**; a mobile telephone network communication unit **152**; and a near-field wireless communication unit **153**. The LAN communication unit **151** is connected to a wireless communication access point of the Internet through wireless communication and performs transmission/reception of data. The mobile telephone network communication unit **152** performs telephone communication (phone call) and transmission/reception of data through wireless communication with a base station of a mobile telephone network. The near-field wireless communication unit **153** performs wireless communication at the time of an approach of a corresponding reader/writer. Each of the LAN communication unit **151**, the mobile telephone network communication unit **152**, and the near-field wireless communication unit **153** includes a coding circuit, a decoding circuit, an antenna, and the like. In addition, an infrared communication unit and the like may be included therein.

The sensor unit **160** is a sensor group used for detecting the state of the video recording device **100** and is configured by: a GPS (Global Positioning System) reception unit **161**; an acceleration sensor **162**; a gyro sensor **163**; a geometric sensor **164**; an illuminance sensor **165**; and a proximity sensor **166**. By using such a sensor group, the position, the movement, the inclination, and the azimuth of the video recording device **100**, ambient brightness, a proximity situation of surrounding objects, and the like are detected. In addition, any other sensor may be included therein.

The extension interface unit **170** is an interface group used for extending the function of the video recording device **100** and is configured by: a video/audio interface; a USB (Universal Serial Bus) interface; a memory interface; and the like. The video/audio interface performs input of a video signal/audio signal from an external video/audio output device, output of a video signal/audio signal to an external video/audio input device, and the like. The USB interface connects a keyboard or other USB devices. The memory interface connects a memory card or any other memory medium and performs transmission/reception of data.

In addition, a configuration of a digital television broadcast reception function, an electronic money payment function, or the like may be added to the information terminal device such as a smartphone or a tablet terminal. The video recording device **100** illustrated in FIG. **1** is assumed to be an information terminal device and thus includes configurations such as the communication processing unit **150** and the sensor unit **160** that are not essential for the execution of the present invention, and, also in the case of a configuration not including such configurations, the operations according to the present invention can be performed.

FIG. **2** is a software configuration diagram of the video recording device **100** according to this embodiment and illustrates the software configurations of the ROM **103**, the RAM **104**, and the storage unit **110**.

In the ROM **103**, a basic operation program **103***a* such as an operating system and other application programs **103***b* are stored. By updating the programs stored in the ROM **103**, the versions of the basic operation program and the other application programs can be upgraded, and functional expansion thereof can be made.

The RAM **104** is a work area when various programs are executed and is configured by: a basic operation executing unit **104***a*; a camera function executing unit **104***b*; a voice recognition executing unit **104***c*; a timing display executing unit **104***d*; and a temporary storage area **104***e*, and the like. For example, the basic operation executing unit **104***a* is configured as the basic operation program **103***a* stored in the ROM **103** is expanded into the RAM **104**, and the expanded basic operation program is executed by the main control unit **101**. The camera function executing unit **104***b*, the voice recognition executing unit **104***c*, and the timing display executing unit **104***d* are configured as a camera function program **110***b*, a voice recognition program **110***c*, and a timing display program **110***d* stored in the storage unit **110** are expanded into the RAM **104** and are executed by the main control unit **101**. The temporary storage area **104***e* is an area in which data is temporarily maintained as is necessary when various application programs are executed. A distinctive feature of this embodiment is a camera operation (recording start timing switching) performed by the camera function executing unit **104***b*, the voice recognition executing unit **104***c*, and the timing display executing unit **104***d*.

The storage unit **110** includes a various information/data storing area **110***a* and stores the camera function program **110***b*, the voice recognition program **110***c*, and the timing display program **110***d* therein. In the various information/data storing area **110***a*, still-image data, moving-image data, and the like captured by the video recording device **100** are stored, and each operation setting value of the video recording device **100**, user's information, and the like are stored. The camera function program **110***b* performs control of switching of a delay time until recording starts in accordance with one of the first imaging unit **123** and the second imaging unit **124** to be used. The voice recognition program **110***c* is used for registering a user's voice and recognizing whether or not a command voice input as a trigger operation is correct. The timing display program **110***d* is used for displaying timing of recording start on the screen when the recording start is delayed. Here, the programs **110***b* to **110***d* described above may be integrated into only one program having the functions thereof.

In addition, the ROM **103** may not have an independent configuration as illustrated in FIGS. **1** and **2** but may use a

partial storage area (other programs **110***e*) inside the storage unit **110**. Furthermore, the camera function executing unit **104***b*, the voice recognition executing unit **104***c*, and the timing display executing unit **104***d* may be configured by hardware realizing equivalent operations.

FIG. **3** is a diagram that illustrates the configuration of a communication system including the video recording device **100** according to this embodiment. The video recording device **100** is connected to a wide-area public network **201** such as the Internet through a wireless communication access point **202**. In addition, the video recording device **100** is connected to a mobile telephone communication server **213** through a base station **203** of a mobile telephone communication network. An application server **211**, an image data server **212**, and a mobile telephone communication server **213** are connected to the wide-area public network **201**. In the communication processing unit **150** of the video recording device **100**, the LAN communication unit **151** is connected to the wireless communication access point **202** of the Internet **201** and performs transmission/reception of data. In addition, the mobile telephone network communication unit **152** is connected to the base station **203** of the mobile telephone communication network and performs transmission/reception of data.

By using such a communication system, the video recording device **100** can download a new application program from the application server **211** through the Internet **201** and the wireless communication access point **202** or the base station **203** of the mobile telephone communication network. At this time, the downloaded new application program is stored in the storage unit **110**. The main control unit **101** expands the new application program stored in the storage unit **110** into the RAM **104** and executes the new application program, thereby realizing a new function of the video recording device **100**, whereby a function expansion can be made.

Each of the programs described above may be in the state of being stored in the ROM **103**, the storage unit **110**, or the like of the video recording device **100** in advance at a time point of product shipment. Alternatively, after the product shipment, the programs may be acquired from the application server **211** or the like on the Internet **201** through the LAN communication unit **151** or the mobile telephone network communication unit **152**. Furthermore, the programs stored in a memory card or the like may be acquired through the extension interface unit **170**.

FIG. **4** is a diagram that illustrates the external view of the video recording device **100** according to this embodiment. Here, a case is illustrated in which the video recording device **100** is an information terminal device such as a smartphone, (a) is a diagram of a front face, and (b) is a diagram of a rear face (back face). On the front face side of the video recording device **100**, a display unit **121** is arranged. The first imaging unit (camera unit) **123** is arranged on a same face (front face) as that of the display unit **121**, and the second imaging unit (camera unit) **124** is arranged on a face (rear face) opposite to the display unit **121**. Hereinafter, the first imaging unit **123** arranged on the same face as that of the display unit **121** will be referred to as an "in camera", and the second imaging unit **124** arranged on the side opposite to the display unit **121** will be referred to as an "out camera". Here, the position of the second imaging unit **124** may be arranged on a side face or the like other than the same face as that of the display unit **121**. The first imaging unit **123** (in camera) mainly photographs the user himself as a subject, and the second imaging unit **124** (out camera) photographs a subject disposed on the periphery.

As the operation unit **140** that receives an operation instruction from a user for the video recording device **100**, various operation keys (a power key **142** and a home key **143**) according to the touch panel **141** arranged to be superimposed on the display unit **121** and button switches are arranged. In addition, an audio output unit (speaker) **131** and an audio input unit (microphone) **133** are included.

Next, an example of various screens displayed on the display unit **121** in accordance with various operations of the video recording device **100** will be illustrated.

FIG. **5** is a diagram that illustrates an example of a basic screen displayed on the display unit **121**. The basic screen **300** is displayed when the power of the video recording device **100** is turned on according to pressing of the power key **142** or when the home key **143** is pressed during the execution of an arbitrary application program. An icon group **301** displayed on the basic screen **300** is a collection of icons associated with application programs that can be executed by the video recording device **100**. By selecting any one of icons, a predetermined application program associated with the selected icon is executed. Among the icons, an icon **302** is an icon at the time of executing the camera function that is a distinctive feature of the video recording device **100** according to this embodiment.

The selection of an icon may be performed by performing a tap operation for an area on the touch panel **141** that corresponds to a position on the display unit **121** at which a target icon is displayed. Alternatively, an operation key such as a cross cursor key or a determination key not illustrated in the drawing may be performed.

FIG. **6** is a diagram that illustrates an example of a camera function selection screen displayed at the time of starting the camera function. The camera function selection menu screen **310** is configured by: an out camera selection icon **311** used in a case where photographing is performed using the out camera; an in camera selection icon **312** in a case where photographing is performed using the in camera; a command voice registration icon **313** used in a case where a command voice is registered; a delay time setting icon **314** used in a case where a recording start delay time is set; and an end icon **315**. A user selects a camera in accordance with a photographing target. Alternatively, in a case where a command voice is not registered, before the photographing process, a command voice is registered.

FIG. **7** is a diagram that illustrates an example of a command voice registration screen displayed when a command voice is registered. The command voice registration screen **320** is configured by: a recording start/stop icon **321**; a playback start/stop icon **322**; and a return icon **323**. At the time of recording, the recording start/stop icon **321** is selected, and a voice uttered by the user is input from the audio input unit **133** and is stored. At the time of playback, the playback start/stop icon **322** is selected, and the stored user's voice is output from the audio output unit **131**.

FIG. **8** is a diagram that illustrates an example of a live view display screen displaying a camera video. The live view display screen **330** is configured by: a command voice reception icon **331**; a live view window **332**; a shutter icon **333**; and an end icon **334**.

The live view window **332** displays video data input from the first imaging unit **123** (in camera) or the second imaging unit **124** (out camera) as it is. In this example, an out camera view input from the second imaging unit **124** is displayed. A user adjusts the layout and the like of a subject to be

captured while checking a video displayed in the live view window **332**. In addition, by performing a touch panel operation such as pinch-out/in at a position located at an upper part of the live view window **332**, zoom-in/out of a displayed video is controlled.

The command voice reception icon **331** represents that a recording process can be started by using a command voice input from the audio input unit **133** as a trigger. In other words, by displaying the icon **331**, it represents that the voice input function is enabled (alternately, the voice input function may be represented to be enabled by changing the shape of the icon **331**). The shutter icon **333** is used for starting a recording process by using the selection of the shutter icon as a trigger. The user can use both the audio input unit **133** and the shutter icon **333** as a trigger for starting a recording process. In addition, whether or not the function for using a voice input as a trigger is enabled can be selected by the user.

Hereinafter, the camera function (an operation for delaying the start of recording) that is a distinctive feature of the video recording device **100** according to this embodiment will be described.

In a general subject photographing process, it is preferable that a delay time until the start of a recording process after a shutter operation (in this embodiment, including the input of a command voice used as a trigger for starting a recording process) is as close as possible to zero. However, in a case where the user himself is photographed (self-image photographing) using a camera that starts a recording process using a voice input as a trigger, such a delay time is not preferable since the user is photographed with his mouth in a state immediately after the utterance of a command voice in that case. In order to avoid this, in this embodiment, a predetermined delay time until the start of a recording process after the input of a command voice is provided. In other words, a control process is performed such that switching to a delay time until the start of recording after detection of a trigger for starting the recording process is made in accordance with a photographing target (an external subject/a self-image) or a photographing method (the out camera/the in camera).

FIG. **9** is a diagram that illustrates a process of controlling switching between recording start delay times. The video recording device **100** according to this embodiment performs the process of controlling switching between delay times in accordance with which one of the two cameras is used.

In a control sequence, when a trigger operation start **401** (an input of a command voice) is received, after a trigger recognition process **402** (a process of recognizing a command voice) and a standby process **403** of a predetermined time are performed, a recording process start **404** is performed. Then, a predetermined recording sequence **405** (storage of video data) is executed, and a recording process end **406** is performed.

As illustrated in (a), in a case where a subject is photographed using the second imaging unit **124** (out camera), a standby process **403** of a standby time Ta is performed. On the other hand, as illustrated in (b), in a case where a subject is photographed using the first imaging unit **123** (in camera), a standby process **403** of a standby time Tb is performed. Here, the standby times of both the cases are different from each other, and the standby time Tb is set to be longer than the standby time Ta (Ta<Tb). Accordingly, a delay time until the recording process start **404** from the trigger operation start **401** is longer at the time of using the in camera illustrated in (b) than at the time of using the out camera illustrated in (a). In this way, the delay time is automatically switched over in accordance with selection of one of the second imaging unit **124** (out camera) and the first imaging unit **123** (in camera). Therefore, an optimal video corresponding to a photographing target (an external subject/a self-image) can be recorded.

Here, in the delay time until the recording process start **404** from the trigger operation start **401**, the trigger recognition process **402** and the standby process **403** are included. In the trigger recognition process **402**, a process of inputting a command voice from the audio input unit **133** and a process of checking the data matching ratio between voice data of the command voice input by the voice recognition executing unit **104***c* and voice data of the recorded command voice are included. Accordingly, a time required for the trigger recognition process **402** is not basically zero. Meanwhile, the standby process **403** is a process that is intentionally inserted for adjusting the timing of the recording process start **404**. Thus, when the second imaging unit **124** (out camera) is used, in order to further decrease the delay time, it is preferable that the standby time Ta of the standby process **403** is close to zero.

While fixed values different from each other may be set to the standby time Ta at the time of using the out camera illustrated in (a) and the standby time Tb at the time of using the in camera illustrated in (b) in advance, arbitrary values may be set thereto by the user. In a case where the setting is made by the user, a method may be used in which the standby times are selected from among a plurality of values prepared in advance. Also in such a case, it is apparent that the standby time Tb is set to be longer than the standby time Ta. The delay time setting icon **314** illustrated in FIG. **6** is used for the user to set the delay times (standby times).

In the recording sequence **405**, not only the process of recording video data in the storage unit **110** (or the image data server **212** or any other memory device), but focusing of a camera unit, an exposure process, an A/D conversion process for the output of a CCD/CMOS sensor, a gamma correction, noise elimination, and image compression process are performed.

According to this embodiment, compared to a case as illustrated in Patent Document 1 described above in which a plurality of command voices are prepared in advance, and the timing at which a recording process is started is delayed in accordance with a command voice, there is no risk of losing the photographing timing due to erroneous selection of a command voice. In addition, compared to a camera device having a plurality of photographing modes (for example, an ordinary mode and a self-timer mode) having mutually-different delay times, checking/selecting of the mode do not need to be performed at each photographing time, and accordingly, the usability is improved.

Next, the flow of the camera operation of the video recording device **100** according to this example will be described in detail. Here, general operations/manipulations as a camera device such as focusing and exposure are known, and thus description thereof will not be presented. In addition, in order to simplify the description, processes performed by the main control unit **101** expanding various programs stored in the ROM **103** and the storage unit **110** into the RAM **104** and executing the programs will be described as processes executed by the executing units **104***a* to **104***d* of the RAM **104**.

FIG. **10** is a flowchart that illustrates the flow of the camera operation of the video recording device **100**. When the icon **302** is selected on the basic screen **300** illustrated in FIG. **5**, the basic operation executing unit **104***a* operates the

camera function executing unit **104***b* and transfers the control subject to the camera function executing unit **104***b*.

The camera function executing unit **104***b* displays the camera function selection menu screen **310** illustrated in FIG. **6** (S**501**) and determines a function menu (icon) that has been selected by the user (S**502**).

In S**502**, in a case where the user selects (1) the out camera selection icon **311**, the camera function executing unit **104***b* enables the second imaging unit **124**, starts inputting video data from the out camera (S**503**), and displays the input video data on the display unit **121** as a live view (S**505**). On the other hand, in a case where the user selects (2) the in camera selection icon **312**, the camera function executing unit **104***b* enables the first imaging unit **123**, starts inputting video data from the in camera (S**504**), and displays the input video data on the display unit **121** as a live view (S**505**).

In S**502**, in a case where the user selects (3) the command voice registration icon **313**, the camera function executing unit **104***b* operates the voice recognition executing unit **104***c* and executes a command voice registration process (S**600**). This command voice registration process (S**600**) will be additionally described with reference with FIG. **11**. In addition, in S**502**, in a case where the user selects the end icon **315** (not illustrated in the drawing), the camera function executing unit **104***b* returns the control subject to the basic operation executing unit **104***a*. The basic operation executing unit **104***a* displays the basic screen **300** and ends the operation of the camera function executing unit **104***b*.

In S**505**, the camera function executing unit **104***b* displays the live view display screen **330** illustrated in FIG. **8** and operates the voice recognition executing unit **104***c*. Then, it is determined whether the user has selected the shutter icon **333** as a trigger operation (S**506**) or whether there is a command voice input from the audio input unit **133** (S**507**). In S**506**, in a case where the user selects the shutter icon **333**, the process proceeds to S**509**.

In S**507**, in a case where the input of a command voice from the audio input unit **133** is detected, the camera function executing unit **104***b* transmits the voice data of the input command voice to the voice recognition executing unit **104***c*. The voice recognition executing unit **104***c* compares the voice data of the input command voice with the voice data of the registered command voice that is registered in the various information/data storing area **110***a* of the storage unit **110** and determines whether or not the input command voice is correct (S**508**). More specifically, the voice recognition executing unit **104***c* acquires a data matching ratio between the voice data of the input command voice and the voice data of the registered command voice and determines whether or not the matching ratio is a predetermined threshold or more. A result of the determination is transmitted to the camera function executing unit **104***b*, and, when the command voice is correct, the process proceeds to S**509**. On the other hand, when the command voice is incorrect, the voice data of the input command voice is discarded, the process is returned to S**506**, and again, the process stands by for selection of the shutter icon **333** or input of a new command voice (S**507**).

In S**509**, the camera function executing unit **104***b* checks whether the camera that is currently operated is the first imaging unit **123** (in camera) or the second imaging unit **124** (out camera) (in other words, whether the icon selected in S**502** is the out camera selection icon **311** or the in camera selection icon **312**).

In a case where (1) the out camera is operated, the camera function executing unit **104***b* executes a predetermined standby process (the standby time Ta: short) (S**510**) and then, starts a recording sequence (S**512**). On the other hand, in a case where (2) the in camera is operated, the camera function executing unit **104***b* executes a predetermined standby process (the standby time Tb: long) (S**511**) and then, starts a recording sequence (S**512**). In the standby process of S**511**, a timing display process to be described later with reference to FIG. **13** may be performed together. When the recording sequence of S**512** ends, the process is returned to S**506**, and a standby process for a next trigger operation is performed.

In this way, in the camera operation according to this embodiment, the recording process is started using a command voice input to the audio input unit **133** or the process of selecting the shutter icon **333** as a trigger. At that time, in accordance with the out camera or the in camera that is operated, a delay time until the start of recording from timing at which the trigger is received is automatically switched over.

In addition, the determination of the input voice in S**508** may be performed based not only on the comparison of the matching ratio of the voice data but also on a detailed comparison of voice print data or the like or a comparison based on only matching between keywords. In a case where the detailed comparison is made based on the voice print data or the like, only a user who has performed the command voice registration process can use the video recording device **100**, whereby the security is improved. On the other hand, in a case where the comparison is made based on only keywords, anyone including the user can use the video recording device **100**, whereby the usability is improved. Thus, it may be configured such that whether the use is limited to a specific user or not is determined by performing switching between comparison methods in accordance with a use environment.

FIG. **11** is a flowchart that illustrates the flow of the command voice registration process (S**600**) illustrated in FIG. **10**.

The camera function executing unit **104***b* operates the voice recognition executing unit **104***c*, displays the command voice registration screen **320** illustrated in FIG. **7** (S**601**), and determines an icon disposed within the screen that is selected by the user (S**602**). In a case where the user selects the recording start/stop icon **321** of "(1)", the process proceeds to S**603**, and an operation of recording a command voice is performed. In a case where the user selects the playback start/stop icon **322** of "(2)", the process proceeds to S**606**, and an operation of playing back a command voice is performed. In a case where the user selects the return icon **323** of "(3), the camera function executing unit **104***b* ends the operation of the voice recognition executing unit **104***c*, and the process proceeds to S**501** illustrated in FIG. **10**.

In the recording operation of S**603**, the camera function executing unit **104***b* starts a process of recording a voice signal input from the audio input unit **133**. Then, when it is detected that the user selects the recording start/stop icon **321** again during the execution of the recording process (S**604**), the process of recording a voice signal input from the audio input unit **133** ends. The voice recognition executing unit **104***c* registers recorded voice data in the various information/data storing area **110***a* of the storage unit **110** as a command voice under the control of the camera function executing unit **104***b* (S**605**). Thereafter, the camera function executing unit **104***b* moves the control to S**601**.

In the playback operation of S**606**, the voice recognition executing unit **104***c* checks whether or not the command voice is registered in the various information/data storing

area **110***a* of the storage unit **110** under the control of the camera function executing unit **104***b*. In a case where the command voice is registered, the voice recognition executing unit **104***c* reads the registered command voice from the various information/data storing area **110***a*, and the camera function executing unit **104***b* starts a process of playing back the registered command voice that has been read. A voice signal of the registered command voice that has been played back is output from the audio output unit **131** (S**607**). Then, when it is detected that the user selects the playback start/stop icon **322** again during the execution of the playback process (S**608**), the camera function executing unit **104***b* ends the process of playing back the registered command voice (S**609**). Thereafter, the camera function executing unit **104***b* moves the control to S**601**.

On the other hand, in a case where the command voice is not registered in S**606**, the camera function executing unit **104***b* displays an indication thereof on the display unit **121** and moves the control to S**601**. In addition, in S**608**, also in a case where it is not detected that the user selects the playback start/stop icon **322** again, after the process of playing back all the data of the registered command voice ends, the control is moved to S**601**.

According to the command voice registration process described above, a voice of a user's taste can be registered as a command voice used as a trigger for the start of a recording process, and the registered command voice can be checked.

Next, additional functions of the video recording device **100** according to this embodiment will be described.

FIG. **12** is a diagram that illustrates an example of a screen on which two camera videos are composed and displayed. In this case, both the first imaging unit **123** (in camera) and the second imaging unit **124** (out camera) are simultaneously enabled, and two units of video data are input. In a live view window **336** of the live view display screen **330**, video data **336***a* input from the out camera and video data **336***b* input from the in camera are composed in the form of PinP (Picture in Picture) and are displayed.

A process of recording the video data composed in the form of PinP in this way is performed as below. When a trigger operation (command voice input) is received, a standby process having the standby time Ta (short) is performed for the video data **336***a* of the out camera, and the standby process having the standby time Tb (long) is performed for the video data **336***b* supplied from the in camera. Then, both the video data **336***a* and the video data **336***b* are composed and recorded. Accordingly, image data supplied from each of two cameras can be recorded in an optimal state.

However, according to the method described above, a predetermined time difference occurs between the two units of video data, and there are cases where a video after the composition becomes unnatural depending on the situation of the subject. In such a case, both the standby times are configured to coincide with each other. More specifically, the standby time Tb (long) of the in camera is also applied to the standby time of the out camera. In such a case, there is no time difference between two units of video data, and unnaturalness can be resolved. Whether the standby times of the two units of video data are configured to be the same or different from each other can be selected by the user depending on the situation of a subject by arranging a selection switch.

FIG. **13** is a diagram that illustrates an example of a screen on which recording timing is displayed.

As described above, in this embodiment, a delay time until the start of recording from a trigger operation (command voice input) is arranged. Particularly, in a case where a video supplied from the first imaging unit **123** (in camera) is recorded, the standby time Tb of the standby process is increased. For this reason, there are cases where the user does not know when an actual recording process is started and feels inconvenience. Thus, in order to resolve this, the timing of the start of recording is displayed on the display unit.

"(a)" illustrates a live view display screen **330** and is in a state standing by for a trigger operation while a camera video is displayed. Here, in a live view window **335**, video data supplied from the in camera is displayed. In addition, in order to receive a trigger operation, a command voice reception icon **331** and a shutter icon **333** are displayed. In this state, the user utters a command voice or selects the shutter icon **333** as a trigger operation.

"(b)" illustrates a recording timing display screen **340** after the reception of a trigger operation. The command voice reception icon **331** and the shutter icon **333** used for a trigger operation are eliminated, and a timing display icon **341** is displayed by the timing display executing unit **104***d*. In this state, a trigger recognition process and a predetermined standby process (in this example, having the standby time Tb: long) are performed.

The timing display icon **341** is configured by: a microphone mark **341***a*; a progress bar **341***b*; and a camera mark **341***c*. In the progress bar **341***b*, a time elapse (painted white) until the start of recording is displayed. The display state is controlled by the timing display executing unit **104***d* and is linked to the standby process described above. In other words, the bar starts to grow from the microphone mark **341***a* that is a start point at a time point when the voice recognition process of a command voice is completed, and, when the bar arrives at the camera mark **341***c* that is an end point, the recording sequence is started. The user can easily acquire a time elapse of the standby process and the timing of the start of the recording process by visually recognizing the bar display of the progress bar **341***b* of the timing display icon **341**.

The design of the timing display icon **341** may be variously represented. Instead of the progress bar, for example, a remaining time display according to countdown using a numerical value or an animation in the shape of an analog time can be made, and any design may be employed as long as the remaining time can be roughly perceived.

To display the recording timing display screen **340** described above is effective when the first imaging unit **123** (in camera) having a long standby time Tb is used. On the other hand, when the second imaging unit **124** (out camera) having a short standby time Ta is used, the display of the progress bar **341***b* instantly ends, and thus, it does not have any meaning. However, in a case where the standby time Ta is set to a large value to some degrees, the display is effective, and, thus, it is preferable that the length of the standby time is compared with a threshold, and, in a case where the length of the standby time is larger than the threshold, the recording timing display screen is displayed.

As described above, according to the video recording device **100** of this embodiment, a delay time is arranged until a recording process is started after detection of a trigger operation for the start of the recording process, and the length of the delay time is automatically switched over in accordance with one of two camera units (the out camera and the in camera) that is used. Accordingly, in a case where a recording process is started using a command voice input

as a trigger or in a case where the user himself is photographed using the in camera (self-image photographing), a subject can be photographed in a natural pose. In addition, by displaying the recording timing display screen **340**, also in a case where a delay time is arranged between the trigger operation and the recording process, timing at which the recording process is actually performed can be easily acquired. Accordingly, a video recording device having improved usability can be provided.

As above, while several embodiments of the present invention have been described, the configuration realizing the technology according to the present invention is not limited to the embodiments described above, and various application examples and modified examples can be made. In other words, in the embodiment described above, while an applied device has been called and described as a video recording device, more specifically, the applied device may be a mobile phone having a camera function, a smartphone, a tablet terminal, a digital still camera, a personal digital assistants (PDA), or a notebook PC. Furthermore, the applied device may be a video camera, a portable gaming device, or any other portable digital device. In addition, numerical values, display terms, and the like represented in the embodiments and the drawings are merely examples, and, in a case where they are equivalent in accordance with an applied device, the effects of the present invention are not degraded.

Some or all of the functions and the like of the present invention described above may be realized by hardware, for example, by designing them using an integrated circuit or the like. In addition, the functions and the like may be realized by software as a microprocessor unit or the like analyses and executes a program realizing each of the functions. Furthermore, hardware and software may be used together.

In addition, control lines and information lines illustrated in the drawings are lines that are considered to be necessary for the description, and it cannot be determined that all the control lines and all the information lines for products are necessarily illustrated. Actually, most of all the configurations may be considered to be connected to each other.

REFERENCE SIGNS LIST

100 Video recording device
101 Main control unit
102 System bus
103 ROM
104 RAM
104*a* Basic operation executing unit
104*b* Camera function Executing unit
104*c* Voice recognition executing unit
104*d* Timing display executing unit
110 Storage unit
120 Video processing unit
121 Display unit
122 Video signal processing unit
123 First imaging unit (in camera)
124 Second imaging unit (out camera)
130 Audio processing unit
131 Audio output unit
132 Audio signal processing unit
133 Audio input unit
140 Operation unit
150 Communication processing unit
160 Sensor unit
170 Extension interface unit
300 Basic screen
310 Camera function selection menu screen
320 Command voice registration screen
330 Live view display screen
340 Recording timing display screen

The invention claimed is:

1. An image recording device configured to execute a plurality of different photographing processes, comprising:
an audio input interface configured to receive a command voice;
a touch display arranged on a first surface of the image recording device and configured to display an image signal and receive a touch operation instruction;
a first camera arranged on a same side of the touch display and configured to photograph an object and acquire a first image signal;
a second camera arranged on an opposite side of the touch display and configured to photograph an object and acquire a second image signal;
a recorder configured to record at least one of the first image signal or the second image signal on a storage; and
a controller,
wherein the controller is configured to:
control such that, when the audio input interface receives the command voice giving a first instruction to start a recording of an image signal, the recorder starts a recording of the first image signal acquired by the first camera on the storage in response to the first instruction,
control such that, when the touch display receives the touch operation instruction giving a second instruction to start a recording of an image signal, the recorder starts a recording of the second image signal acquired by the second camera on the storage in response to the second instruction, and
control such that a first standby time of a case where the first camera is enabled and the second camera is disabled is longer than a second standby time of a case where the second camera is enabled and the first camera is disabled,
wherein the first standby time is a time from a recognition of the first instruction to a start of the recording of the first image signal acquired by the first camera, and the second standby time is a time from a recognition of the second instruction to a start of the recording of the second image signal acquired by the second camera.

2. The image recording device according to claim **1**,
wherein the first camera is enabled in accordance with the command voice.

3. The image recording device according to claim **1**,
wherein the first standby time is settable or selectable by a user.

4. The image recording device according to claim **1**,
wherein the second standby time is settable or selectable by a user.

5. The image recording device according to claim **1**,
wherein the controller causes an elapse state of the first standby time from the photographing trigger to the recording start of the image signal to the recorder to be displayed on the touch display.

6. The image recording device according to claim **1**,
wherein the controller causes an elapse state of the second standby time from the photographing trigger to the recording start of the image signal to the recorder to be displayed on the touch display.

7. The image recording device according to claim 1, wherein the storage is an internal storage of the image recording device.

8. The image recording device according to claim 1, wherein the storage is an external storage connected to the image recording device.

9. The image recording device according to claim 1, further comprising,

a communication unit including circuitry and configured to perform communication with a server device on the Internet,

wherein the recorder is configured to record the first image signal input from the first camera or the second image signal from the second camera in the server device through the communication unit.

10. The image recording device according to claim 1, further comprising,

a command voice storage configured to store a command voice for instructing photographing,

wherein the recorder is configured to perform control such that a command voice to be recorded in the command voice storage is received from the audio input interface and stored in the command voice storage as a command voice registration process, and

in the first photographing process,

the recorder determines that the command voice instructs the photographing when the command voice input to the audio input interface is identical to the command voice stored in the command voice storage, and determines that the command voice does not instruct the photographing when the command voice input to the audio input interface is not identical to the command voice stored in the command voice storage.

11. An image recording method of an image recording device, comprising:

photographing an object and acquiring an image signal by a first camera or a second camera, the first camera being arranged on the same face side of a touch display and configured to acquire a first image signal, the second camera being arranged on an opposite side of the touch display and configured to acquire a second image signal;

in a case that the first camera is used for photographing:

receiving a command voice from an audio input interface;

determining whether or not the command voice includes a first instruction to start a recording of the first image signal;

performing a first standby process during a first predetermined time when the command voice includes the first instruction and when the first camera is enabled and the second camera is disabled; and

start recording the first image signal acquired by the first camera after the first predetermined time; and

in a case that the second camera is used for photographing:

receiving a touch operation instruction from the touch display;

determining whether or not the touch operation instruction includes a second instruction to start a recording of the second image signal;

performing a second standby process during a second predetermined time when the touch operation instruction includes the second instruction and when the second camera is enabled and the first camera is disabled; and

start recording the second image signal acquired by the second camera after the second predetermined time,

wherein the first predetermined time is set to be longer than the second predetermined time, and

wherein the first predetermined time is a time from a recognition of the first instruction to a start of the recording of the first image signal acquired by the first camera, and the second predetermined time is a time from a recognition of the second instruction to a start of the recording of the second image signal acquired by the second camera.

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EXHIBIT 9

US011017815B2

(12) **United States Patent**
Yoshida et al.

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(45) **Date of Patent: May 25, 2021**

(54) **EDITING METHOD AND RECORDING AND REPRODUCING DEVICE**

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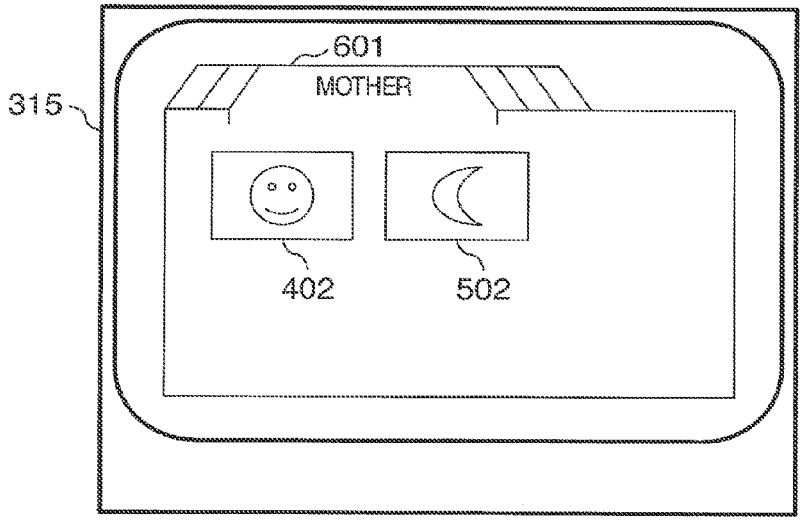
Fandango Media, LLC's S.P.R. 25 Invalidity Contentions which were filed Mar. 26, 2018 in the following litigation: *Maxell, Ltd.* v. *Fandango Media, LLC*, Civil Action No. 2:17-cv-07534 Ag-(SSx) (C.D. Cali.), filed Oct. 13, 2017.
(Continued)

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(74) *Attorney, Agent, or Firm* — Mattingly & Malur, PC

(57) **ABSTRACT**

In order to provide a recording and reproducing device that allows a user to select and manage arbitrary play lists, a unit of management for managing all registered play list information and an upper management hierarchical level are added. The unit of management is adapted to be handled on the same level with unified information that indicates a reproduction range of all AV data. User-defined unified information is adapted to be handled on the added management hierarchical level. The user-defined unified information is formed to allow arbitrary reproduction ranges contained on a lower hierarchical level to be registered.

27 Claims, 9 Drawing Sheets



Related U.S. Application Data

continuation of application No. 15/808,175, filed on Nov. 9, 2017, now Pat. No. 10,199,072, which is a continuation of application No. 15/176,435, filed on Jun. 8, 2016, now Pat. No. 9,818,449, which is a continuation of application No. 14/141,417, filed on Dec. 26, 2013, now Pat. No. 9,384,783, which is a continuation of application No. 12/567,898, filed on Sep. 28, 2009, now Pat. No. 8,644,684, which is a continuation of application No. 11/203,457, filed on Aug. 11, 2005, now Pat. No. 7,613,383.

(51) **Int. Cl.**

G11B 27/10	(2006.01)
G11B 27/034	(2006.01)
G11B 27/34	(2006.01)
H04N 5/76	(2006.01)
H04N 9/87	(2006.01)
G06F 3/0482	(2013.01)
G11B 27/031	(2006.01)
H04N 5/93	(2006.01)
H04N 5/92	(2006.01)
H04N 9/82	(2006.01)

(52) **U.S. Cl.**

CPC ***G11B 27/034*** (2013.01); ***G11B 27/34*** (2013.01); ***H04N 5/76*** (2013.01); ***H04N 9/87*** (2013.01); *G11B 2220/2562* (2013.01); *H04N 9/8205* (2013.01)

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FIG.1

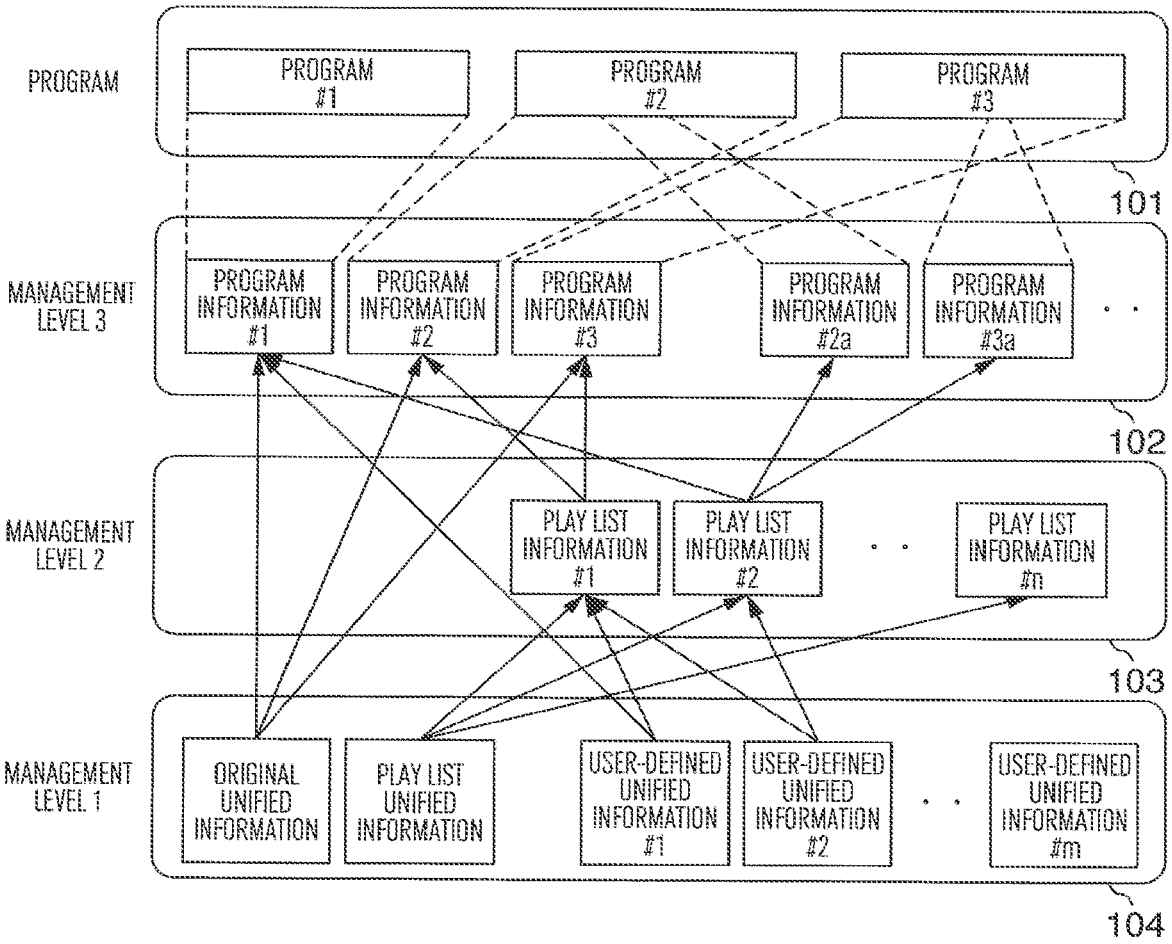

PROGRAM
PROGRAM #1
PROGRAM #2
PROGRAM #3
101
MANAGEMENT LEVEL 3
PROGRAM INFORMATION #1
PROGRAM INFORMATION #2
PROGRAM INFORMATION #3
PROGRAM INFORMATION #2a
PROGRAM INFORMATION #3a
102
MANAGEMENT LEVEL 2
PLAY LIST INFORMATION #1
PLAY LIST INFORMATION #2
PLAY LIST INFORMATION #n
103
MANAGEMENT LEVEL 1
ORIGINAL UNIFIED INFORMATION
PLAY LIST UNIFIED INFORMATION
USER-DEFINED UNIFIED INFORMATION #1
USER-DEFINED UNIFIED INFORMATION #2
USER-DEFINED UNIFIED INFORMATION #m
104

FIG.2
PRIOR ART

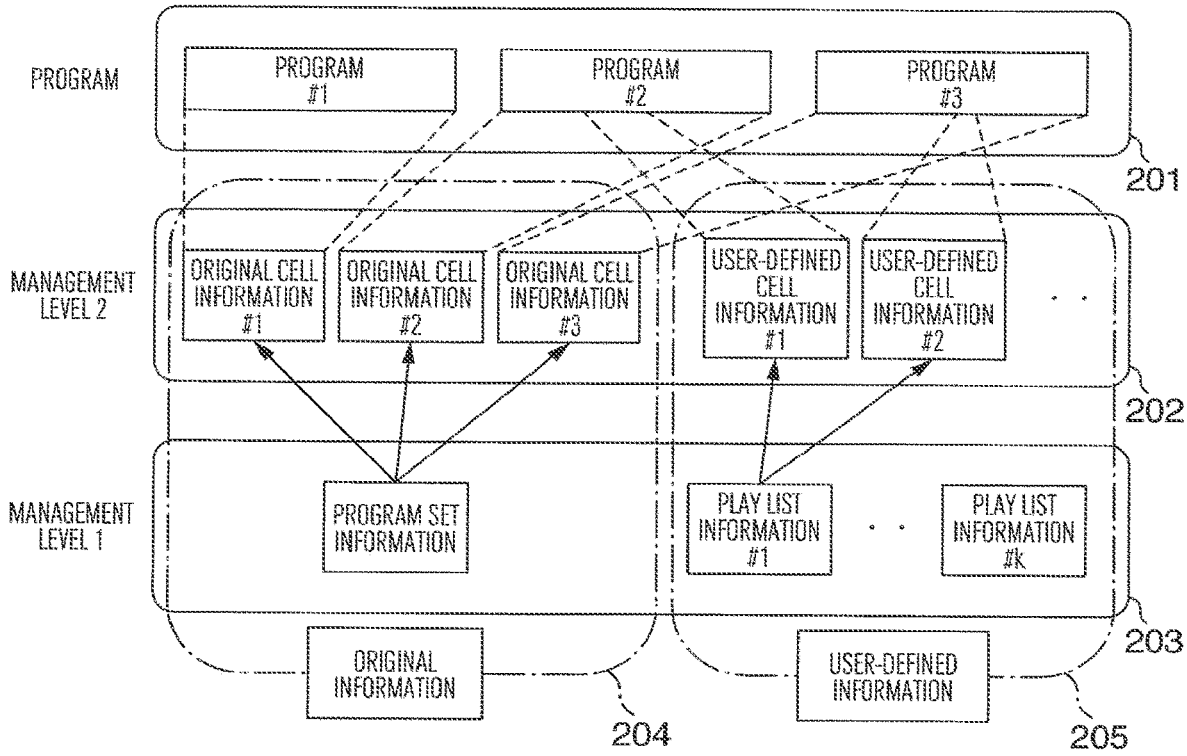


FIG.3

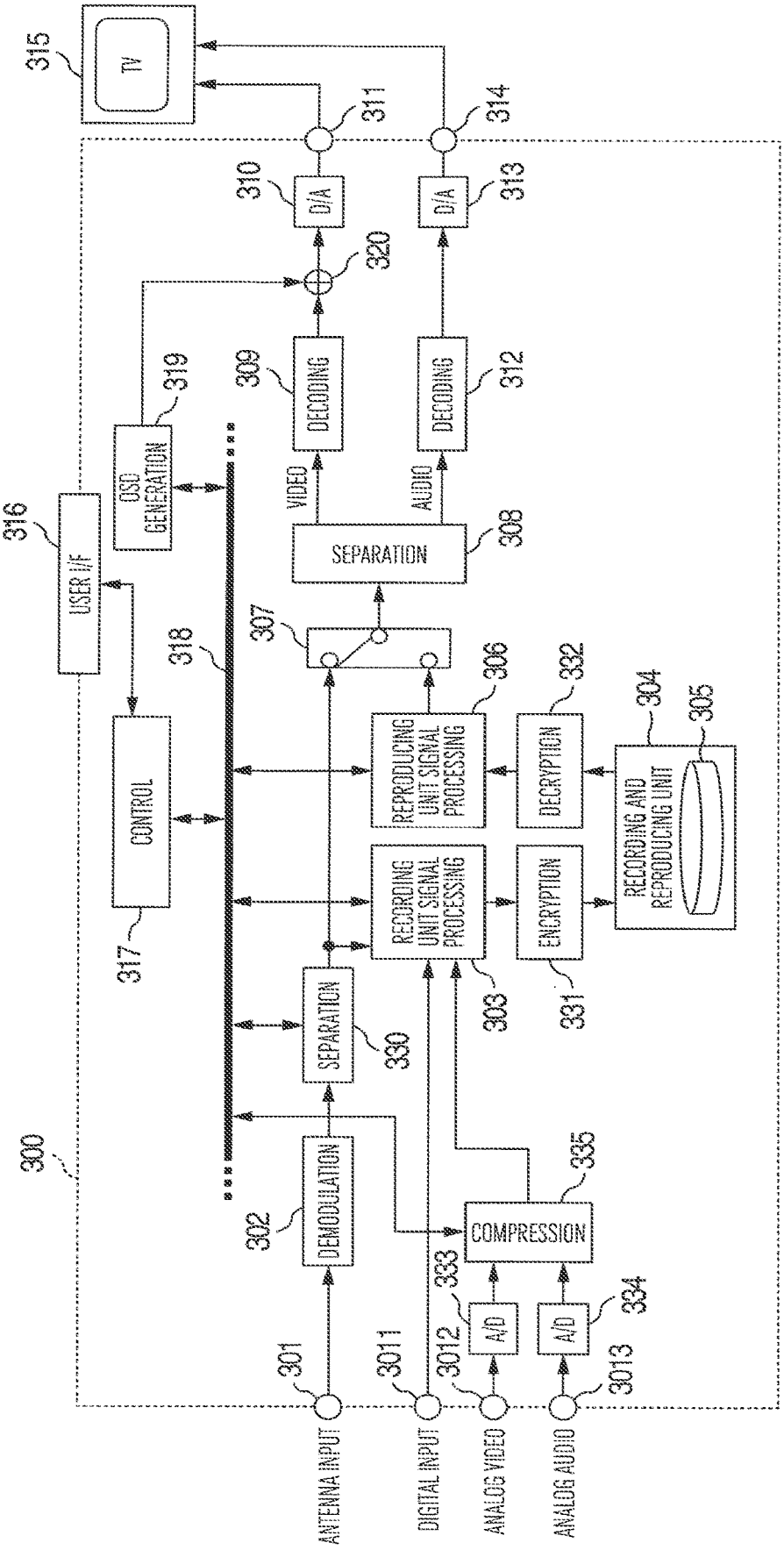

315
TV
311
314
310
D/A
313
D/A
320
319
309
DECODING
312
DECODING
OSD GENERATION
VIDEO
AUDIO
316
USER I/F
SEPARATION
308
318
307
306
332
304
305
CONTROL
REPRODUCING UNIT SIGNAL PROCESSING
DECRYPTION
RECORDING AND REPRODUCING UNIT
317
RECORDING UNIT SIGNAL PROCESSING
ENCRYPTION
303
331
SEPARATION
330
300
335
DEMODULATION
302
COMPRESSION
333
334
A/D
A/D
301
3011
3012
3013
ANTENNA INPUT
DIGITAL INPUT
ANALOG VIDEO
ANALOG AUDIO

FIG.4

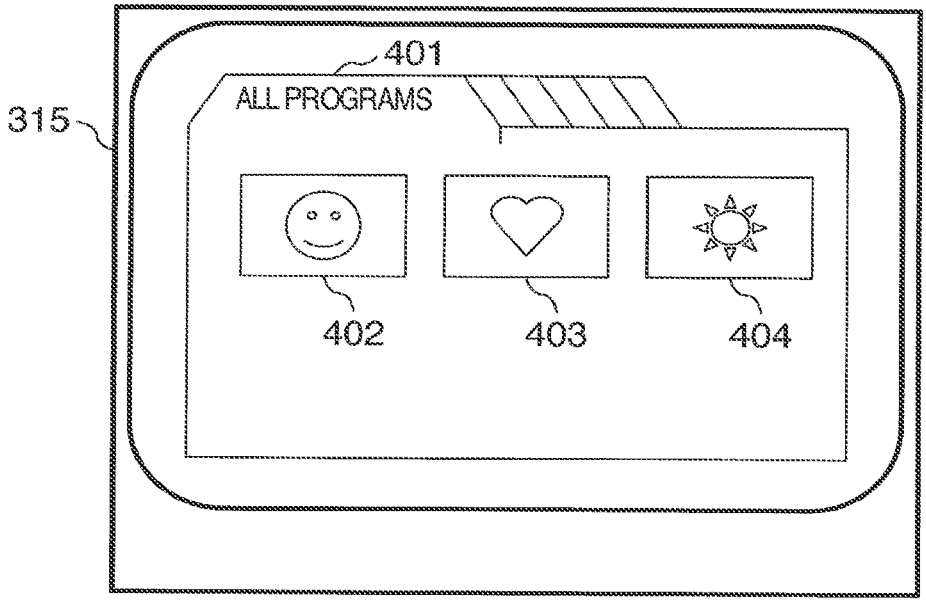

401
ALL PROGRAMS
315
402
403
404

FIG.5

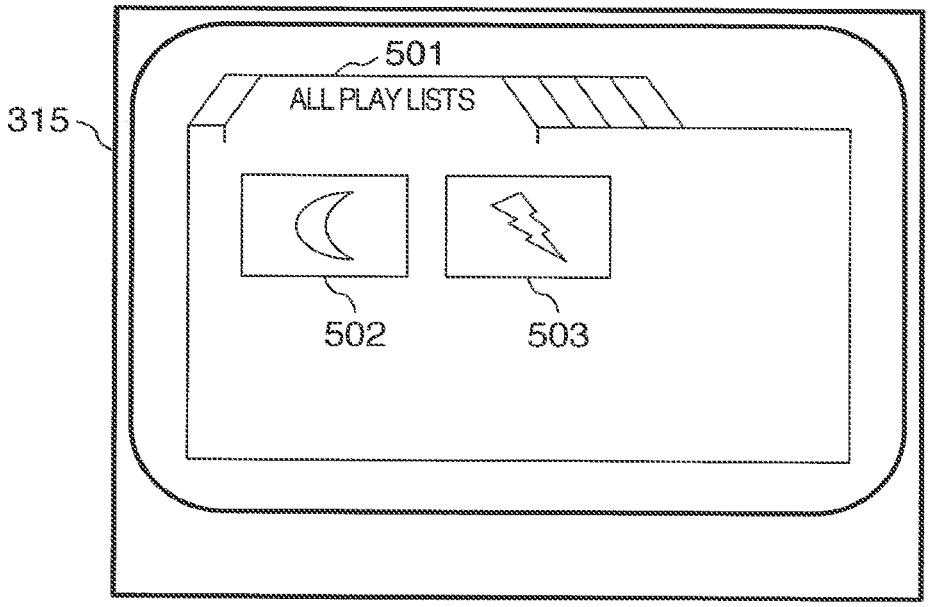

501
ALL PLAY LISTS
315
502
503

FIG.6

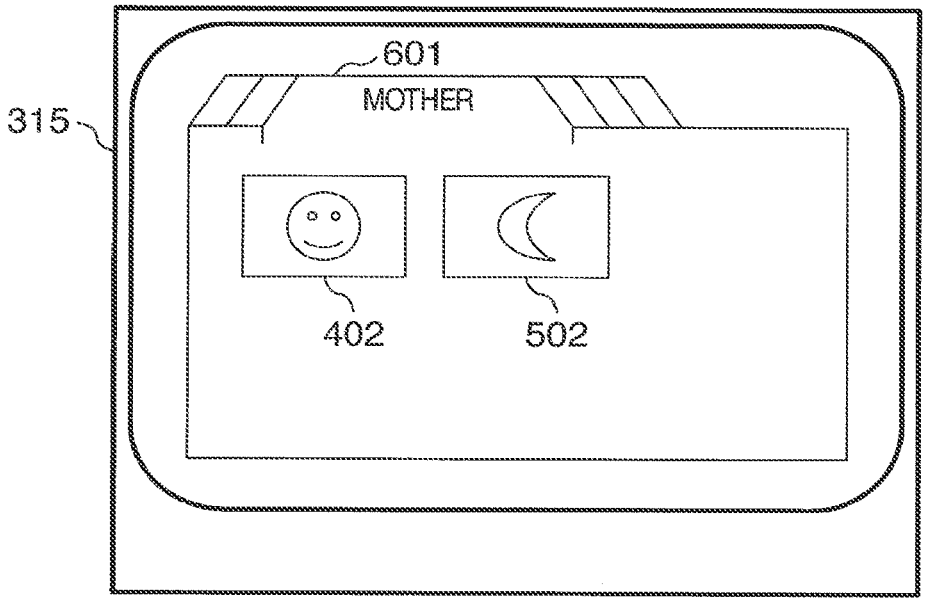


FIG.7

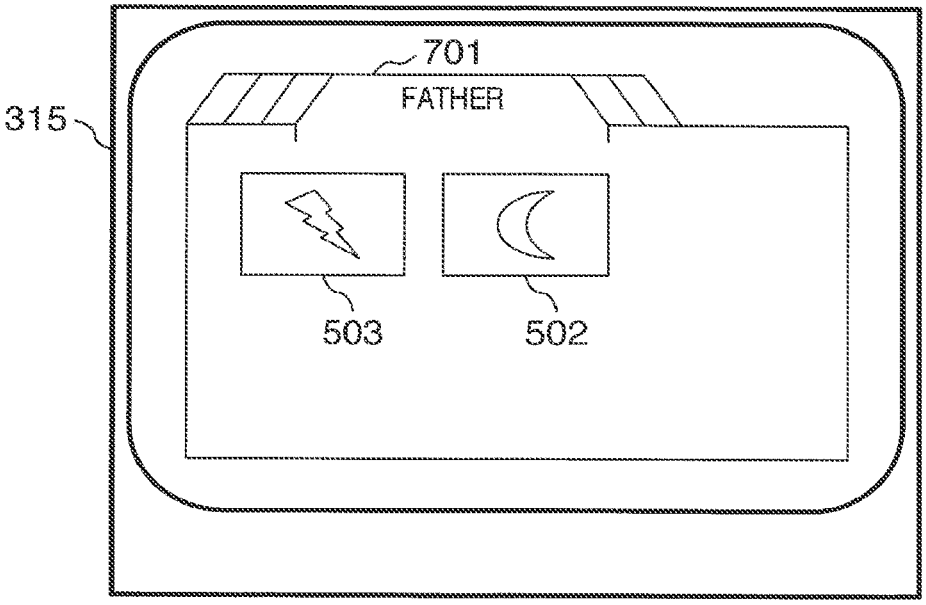


FIG.8

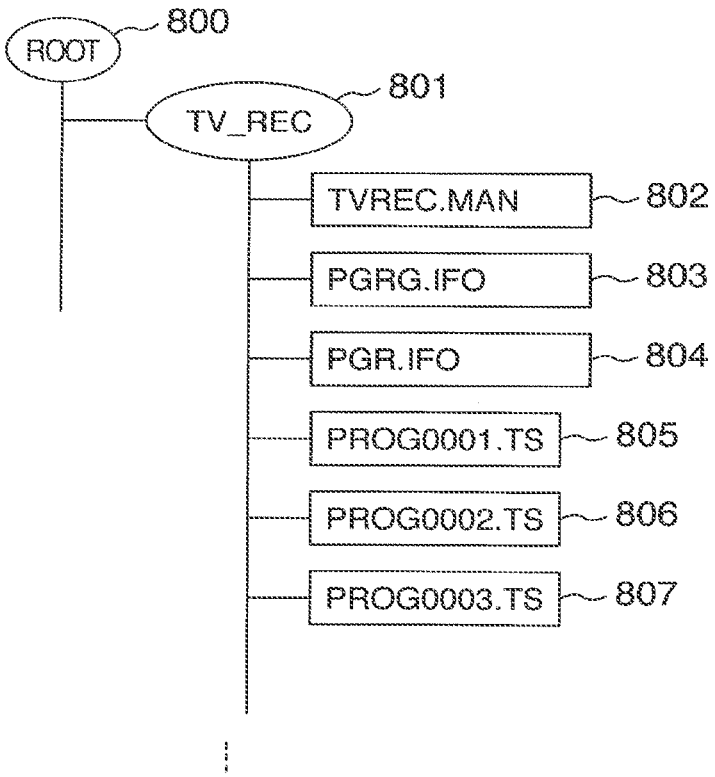

ROOT
800
TV_REC
801
TVREC.MAN
802
PGRG.IFO
803
PGR.IFO
804
PROG0001.TS
805
PROG0002.TS
806
PROG0003.TS
807

FIG.9

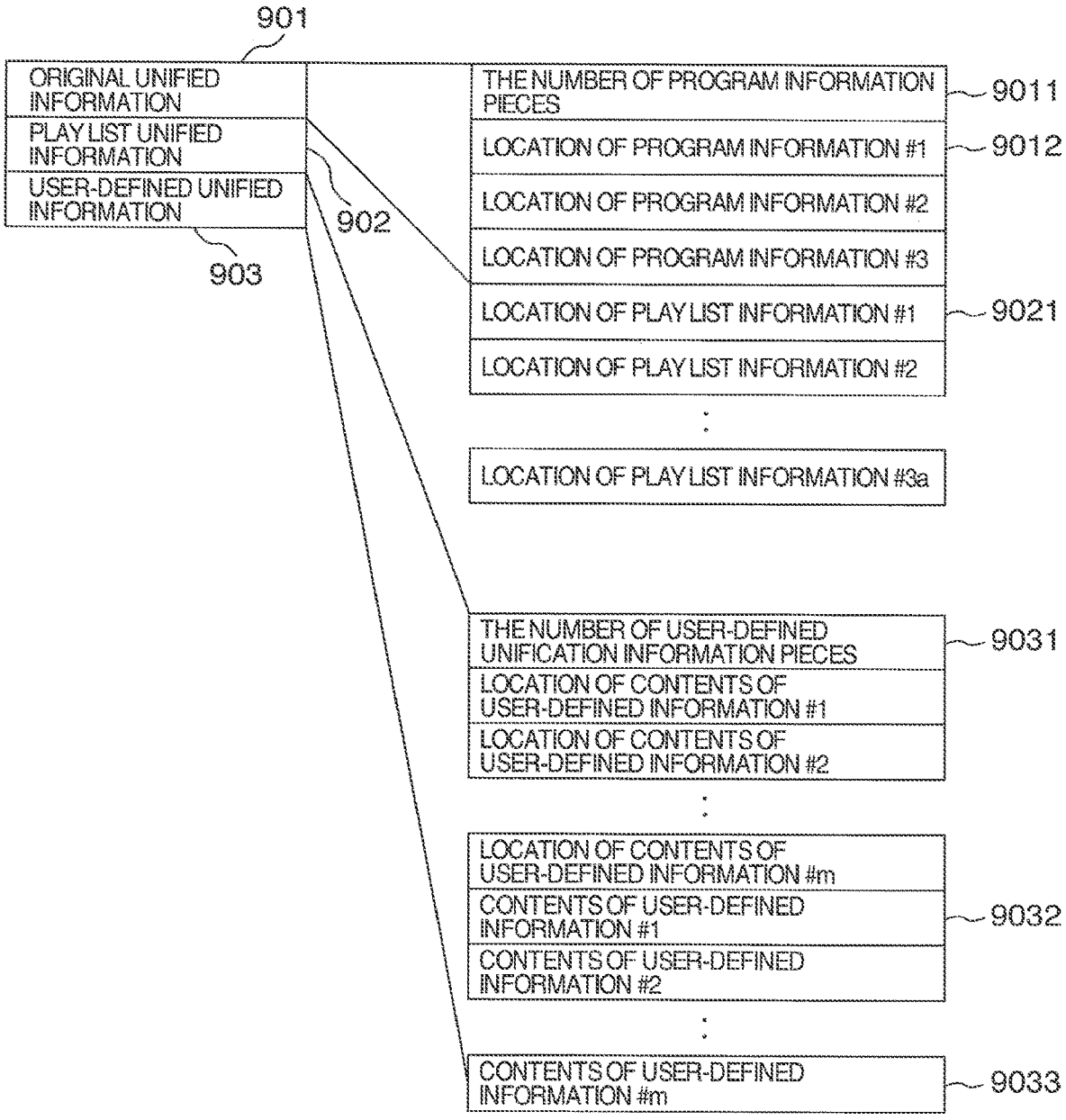

901
ORIGINAL UNIFIED INFORMATION
PLAY LIST UNIFIED INFORMATION
USER-DEFINED UNIFIED INFORMATION
902
903
THE NUMBER OF PROGRAM INFORMATION PIECES
9011
LOCATION OF PROGRAM INFORMATION #1
9012
LOCATION OF PROGRAM INFORMATION #2
LOCATION OF PROGRAM INFORMATION #3
LOCATION OF PLAY LIST INFORMATION #1
9021
LOCATION OF PLAY LIST INFORMATION #2
LOCATION OF PLAY LIST INFORMATION #3a
THE NUMBER OF USER-DEFINED UNIFICATION INFORMATION PIECES
9031
LOCATION OF CONTENTS OF USER-DEFINED INFORMATION #1
LOCATION OF CONTENTS OF USER-DEFINED INFORMATION #2
LOCATION OF CONTENTS OF USER-DEFINED INFORMATION #m
CONTENTS OF USER-DEFINED INFORMATION #1
9032
CONTENTS OF USER-DEFINED INFORMATION #2
CONTENTS OF USER-DEFINED INFORMATION #m
9033

FIG.10

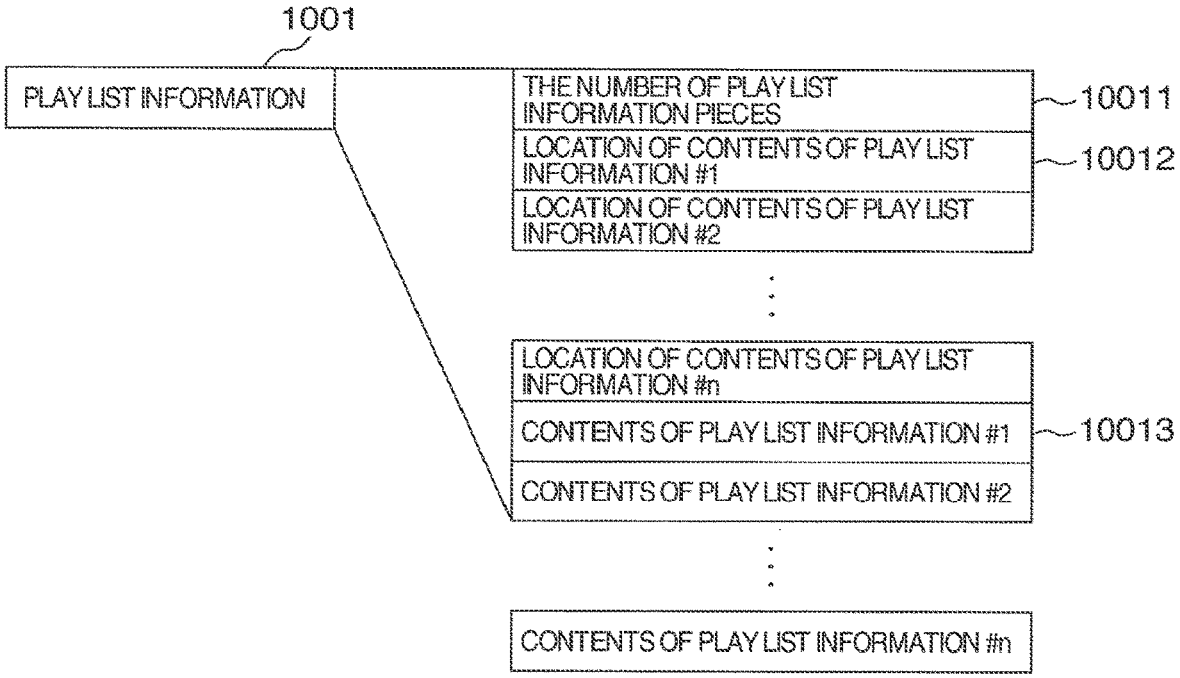

1001
PLAY LIST INFORMATION
THE NUMBER OF PLAY LIST INFORMATION PIECES
10011
LOCATION OF CONTENTS OF PLAY LIST INFORMATION #1
10012
LOCATION OF CONTENTS OF PLAY LIST INFORMATION #2
LOCATION OF CONTENTS OF PLAY LIST INFORMATION #n
CONTENTS OF PLAY LIST INFORMATION #1
10013
CONTENTS OF PLAY LIST INFORMATION #2
CONTENTS OF PLAY LIST INFORMATION #n

FIG.11

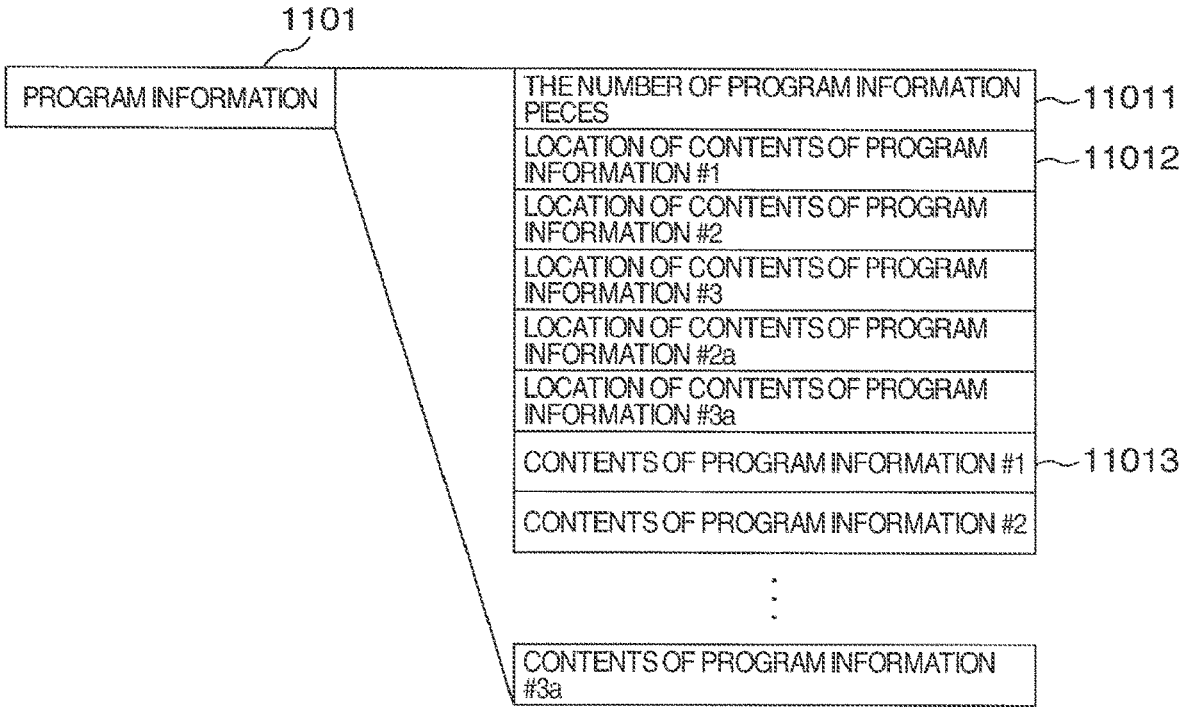

1101
PROGRAM INFORMATION
THE NUMBER OF PROGRAM INFORMATION PIECES
11011
LOCATION OF CONTENTS OF PROGRAM INFORMATION #1
11012
LOCATION OF CONTENTS OF PROGRAM INFORMATION #2
LOCATION OF CONTENTS OF PROGRAM INFORMATION #3
LOCATION OF CONTENTS OF PROGRAM INFORMATION #2a
LOCATION OF CONTENTS OF PROGRAM INFORMATION #3a
CONTENTS OF PROGRAM INFORMATION #1
11013
CONTENTS OF PROGRAM INFORMATION #2
CONTENTS OF PROGRAM INFORMATION #3a

FIG.12

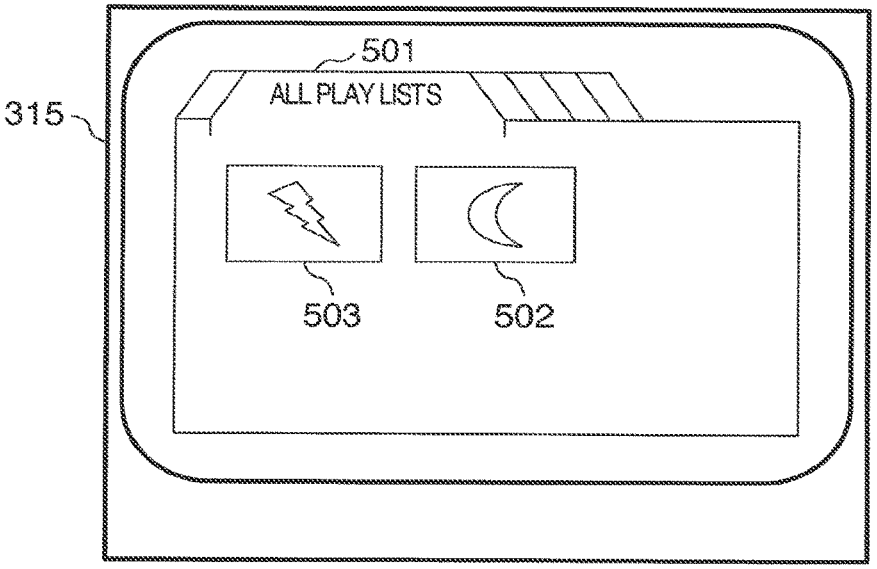
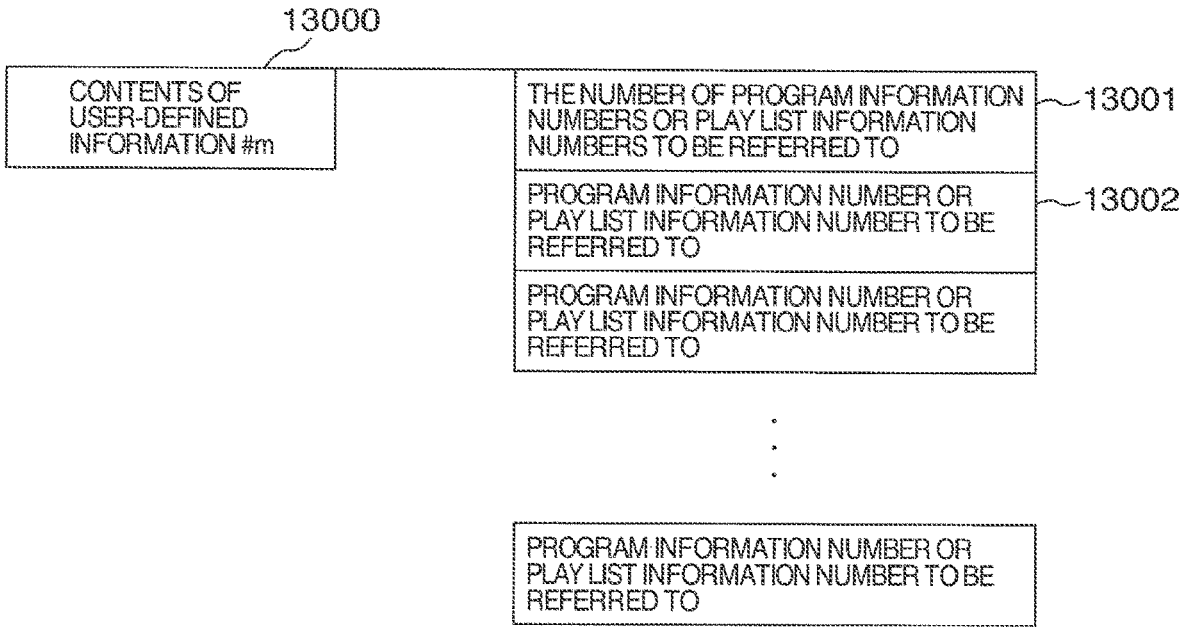

315
501
ALL PLAY LISTS
503
502

FIG.13


13000
CONTENTS OF USER-DEFINED INFORMATION #m
THE NUMBER OF PROGRAM INFORMATION NUMBERS OR PLAY LIST INFORMATION NUMBERS TO BE REFERRED TO
13001
PROGRAM INFORMATION NUMBER OR PLAY LIST INFORMATION NUMBER TO BE REFERRED TO
13002
PROGRAM INFORMATION NUMBER OR PLAY LIST INFORMATION NUMBER TO BE REFERRED TO
PROGRAM INFORMATION NUMBER OR PLAY LIST INFORMATION NUMBER TO BE REFERRED TO

EDITING METHOD AND RECORDING AND REPRODUCING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS(S)

This is a continuation application of U.S. patent application Ser. No. 16/221,908, filed Dec. 17, 2018, which is a continuation application of U.S. patent application Ser. No. 15/808,175, filed Nov. 9, 2017, which is a continuation application of U.S. patent application Ser. No. 15/176,435, filed Jun. 8, 2016, now U.S. Pat. No. 9,818,449, which is a continuation of U.S. patent application Ser. No. 14/141,417, filed Dec. 26, 2013, now U.S. Pat. No. 9,384,783 (the entire disclosure of which is incorporated herein by reference for all purposes), which is a continuation of U.S. patent application Ser. No. 12/567,898, filed Sep. 28, 2009, now U.S. Pat. No. 8,644,684 (the entire disclosure of which is incorporated herein by reference for all purposes), which is a continuation of U.S. patent application Ser. No. 11/203,457, filed on Aug. 11, 2005, now U.S. Pat. No. 7,613,383 (the entire disclosure of which is incorporated herein by reference for all purposes), which application claims priority from Japanese Patent Application Nos. JP2004-349264, filed Dec. 2, 2004, JP2004-378767, filed Dec. 28, 2004, and JP2004-378768, filed Dec. 28, 2004, the entire disclosures of which are incorporated herein by reference for all purposes.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a recording and reproducing device which records data onto a recording medium and reproduces data from the recording medium.

Description of the Related Art

As the high-efficiency coding technique advances, it has become possible to handle AV data such as video data and audio data as digital data, conduct code rate compression, and record resultant data on a large-capacity recording medium such as a hard disk or a recording type optical disk in real time. When digital data already compressed in code rate is inputted to a recording and reproducing device having such a recording medium from outside by broadcasting or communication, it is also possible to record the digital data on the recording medium intact.

In these recording and reproducing device, management information for managing digital data to be recorded is generated and recorded together onto the same recording medium. When a rewritable recording medium is used, the user can conduct editing work on the recording and reproducing device by rewriting the management information and generating and manipulating a list indicating the reproduction sequence (hereinafter referred to as play list) (see, for example, JP-A-2000-152180).

SUMMARY OF THE INVENTION

In the above-described conventional technique, it is mentioned that the play list indicates the reproduction sequence by linking portions of AV data together. As an example, a management state of AV data on a recording medium in the above-described conventional technique is shown in FIG. **2**.

Reference numeral **201** designates AV data themselves on the recording medium. The case where a program #1 to a program #3 are present as recording units is shown. Reference numeral **202** designates a second management hierarchical level (management level 2) in management information. Original cell information #1 to original cell information #3 indicate the whole reproduction range of program units, i.e., a program #1 to a program #3, respectively. Each of user-defined cell information #1 to user-defined information #2 indicates a reproduction range of the whole or a part of a program arbitrarily specified by the user. The number of the user-defined cell information #1 to user-defined information #2 is increased or decreased by the user's editing manipulation. Reference numeral **203** designates a first management hierarchical level (management level 1). Program information contains all of the original cell information #1 to original cell information #3. By conducting reproduction on the basis of the program set information, the user can reproduce all AV data recorded on the recording medium. Play list information #1 to play list information # k indicate a reproduction sequence of the user-defined cell information arbitrarily specified by the user. It is possible to have a plurality of reproduction sequences. Inside of a frame **204** becomes original information for managing the whole AV data in the management information. Inside of a frame **205** becomes user-defined information for managing the play list obtained by the user's editing manipulation.

In FIG. **2**, the play list information is placed on the same level with the program set information and managed as the management level 1. Therefore, the sequence of a plurality of play list information pieces themselves is determined uniquely. For example, as for a catalog of the play lists, it is impossible on the user's interface to alter the display sequence. In view of the problem, the present invention has been achieved. An object of the present invention is to provide a recording scheme and device in which the user can conduct manipulation of arbitrarily rearranging the display sequence of the play lists in the play list catalog on the user interface.

Furthermore, in the conventional technique example, attention is not paid to that a plurality of users generate, select and manage favorite play list information. For example, even when a plurality of users desire to generate, select and manage respective favorite play list information pieces, it cannot be implemented. Furthermore, attention is not especially paid to that a user select some arbitrary play lists from among a plurality of play lists and manage them.

In view of these problems, the present invention has been achieved. An object of the present invention is to provide a recording and reproducing device in which the user can select and manage arbitrary play lists.

In order to achieve the objects, in accordance with the present invention, a unit of management for managing all registered play list information and an upper management hierarchical level are added. The unit of management is adapted to be handled on the same level with unified information that indicates a reproduction range of all AV data. User-defined unified information is adapted to be handled on the added management hierarchical level. The user-defined unified information is formed to allow arbitrary reproduction ranges contained on a lower hierarchical level to be registered.

In a recording and reproducing device according to the present invention, it becomes possible for the user to select arbitrary play lists or reproduction ranges and conduct management. Even in the case where a plurality of users share a single recording medium, therefore, each user can

manage favorite reproduction contents, resulting in improved usage. Since the play lists are subject to unified management, it becomes possible for the user to arbitrarily alter the display sequence of play lists.

According to the present invention, a recording and reproducing device improved in usage can be provided.

Other objects, features and advantages of the invention will become apparent from the following description of the embodiments of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a management state of AV data in a recording and reproducing device according to an embodiment of this invention;

FIG. **2** shows a management state of AV data in a conventional technique example;

FIG. **3** shows a block diagram of a recording and reproducing device according to an embodiment of this invention;

FIG. **4** shows a display output example of original unified information;

FIG. **5** shows a display output example of play list unified information;

FIG. **6** shows a first output example of user-defined unified information;

FIG. **7** shows a second output example of user-defined unified information;

FIG. **8** shows an example of a file structure of original unified information, play list unified information, user-defined unified information, play list information, program information, and AV data (program);

FIG. **9** shows an example of a management table structure of original unified information, play list unified information, and user-defined unified information;

FIG. **10** shows an example of a management table of play list information;

FIG. **11** shows an example of a management table of program list information;

FIG. **12** shows a display output example of play list unified information; and

FIG. **13** shows an example of a table indicating contents of user-defined information # m.

DESCRIPTION OF THE EMBODIMENTS

Hereafter, embodiments of the present invention will be described with reference to the drawings. FIG. **1** shows a management state of AV data on a recording medium in a recording and reproducing device according to the present invention. In the same way as the reference numeral **201** in FIG. **2**, reference numeral **101** designates AV data themselves on the recording medium. The case where programs #1 to #3 are present as recording units is shown.

Reference numeral **102** corresponds to **202** in FIG. **2**. However, reference numeral **102** designates a third management hierarchical level (management level 3) in management information. Program information #1 to program information #3 indicate the whole reproduction ranges of program units, i.e., program #1 to program #3, respectively. Each of program information #2a to program information #3a indicates a reproduction range of the whole or a part of a program arbitrarily specified by the user. The program information #2a to program information #3a indicate a part of the program #2 and a part of the program #3, respectively. In places corresponding to the program information #1 to program information #3, information is also added, as AV data is added, i.e., with an increase in programs. In places corresponding to the program information #2a to the program information #3a, the number of information pieces increases or decreases due to the editing manipulation of the user.

Reference numeral **103** corresponds to the management level 1 in FIG. **2**. However, numeral **103** designates a second management hierarchical level (management level 2), which includes only play list information #1 to play list information # n. Each play list information indicates a reproduction sequence of arbitrary program information pieces on the management level 3. It is possible to have a plurality of reproduction sequences.

Reference numeral **104** designates a newly added first management hierarchical level (management level 1) in the management information as a feature point of the present invention. The management level 1 includes a plurality of unified information pieces. Original unified information corresponds to the program set information shown in FIG. **2**. The original unified information contains all of the program information #1 to program information #3 on the management level 3. By conducting reproduction on the basis of all of the program information #1 to program information #3, it becomes possible for the user to reproduce all AV data recorded on the recording medium. Play list unified information contains all of the play list information #1 to play list information # n on the management level 2. By conducting reproduction on the basis of all of the play list information #1 to play list information # n on the management level 2, it becomes possible for the user to successively reproduce all registered play lists. User-defined unified information #1 to user-defined unified information # m contain arbitrary one or more from among play list information pieces on the management level 2 and program information pieces on the management level 3. For example, when a plurality of users use a single recording medium, it becomes possible to manage reproduced contents that meet respective users' tastes by using one user-defined unified information every user.

An embodiment of a recording and reproducing device according to the present invention will be described more specifically by using another drawing.

FIG. **3** is a block diagram showing an example of a recording and reproducing device according to the present invention. A recording and reproducing device capable of receiving digital broadcast, recording the digital broadcast on a recording medium, reproducing recorded data, and obtaining a reproduced output is shown. Reference numeral **300** designates a recording and reproducing device, **301** an input terminal supplied with a received wave from an antenna, **3011** an input terminal supplied with compressed video and audio data from another device, **3012** an analog video input terminal supplied with an analog video signal, **3013** an analog audio input terminal supplied with an analog audio input terminal, **333** and **334** analog/digital (A/D) conversion circuits each of which converts an analog signal to a digital signal, **302** a demodulation circuit, **330** a separation circuit which separates the demodulated digital signal into audio, video and other data, **335** a compression circuit which compresses digitized video and audio signals, **303** a recording unit signal processing circuit, **331** an encryption circuit which encrypts data to be recorded, **304** a recording and reproducing unit including a drive function of a recording medium, **305** a recording medium, **332** a decryption circuit which decrypts data encrypted and recorded on the recording medium, **306** a reproducing unit signal processing circuit, **307** a switchover circuit, **308** a separation circuit,

309 a video decoding circuit, **310** a digital/analog (D/A) conversion circuit, **311** a video output terminal, **312** an audio decoding circuit, **313** a D/A conversion circuit. **314** an audio output terminal, **315** a TV set, **316** a user I/F, **317** a control unit, **318** a system bus, **319** an OSD generation unit, and **320** an addition circuit.

At the time of recording, a signal transmitted by digital broadcast or the like and received is demodulated in the demodulation circuit **302** by using a predetermined scheme, subjected to necessary signal processing such as timing adjusting data addition and modulation in the recording unit signal processing circuit **303**, encrypted in the encryption circuit **331**, and then recorded on the recording medium **305** by the recording and reproducing unit **304**. A digital signal input from the digital input terminal **3011** is subjected to necessary signal processing such as timing adjusting data addition and modulation in the recording unit signal processing circuit **303**, encrypted in the encryption circuit **331**, and then recorded on the recording medium **305** by the recording and reproducing unit **304**. An analog video signal input from the analog video input terminal **3012** and an analog audio signal input from the analog audio input terminal **3013** are subjected to compression processing in the compression circuit **335**, encrypted in the encryption circuit **331** via the recording unit signal processing circuit **303**, and then recorded on the recording medium **305** by the recording and reproducing unit **304**.

At the time of reproducing, encrypted digital data read out from the recording medium **305** via the recording and reproducing unit **304** in accordance with the user's order is decrypted in the decryption circuit **332**, subjected to signal processing required for reproduction such as demodulation in a form based on a predetermined modulation scheme in the reproducing unit signal processing circuit **103**, and sent to the separation circuit **308** via the switchover circuit **307**. Resultant video digital data is subjected to predetermined video decoding processing in the video decoding circuit **309**, converted to an analog signal in the D/A conversion circuit **310**, and then displayed as a monitor output on the TV set **315** via the video output terminal **311**. Audio digital data obtained from the separation circuit **308** is subjected to predetermined audio decoding processing in the audio decoding circuit **312**, converted to an analog signal in the D/A conversion circuit **313**, and then outputted by an audio output mechanism in the TV set **315** via the audio output terminal **314**.

The control unit **317** controls various components in the recording and reproducing device **300** via the system bus **318**. Furthermore, the control unit **317** controls the whole device to cause operation based on the user's order input which is inputted via the user I/F **316** to be conducted. By the way, an order input request to the user or necessary OSD display for the user is implemented by preparing it in the OSD generation unit **319**, adding it to an output of the video decoding circuit **309** on a suitable level, and finally outputting it to a monitor screen on the TV set **315**.

The case where each unified information on the management level 1 is used for menu display of recording data will now be described as a specific use example of the management information configuration in FIG. **1**.

FIG. **4** shows an example in which menu display is conducted by using the original unified information shown in FIG. **1**. Reference numeral **315** designates the TV set shown in FIG. **3**, **401** a tag for displaying all programs, **402** a thumbnail indicating program information #1, **403** a thumbnail indicating program information #2, and **404** a thumbnail indicating program information #3. The user moves a cursor position on the screen to a desired thumbnail and conducts selection and determination by using a remote controller or the like. As a result, the user can reproduce arbitrary programs or all programs.

FIG. **5** shows an example in which menu display is conducted by using the play list unified information shown in FIG. **1**. Reference numeral **501** designates a tag for displaying all play lists, **502** a thumbnail indicating play list information #1, and **503** a thumbnail indicating play list information #2. In the same way as the above-described case, the user moves a cursor position on the screen to a desired thumbnail and conducts selection and determination by using a remote controller or the like. As a result, the user can reproduce arbitrary play lists or all play lists. By the way, display switching from the all program display tag **401** to all play list display tag can be implemented by, for example, movement of the cursor in tag character positions conducted by the user.

FIG. **6** shows an example in which menu display is conducted by using the user-defined unified information #1 shown in FIG. **1**. Reference numeral **601** designates a menu display tag for user #1 (who is supposed to be "mother" here). As appreciated from FIG. **1**, reference numerals **402** and **502** designate thumbnails indicating the program information #1 and the play list information #1, respectively. The "mother" can use the menu display tag for mother **601** as a folder dedicated to herself, and freely register and delete data to be reproduced. In the same way, FIG. **7** shows an example in which menu display is conducted by using the user-defined unified information #2 shown in FIG. **1**. Reference numeral **701** designates a menu display tag for user #2 (who is supposed to be "father" here). As appreciated from FIG. **1**, reference numerals **503** and **502** designate thumbnails indicating the play list information #2 and the play list information #1, respectively. In this case, the "father" selects two play lists. However, the reproduction sequence of them can be altered. In the same way as the "mother," the "father" can use the menu display tag for father **701** as a folder dedicated to himself, and freely register and delete data to be reproduced.

As heretofore described, in the embodiment of the present invention, a unit of management for managing all registered play list information and an upper management hierarchical level are added. The unit of management is adapted to be handled on the same level with unified information that indicates a reproduction range of all AV data. User-defined unified information is adapted to be handled on the added management hierarchical level. The user-defined unified information is formed to allow arbitrary reproduction ranges contained on a lower hierarchical level to be registered therein. As a result, it becomes possible for the user to select arbitrary play lists or reproduction ranges and conduct management. Even in the case where a plurality of users share a single recording medium, therefore, each user can manage favorite reproduction contents, resulting in improved usage.

In the embodiment heretofore described, the case where digital broadcast is received and digital data is recorded intact has been described. However, this is not restrictive. A configuration having a network I/F to acquire AV data from an external network or having coding unit to conduct recording onto the recording medium while coding analog data may also be used. In other words, the present embodiment refers to data management on the recording medium, and its input route is not especially restricted.

FIG. **8** shows an example of file configurations used to actually record the program, program information, play list

information, original unified information, play list unified information, and user-defined information on the recording medium **305** (FIG. **3**). The recording medium is a medium on which digital recording and reproducing are conducted. Files on the medium are managed by a file system similar to that used to manage a recording medium in the so-called personal computer or the like. In FIG. **8**, "ROOT" **800** represents a highest hierarchical level of a file directory. "TV_REC" **801** is a directory under the highest hierarchical level. "TVREC.MAN" **802**, "PGRG.IFO" **803**, "PGR.IFO" **804**, "PROG0001.TS" **805**, . . . of files which implement the management structure shown in FIG. **1** according to the present invention are recorded in the "TV_REC" **801**. In the "TVREC.MAN" **802**, the original unified information, the play list unified information, and the user-defined unified information #1 to # m on the management level 1 shown in FIG. **1** are described as management tables. In the "PGRG.IFO" **803**, the play list information #1 to the play list information # n on the management level 2 shown in FIG. **1** are recorded as management tables. In the "PGR.IFO" **804**, the program information #1 to the program information #3a on the management level 3 shown in FIG. **1** are recorded as management tables. "PROG0001.TS" **805**, "PROG0002.TS" **806** and "PROG0003.TS" **807** are entity files of AV data in each program. For example, AV data between recording start and recording end of one time is recorded in the "PROG0001.TS." AV data between recording start and recording end of the next time is recorded in the "PROG0002.TS." In this way, the file name is updated and recording is conducted. Thereafter, the management files **802** to **804** are updated.

The file structure and the configuration of management tables themselves concerning the management structure "TVREC.MAN" **802**, "PGRG.IFO" **803**, "PGR.IFO" **804**, "PROG0001.TS" **805**, . . . of files may be formed by using any method. However, an example of how to implement the management configuration in the case of FIG. **1** using the files will now be described.

FIG. **9** shows a configuration of management tables of the "TVREC.MAN" **802** (FIG. **8**). As original unified information **901**, the number of AV data recorded as the number of program information pieces **9011**, i.e., the total number (three in this case) of entity files ("PROG0001.TS" **805**, "PROG0002.TS" **806** and "PROG0003.TS" **807**) of the AV data is described. Under the original unified information **901**, location tables **9012** of respective original program information pieces are recorded. As play list unified information **902**, play list location information tables are recorded in **9021** and subsequent tables. In **9031**, the number of user-defined unified information pieces is recorded. After that, contents of #1 to # m of the user-defined information are recorded.

FIG. **13** shows contents of the user-defined information # m described above. The user-defines information # m has combinations of original program information and play list information as a table.

FIG. **10** shows a management table of the "PGRG.IFO" **803** (FIG. **8**), which corresponds to the management level 2 shown in FIG. **1**. As play list information **1001**, the total number of the play list information pieces is first described as designated by **10011**. (In this case, the total number of the play list information pieces is n.) Beginning with **10012** indicated under the reference numeral **10011**, locations in which contents of the play list information #1 to # n are described are recorded as tables. Beginning with **10013**, contents of the play list information #1 to # n (contents of the reproduction sequence, which are management tables having combinations of program information indicating the reproduction start location and reproduction end location of AV data described later) are recorded.

FIG. **11** shows a management table of the "PGR.IFO" **804** (FIG. **8**), which corresponds to the management level 3 shown in FIG. **1**. As program information **1101**, the total number of the program information pieces including all of the program information pieces paired with the original information program #1, #2 and #3 (FIG. **1**) and the user-defined program information #2a and #3a (FIG. **1**) is recorded as designated by **11011**. Beginning with **11012** indicated under the reference numeral **11011**, tables indicating locations in which contents of the program information #1 to #3a are described are recorded. Beginning with **11013**, contents of the program information #1 to #3a (describing the reproduction start location and reproduction end location of the "PROG0001.TS" **805**, "PROG0002.TS" **806** and "PROG0003.TS" **807** (FIG. **8**)) are recorded.

By conducting the management as heretofore described, it becomes possible to sort the location information, for example, in the play list location table **9021** and alter the sequence of displaying play lists on a GUI view from the state shown in FIG. **5** to the state shown in FIG. **12**. In the case where the number of play lists has become very large, a play list that is high in user's use frequency can be displayed in the first place in the GUI view. As a result, it is possible to implement a usable recording and reproducing device, reproducing device, or recording method. For example, a plurality of users can set play lists that they want to view and recorded original contents freely and individually. Even when the number of recorded programs is very large, the user can rapidly find out a program that the user wants to view, because the user can refer to a folder defined by the user.

In the present embodiment, a clear distinction is made between the user-defined play list unified information and the user-defined unified information #1 to # m. The user-defined play list unified information may be defined as user-defined play list unified information having no link to the original program information of the user-defined unified information.

It should be further understood by those skilled in the art that although the foregoing description has been made on embodiments of the invention, the invention is not limited thereto and various changes and modifications may be made without departing from the spirit of the invention and the scope of the appended claims.

The invention claimed is:

1. An information processing apparatus comprising:

a network interface;

a recording medium on which is stored a plurality of video information including first video information received wirelessly by the network interface over a network from another information processing apparatus, wherein at least some of the plurality of video information is associated with a user profile;

a display; and

a processor for controlling the display to display:

a first area including a first character associated with a first group of video information for a first classification and a second character associated with a second group of video information for a second classification different from the first classification, the first group of video information being configured to allow a user to edit, wherein the first group of video information and the second group of video information are part of the plurality of stored video information, and

a second area displaying thumbnails corresponding to at least a portion of the plurality of stored video information,

wherein user selection of the first character enables the display of a first group of thumbnails corresponding to the first group of video information in the second area,

wherein user selection of the second character enables the display of a second group of thumbnails corresponding to the second group of video information in the second area,

wherein, upon one video information stored on the recording medium included in both the first group of video information and the second group of video information being deleted from the first group of video information, the one video information continues to be included in the second group of video information and the processor controls the display to display a thumbnail corresponding to the one video information as one of the second group of thumbnails when the second character is selected.

2. The information processing apparatus of claim **1**, further comprising:

wherein the processor generates a group of video information based on user preferences determined by the user selections of the video information, and

wherein, upon user selection of the group, the processor controls the display to display thumbnails that correspond to the video information and no other thumbnails associated with video information of other users.

3. The information processing apparatus of claim **1**, further comprising:

an antenna for wirelessly receiving the first video information from the other information processing apparatus.

4. The information processing apparatus of claim **1**,

wherein the plurality of stored video information includes third video information recorded by the information processing apparatus, fourth video information, and fifth video information,

wherein the display displays a user interface having thumbnails corresponding to each of the third, fourth, and fifth video information.

5. The information processing apparatus of claim **4**,

wherein the display displays the third, fourth, and fifth video information according to predetermined playback sequence.

6. The information processing apparatus of claim **1**,

wherein the plurality of stored video information includes third video information, fourth video information, and fifth video information,

wherein the plurality of stored video information includes management information corresponding to the third, fourth, and fifth video information,

wherein the management information includes filename information and timing information for each of the third, fourth, and fifth video information such that when the third, fourth, and fifth video information is stored in the recording medium the filename information is updated according to a predetermined sequence.

7. The information processing apparatus of claim **1**, further comprising:

an analog to digital converter for converting analog audio information being recorded into digital audio information;

a compressor for compressing the plurality of video information including digital video information and the digital audio information;

a decoder for decoding, during playback, the compressed digital video information and the compressed digital audio information included in the plurality of stored video information and selected for reproduction by the user; and

a digital to analog converter for converting at least the decoded digital audio information into analog audio information during playback.

8. The information processing apparatus of claim **1**, further comprising:

an on screen display generator generating on screen display information, wherein the plurality of stored video information includes third video information such that, upon selection for playback, the third video information is outputted with the on screen display information for display of the third video information and the on screen display information.

9. An information processing method implemented on an information processing apparatus, the information processing method comprising:

storing a plurality of video information including first video information received wirelessly by a network interface over a network from another information processing apparatus, wherein at least some of the plurality of video information is associated with a user profile; and

displaying:

a first area including a first character associated with a first group of video information for a first classification and a second character associated with a second group of video information for a second classification different from the first classification, the first group of video information being configured to allow a user to edit, wherein the first group of video information and the second group of video information are part of the plurality of stored video information, and

a second area displaying thumbnails corresponding to at least a portion of the plurality of stored video information,

wherein user selection of the first character enables the display of a first group of thumbnails corresponding to the first group of video information in the second area, and

wherein user selection of the second character enables the display of a second group of thumbnails corresponding to the second group of video information in the second area;

upon one video information stored on the recording medium included in both the first group of video information and the second group of video information being deleted from the first group of video information, the one video information continues to be included in the second group of video information, and displaying a thumbnail corresponding to the one video information as one of the second group of thumbnails when the second character is selected;

wherein the processor generating a group of video information based on user preferences determined by the user selections of the video information, and

upon user selection of the group, displaying thumbnails that correspond to the video information and no other thumbnails associated with video information of other users.

10. The information processing method of claim **9**, further comprising:

wirelessly receiving the first video information from the other information processing apparatus via an antenna of the information processing apparatus.

11. The information processing method of claim **9**,

wherein the plurality of stored video information includes third video information recorded by the information processing apparatus, fourth video information, and fifth video information,

wherein the information processing apparatus displays a user interface having thumbnails corresponding to each of the third, fourth, and fifth video information.

12. The information processing method of claim **11**,

wherein the information processing apparatus displays the third, fourth, and fifth video information according to predetermined playback sequence.

13. The information processing method of claim **9**,

wherein the plurality of stored video information includes third video information, fourth video information, and fifth video information,

wherein the plurality of stored video information includes management information corresponding to the third, fourth, and fifth video information,

wherein the management information includes filename information and timing information for each of the third, fourth, and fifth video information such that when the third, fourth, and fifth video information is stored in the recording medium the filename information is updated according to a predetermined sequence.

14. The information processing method of claim **9**, further comprising:

converting, by an analog to digital converter of the information processing apparatus, analog audio information being recorded into digital audio information;

compressing, by a compressor of the information processing apparatus, the plurality of video information including digital video information and the digital audio information;

decoding, during playback and by a decoder of the information processing apparatus, the compressed digital video information and the compressed digital audio information included in the plurality of stored video information and selected for reproduction by the user; and

converting, by a digital to analog converter of the information processing apparatus, at least the decoded digital audio information into analog audio information during playback.

15. The information processing method of claim **9**, further comprising:

generating, by the information processing apparatus, on screen display information,

wherein the plurality of stored video information includes third video information such that, upon selection for playback, the third video information is outputted with the on screen display information for display of the third video information and the on screen display information.

16. A method for reproducing video content associated with user profiles being implemented on an information processing apparatus, comprising:

receiving, via a network, first video information wirelessly from a device external to the information processing apparatus, the first video information being received including second video information that is encrypted;

displaying, on a display device, a first user interface for a user to select a user profile from among a plurality of user profiles including a first user profile associated with a first character and a second user profile associated with a second character, the plurality of user profiles being associated with video information and the first user interface including an option for a user to select the first user profile from the plurality of user profiles by selecting the first character;

receiving a selection of the first user profile;

displaying, in response to the selection, a second user interface for a user to select desired video information to be reproduced from among the first video information, the second user interface being associated with the first user profile and displaying the first character, the first character associated with a first group of video information and indicating an identity of the user of the first user profile, the second user interface further displaying thumbnails corresponding to the first group of video information;

displaying the second character and a second group of thumbnails corresponding to a second group of video information associated with the second user profile when the second character is selected, the first group of video information and the second group of video information including one video information that is the same;

receiving a selection to remove the one video information from the first group of video information associated with the first user profile;

removing the one video information from the first group of video information, wherein, upon the one video information being removed from the first group of video information, the one video information continues to be included in the second group of video information for the second user profile and the second group of thumbnails continues to display a thumbnail corresponding to the one video information when the second character is selected;

receiving a selection of desired video information based on a selection of a thumbnail from the first group of thumbnails, the desired video information included in the second video information;

decrypting video information corresponding to the selected thumbnail; and

displaying the decrypted video information.

17. The method of claim **16**,

wherein any user can delete stored video information regardless of a user profile from the plurality of user profiles that was used to record the stored video information.

18. The method of claim **16**, further comprising:

generating a list of video information based on preferences of a user determined by a user selections of thumbnails from the first or second group of thumbnails.

19. The method of claim **16**, further comprising:

generating a list of video information based on preferences of a user determined by a user selections of thumbnails associated with the first video information, the list including third video information;

receiving a selection of the list by the user; and

in response to the selection of the list, displaying the thumbnails that correspond to the third video information and no other thumbnails associated with video information of other users.

20. The method of claim **16**, further comprising:

generating on screen display information, wherein the first video information includes third video information

such that, upon selection for playback, the third video information is outputted with the on screen display information for display of the third video information and the on screen display information.

21. An information processing apparatus comprising:

a network interface receiving first video information wirelessly from a device external to the information processing apparatus, the first video information being received including second video information that is encrypted;

a display displaying a first user interface for a user to select a user profile from among a plurality of user profiles including a first user profile associated with a first character and a second user profile associated with a second character, the plurality of user profiles being associated with video information and the first user interface including an option for a user to select the first user profile from the plurality of user profiles by selecting the first character;

an input interface receiving a selection of the first user profile at a first time and a selection of the second character at a second time,

wherein, in response to the selection of the first user profile, the display displays a second user interface for a user to select desired video information to be reproduced from among the first video information, the second user interface being associated with the first user profile and displaying the first character, the first character associated with a first group of video information and indicating an identity of the user which the first user profile is associated with, the second user interface further displaying thumbnails corresponding to the first group of video information, and

wherein, in response to the selection of the second user profile, the display displays the second character and a second group of thumbnails corresponding to a second group of video information associated with the second user profile when the second character is selected, the first group of video information and the second group of video information including one video information that is the same; and

a processor for removing one video information from the first group of video information after the input interface receives a selection to remove the one video information from the first group of video information associated with the first user profile, wherein, upon the one video information being removed from the first group of video information, the one video information continues to be included in the second group of video information for the second user profile and the second group of thumbnails continues to display a thumbnail corresponding to the one video information when the second character is selected,

wherein the processor decrypts second video information corresponding to a selected thumbnail when the input interface receives a selection of desired video information based on a selection of a thumbnail from the first group of thumbnails, and

wherein the display displays the decrypted video information.

22. The information processing apparatus of claim **21**, further comprising:

an antenna for wirelessly receiving the first video information.

23. The information processing apparatus of claim **21**, wherein any user can delete stored video information regardless of a user profile from the plurality of user profiles that was used to record the stored video information.

24. The information processing apparatus of claim **21**, wherein the processor generates a list of video information based on preferences of a user determined by a user selections of thumbnails from the first or second group of thumbnails.

25. The information processing apparatus of claim **21**, wherein the processor generates a list of video information based on preferences of a user determined by a user selections of thumbnails associated with the first video information, the list including third and fourth video information, and, in response to the input interface receiving a selection of the list by the user, the display displays only those thumbnails that correspond to the third and fourth video information and no other thumbnails associated with video information of other users.

26. The information processing apparatus of claim **21**, further comprising:

an analog to digital converter for converting analog audio information being recorded into digital audio information;

a compressor for compressing the first video information;

a decoder for decoding, during playback, audio and video information included in the first video information and selected for reproduction by the user; and

a digital to analog converter for converting at least the digital audio information into audio information during playback.

27. The information processing apparatus of claim **21**, further comprising:

an on screen display generator generating on screen display information,

wherein the first video information includes third video information such that, upon selection for playback, the third video information is outputted with the on screen display information for display of the third video information and the on screen display information.

* * * * *

EXHIBIT 10

US010129590B2

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Kurita et al.

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(54) **DISPLAY APPARATUS AND VIDEO PROCESSING APPARATUS**

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See application file for complete search history.

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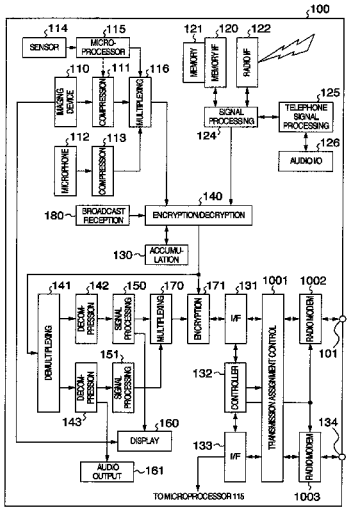
Office Action, dated Jun. 7, 2018, which issued during the prosecution of Chinese Patent Application No. 201510969210.6, which corresponds to the present application.

Primary Examiner — Amy Hsu
(74) *Attorney, Agent, or Firm* — Baker Botts L.L.P.

(57) **ABSTRACT**

While presenting on a display apparatus videos of high picture quality obtained from portable video processing apparatuses such as a camera and a cellular, it is possible to communicate with the Internet and/or a home network. A display apparatus includes a first radio communication unit capable of receiving video information by radio from an external video processing apparatus, a second radio communication unit capable of connecting by radio to a network, and a control unit for controlling assignment of connection by radio transmission for each of the first and second radio communication units. The control unit assigns connection of the first radio communication unit with higher priority and controls the assignment of the transmission rate such that the transmission rate between the first radio communication unit and the external video processing apparatus is more than that between the second radio communication unit and the network.

10 Claims, 9 Drawing Sheets



(51) **Int. Cl.**

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H04N 21/414	(2011.01)
H04N 21/4367	(2011.01)

(52) **U.S. Cl.**
CPC ... ***H04N 21/4122*** (2013.01); ***H04N 21/41407*** (2013.01); *H04N 21/4367* (2013.01)

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FIG. 1

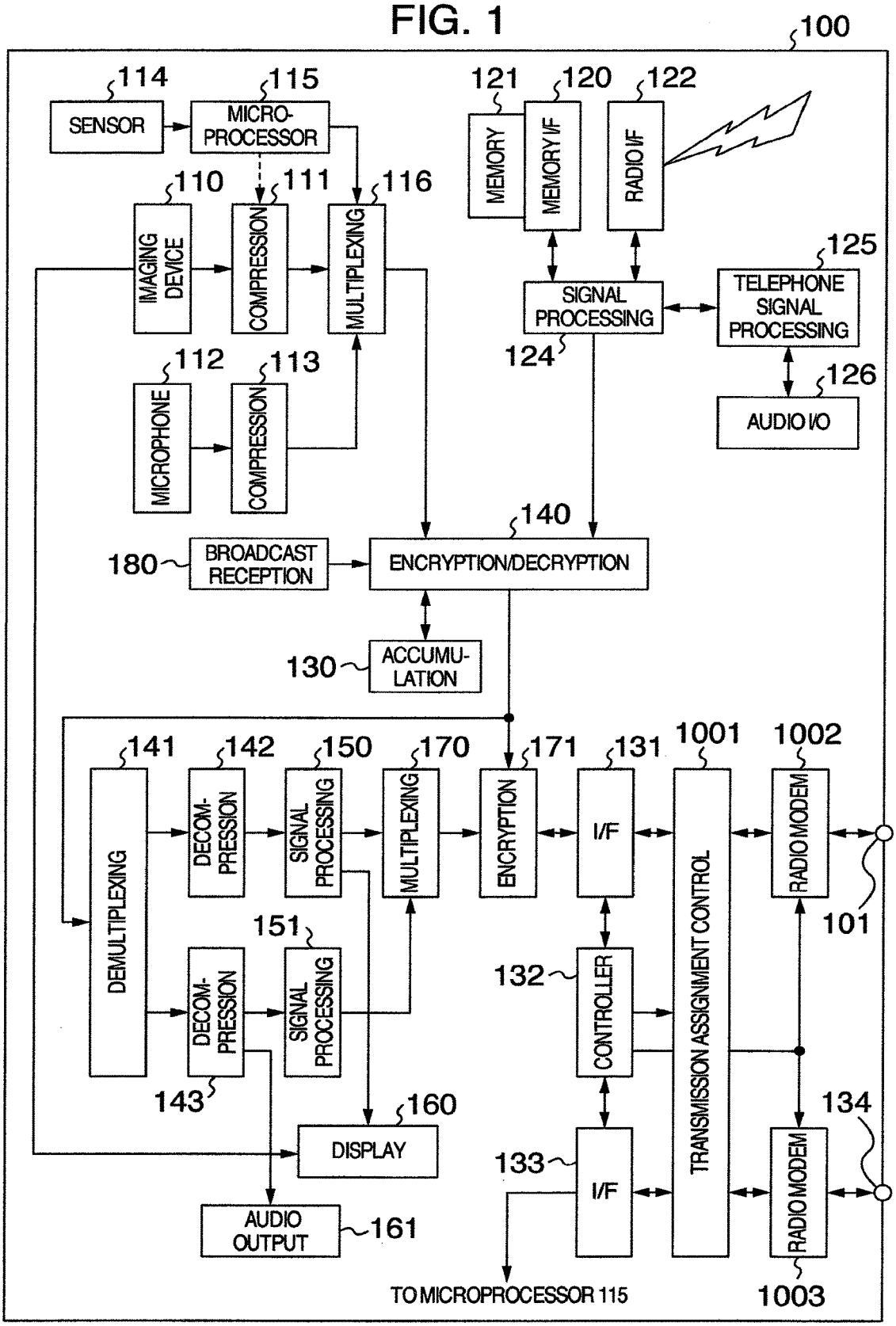

100
114
SENSOR
115
MICRO-PROCESSOR
121
MEMORY
120
MEMORY I/F
122
RADIO I/F
110
IMAGING DEVICE
111
COMPRESSION
116
MULTIPLEXING
125
TELEPHONE SIGNAL PROCESSING
SIGNAL PROCESSING
124
126
AUDIO I/O
112
MICROPHONE
113
COMPRESSION
140
180
BROADCAST RECEPTION
ENCRYPTION/DECRYPTION
130
ACCUMU-LATION
141
142
150
170
171
131
1001
1002
DEMULTIPLEXING
DECOM-PRESSION
SIGNAL PROCESSING
MULTIPLEXING
ENCRYPTION
I/F
TRANSMISSION ASSIGNMENT CONTROL
RADIO MODEM
101
151
132
CONTROLLER
143
160
134
DISPLAY
133
I/F
AUDIO OUTPUT
161
TO MICROPROCESSOR 115
1003

FIG. 2

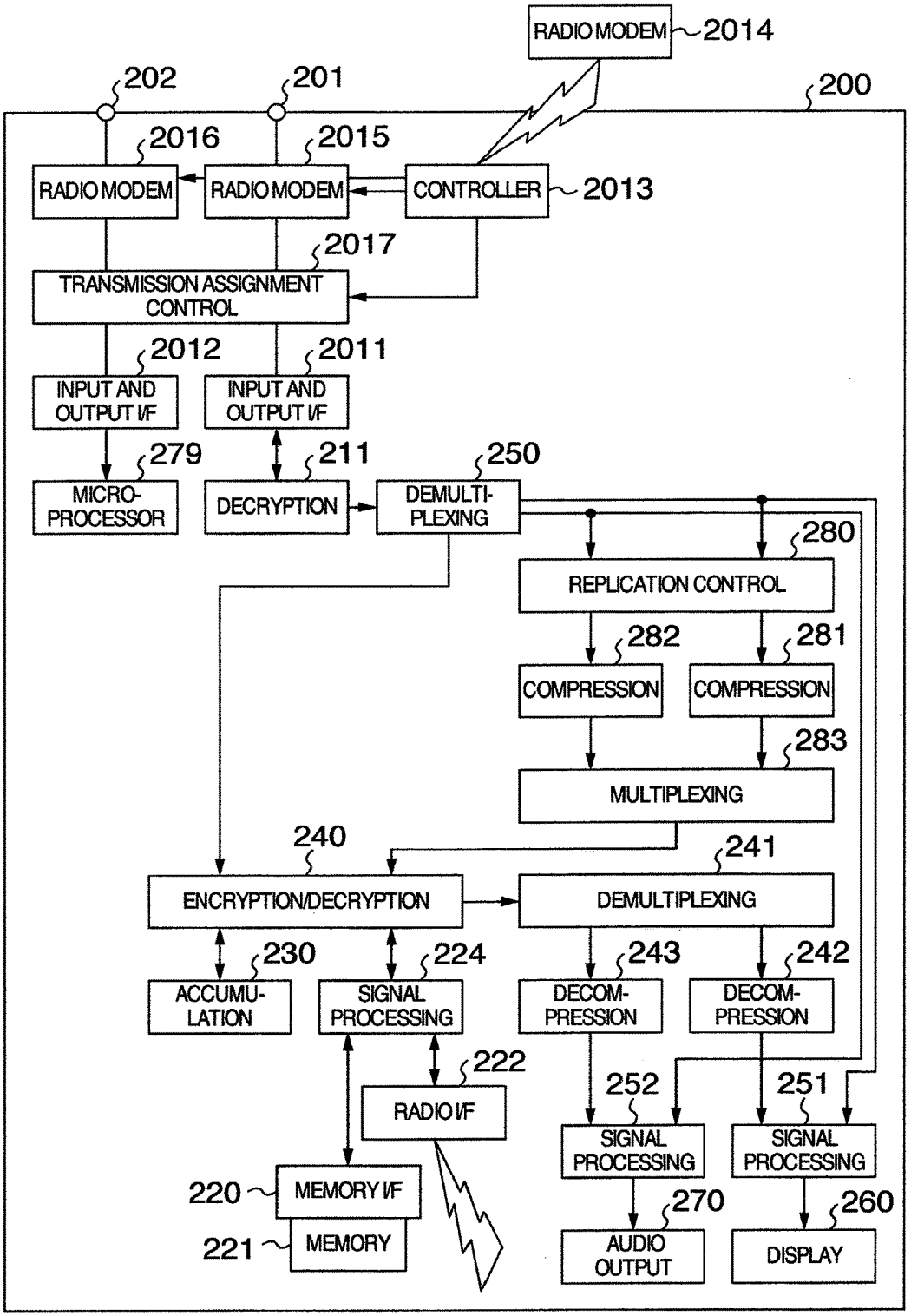

RADIO MODEM
2014
202
201
200
2016
2015
RADIO MODEM
RADIO MODEM
CONTROLLER
2013
2017
TRANSMISSION ASSIGNMENT CONTROL
2012
2011
INPUT AND OUTPUT I/F
INPUT AND OUTPUT I/F
279
211
250
MICRO-PROCESSOR
DECRYPTION
DEMULTI-PLEXING
280
REPLICATION CONTROL
282
281
COMPRESSION
COMPRESSION
283
MULTIPLEXING
240
241
ENCRYPTION/DECRYPTION
DEMULTIPLEXING
230
224
243
242
ACCUMU-LATION
SIGNAL PROCESSING
DECOM-PRESSION
DECOM-PRESSION
222
252
251
RADIO I/F
SIGNAL PROCESSING
SIGNAL PROCESSING
220
MEMORY I/F
270
260
221
MEMORY
AUDIO OUTPUT
DISPLAY

FIG. 3

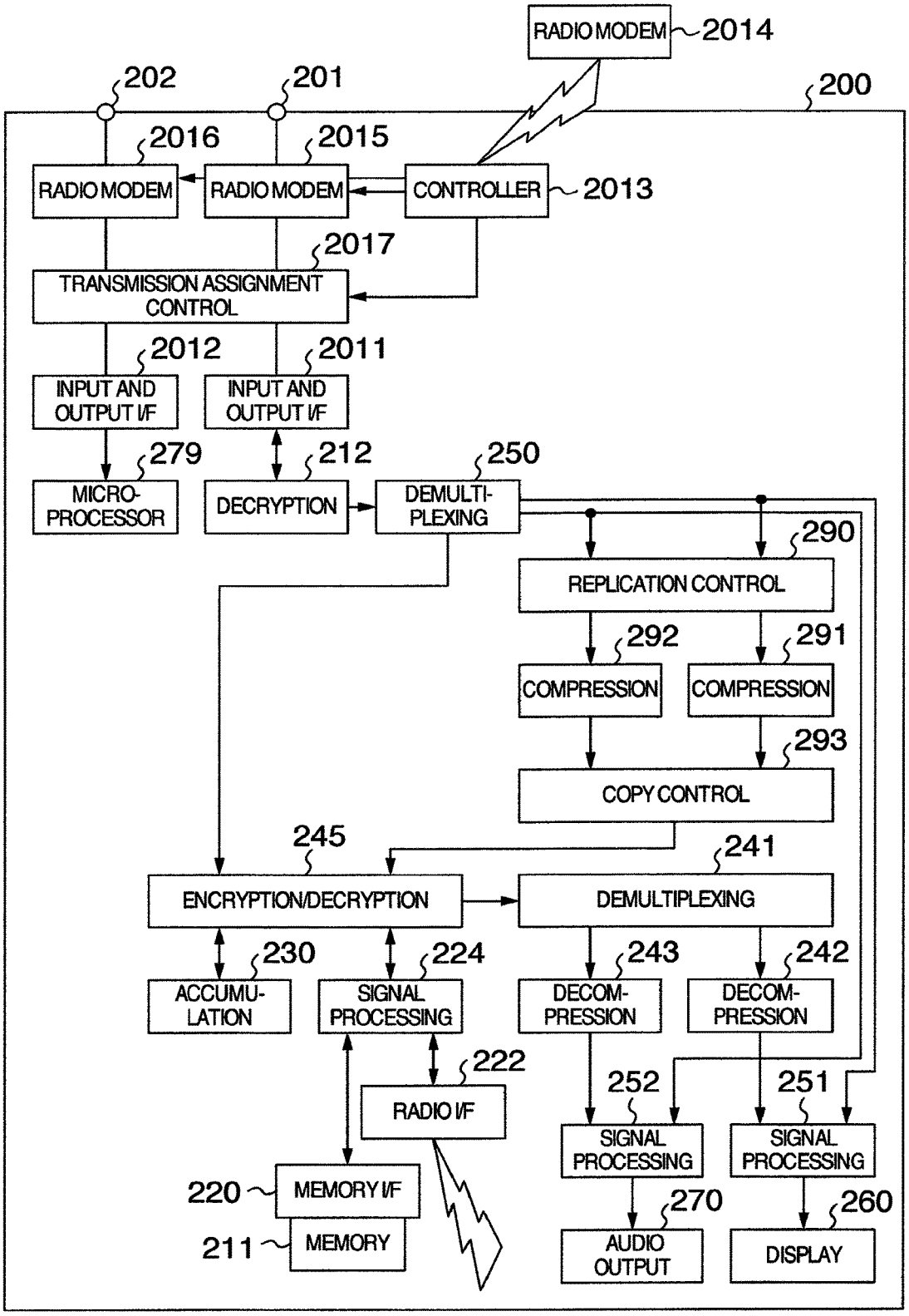

RADIO MODEM
2014
202
201
200
2016
2015
RADIO MODEM
RADIO MODEM
CONTROLLER
2013
2017
TRANSMISSION ASSIGNMENT CONTROL
2012
2011
INPUT AND OUTPUT I/F
INPUT AND OUTPUT I/F
279
212
250
MICRO-PROCESSOR
DECRYPTION
DEMULTI-PLEXING
290
REPLICATION CONTROL
292
291
COMPRESSION
COMPRESSION
293
COPY CONTROL
245
241
ENCRYPTION/DECRYPTION
DEMULTIPLEXING
230
224
243
242
ACCUMU-LATION
SIGNAL PROCESSING
DECOM-PRESSION
DECOM-PRESSION
222
252
251
RADIO I/F
SIGNAL PROCESSING
SIGNAL PROCESSING
220
MEMORY I/F
270
260
211
MEMORY
AUDIO OUTPUT
DISPLAY

FIG. 4

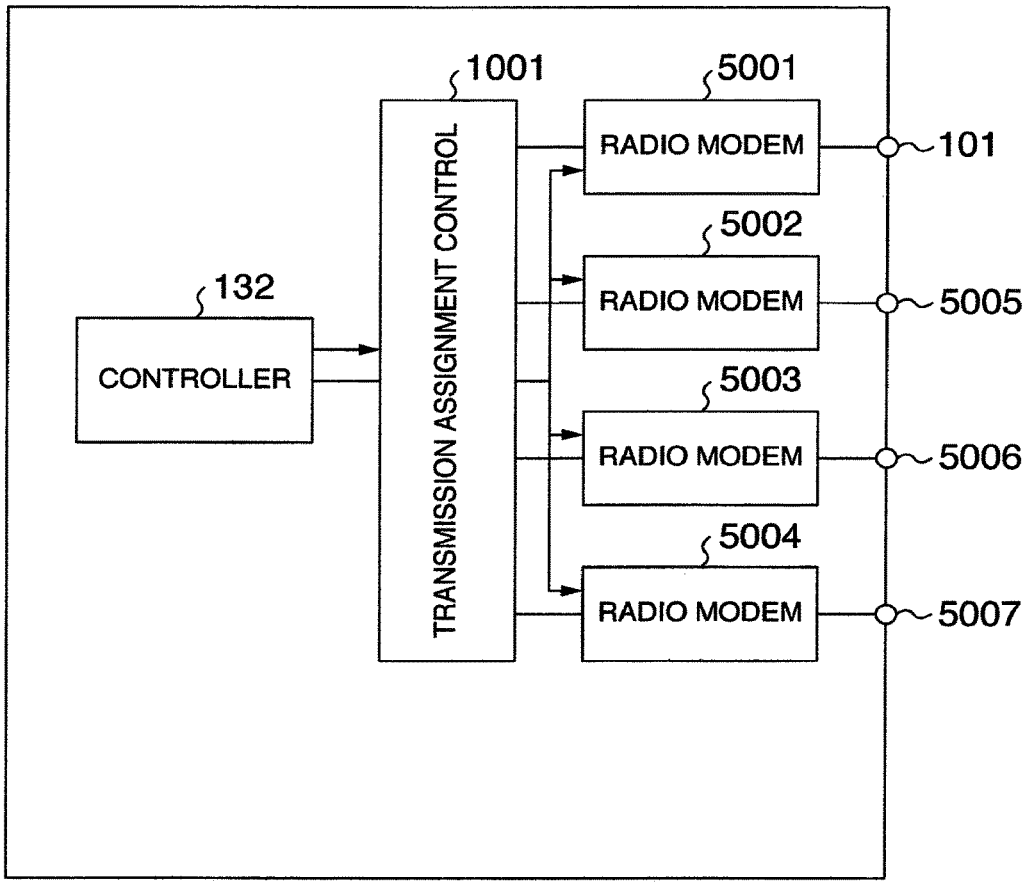

1001
5001
RADIO MODEM
101
5002
RADIO MODEM
5005
132
CONTROLLER
TRANSMISSION ASSIGNMENT CONTROL
5003
RADIO MODEM
5006
5004
RADIO MODEM
5007

FIG. 5

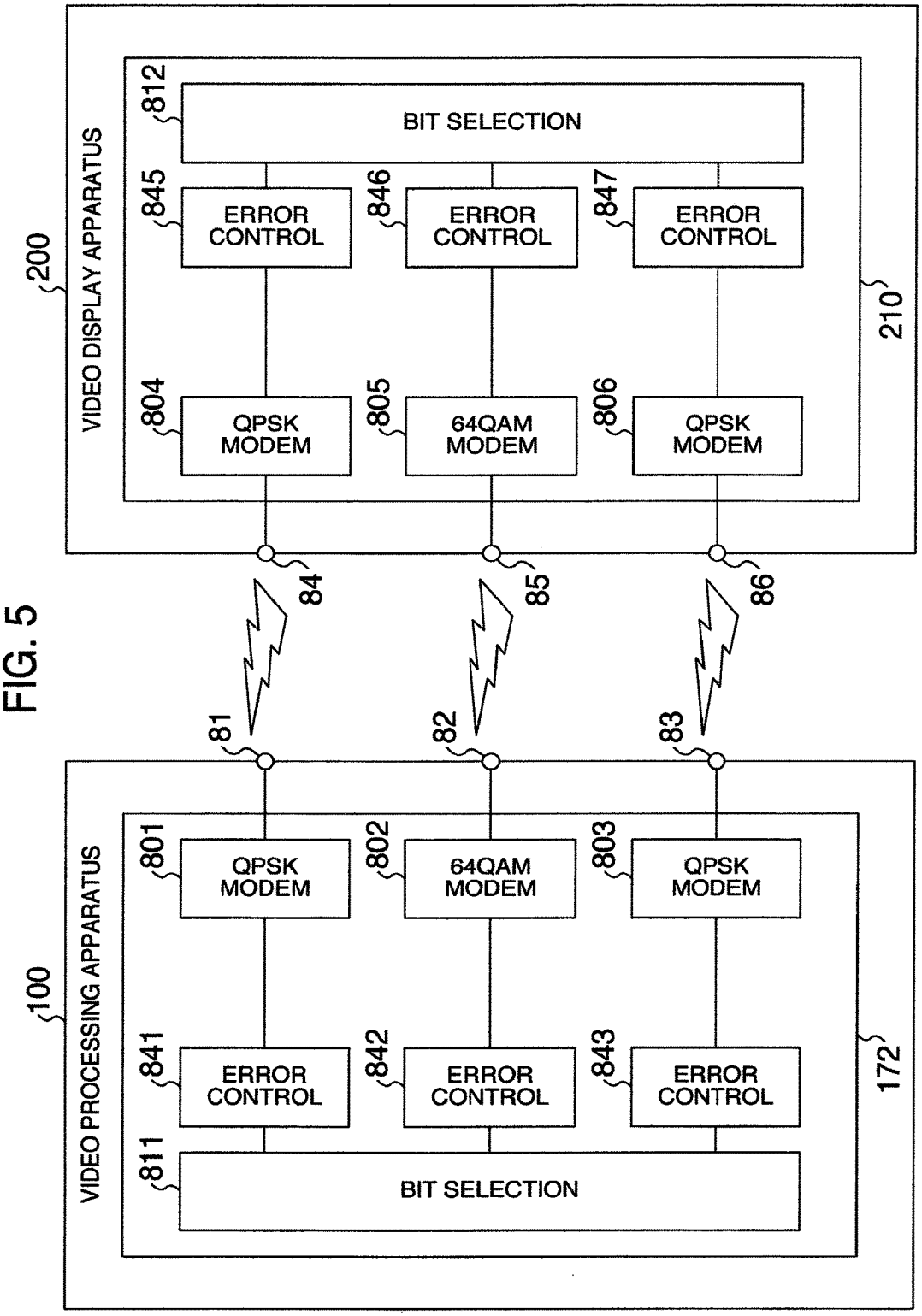

200
VIDEO DISPLAY APPARATUS
210
812
BIT SELECTION
845
ERROR CONTROL
846
ERROR CONTROL
847
ERROR CONTROL
804
QPSK MODEM
805
64QAM MODEM
806
QPSK MODEM
84
85
86
81
82
83
100
VIDEO PROCESSING APPARATUS
172
801
QPSK MODEM
802
64QAM MODEM
803
QPSK MODEM
841
ERROR CONTROL
842
ERROR CONTROL
843
ERROR CONTROL
811
BIT SELECTION

FIG. 6

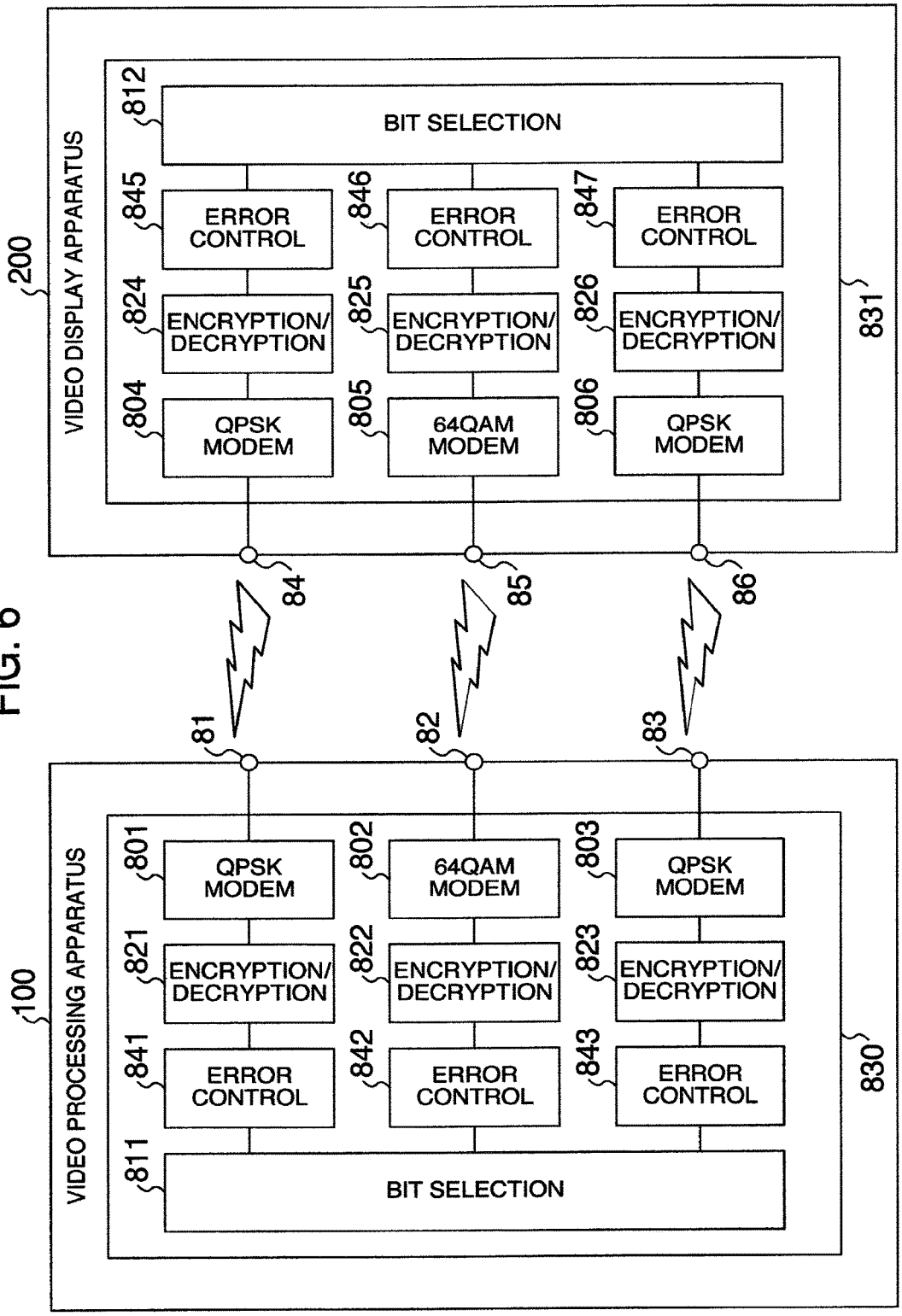

200
VIDEO DISPLAY APPARATUS
812
BIT SELECTION
845
ERROR CONTROL
846
ERROR CONTROL
847
ERROR CONTROL
824
ENCRYPTION/ DECRYPTION
825
ENCRYPTION/ DECRYPTION
826
ENCRYPTION/ DECRYPTION
804
QPSK MODEM
805
64QAM MODEM
806
QPSK MODEM
831
84
85
86
81
82
83
100
VIDEO PROCESSING APPARATUS
801
QPSK MODEM
802
64QAM MODEM
803
QPSK MODEM
821
ENCRYPTION/ DECRYPTION
822
ENCRYPTION/ DECRYPTION
823
ENCRYPTION/ DECRYPTION
841
ERROR CONTROL
842
ERROR CONTROL
843
ERROR CONTROL
811
BIT SELECTION
830

FIG. 7

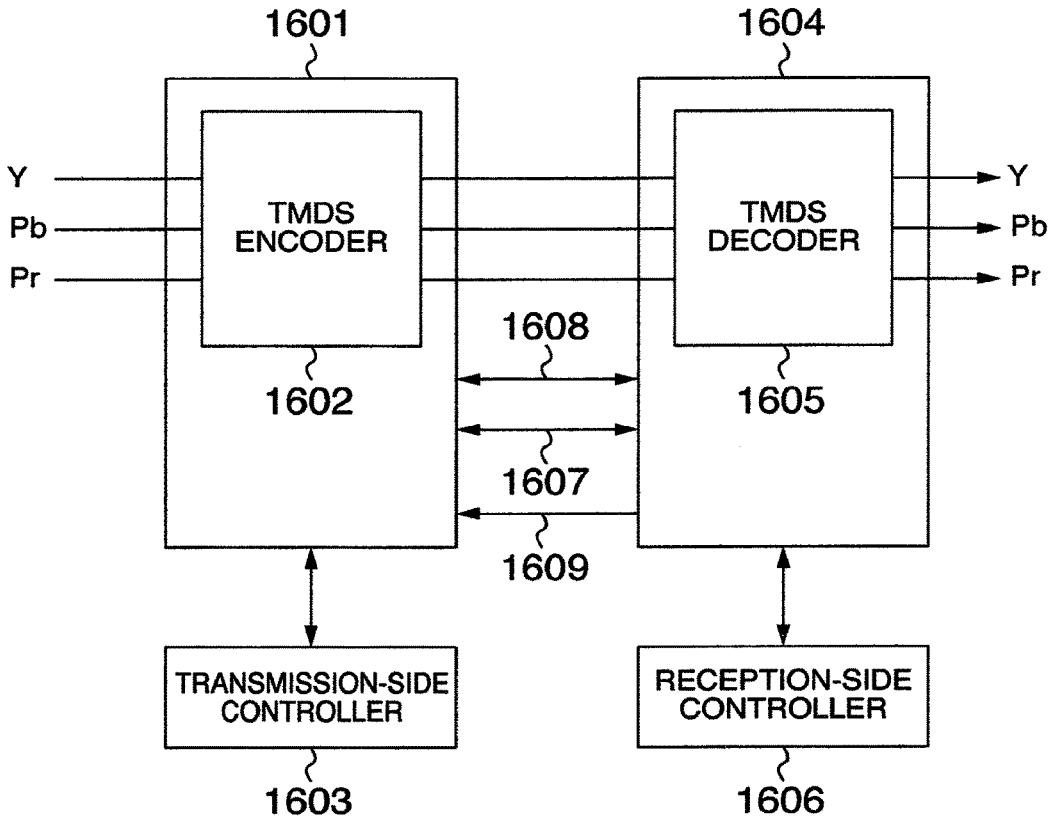

1601
1604
Y
Pb
Pr
TMDS ENCODER
TMDS DECODER
Y
Pb
Pr
1608
1602
1605
1607
1609
TRANSMISSION-SIDE CONTROLLER
RECEPTION-SIDE CONTROLLER
1603
1606

FIG. 8

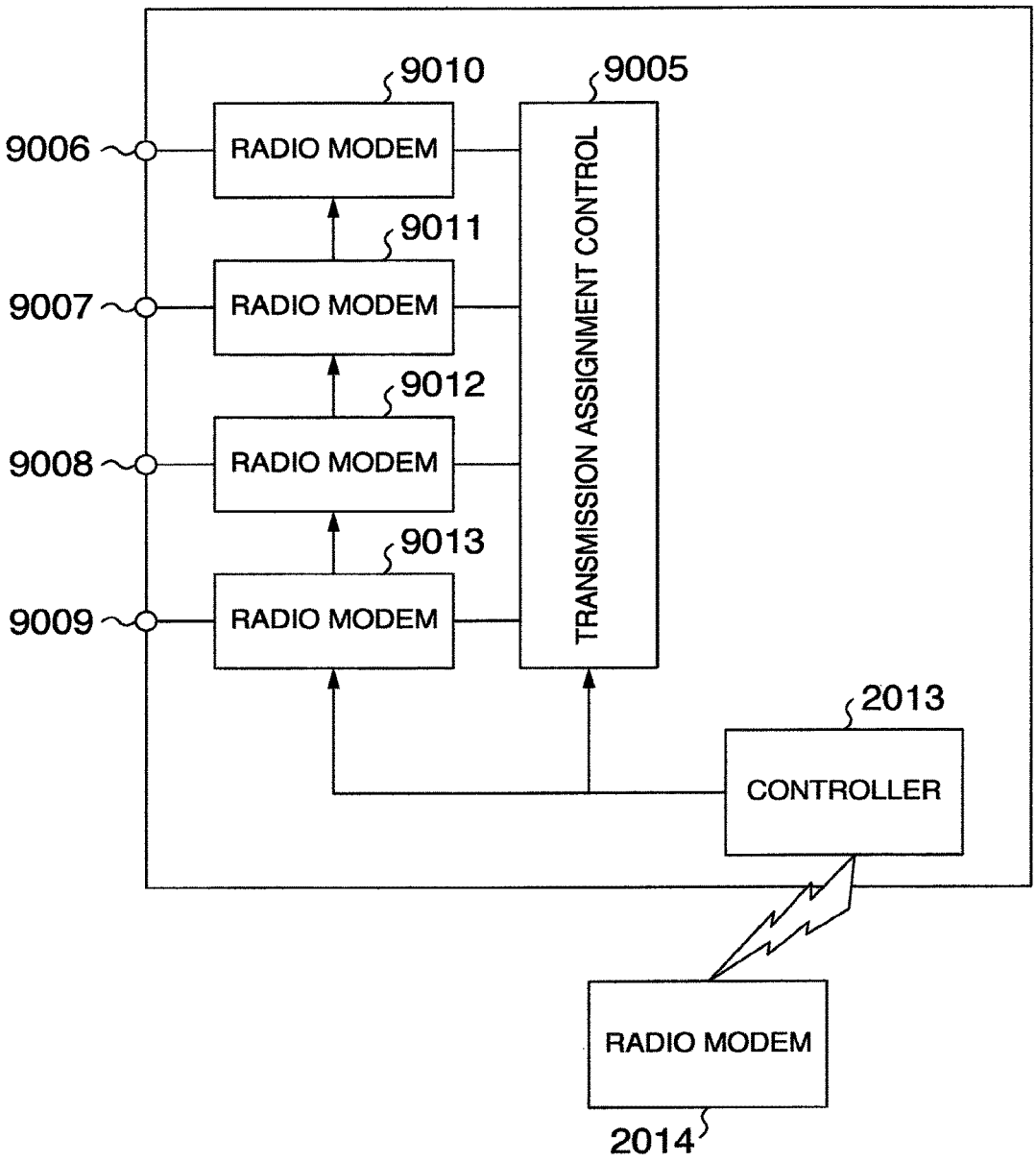

9010
9005
9006
RADIO MODEM
TRANSMISSION ASSIGNMENT CONTROL
9011
9007
RADIO MODEM
9012
9008
RADIO MODEM
9013
9009
RADIO MODEM
2013
CONTROLLER
RADIO MODEM
2014

FIG. 9

SCHEME	SCHEME 1	SCHEME 2
BANDWIDTH	6MHz	6MHz
CARRIER MODULATION SCHEME	64QAM	QPSK
CONVOLUTION CODE	3/4	2/3
GUARD INTERVAL	1/8	1/8
TRANSMISSION CAPACITY	17Mbps	5Mbps

FIG. 10

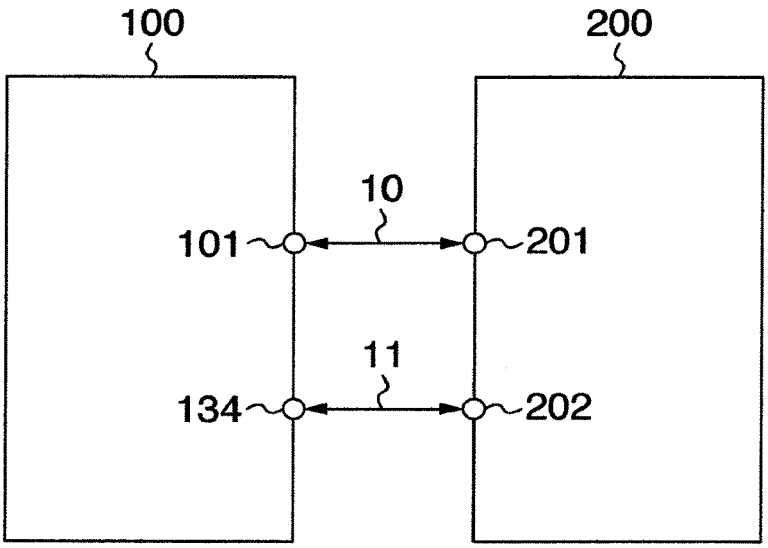
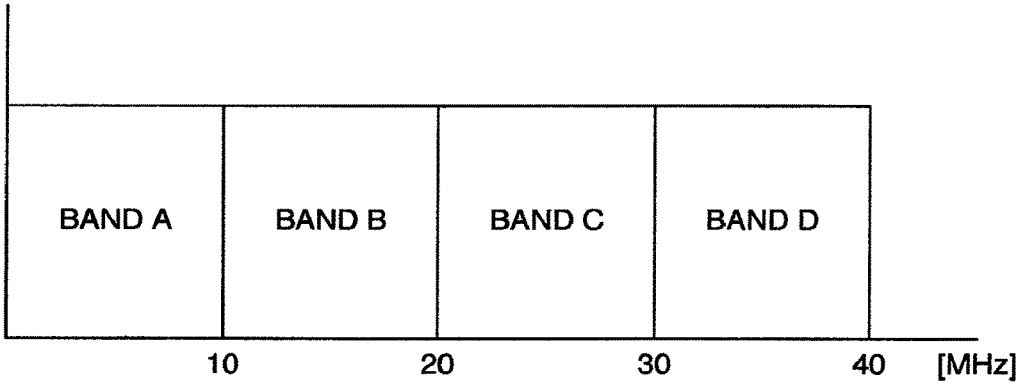


FIG. 11



DISPLAY APPARATUS AND VIDEO PROCESSING APPARATUS

INCORPORATION BY REFERENCE

The present application is a continuation of U.S. patent application Ser. No. 12/260,410, filed on Oct. 29, 2008, which claims priority to Japanese Patent Application No. 2007-306750, filed on Nov. 28, 2007, the content of both of which is hereby incorporated by reference into this application.

BACKGROUND OF THE INVENTION

The present invention relates to a technique to establish connections between a plurality of apparatuses and networks by radio.

To connect a video processing apparatus to a video display apparatus as another video processing apparatus to view videos, there has been employed a method to establish analog connections therebetween to transmit video and audio signals. However, as digital apparatuses have been widely spread, there is employed, to prevent picture quality deterioration and to protect copyright of contents to be viewed, a method in which digital connections are established between the apparatuses and video and audio signals are encrypted to be transmitted therebetween.

High Definition Digital Multimedia Interface (HDMI) is known as an example of an interface for digital transmission. According to the HDMI, the base band signal and the audio signal of high definition are time-division multiplexed and the resultant signal is encrypted through HDCP for transmission thereof.

A conventional technique in which digitized video and audio signals are multiplexed for transmission as above is described in, for example, JP-A-2007-202115.

SUMMARY OF THE INVENTION

According to the HDMI, which is developed on assumption of uses for connections between apparatuses installed in a house of a family, consideration has not been given to connections with the internet and a network in the family or a home network while viewing high-quality videos. It is therefore an object of the present invention, devised to overcome the difficulty, to provide a technique wherein while presenting on a display apparatus videos of high picture quality obtained from portable video processing apparatuses such as a camera and a cellular phone, it is possible to communicate with the internet and/or a home network.

According to one aspect of the resent invention, there is provided a display apparatus including a first radio communication unit capable of receiving video information by radio from an external video processing apparatus, a second radio communication unit capable of connecting by radio to a network, and a connection assignment control unit for controlling assignment of connection by radio transmission for each of the first and second radio communication units. The control unit assigns connection of the first radio communication unit with higher priority and controls the assignment of the transmission rate, for example, such that the transmission rate between the first radio communication unit and the external video processing apparatus is more than the transmission rate between the second radio communication unit and the network.

According to another aspect of the present invention, there is provided a video processing apparatus including a first radio communication unit capable of transmitting video information by radio to an external display apparatus, a second radio communication unit capable of connecting by radio to a network, and a connection assignment control unit for controlling assignment of connection by radio transmission for each of the first and second radio communication units. The control unit assigns connection of the first radio communication unit with higher priority and controls the assignment of the transmission rate, for example, such that the transmission rate between the first radio communication unit and the external video display apparatus is more than the transmission rate between the second radio communication unit and the network.

In the display apparatus constructed as above, the first radio communication unit can communicate video information of high picture quality with an external video processing apparatus. The second radio communication unit can connect by radio to the internet and a home network. The controller controls the transmission rate of the radio transmitter module to be assigned to the first radio communication unit and can change the transmission rate of the radio transmitter module to be assigned to the second radio communication unit. It is possible for the controller to determine and to control the radio transmission rates to be assigned to the first and second radio communication units. The controller controls the operation such that the assignment to the first radio communication module to conduct transmission to receive video information from an external video processing apparatus is carried out with higher priority. Therefore, it is possible that video information of high picture quality is continuously fed from the video processing apparatus to the video information apparatus as well as information is transmitted from the internet and a home network. There can be hence provided a video display apparatus having high serviceability.

According to the present invention, it is possible to communicate with a network while displaying videos of high picture quality obtained by a video processing apparatus.

Other objects, features and advantages of the invention will become apparent from the following description of the embodiments of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram showing an example of an embodiment of a video processing apparatus **100** according to the present invention;

FIG. **2** is a block diagram showing an example of an embodiment of a video display apparatus **200** according to the present invention;

FIG. **3** is a block diagram showing another example of an embodiment of a video display apparatus **200** according to the present invention;

FIG. **4** is a diagram showing an example of a radio modulator and demodulator or modem of the video processing apparatus **100**;

FIG. **5** is a block diagram showing an example of a system in which two video processing apparatuses are wirelessly connected to each other;

FIG. **6** is a block diagram showing another example of a system in which two video processing apparatuses are wirelessly connected to each other;

FIG. **7** is a diagram showing an example of structure of the HDMI;

FIG. **8** is a diagram showing an example of a radio modem of the video display apparatus;

FIG. **9** shows a diagram showing an example of transmission parameters of a radio modem in the embodiment;

FIG. **10** is a diagram showing connections between the video processing apparatus **100** and the video display apparatus **200** in the embodiment of the present invention; and

FIG. **11** is a diagram showing an example of assignment of bands in another example of a radio modem shown in FIGS. **4** and **8**.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Referring now to the drawings, description will be given of an embodiment according to the present invention.

First Embodiment

FIG. **10** shows an embodiment of the present invention. In this example, the system includes two video processing apparatuses, i.e., a video processing apparatus **100** which is, for example, a portable video processing apparatus capable of receiving a digital broadcast signal via a base station antenna for cellular phones or a broadcast transmission tower and a video display apparatus **200** such as a tuner capable of receiving a digital broadcast signal from a broadcast transmission tower. These apparatuses are connected, for example, via a bidirectional interface **10** to each other. Resultantly, a video signal of high picture quality and other information items and signals can be bidirectionally communicated therebetween. On the other hand, between a terminal **134** of the video processing apparatus **100** and a terminal **202** of the video display apparatus **200**, signals from the internet and a home network are communicated by radio. The frequency bands used for the transmission between the terminals **134** and **202** are limited to predetermined frequency bands. This increases the radio wave resource efficiency and prevents the problem of interference with other apparatuses.

In the embodiment, the portable video processing apparatus **100** is specifically, for example, a digital camera, a video camera, a cellular phone, a game machine, or a personal media player.

FIG. **1** shows a concrete example of the video processing apparatus **100** employed in the first embodiment of the present invention. This is a specific configuration of the apparatus **100** shown in FIG. **10**. In FIG. **1**, an imaging device **110** receives a moving or still picture supplied via an optical system to convert the picture into en electric signal. To transmit a moving picture, a compression circuit **111** employs a compression method, e.g., Moving Picture Experts Group 2 (MPEG2), MPEG4, or AVC/H.264. To transmit a still picture, the compression circuit **111** employs a compression method, e.g., Joint Photographic Experts Group (JPEG). The compression circuit **111** efficiently bit-compresses the received image.

A microphone **112** converts sound into an electric signal. A compression circuit **113** uses a compression method such as an MPEG audio to efficiently bit-compress the received audio signal.

A multiplexer circuit **116** receives the bit-compressed video and audio signals from the compression circuits **111** and **113** and various information items from a microprocessor **115**. By use of the information items, the multiplexer **116** multiplexes the signals according to a predetermined format. When a still picture is shot, the audio signal is not obtained in an ordinary case. However, it is also possible to multiplex an audio signal in synchronism with the still picture shooting operation.

The information items from the microprocessor **115** include, for example, positional information (horizontal positions, vertical positions on the right, and vertical positions on the left), date, and exposure information at shooting.

In FIG. **1**, the multiplexed signal from the multiplexer **116** is fed via an encryption/decryption circuit **140** to be stored in a storage **130**. The storage **130** may be, for example, a hard disk device, an optical disk device, or a semiconductor memory device. The type of the storage **130** may be determined according to, for example, a storage capacity, a size of the storage **130**, easiness of removing a storage medium, and/or a price of the storage **130** according to necessity. It is also possible to store the multiplexed signal via a signal processing circuit **124** and a memory interface **120** in a memory **121**.

When information is shot by a particular person, copyright of the information belongs to the person. Hence, ordinarily, such information is not required to be encrypted for the storage thereof. However, the storage medium having stored information by the storage **130** may be lost. It will be more safe if the multiplexed signal from the multiplexer **116** is once encrypted by the encryption/decryption circuit **140** to be stored in the storage **130** or the memory **121**.

The video processing apparatus **100** may also support the use of a removable memory or include a cellular phone function or a radio Local Area Network (LAN) function. The memory interface **120** is an interface for a removable memory **121**. When video and audio contents of still and moving pictures are recorded by another apparatus in the memory **121** and the memory **121** is connected to the interface **120**, the contents can be recorded via the signal processing circuit **124** and the encryption/decryption circuit **140** into the storage **130**.

In this situation, the signal processing circuit **124** checks to determine whether or not the copyright of the contents recorded in the memory **121** is protected and whether or not the duplication thereof is prohibited. According to the detected condition, the encryption/decryption circuit **140** encrypts the contents and moves the encrypted contents in the storage **130**.

Similarly, audio and video contents of still and moving pictures are received as inputs by a radio interface **122**. The contents are stored via the signal processing circuit **124** and the encryption/decryption circuit **140** in the storage **130**. Also, according to conditions of the copyright protection and the replication restriction, the contents are encrypted by the encryption/decryption circuit **140**, as required.

When it is desired to reproduce a content stored in the storage **130** to view the reproduced content, the user selects the content by an input key or a remote control, not shown. The selected content is read from the storage **130** to be decoded by the encryption/decryption circuit **140** and is then separated by a demultiplexer circuit **141** into an audio signal and a video signal.

When a broadcast program is received by a broadcast receiver **180**, the encrypted signal encrypted for the broadcast is decrypted by the encryption/decryption circuit **140**. If encryption is required to store the signal, the signal is accordingly encrypted by the circuit **140** to be stored in the storage **130** and the memory **121**. To immediately view the

received broadcast program in real time, the signal is separated by the demultiplexer **141** into a video signal and an audio signal.

The separated and compressed video signal is decompressed by a decompression circuit **142** to be fed to a signal processing circuit **150**. The circuit **150** conducts a scanning-line conversion for the video signal on the basis of the number of scanning lines of a display **160** to output the resultant video signal to the display **160**. The separated and compressed audio signal is decompressed by a decompression circuit **143** to be delivered to an audio output device **161**. Since the video processing apparatus **100** includes the display **160** and the audio output device **161**, it is possible to immediately view the broadcast program without externally connecting any video display apparatus. In a situation wherein the period of time required for the decompression varies between the video and audio signals and/or a time difference exists between the video display and the audio output due to presence or absence of the scanning-line conversion, if the audio signal is advanced in time relative to the video signal, the user particularly perceives an uncomfortable feeling. To overcome the difficulty, the audio signal is delayed, for example, in the decompression processing, namely, a lip-sync operation is carried out. This removes the uncomfortable feeling due to the difference in time between the video and audio signals.

Description will now be given of a situation wherein the video processing apparatus **100** is employed as a cellular phone. For example, a voice of a conversation is inputted to the audio input/output section **126** to produce an electric signal. For the signal, a telephone signal processing circuit **125** executes predetermined signal processing and modulation processing. The resultant signal is transmitted via an antenna, not shown, to a base station of the cellular phone. An audio signal sent from the base station is received by an antenna, not shown, to be fed to the telephone signal processing circuit **125**. For the signal, the circuit **125** executes predetermined signal processing and demodulation processing. The resultant signal is fed to the audio I/O section **126** to be reproduced as a voice. The video processing apparatus **100** can also receive a content of a moving picture transmitted from the base station of the cellular phone. The content is received by an antenna, not shown, to be delivered via the telephone signal processing circuit **125** to the signal processing circuit **124**. The content is similarly processed as above by the encryption/decryption circuit **140**. The resultant signal of the content is fed to a display and an audio output unit incorporated in the video processing apparatus **100** to be viewed/listened by the user. The content thus processed may also be fed via a terminal **101**, a connection cable **10**, and a terminal **201** to an external video display apparatus **200** to be displayed on a large-sized screen. While viewing the content, it is possible to record the content in a recording medium incorporated in the video processing apparatus **100** or a recording medium, e.g., a memory **121** connected thereto, for example, to view the content later. The memory **121** may also be used as a recording medium to record a movie and the like.

Similarly, a program broadcast from a broadcast transmission tower is received by a broadcast receiver **180** of the video processing apparatus **100** to be viewed by the apparatus **100** or to be stored in a recording medium, not shown, incorporated in the apparatus **100** or a recording medium, e.g., the memory **121** connected thereto. Also, the content may be fed via the terminal **101**, the cable **10**, and the terminal **201** to the video display apparatus **200** to be viewed by the user.

In addition, by installing an imaging device **110** and a microphone **112** in the video processing apparatus **100**, still and moving pictures can be shot together with audios and can be stored in an incorporated recording medium, not shown, and/or the memory **121**. The videos and audios stored in the recording medium and/or the memory **121** may be fed via the terminal **101** to the video display apparatus **200** to be enjoyed by the user.

When the user views video and audio signals by use of the external video display apparatus **200**, the apparatus **200** confirms scanning lines which the apparatus **200** can support. If the scanning lines match those of the video signals to be displayed, the signals are immediately outputted in real time. Otherwise, the scanning lines of the video signals are converted by a signal processing circuit **150** into the required scanning lines to be fed to a multiplexer circuit **170**. In the circuit **170**, the video signals are multiplexed on the time axis, with the audio signals processed by a signal processing circuit **151**. The circuit **151** compresses the audio signals on the time axis during a period corresponding to the blanking period of the video signals and conducts a time adjusting operation to carry out the lip-sync operation according to the necessity. The video and audio signals multiplexed by the multiplexer circuit **170** are delivered to an encryption circuit **171**. For the signals, the circuit **171** carries out encryption for the transmission of the signals between the video processing apparatus **100** and the video display apparatus **200** and outputs the resultant signals via a video interface circuit **131**, a transmission rate assignment controller **1001**, and the terminal **101** to the video display apparatus **200**. On the other hand, the terminal **134** is connected to a network such as the internet as described above and is used to wirelessly communicate videos and other information items obtained from the network by use of a radio modem circuit **1003**. The information from the network is demodulated by the circuit **1003** to be fed via the transmission rate assignment controller **1001** to an interface circuit **133** and is delivered therefrom to a microprocessor **115**. The microprocessor **115** determines the type of the information from the network. If the information is, for example, a video stream compressed in a predetermined format, the microprocessor **115** feeds the video stream to the demultiplexer circuit **141** and the decompression circuit **143**. For the video stream, the circuits **141** and **143** conduct processing as described above. The resultant signals are presented on the display **160**. According to necessity, the audio information obtained from the network is reproduced by the audio output device **161**. If the information from the network is an update program of an application program or an Operating System (OS), the microprocessor **115** executes addition and storage processing for new software or executes update processing for the associated program. Although the processing of the network information is executed by the microprocessor **115** to process video information in the embodiment, it is also possible to arrange a microprocessor to dedicatedly process the network information.

The controller **132** controls the transmission rate assignment control circuit **1001** on the basis of time control information of the video signal to variably control the transmission rate of the radio modem circuit **1002**. At the same time, the controller **132** variably controls the transmission rate of the radio modem circuit **1003** for radio communication with a network such as the Internet. According to the embodiment, in the assignment of the transmission rate to the demodulation circuits **1001** and **1002**, the controller **132** gives preference to the demodulation circuit

1001. In other words, the transmission rate of the demodulation circuit **1001** is more than that of the modem circuit **1002**. Hence, within the limited range of bands for the radio transmission, the modem **1002** can transmit video information without deteriorating the video quality of the video information having high picture quality. The band of radio signals from the terminal **101** and that of radio signals from the terminal **134** are fixed. Therefore, if the band of signals from the terminal **101** is expanded, that of signals from the terminal **134** narrows to slightly lower the communication speed of the network. However, this rarely influences the system operation since information regarding the network is less frequently exchanged as compared with video information sent from the video processing apparatus **100**.

When the signal from the terminal **101** is to be stored in the destination thereof, the compressed signal is transmitted without decompressing the signal. In the operation, the encryption/decryption circuit **140** delivers the compressed signal to the encryption circuit **171**. The circuit **171** conducts predetermined encryption for the signal and then outputs the resultant signal via the video interface circuit **131**, the transmission rate assignment controller **1001**, and the terminal **101**. Also in this situation, the control circuit **132** variably controls the transmission rate of the radio modem **1002** in association with the time control information of the video signal. As a result, the radio modem **1002** can send the video information without deteriorating the video quality of the video information having high picture quality.

In the description above, the video and audio signals obtained from the imaging device **110** and the microphone **112** and the contents inputted from the memory **121** and the radio interface **122** are once stored in the storage **130** to be thereafter reproduced. However, if the storing of the signals and the contents are not required or are immediately viewed, the signals and the contents are demultiplexed by the demultiplexer **141** without conducting the encryption and decryption for the storage by the encryption/decryption circuit **140**. Resultantly, the videos and audios can be enjoyed by use of the display **160** and the audio output device **161** of the video processing apparatus **100**. Also, it is possible to enjoy the videos and audios by a receiver externally connected via the wired interface circuit **131** to the apparatus **100**.

Description will now be specifically given of one technical aspect of the embodiment, namely, the transmission rate assignment control circuit **1001** and the radio demodulation circuits **1002** and **1003**. The modem circuits **1002** and **1003** conduct demodulation through Orthogonal Frequency Division Multiplexing (OFDM). In the example, the modem **1002** is a first radio communication unit which wirelessly sends video information and audio information to the external video display apparatus **200** and which receives data and information by radio therefrom. The modem **1002** is connected via the transmission rate assignment controller **1001** to the interface circuit **131** which communicates with the video display apparatus **200**. On the other hand, the modem **1003** is a second radio communication unit which connects to (accesses) a network, e.g., the Internet or a home network to wirelessly communicate various information including video signals, audio signals, and data therewith. The modem **1003** is connected via the transmission rate assignment controller **1001** to the interface circuit **133** for networks. The controller **1001** variably controls, according to a control signal from the controller **132**, the transmission rates respectively of the modems **1002** and **1003** by variably setting the modulation/demodulation methods, the frequency bands, and the number of carriers respectively for the modems **1002** and **1003**. In short, the controller **132** controls distribution of the radio transmission rate of each modem by controlling the transmission rate assignment controller **1001**. As a specific example of operation in which the transmission rate is controlled by changing parameters including the demodulation method and the frequency band, FIG. **9** shows the difference in the transmission rate between two schemes.

According to the embodiment, the controller **132** and the transmission rate assignment controller **1001** control the radio transmission assignment such that the radio transmission rate of the modem **1002** to send the video information of high picture quality by radio to the video display apparatus **200** takes precedence over the radio transmission rate of the modem **1003** to connect to a network for communication. That is, the radio transmission rate of the modem **1002** is more than that of the modem **1003**. For example, in a situation wherein the modem **1002** transmits video information to the display apparatus **200** and the modem **1003** simultaneously connects to the Internet to receive Internet information, the controller **132** controls the operation to continuously supply videos with high picture quality to the user, specifically, to set the transmission scheme of the modem **1002** to, for example, "scheme **1**" shown in FIG. **9**. For the radio modem **1003**, the controller **132** sets the transmission scheme thereof to "scheme **2**" of FIG. **9**. As can be seen from FIG. **9**, the transmission capacity of scheme **1** is 17 Megabits per second (Mbps) which is more than three times that of scheme **2** (5 Mbps). As above, in the limited transmission capacity for radio transmission, a higher transmission rate is assigned to the communication with the display apparatus **200** in the embodiment. It is hence possible that the user continuously views videos with high picture quality on the display apparatus **100**. Naturally, the variable control of the transmission rate is not limited to the example shown in FIG. **9**.

The controller **132** and the transmission rate assignment controller **1001** may variably control the radio transmission assignment to the modems **1002** and **1003** in response to an indication from the user. For example, in a situation wherein the user issues an indication to transmit video information by radio via the modem **1002** to the display apparatus **200** while acquiring information from the Internet according to scheme **1** of FIG. **9** by use of the modem **1003**, the controller **132** outputs a control signal to the assignment controller **1001** such that the transmission scheme of the modem **1003** is changed from scheme **1** to scheme **2** of FIG. **9** and that of the modem **1002** is set to scheme **1** of FIG. **9** conduct communications. The transmission rate of the modem **1002** may be variably changed according to fineness or precision of the video information sent from the modem **1002** to the display apparatus **200**. For example, if the fineness of the video information is altered from SD (640×480) to HD (1980×1080), the controller **132** instructs the assignment controller **1001** to heighten the transmission rate of the modem circuit **1002**. It is preferable in the operation that the transmission rate of the modem **1003** is lowered in association with the variable control of the transmission rate of the modem **1002**.

The transmission rates of the radio modems **1002** and **1003** may also be variably controlled by a communication technique using a plurality of antennas such as a Multi-Input Multi-Output (MIMO) scheme.

Referring next to FIG. **4**, description will be given of other examples of the transmission rate assignment controller and the radio modem. FIG. **4** shows only part of the system associated with the transmission rate assignment control. In FIG. **4**, the same functional constituent components as those of FIG. **1** are assigned with the same reference numerals.

In FIG. **4**, radio modem circuits **5001** to **5004** are modems having respective fixed transmission capacity values and differ from each other only in the frequency band for transmission. The modems **5001** to **5004** respectively have bands A to D as shown in FIG. **11**. Terminals **101** and **5005** to **5007** are input terminals to receive signals and are arranged respectively for radio modems **5001** to **5004**. In operation, the modems **5001** to **5004** may be appropriately combined with each other. For example, according to necessity, the modems **5001** and **5002** are employed to transmit video information and the modems **5003** and **5004** are utilized to communicate with the network such as the Internet. That is, while the interface circuit **131** wirelessly transmits video information and audio information via the modems **5001** and **5002** to the video display apparatus **200**, the interface circuit **133** conducts communication via the modems **5003** and **5004** with the network. In a situation wherein a wide band is required to transmit video information of high picture quality (e.g., video information of HD resolution), the modems **5001** to **5003** are assigned to send video information and only the modem **5004** is assigned to communicate with the network such as the Internet. Specifically, the interface circuit **131** transmits video and audio information by radio via the modems **5001** to **5003** to the display apparatus **200**, and the interface circuit **133** communicates with the network via the modem **5004**. As a result, video information of high picture quality can be continuously transmitted and it is also possible to communicate with the Internet. Particularly, the broadcast signal is required to be presented by synchronizing the time information sent from the broadcasting station with that on the receiver side. According to the present invention, the time information can be appropriately controlled without deteriorating the quality of the video information.

FIG. **2** shows a specific configuration of the video display apparatus **200** of FIG. **10**. In FIGS. **2** and **10**, the same constituent components are assigned with the same reference numerals and detailed description thereof will be avoided. Description will be given of a situation wherein an uncompressed baseband signal of a moving picture is inputted via the terminal **201**. The signal from the external video processing apparatus **100** thus received via the terminal **201** is demodulated by a radio modem circuit **2015** to be supplied via a transmission rate assignment controller **2017** and an input/output interface circuit **2011** to a decryption circuit **211**. In operation, a controller **2013** drives the assignment controller **2017** to vary the transmission rate of the modem **2015** according to that of the video information delivered from the video processing apparatus **100**. Resultantly, an input/output interface circuit **2011** can receive the video information of high picture quality at preset timing.

The decryption circuit **211** is associated with encryption by the encryption circuit **171** shown in FIG. **1** and decrypts a signal encrypted by the circuit **171**. The decrypted signal is fed to a demultiplexer circuit **250**, and then video and audio signals obtained from the demultiplexer **250** are inputted to signal processing circuits **251** and **252**, respectively. For the received video signal, the circuit **251** conducts a scanning-line conversion and a resolution conversion according to the number of pixels displayable by a display **260**. The circuit **252** decompresses on the time axis the audio signal which is compressed and multiplexed on the time axis by use of the blanking of the video signal. According to necessity, the circuit **252** carries out the lip-sync operation and the sound quality adjustment. Signals outputted respectively from the circuits **251** and **252** are inputted respectively to a display **260** and an audio input/output unit **270** to be viewed by the user.

Description will now be given of operation when a compressed moving-picture signal is received via the terminal **201**. This operation aims at storing the moving-picture signal in a storage **230** incorporated in the apparatus **200**.

The signal received from the terminal **201** is delivered via the wired input/output interface circuit **2011** to the decryption circuit **211**. The circuit **211** corresponds to the encryption circuit **171** shown in FIG. **2** and decrypts a signal encrypted by the circuit **171**. The decrypted signal is inputted to an encryption/decryption circuit **240**. The circuit **240** reads copy control information of the content to be stored and encrypts the content for the storage thereof according to the information. The encrypted signal is stored in the storage **230** in the compressed state.

In a situation wherein the user views the compressed signal received via the terminal **201** while storing the signal in the storage, a signal corresponding to a compressed signal decrypted by the encryption/decryption circuit **211** is fed from the encryption/decryption circuit **240** to a demultiplexer circuit **241**. In the circuit **241**, the signal is separated into a compressed video signal and a compressed audio signal. The separated video and audio signals are decompressed respectively by decompression circuits **242** and **243** to baseband signals to be respectively supplied to the signal processing circuits **251** and **252**. Signals outputted respectively therefrom are delivered respectively to the display and the audio output unit **270** to be viewed by the user.

When a content stored in the storage **230** is reproduced to be viewed by the user, information items such as titles of the contents stored in the storage **230** are presented on the display **260**. When the user selects one of the contents, a signal of the selected content is fed from the storage **230** to the encryption/decryption circuit **240**. The circuit **240** decrypts the encrypted signal of the content to input the resultant signal to the demultiplexer **241**. The signal of the content is thereafter similarly processed as described above to be viewed by the user.

It is possible to similarly reproduce contents stored in a memory **221**. As in the reproduction of contents stored in the storage **230**, the user selects one of the contents stored in a memory **221** to view the content. The selected content is transferred via a memory interface **220** and a signal processing circuit **224** to the encryption/decryption circuit **240**. Specifically, the circuit **224** executes processing necessary to read the content from the memory **221** to input compressed and multiplexed video and audio signals of the content to the circuit **240**. Subsequent signal processing is similar to the processing executed after the content is read from the storage **230**.

As in the operation to store a content in the storage **230**, it is possible to store the content in the memory **221**. Although detailed description of the associated processing will be avoided, the content encrypted by the encryption/decryption circuit **240** is stored via the signal processing circuit **224** and the memory interface **220** into the memory **221**.

To view or to store a content transmitted by radio, the system executes processing in a similar way. A compressed content received by radio is fed via a radio interface **222** and the signal processing circuit **224** to the encryption/decryption circuit **240**. The circuit **240** decrypts the signal encrypted for the radio transmission. Subsequent processing is similar to the processing executed at reproduction of the signal from the storage **230**.

When an uncompressed baseband signal is received from the terminal **201** or **202**, the content can be efficiently stored in the storage **230** and the memory **221**. Description will be given of operation in this situation.

The content inputted from the terminal **201** is transferred via the input/output interface **2011**, the decryption circuit **211** and the demultiplexer circuit **250** to be separated into a video signal and an audio signal. The video and audio signals thus separated are fed via a replication control circuit **280** to compression circuits **281** and **282**. The circuit **280** reads, from the content, multiplexed replication control information to determine whether or not replication of the content is allowed. As the control information, a bit may be assigned to a designated field. Or, by using electronic watermark, the information may be superimposed onto video or audio information. Information inputted from the network to the terminal **202** is also processed in a similar fashion as above.

The compression circuit **281** compresses the video signal by use of a compression scheme, e.g., MPEG2, MPEG4, or AVC/H.264. The compression circuit **282** compresses the audio signal according to a compression scheme, e.g., MPEG Audio. The compressed video and audio signals are inputted to a multiplexer circuit **283** to be multiplexed. The multiplexed signal is fed to the encryption/decryption circuit **240** to be thereafter similarly stored in the storage **230** and/or the memory **221**. As a result, the content can be efficiently recorded therein for a long period of time according to copyright information.

On the other hand, the signal from a network such as the Internet received via the terminal **202** is demodulated by a radio modem circuit **2016** to be supplied via a transmission rate assignment controller circuit **2017** and an input/output interface circuit **2012** to a microprocessor **279**. The type of information of the video information from the network is determined. If the information is, for example, a video stream compressed in a predetermined format, the system transfers the information to demultiplexer circuit **241** and the decompression circuits **242** and **243**. After the information is processed by these circuits in a similar way as described above, an image of the information is presented on the display **260**. According to necessity, audio information obtained from the network is reproduced by the audio output unit **261**. If the information from the network is an update program for an application program, an operating system OS, or the like, the microprocessor **279** adds and stores new software and/or updates an associated program. It is also possible that the function of the microprocessor **279** is installed in the controller **2013** to configure one unified module including the microprocessor **279** and the controller **2013**.

In the operation, the controller **2013** controls the transmission rate assignment controller **2017** to vary the transmission rate of the radio modem **2015** in association with the transmission rate of the video information received from the video processing apparatus **100**. Since the transmission rate of the radio modem **2015** to receive the video information from the apparatus **100** takes precedence over that of the modem **2016** in the transmission rate assignment, the transmission rate of the modem **2016** is lower than that of the modem **2015**. In the embodiment as described above, the transmission rate of the modem **2015** to receive the video information from the apparatus **100** is higher than that of the modem **2016** to communicate with the network. Therefore, within the limited range of bands for the radio transmission, it is possible to obtain the high-quality video information from the external video processing apparatus **100** without deteriorating the video quality. The band of radio signals received by the terminal **201** and that of radio signals inputted to the terminal **202** are fixed. Hence, if the band of signals from the terminal **201** is expanded, that of signals from the terminal **202** narrows. This slightly lowers the communication speed of the network. However, this rarely influences the system operation since information regarding the network is less frequently exchanged as compared with video information sent from the video processing apparatus **100**.

Next, description will be specifically given of one technical aspect of the embodiment, namely, the transmission rate assignment controller **2017** and the radio modems **2015** and **2016**. The modems **2015** and **2016** carry out OFDM modulation/demodulation. In the example, the modem **2015** is a first radio communication unit which wirelessly receives video information and audio information from the external video processing apparatus **100** and which sends data and information by radio to the apparatus **100**. The modem **2015** is connected via the transmission rate assignment controller **2017** to the interface circuit **2011** which communicates with the video display apparatus **200**. On the other hand, the modem **2016** is a second radio communication unit which connects to (accesses) a network, e.g., the Internet or a home network to wirelessly communicate various information including video signals, audio signals, and data with the network. The modem **2016** is connected via the transmission rate assignment controller **2017** to the interface circuit **2012** for networks. The controller **2017** variably controls, according to a control signal from the controller **2013**, the transmission rates respectively of the modems **2015** and **2016** by variably designating the modulation/demodulation methods, the frequency bands, and the number of carriers respectively for the modems **2015** and **2016**. In other words, the controller **2013** controls distribution of the radio transmission rate of each modem by controlling the transmission rate assignment controller **2017**. As a specific example of operation in which the transmission rate is controlled by changing parameters including the demodulation method and the frequency band, FIG. **9** shows the difference in the transmission rate between two schemes.

In the embodiment, the controller **2013** and the transmission rate assignment controller **2017** control the radio transmission rate assignment so that the radio transmission rate of the modem **2015** to receive the video information of high picture quality by radio from the external video processing apparatus **100** takes precedence over the radio transmission rate of the modem **2016** to connect to a network for communication. In short, the radio transmission rate of the modem **2015** is more than that of the modem **2016**. For example, in a situation wherein the modem **2015** receives video information from the video processing apparatus **100** and the modem **2016** simultaneously connects to the Internet to receive Internet information, the controller **2013** controls the operation to continuously provide videos with high picture quality to the user, specifically, to set the transmission scheme of the modem **2015** to, for example, "scheme **1**" shown in FIG. **9**. For the radio modem **2016**, the controller **2013** sets the transmission scheme thereof to "scheme **2**" shown in FIG. **9**. As can be seen from FIG. **9**, the transmission capacity of scheme **1** is 17 Mbps which is more than three times that of scheme **2** (5 Mbps). Hence, in the limited transmission capacity for radio transmission, a higher transmission rate is assigned to the communication with the video processing apparatus **100** in the embodiment. It is therefore possible that the user continuously watches videos with high

picture quality on the display apparatus **100**. Naturally, the variable control of the transmission rate is not limited to the example shown in FIG. **9**.

The controller **2013** and the transmission rate assignment controller **2017** may control the radio transmission assignment to the modems **2015** and **2016** in response to an indication from the user. For example, in a situation wherein the user issues an indication to receive video information by radio via the modem **2015** from the video processing apparatus **100** while acquiring information from the Internet according to scheme **1** of FIG. **9** by use of the modem **2016**, the controller **2013** outputs a control signal to the assignment controller **2017** such that the transmission scheme of the modem **2016** is changed from scheme **1** to scheme **2** of FIG. **9** and that of the modem **2015** is set to scheme **1** of FIG. **9**. The transmission rate of the modem **2015** may be changed according to precision of the video information which is sent from the video processing apparatus **100** to be received by the modem **2015**. For example, the precision of the video information above is changed from SD (640×480) to HD (1980×1080), the controller **2013** instructs the assignment controller **2017** to heighten the transmission rate of the modem circuit **2015**. It is preferable in the operation that the transmission rate of the modem **2016** is lowered in association with the variable control of the transmission rate of the modem **2015**.

The transmission rates of the radio modems **2015** and **2016** may also be variably controlled by a communication technique using a plurality of antennas such as the MIMO scheme.

Referring next to FIG. **8**, description will be given of other examples of the transmission rate assignment controller and the radio modem. FIG. **8** shows only part of the system associated with the transmission rate assignment control. In FIG. **8**, the same functional constituent components as those of FIG. **1** are assigned with the same reference numerals.

In FIG. **8**, a transmission rate assignment controller **9005** operates in a similar way as the transmission rate assignment controller **1001** described above and assigns transmission rates respectively to radio modems **9010** to **9013** according to an instruction from the controller **2013**. The modem circuits **9010** to **9013** are modems having respective fixed transmission capacity values and differ from each other only in the frequency band for transmission. The modems **9010** to **9013** respectively have bands A to D as shown in FIG. **11**. Terminals **9006** and **9007** are input terminals to receive signals and are arranged respectively for radio modems **9010** to **9013**. In operation, the modems **9010** to **9013** may be appropriately combined with each other. For example, under supervision of the assignment controller **9005**, the modems **9010** and **9011** are employed to transmit video information and the modems **9012** and **9013** are utilized for communication with the network such as the Internet depending on cases. That is, while the interface circuit **2011** transmits by radio video information and audio information via the modems **9010** and **9011** to the video display apparatus **200**, the interface circuit **2012** communicates via the modems **9012** and **9013** with the network. In a situation wherein a wide band is required to receive video information of high picture quality (e.g., video information of HD resolution) from the video processing apparatus **100**, the modems **9010** to **9012** are allocated to transmit video information and only the modem **9013** is allocated to communicate with the network such as the Internet. That is, the interface circuit **2011** transmits video and audio information by radio via the modems **9010** to **9012** to the video display apparatus **200**, and the interface circuit **2012** communicates with the network via the modem **9013**. Resultantly, video information of high picture quality can be continuously transmitted and it is also possible to communicate with the Internet. In particular, the broadcast signal is required to be presented by synchronizing the time information sent from the broadcasting station with that on the receiver side. According to the embodiment, the time information can be appropriately controlled without deteriorating the quality of the video information.

Description will now be given supplementally of the High Definition Digital Multimedia Interface (HDMI). FIG. **7** shows an example the HDMI configuration mainly including a transmission side and a reception side. The transmission side includes a transmitter section **1601** and a transmission controller section **1603** to control the transmitter section **1601**. The transmitter section **1601** encodes a video signal (Y, Pb, Pr) and an audio signal to output resultant signals to a receiver section **1604**. Also, the transmitter section **1601** includes a TMDS encoder circuit **1602** which converts the video signal (Y, Pb, Pr) and the audio signal respectively into serial video data and serial audio data. On the other hand, the reception side includes a receiver section **1604** and a reception controller section **1606** to control the receiver section **1604**. The receiver section **1604** receives the video data and the audio data from the transmitter section **1601** and conducts a TMDS decoding operation for the data by a TMDS decoder circuit **1605** to thereby reproduce baseband video data and baseband audio data. A CEC line **1607** is an apparatus control line to transmit a control signal for apparatuses. Display specification information known as "DDC" is transmitted via a DDC line **1608**. The reception side transmits to the transmission side a Hot Plug Detect (HPD) signal **1609** indicating that a connection is established between apparatuses of the transmission and reception sides.

To conduct transmission according to the HDMI standard, apparatuses mutually recognize in a procedure as follows. A physical address is obtained via the DDC line. The physical address is an identification number to discriminate an associated apparatus. By use of a CEC bus for bidirectional connection, a logical address is obtained for bidirectional communication of each apparatus. The logical address is identification information defining a category of each apparatus, e.g., a display or a recording apparatus.

FIG. **5** is a diagram to supplementally explain a radio interface **11** between the video processing apparatus **100** and the video display apparatus **200**. In FIG. **5**, the apparatuses **100** and **200** are almost the same as those described in conjunction with, for example, FIG. **1**. To simplify explanation, for the constituent components of the apparatus **100**, only the radio interface circuit **133** is shown in FIG. **8** and the other constituent components are not shown. For the constituent components of the display apparatus **200**, only the radio input/output interface circuit **2012** is shown and the other constituent components are not shown. The interface circuits **133** and **2012** are bidirectional interfaces.

In FIG. **5**, a channel between antennas **81** and **84** and a channel between antennas **82** and **85** are channels to bidirectionally transmit a video signal, an audio signal, and control signals indicating copyright protection and a replication restriction condition of contents. On the other hand, a channel between antennas **83** and **86** is disposed to transmit an inter-apparatus control signal. Bit selection circuits **811** and **812** receive the video signal, the audio signal, the control signals indicating copyright protection and a replication restriction condition of contents, and the inter-apparatus control signal. In the demodulation, the QPSK demodulation scheme is more resistive against trans-

mission errors as compared with the 64QAM demodulation scheme. For the transmission efficiency, the 64QAM demodulation scheme is superior to the QPSK demodulation scheme. Description will now be given of a situation wherein a video signal, an audio signal, and control signals indicating copyright protection and a replication restriction condition of contents are fed from the video processing apparatus **100** to the video display apparatus **200**. Assume in the operation that the transmission direction from the apparatus **100** to the apparatus **200** is an uplink direction and the transmission direction from the apparatus **200** to the apparatus **100** is an downlink direction.

To transmit information, the video processing apparatus **100** determines, by a carrier detector circuit, not shown, a state of an associated transmission path, i.e., whether or not the channel is reserved for another apparatus. In the carrier detection, a check is made to determine whether or not a carrier is detected in a predetermined frequency band for a predetermined period of time. If it is detected by the detector that the channel is occupied by another apparatus, the check is again carried out after a lapse of a predetermined period of time to determine whether or not an available channel is present. If such available channel is present, the condition is notified to the microprocessor **115** of the video processing apparatus **100**. The microprocessor **115** outputs from a QPSK modem circuit **803** a channel use request signal as an inter-apparatus control signal to secure the channel use right. Thereafter, the microprocessor **115** sends a transmission request signal to a bit selection circuit **811**. An error control circuit **843** adds an error control bit for error detection and correction to the transmission request signal and then transfers the signal to the QPSK modem **803**. The modem **803** conducts a QPSK modulation for the signal to resultantly transmit a radio signal via the antenna **83** to the display apparatus **200**. The apparatus **200** then receives the radio signal by the antenna **86**, carries out a QPSK demodulation for the signal by a QPSK modem **806**, conducts error detection and correction control for the demodulated signal by an error control circuit **847** to produce an inter-apparatus control signal, and delivers the signal to the bit selection circuit **812**.

The microprocessor in the video display apparatus **200** decodes the inter-apparatus control signal and receives the transmission request signal from the video processing apparatus **100** together with apparatus category information regarding the apparatus **100** (information to identify a category indicating whether the associated apparatus is a display apparatus or a recording apparatus) and an apparatus identification number of the apparatus **100**. An image to urge the user to determine whether or not a connection is established to the video processing apparatus **100** is presented on a display screen of the display apparatus **200**. In response thereto, the user indicates allowance for the connection by using an input device such as a remote controller of the display apparatus **200**. Thereafter, between the apparatuses **100** and **200**, the apparatus category information and the identification number to identify each of the apparatuses are communicated to exchange information to observe the copyright protection and the replication restriction condition of the content. If there does not exist any problem, it is allowed that the apparatuses **100** and **200** are connected to each other. In a situation wherein the connection is meaningless, for example, each of the apparatuses **100** and **200** is an input or output dedicated unit or the copyright protection or the replication restriction condition of the content is not observed, the connecting operation is interrupted and an indication of the condition is displayed on the apparatuses **100** and **200**. Description will now be given of a situation wherein the copyright protection and the replication restriction condition of the content are observed.

By using the video signal, the audio signal, and the control signal indicating the copyright protection and the replication restriction condition of the contents associated with the video and audio signals which are inputted to an interface circuit **172**, two bits are selected from the Most-Significant Byte (MSB) of the video signal so that error detection and correction control bits are added thereto by an error control circuit **841** and the resultant signal is fed to a QPSK modem circuit **801**. The modem circuit **801** conducts a QPSK modulation for the signal and then transmits an associated radio signal from the antenna **81**. To the remaining third to eighth bits, an error control circuit **842** adds error detection and correction control bits to send the resultant signal to a 64QAM modem circuit **802**. The modem **802** carries out a 64QAM modulation for the signal and resultantly transmits a radio signal from the antenna **82**.

In the video display apparatus **200**, a QPSK modem circuit **804** conducts a QPSK demodulation for the signal received via the antenna **84** and an error control circuit **845** carries out error control for the resultant signal to output two high-order bits of the video signal to the bit control circuit **812**. For the remaining signals received via the antenna **85**, a 64QAM modem circuit **805** conducts a 64QAM demodulation. For the resultant signal, an error control circuit **846** carries out error control to output the obtained signal to the bit control circuit **812**.

Description will now be given of the inter-apparatus control signal. When an inter-apparatus control signal is sent in a downlink direction, i.e., from the video display apparatus **200** to the video processing apparatus **100**, the signal is fed from the bit selection circuit **812** via the error control circuit **847** to the QPSK modem circuit **806** to be demodulated. The demodulated signal is delivered from the antenna **86**. The video processing apparatus **100** receives the signal by the antenna **83** to send the signal to the QPSK modem circuit **803**. For the signal, the circuit **803** conducts a QPSK demodulation. For the demodulated signal, an error detection and correction is carried out by the error control circuit **843** to feed the resultant signal to the bit selection circuit **811**. Conversely, when an inter-apparatus control signal is transmitted in an uplink direction, i.e., from the video processing apparatus **100** to the video display apparatus **200**, the signal is fed from the bit selection circuit **811** via the error control circuit **843** to the QPSK modem circuit **803** to be modulated. The modulated signal is outputted from the antenna **83**. The display apparatus **200** receives the signal by the antenna **86**. For the signal, the modem **806** conducts a QPSK demodulation. For the demodulated signal, the error control circuit **847** conducts an error detection and correction to send the resultant signal to the bit selection circuit **812**. By virtue of the operation, there is obtained an advantage that for the inter-apparatus control signal which is important to construct the system, an erroneous operation is less frequently occurs even in a noisy environment.

In the configuration of the embodiment, for two high-order bits of the digital signal, there can be conducted the transmission highly resistive against noise with a relatively low transmission rate. That is, by using the fact that higher order bits of a video signal more strongly affect the picture quality, two bits are taken out from the video signal in order of MSB and a transmission path using the QPSK modulation is allocated to the information of these two bits, to thereby preventing deterioration of the picture quality. In a system in which the audio information is more important than the

video information, the transmission path using the QPSK modulation may be allocated to important bits, e.g., two high-order bits of the audio signal.

When a human perceives an image on a screen, a higher-frequency is less influential as compared with a lower-frequency component for the frequency component in the horizontal direction of the screen and that in the vertical direction thereof. For a moving object on the screen, it is likely that the human eyes cannot appropriately follow a high-speed movement of the object. By using these tendencies, it is also possible that in the horizontal direction of the screen, the signal is subdivided into a lower-frequency component and a higher-frequency component so that the QPSK modulation is used for the lower-frequency component and the 64QAM modulation is employed for the higher-frequency component. As a result, within the limited transmission bands, the noise resistivity can be increased for important information and the overall transmission capacity is secured. Similarly, it is possible that in the vertical direction of the screen, the signal is subdivided into a lower-frequency component and a higher-frequency component so that the QPSK modulation is used for the lower-frequency component and the 64QAM modulation is employed for the higher-frequency component. Resultantly, within the limited transmission bands, it is possible to heighten the noise resistivity for important information and the overall transmission capacity is secured. Additionally, by combining the operation for the frequency component in the horizontal direction of the screen with that for the frequency component in the vertical direction of the screen, the noise resistivity can be strengthened for desired important information.

In the description above, the error control circuits **841** to **843** add the error control information items to the bits inputted respectively thereto. However, it is also possible that the bits inputted to the circuits **841** to **843** are collectively treated as one word to add error control information to the word. This advantageously leads to a simplified configuration of the error control circuits.

Although detailed description has not been given of the encryption in the embodiment shown in FIG. **5**, it is possible to execute the processing as shown in FIG. **6** by combining the encryption circuit **171** with the interface circuit **172**. FIG. **6** shows an example of the configuration to carry out the encryption in the system of FIG. **5**. The system shown in FIG. **6** includes encryption/decryption circuits **821** to **826**, interface circuits **830** and **831** including encryption, and error control circuits **841** to **847**.

In the example of FIG. **6**, the bit selection circuit **811** selects predetermined bits as in the example shown in FIG. **5**. For the respective bits, the error control circuits **841** and **842** conduct error control. For the resultant signals, the encryption/decryption circuits **821** and **822** respectively carry out encryption. The obtained signals are inputted respectively to the QPSK modem circuit **801** and the 64QAM modem circuit **802** to be demodulated. The signals demodulated respectively by the circuits **801** and **802** are delivered to the encryption/decryption circuits **824** and **825** to be decrypted. The decrypted signals are fed to the bit selection circuit **812** and are therein bit-combined with each other. As a result, the signal processing can be executed according to importance of signals to possibly suppress errors in the processing of more important information. Hence, the signals of information can be efficiently transmitted without deteriorating the picture quality.

It is also possible to further increase transmission efficiency by combining lossless coding with the encryption/decryption circuits **821** to **826**. For example, in the example of FIG. **6**, before executing the encryption processing in the encryption/decryption circuits **821** to **823**, the number of bits to be transmitted is reduced, for example, by use of reversible arithmetic codes based on a statistic property. In the video display apparatus **200**, the received signals are decrypted by the encryption/decryption circuits **824** to **826**. Thereafter, the reversible codes corresponding to the circuits **821** to **823** are decoded to be fed to the error control circuits **845** to **846** for the error detection and correction thereof. The obtained signals are fed to the bit selection circuit **812** to be bit-combined with each other. Since the transmission rate of the information to be transmitted can be lowered by combining the reversible codes as above, the signal can be more efficiently transmitted.

Description will be supplementally given of the encryption. By using AES128 bit encryption in all encryption circuits for the encryption, it is possible to conduct the encryption with high safety for the protection of contents. Moreover, if the AES128 bit encryption is employed for the content encryption circuit **821** and the Data Encryption Standard (DES) encryption is used for the other encryption circuits, there can be easily constructed a system in which the protection of important contents and the processing efficiency are appropriately achieved.

It is also possible to construct a system in which a changeover operation is conducted between the baseband signal transmission and the compressed signal transmission in response to an inter-apparatus control signal. With the configuration, to transmit a compressed signal according to, for example, a content protection request, the error resistivity is enhanced on the transmission path by transmitting the signal using the QPSK modulation. To transmit the baseband signal, the transmission efficiency is increased by using the 64QAM modulation.

The operations of the video processing apparatus **100** and the video display apparatus **200** in FIG. **6** are basically similar to those of the apparatuses **100** and **200** shown in FIG. **5**. To transmit a signal, the video processing apparatus **100** determines the state of an associated transmission path, specifically, detects by a carrier detection circuit, not shown, whether or not the channel to be used is occupied by another apparatus. In the carrier detection, a check is made to determined whether or not a carrier is detected in a predetermined frequency band for a predetermined period of time. If it is detected by the detector that the channel is occupied by another apparatus, the check is again carried out after a lapse of a predetermined period of time to determine whether or not an available channel is present. If such available channel is present, the condition is notified to the microprocessor **115** of the video processing apparatus **100**. The microprocessor **115** outputs from the QPSK modem circuit **803** a channel use request signal as an inter-apparatus control signal to secure the channel use right. Thereafter, the microprocessor **115** sends a transmission request signal to a bit selection circuit **811**.

The error control circuit **843** adds error control bits for error detection and correction to the transmission request signal which is in turn encrypted by an encryption/decryption circuit **823** and then transferred to the QPSK modem **803**. The modem **803** conducts a QPSK modulation for the signal to resultantly transmit a radio signal via the antenna **83** to the display apparatus **200**. The apparatus **200** then receives the radio signal by the antenna **86**, carries out a QPSK demodulation for the signal by the modem **806**, and decrypts the signal by the encryption/decryption circuit **826**. For the demodulated signal, the error control circuit **847**

conducts error detection and correction control to produce an inter-apparatus control signal and delivers the signal to the bit selection circuit **812**. The microprocessor in the video display apparatus **200** decodes the inter-apparatus control signal and receives the transmission request signal from the video processing apparatus **100** together with apparatus category information regarding the apparatus **100** (information to identify a category indicating whether the associated apparatus is a display apparatus or a recording apparatus) and an apparatus identification number of the apparatus **100**. An image to urge the user to determine whether or not a connection is established to the video processing apparatus **100** is presented on a display screen of the display apparatus **200**. In response thereto, the user indicates allowance for the connection by use of an input device such as a remote control of the display apparatus **200**. Thereafter, between the apparatuses **100** and **200**, the apparatus category information and the identification number to identify each of the apparatuses are communicated to exchange information to observe the copyright protection and the replication restriction condition of the content. If there does not exist any problem, it is allowed that the apparatuses **100** and **200** are connected to each other. In a situation wherein the connection is meaningless, for example, each of the apparatuses **100** and **200** is an input or output dedicated unit or the copyright protection or the replication restriction condition of the content is not observed, the connecting operation is interrupted and the status is displayed on the apparatuses **100** and **200**. As above, in a situation wherein the copyright protection and the replication restriction condition of the content are observed, the connection is established to transmit video and audio signals from the video processing apparatus **100** to the video display apparatus **200**.

Second Embodiment

FIG. **3** shows a second embodiment of the present invention and is another configuration of the video display apparatus **200** shown in FIG. **1**. The configuration of FIG. **3** is partially equal to that of FIG. **2**. The same constituent components are assigned with the same reference numerals, and detailed description thereof will be avoided. The apparatus **200** of FIG. **3** includes a decryption circuit **212**, encryption/decryption circuits **245** and **290**, compression/transcoding circuits **291** and **292**, and copy control circuit **293** which is a multiplexing circuit.

In the embodiment of FIG. **3**, when a baseband signal is inputted via the terminal **201** or **202**, the system operates in almost the same way as for the embodiment shown in FIG. **2**. Each of the compression/transcoding circuits **291** and **292** operates as a compression circuit for the baseband signal. When a compressed signal is inputted from the terminal **201** or **202**, the signal is fed via the input/output interface **210** to the encryption/decryption circuit **212** to be decrypted. The signal is then delivered to the demultiplexer circuit **250** to be separated into a compressed video signal and a compressed audio signal. These signals are inputted to the replication control circuit **290**, which determines allowance or rejection of replication of the signals based on information indicating a replication restriction condition. If the replication is allowed, the bit rates of the compressed video and audio signals are lowered by the compression/transcoding circuits **291** and **292** by using, for example, a compression method having high compression efficiency according to necessity. Output signals from the circuits **291** and **292** are multiplexed by the multiplexer circuit **293** to be inputted to the encryption/decryption circuit **245**. In this situation, if the replication is allowed by the replication control circuit **290**, the circuit **245** encrypts the input signal for the storage thereof to store the encrypted signals in the storage **230** and/or the memory **221**. To reproduce the stored signal, the circuit **245** decrypts the signal read from the storage **230** or the memory **221**, and the decrypted signal is separated by the demultiplexer circuit **241** into a video signal and an audio signal. Thereafter, these signals are processed in almost the same way as described above and the user resultantly enjoys the image and the sound. In a situation wherein the user enjoys the image and the sound while storing the signal in the storage **230** or the memory **221**, the signal from the multiplexer **293** is delivered via the encryption/decryption circuit **245** to the demultiplexer **241** to be processed almost in the same way as above. In this case, it is possible to confirm the picture quality of the transcoded signal. To enjoy the image and the sound without storing the signal, the signal is fed from the decryption circuit **212** via the circuit **245** to the demultiplexer **241** to be separated into a video signal and an audio signal. Thereafter, the signals are processed in substantially the same way as described above.

According to the embodiment of FIG. **3**, also in a situation wherein a compressed signal is inputted thereto, by conducting the transcoding for the signal, the signal can be efficiently stored with a high compression ratio. Although the signal processing is carried out by use of circuits such as the compression circuits **111** and **113** in the embodiment, the circuits may be implemented by software means. In this situation, there can also be obtained similar advantages. According to the present invention, the signal processing may be accomplished in any appropriate fashion, that is, the present invention does not particularly limit how to implement the signal processing.

It should be further understood by those skilled in the art that although the foregoing description has been made on embodiments of the invention, the invention is not limited thereto and various changes and modifications may be made without departing from the spirit of the invention and the scope of the appended claims.

The invention claimed is:

1. A video processing apparatus, comprising:

a first radio communication circuit capable of transmitting video information by radio or receiving information by radio;

a second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information;

an imaging circuit capable of receiving video information via an optical system;

an accumulation circuit capable of accumulating video information received by the imaging circuit; and

a controller,

wherein the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio,

the controller controls assignment of connection for each of the first and second radio communication circuit in response to receiving an indication from a user; and

wherein the controller controls each of the first and second radio communication circuit, so that the first radio communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network simultaneously.

2. The video processing apparatus according to claim **1**, wherein, upon receiving an indication to transmit video information accumulated in the accumulation circuit via the

first radio communication circuit, the controller assigns connection of the first radio communication circuit prior to connection of the second radio communication circuit.

3. The video processing apparatus according to claim **1**, wherein, upon receiving an indication to transmit video information accumulated in the accumulation circuit via the first radio communication circuit while acquiring information from the internet via the second radio communication circuit, the controller assigns connection of the first radio communication circuit prior to connection of the second radio communication circuit.

4. The video processing apparatus according to claim **1**, further comprising a radio interface capable of receiving video information by radio,

wherein the accumulation circuit accumulates the video information received via the radio interface, and

the first radio communication circuit is further capable of transmitting the accumulated video information.

5. A display apparatus, comprising:

a first radio communication circuit capable of receiving video information by radio or transmitting information by radio;

a second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information;

a display capable of displaying the information received by the first radio communication circuit or the second radio communication circuit; and

a controller,

wherein the controller controls assignment of connection for each of the first and second radio communication circuits in response to receiving an indication from a user; and

wherein the controller controls each of the first and second radio communication circuits, so that the first radio communication circuit receives video information and the second radio communication circuit connects to the internet or the home network simultaneously.

6. The display apparatus according to claim **5**, wherein, upon receiving an indication to receive the video information from an external device via the first radio communication circuit, the controller assigns connection of the first radio communication circuit prior to connection of the second radio communication circuit.

7. The display apparatus according to claim **5**, wherein, upon receiving an indication to receive the video information via the first radio communication circuit while acquiring information from the internet via the second radio communication circuit, the controller assigns connection of the first radio communication circuit prior to connection of the second radio communication circuit.

8. The display apparatus according to claim **5**, further comprising a radio interface capable of receiving video information by radio,

wherein the display device is further capable of displaying the video information received via the radio interface.

9. A method for video processing, comprising:

receiving video information via an optical system by an imaging circuit;

accumulating video information received by the imaging circuit;

transmitting the video information to an external device by radio, via a first radio communication circuit; and

connecting, by radio, to an internet or a home network to transmit and receive information, via a second radio communication circuit;

wherein assignment of connection for each of the first and second radio communication circuit is controlled in response to receiving an indication from a user; and

wherein the transmitting and connecting is controlled so that the first radio communication circuit is configured to transmit video information and the second radio communication circuit is configured to connect to the internet or the home network simultaneously.

10. A method, comprising:

receiving video information by radio, via a first radio communication circuit and connecting by radio to an internet or a home network to transmit and receive information, via a second radio communication circuit; and

displaying, via a display circuit, information received by the first radio communication circuit or the second radio communication circuit;

wherein assignment of connection for each of the first and second radio communication circuit is controlled in response to receiving an indication from a user; and

wherein the receiving and connecting is controlled so that the first radio communication circuit is configured to receive video information and the second radio communication circuit is configured to connect to the internet or the home network simultaneously.

* * * * *

EXHIBIT 11

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(12) EX PARTE REEXAMINATION CERTIFICATE (11946th)

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(54) **DISPLAY APPARATUS AND VIDEO PROCESSING APPARATUS**

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None
See application file for complete search history.

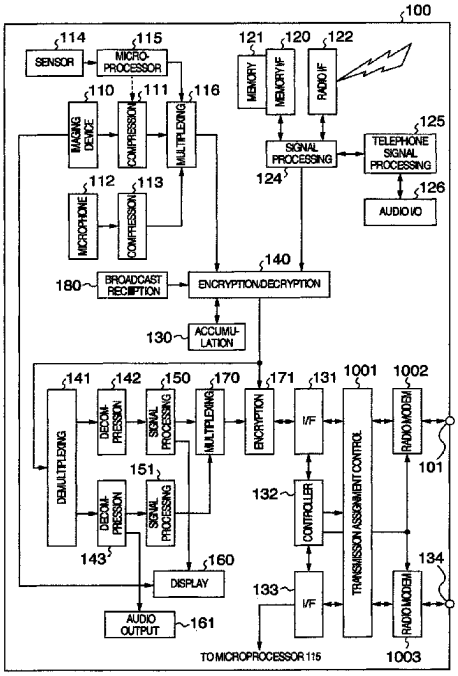
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To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/014,651, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — My Trang Ton

(57) **ABSTRACT**

While presenting on a display apparatus videos of high picture quality obtained from portable video processing apparatuses such as a camera and a cellular, it is possible to communicate with the Internet and/or a home network. A display apparatus includes a first radio communication unit capable of receiving video information by radio from an external video processing apparatus, a second radio communication unit capable of connecting by radio to a network, and a control unit for controlling assignment of connection by radio transmission for each of the first and second radio communication units. The control unit assigns connection of the first radio communication unit with higher priority and controls the assignment of the transmission rate such that the transmission rate between the first radio communication unit and the external video processing apparatus is more than that between the second radio communication unit and the network.



EX PARTE REEXAMINATION CERTIFICATE

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims **1**, **5**, **9** and **10** are determined to be patentable as amended.

Claims **2-4** and **6-8**, dependent on an amended claim, are determined to be patentable.

New claims **11-25** are added and determined to be patentable.

1. A video processing apparatus, comprising:

a first radio communication circuit *implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the first radio communication circuit* capable of transmitting video information by radio or receiving information by radio *using the first transmission frequency band*;

a second radio communication circuit *implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit* capable of connecting by radio to an internet or a home network to transmit and receive information *using the second transmission frequency band*;

a third radio communication circuit capable of transmitting information and using a third transmission frequency band;

an imaging circuit capable of receiving video information *and still picture information* via an optical system;

a compression circuit compressing the still picture information using a first type of compression method and the video information using a second type of compression method;

an input device capable of receiving a user indication;

an accumulation circuit capable of accumulating video information received by the imaging circuit *after the video information is compressed by the compression circuit*; and

a controller *controlling assignment of connection of each of the first, second, and third radio communication circuits*,

wherein the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio,

wherein the controller controls assignment of connection for each of the first and second radio communication circuit in response to receiving an indication from a user**[**; and**]** *such that when an indication from the user indicates to transmit video information using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video information,*

wherein the controller controls each of the first and second radio communication circuit**[**,**]** so that the first radio communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network simultaneously, *and*

wherein the second or third radio communication circuits receive a signal from the internet indicating that an update for an operating system of the video processing apparatus is available, and the video processing apparatus executes an update process such that an updated operating system of the video processing apparatus is stored in the video processing apparatus after execution of the update process.

5. A display apparatus, comprising:

a first radio communication circuit *implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the first radio communication circuit* capable of receiving video information by radio or transmitting information by radio *using the first transmission frequency band*;

a second radio communication circuit *implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit* capable of connecting by radio to an internet or a home network to transmit and receive information *using the second transmission frequency band*;

a third radio communication circuit capable of transmitting information and using a third transmission frequency band;

a compression circuit capable of implementing a plurality of compression schemes including a first compression scheme, the compression circuit compressing the video information received by the first radio communication circuit using the first compression scheme;

a display capable of displaying the information received by the first radio communication circuit or the second radio communication circuit; and

a controller *controlling assignment of connection of each of the first, second, and third radio communication circuits*,

wherein the controller controls assignment of connection for each of the first and second radio communication circuits in response to receiving an indication from a user**[**; and**]** *such that when an indication from the user indicates to use the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for receiving the video information or transmitting the information by radio,*

wherein the controller controls each of the first and second radio communication circuits**[**,**]** so that the first radio communication circuit receives video information and the second radio communication circuit connects to the internet or the home network simultaneously, *and*

wherein the second or third radio communication circuits receive a signal from the internet indicating that an update for an operating system of the display apparatus is available, and the display apparatus executes an update process such that an updated operating system of the display apparatus is stored in the display apparatus after execution of the update process.

9. A method for video processing, comprising:

receiving video information *and still picture information* via an optical system by an imaging circuit *of a video processing apparatus*;

compressing the still picture information using a first type of compression method and the video information using a second type of compression method;

accumulating video information received by the imaging circuit *after the video information is compressed by the compression circuit*;

implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band;

transmitting, *using the first transmission frequency band,* the video information to an external device by radio, via a first radio communication circuit; [and]

implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band;

connecting, by radio, to an internet or a home network to transmit and receive information *using the second transmission frequency band,* via a second radio communication circuit;

transmitting, via a third radio communication circuit, information using a third transmission frequency band;

controlling, via a controller, assignment of connection of each of the first, second, and third radio communication circuits, wherein assignment of connection for each of the first and second radio communication circuit is controlled in response to receiving an indication from a user[; and] *such that when an indication from the user indicates to transmit video information using the first radio communication circuit, a connection is assigned to the first radio communication circuit for transmitting the video information,*

wherein the transmitting and connecting is controlled so that the first radio communication circuit is configured to transmit video information and the second radio communication circuit is configured to connect to the internet or the home network simultaneously*;*

receiving, via the second or third radio communication circuits a signal from the internet indicating that an update for an operating system is available;

executing the update process; and

storing an updated operating system after execution of the update process.

10. A method, comprising:

implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band;

implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band;

receiving video information by radio *using the first transmission frequency band*, via a first radio communication circuit and connecting by radio to an internet or a home network to transmit and receive information *using the second transmission frequency band*, via a second radio communication circuit; [and]

compressing the video information received by the first radio communication circuit using a first compression scheme;

transmitting, via a third radio communication circuit, information using a third transmission frequency band;

displaying, via a display circuit, information received by the first radio communication circuit or the second radio communication circuit;

controlling, via a controller, assignment of connection of each of the first, second, and third radio communication circuits, wherein assignment of connection for each of the first and second radio communication circuit is controlled in response to receiving an indication from a user[; and] *such that when an indication from the user indicates to use the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for receiving the video information,*

wherein the receiving and connecting is controlled so that the first radio communication circuit is configured to receive video information and the second radio communication circuit is configured to connect to the internet or the home network simultaneously*;*

receiving, via the second or third radio communication circuits, a signal from the internet indicating that an update for an operating system is available;

executing the update process; and

storing an updated operating system after execution of the update process.

11. The video processing apparatus of claim 1, further comprising a fourth radio communication circuit capable of transmitting information and using a fourth transmission frequency band that is different from the first, second, and third transmission frequency bands, wherein the controller controls assignment of connection of each of the first, second, third, and fourth radio communication circuits.

12. The video processing apparatus of claim 1, wherein the third transmission frequency band is different from the first and second transmission frequency bands.

13. The video processing apparatus of claim 1, wherein transmitting of the information by the third radio communication circuit comprises transmitting video information to the external device.

14. The video processing apparatus of claim 1, wherein transmitting of the information by the third radio communication circuit comprises connecting to the internet.

15. The video processing apparatus of claim 1, wherein the input device is capable of receiving a user's selection of content to be displayed on the video processing apparatus.

16. The video processing apparatus of claim 1, wherein the second or third radio communication circuits receive a signal from the internet indicating that an update for an application of the video processing apparatus is available, and the video processing apparatus executes an application update process such that an updated application of the video processing apparatus is stored in the video processing apparatus after execution of the application update process.

17. The video processing apparatus of claim 1, further comprising:

a display for displaying a screen requesting user input, wherein the displayed screen prompts the user for a user input that indicates whether the user allows a connection between the first radio communication circuit and the external device to be established, wherein in response to receiving the user input indicating allowance of the connection, the first radio communication circuit transmits the accumulated video information to the external device.

18. The video processing apparatus of claim 1, wherein the second modulation scheme comprises quadrature amplitude modulation (QAM).

19. The video processing apparatus of claim 1, wherein the second radio communication circuit is controllable to change from the second modulation scheme to a different modulation scheme.

20. The video processing apparatus of claim 1, wherein the video processing apparatus comprises a cellular phone.

21. The video processing apparatus of claim 1, wherein the second and third radio communication circuits conduct demodulation through Orthogonal Frequency Division Multiplexing (OFDM).

22. The video processing apparatus of claim 1, wherein at least the first radio communication circuit and the third radio communication circuit are implemented as a combined circuit.

23. A cellular phone, comprising:

a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and first transmission frequency band, the first radio communication circuit capable of transmitting video information by radio or receiving information by radio using the first transmission frequency band;

a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band;

a third radio communication circuit capable of transmitting information using a third transmission frequency band;

a fourth radio communication circuit capable of transmitting information using a fourth transmission frequency band;

an imaging circuit capable of receiving video information and still picture information via an optical system;

a compression circuit compressing the still picture information using a first type of compression method and the video information using a second type of compression method;

a microphone receiving audio information corresponding to the video information received via the imaging circuit;

an accumulation circuit capable of accumulating video information received by the imaging circuit and audio information received by the microphone, wherein the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio;

a display displaying the video information received by the first radio communication circuit and displaying information received by the second radio communication circuit via the internet or home network;

a controller controlling assignment of connection of each of the first, second, third, and fourth radio communication circuits,

wherein the controller controls assignment of connection for each of the first and second radio communication circuit in response to receiving an indication from a user such that when an indication from the user indicates to transmit video information using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video information,

wherein the controller controls each of the first and second radio communication circuit so that the first radio communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network simultaneously, and

wherein the second or third radio communication circuits receive a signal from the internet indicating that an update for an operating system of the cellular phone is available, and the cellular phone executes an update process such that an updated operating system of the cellular phone is stored in the cellular phone after execution of the update process.

24. The cellular phone of claim 23, wherein the second or third radio communication circuits receive a signal from the internet indicating that an update for an application of the cellular phone is available, and the cellular phone executes an application update process such that an updated application of the cellular phone is stored in the cellular phone after execution of the application update process.

25. The cellular phone of claim 23, wherein the first modulation scheme comprises shift keying modulation and the second modulation scheme comprises quadrature amplitude modulation (QAM).

* * * * *

EXHIBIT 12

US011445241B2

(12) **United States Patent**
Kurita et al.

(10) **Patent No.: US 11,445,241 B2**
(45) **Date of Patent: Sep. 13, 2022**

(54) **INFORMATION PROCESSING APPARATUS AND INFORMATION PROCESSING METHOD**

(71) Applicant: **MAXELL, LTD.**, Kyoto (JP)

(72) Inventors: **Toshiyuki Kurita**, Yokohama (JP); **Hitoaki Owashi**, Yokohama (JP)

(73) Assignee: **MAXELL, LTD.**, Kyoto (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **17/568,166**

(22) Filed: **Jan. 4, 2022**

(65) **Prior Publication Data**

US 2022/0132204 A1 Apr. 28, 2022

Related U.S. Application Data

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(Continued)

(30) **Foreign Application Priority Data**

Nov. 28, 2007 (JP) 2007-306750

(51) **Int. Cl.**
H04N 21/4363 (2011.01)
H04L 69/14 (2022.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H04N 21/43637*** (2013.01); ***H04L 69/14*** (2013.01); ***H04N 5/44*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H04N 21/43637; H04N 5/44; H04N 21/4122; H04N 21/41407; H04N 21/4367; H04L 69/14
See application file for complete search history.

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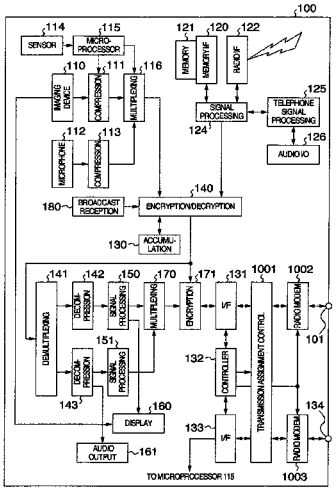
Office Action, dated Jun. 7, 2018, which issued during the prosecution of Chinese Patent Application No. 201510969210.6, which corresponds to the present application.
(Continued)

Primary Examiner — Mekonnen D Dagnew
(74) *Attorney, Agent, or Firm* — Mattingly & Malur, PC

(57) **ABSTRACT**

While presenting on a display apparatus videos of high picture quality obtained from portable video processing apparatuses such as a camera and a cellular, it is possible to communicate with the Internet and/or a home network. A display apparatus includes a first radio communication unit capable of receiving video information by radio from an external video processing apparatus, a second radio communication unit capable of connecting by radio to a network, and a control unit for controlling assignment of connection by radio transmission for each of the first and second radio communication units. The control unit assigns connection of the first radio communication unit with higher priority and controls the assignment of the transmission rate such that the transmission rate between the first radio communication unit and the external video processing apparatus is more than that between the second radio communication unit and the network.

28 Claims, 9 Drawing Sheets



Related U.S. Application Data

No. 16/269,662, filed on Feb. 7, 2019, which is a continuation of application No. 15/891,085, filed on Feb. 7, 2018, now Pat. No. 10,244,284, which is a continuation of application No. 15/208,886, filed on Jul. 13, 2016, now Pat. No. 10,129,590, which is a continuation of application No. 12/260,410, filed on Oct. 29, 2008, now Pat. No. 9,420,212.

(51) **Int. Cl.**

H04N 21/41	(2011.01)
H04N 21/414	(2011.01)
H04N 5/44	(2011.01)
H04N 21/4367	(2011.01)

(52) **U.S. Cl.**

CPC ... ***H04N 21/4122*** (2013.01); ***H04N 21/41407*** (2013.01); *H04N 21/4367* (2013.01)

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FIG. 1

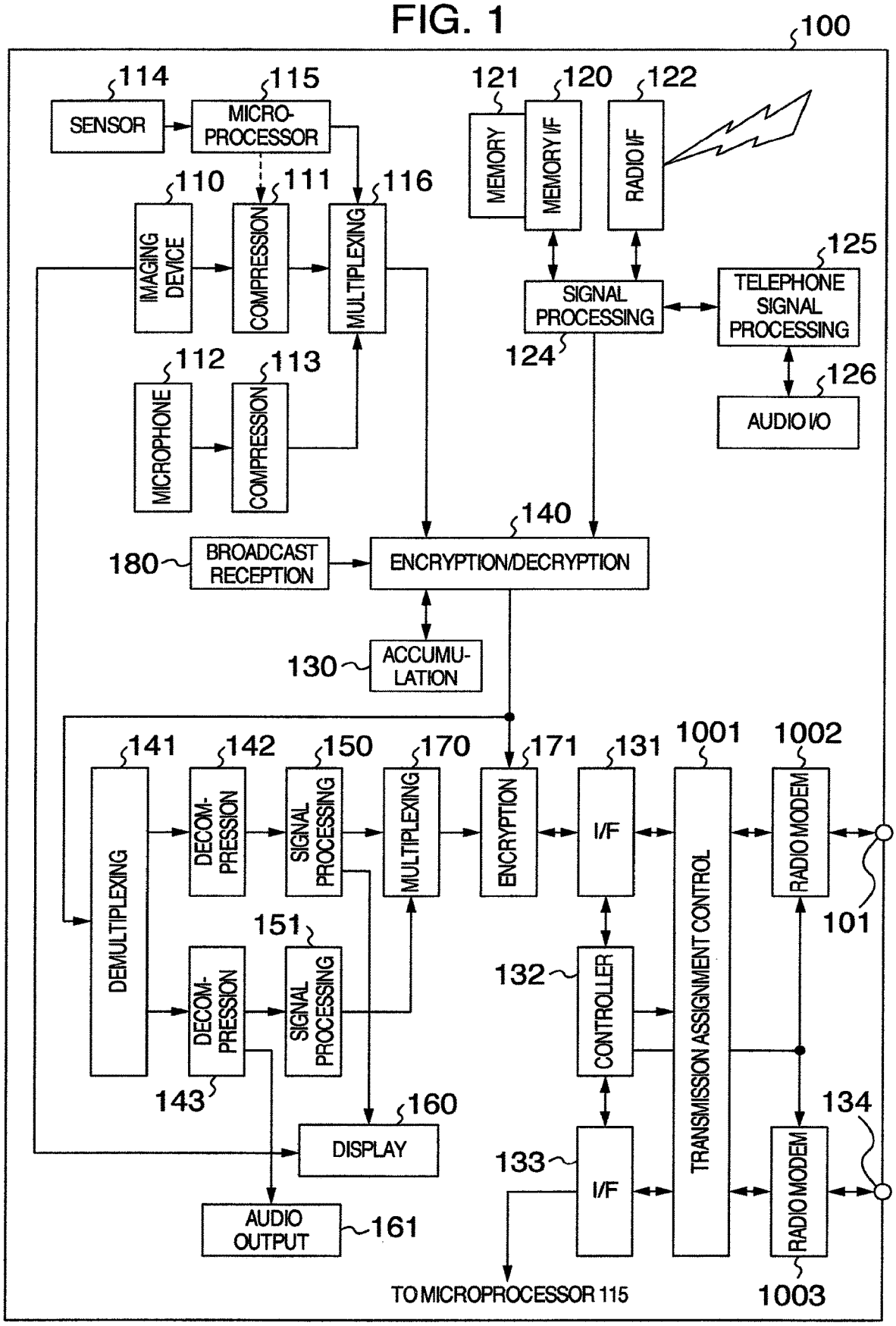

100
114
SENSOR
115
MICRO-PROCESSOR
121
MEMORY
120
MEMORY I/F
122
RADIO I/F
110
IMAGING DEVICE
111
COMPRESSION
116
MULTIPLEXING
125
TELEPHONE SIGNAL PROCESSING
SIGNAL PROCESSING
124
126
AUDIO I/O
112
MICROPHONE
113
COMPRESSION
140
180
BROADCAST RECEPTION
ENCRYPTION/DECRYPTION
130
ACCUMU-LATION
141
142
150
170
171
131
1001
1002
DEMULTIPLEXING
DECOM-PRESSION
SIGNAL PROCESSING
MULTIPLEXING
ENCRYPTION
I/F
TRANSMISSION ASSIGNMENT CONTROL
RADIO MODEM
101
151
132
CONTROLLER
DECOM-PRESSION
SIGNAL PROCESSING
143
160
134
DISPLAY
133
I/F
RADIO MODEM
AUDIO OUTPUT
161
TO MICROPROCESSOR 115
1003

FIG. 2

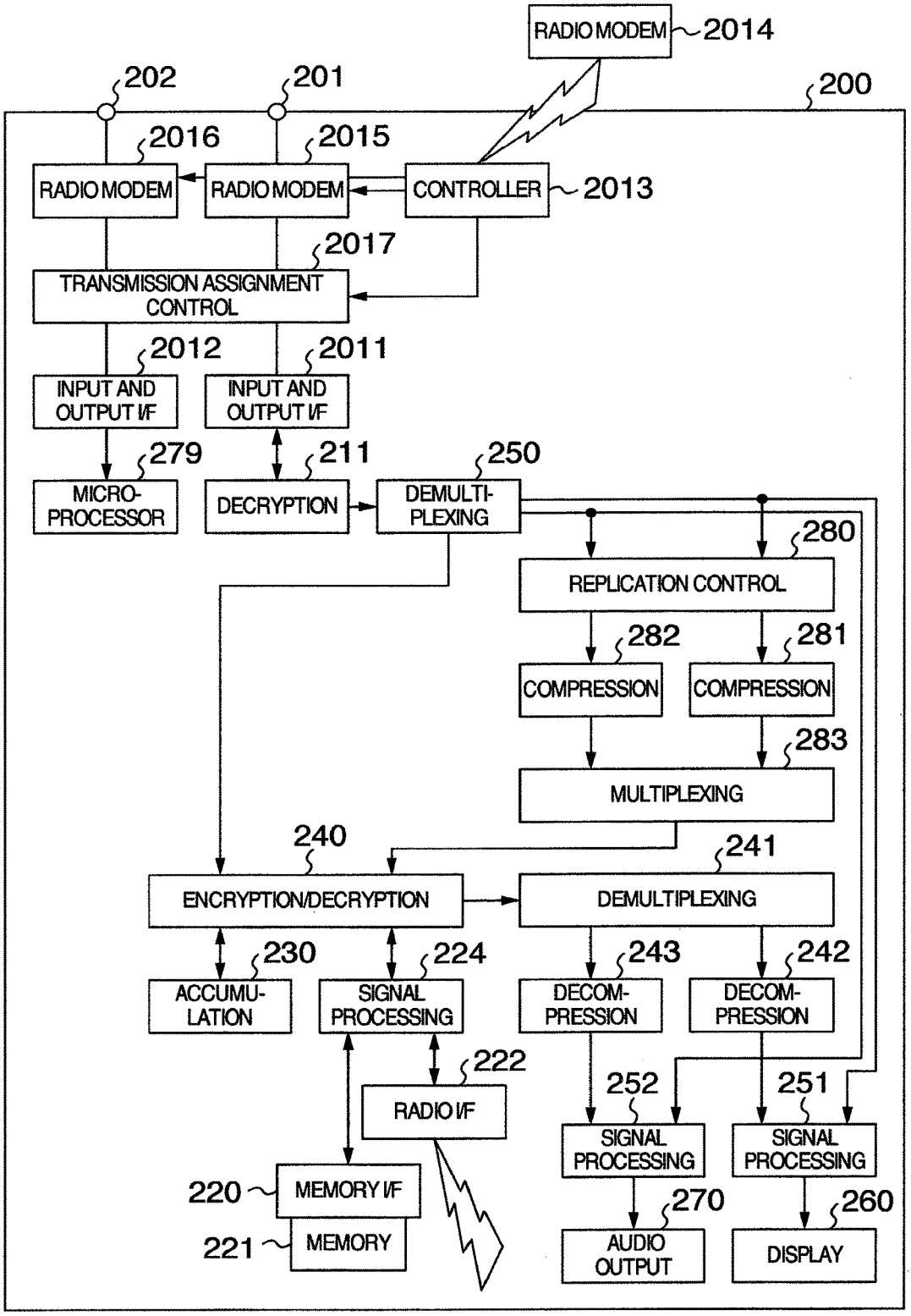

RADIO MODEM
2014
202
201
200
2016
2015
RADIO MODEM
RADIO MODEM
CONTROLLER
2013
2017
TRANSMISSION ASSIGNMENT CONTROL
2012
2011
INPUT AND OUTPUT I/F
INPUT AND OUTPUT I/F
279
211
250
MICRO-PROCESSOR
DECRYPTION
DEMULTI-PLEXING
280
REPLICATION CONTROL
282
281
COMPRESSION
COMPRESSION
283
MULTIPLEXING
240
241
ENCRYPTION/DECRYPTION
DEMULTIPLEXING
230
224
243
242
ACCUMU-LATION
SIGNAL PROCESSING
DECOM-PRESSION
DECOM-PRESSION
222
252
251
RADIO I/F
SIGNAL PROCESSING
SIGNAL PROCESSING
220
MEMORY I/F
270
260
221
MEMORY
AUDIO OUTPUT
DISPLAY

FIG. 3

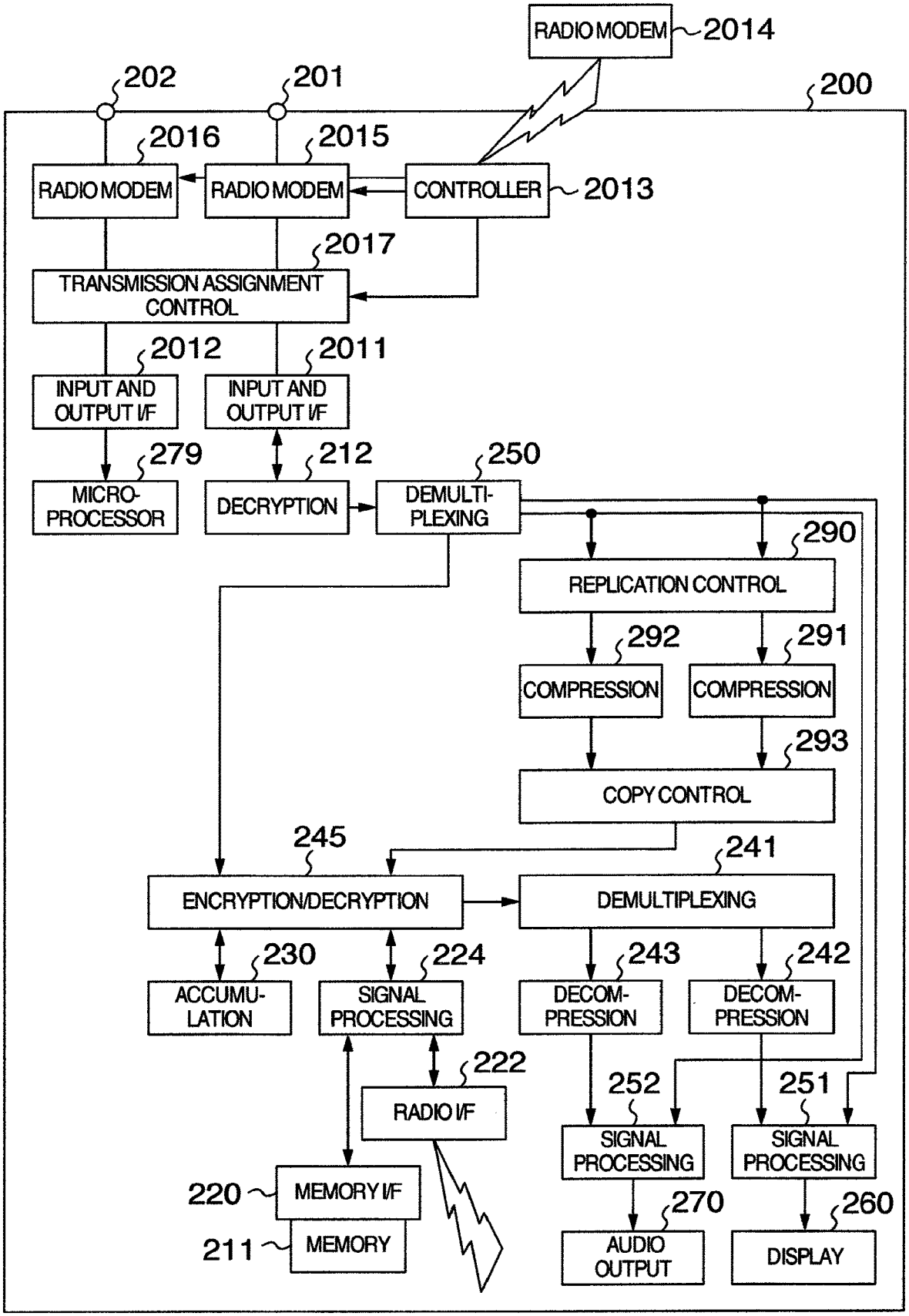

RADIO MODEM
2014
202
201
200
2016
2015
RADIO MODEM
RADIO MODEM
CONTROLLER
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2017
TRANSMISSION ASSIGNMENT CONTROL
2012
2011
INPUT AND OUTPUT I/F
INPUT AND OUTPUT I/F
279
212
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MICRO-PROCESSOR
DECRYPTION
DEMULTI-PLEXING
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REPLICATION CONTROL
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COMPRESSION
COMPRESSION
293
COPY CONTROL
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ENCRYPTION/DECRYPTION
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SIGNAL PROCESSING
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MEMORY
AUDIO OUTPUT
DISPLAY

FIG. 4

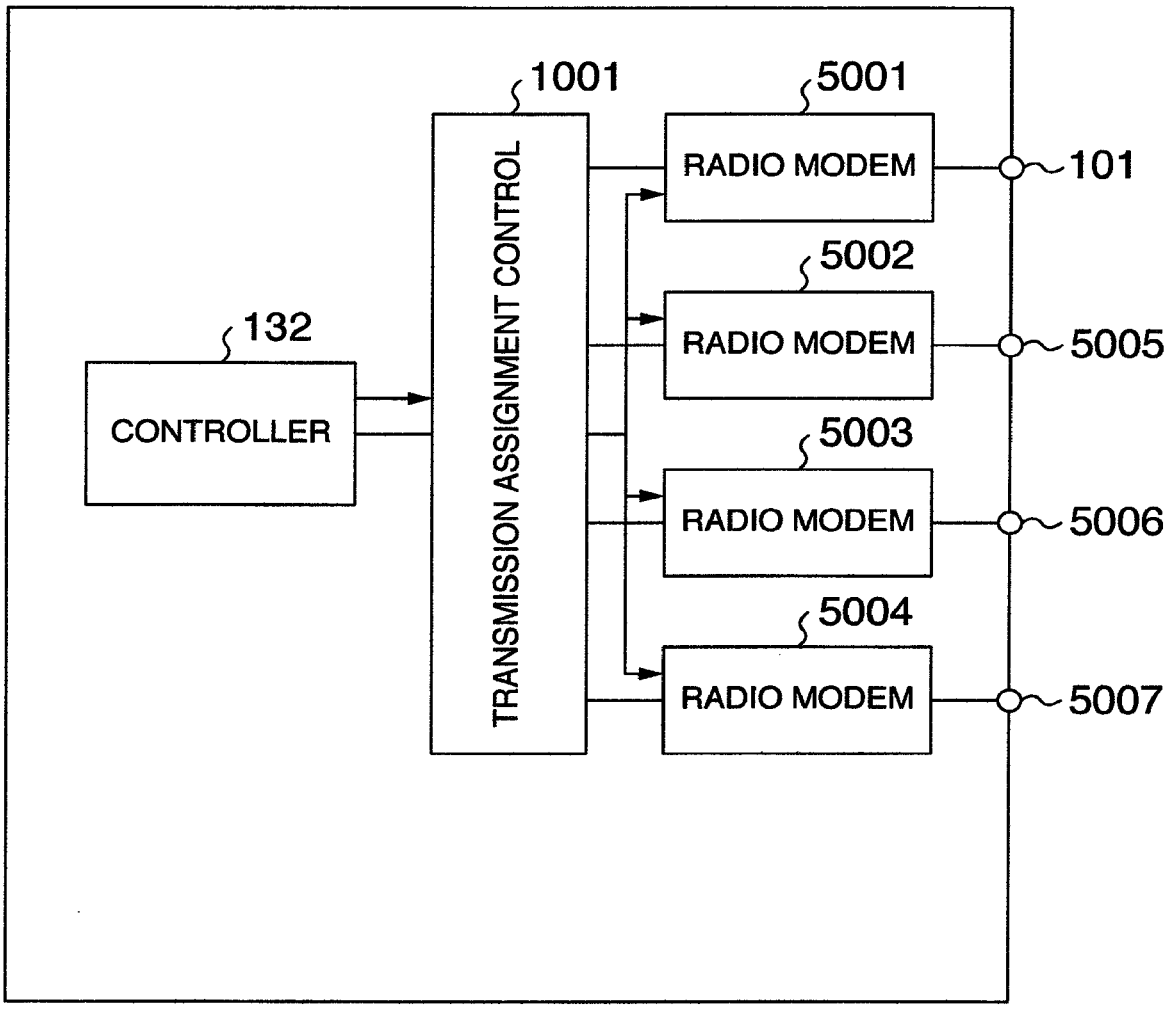

1001
5001
RADIO MODEM
101
5002
RADIO MODEM
5005
132
CONTROLLER
TRANSMISSION ASSIGNMENT CONTROL
5003
RADIO MODEM
5006
5004
RADIO MODEM
5007

FIG. 5

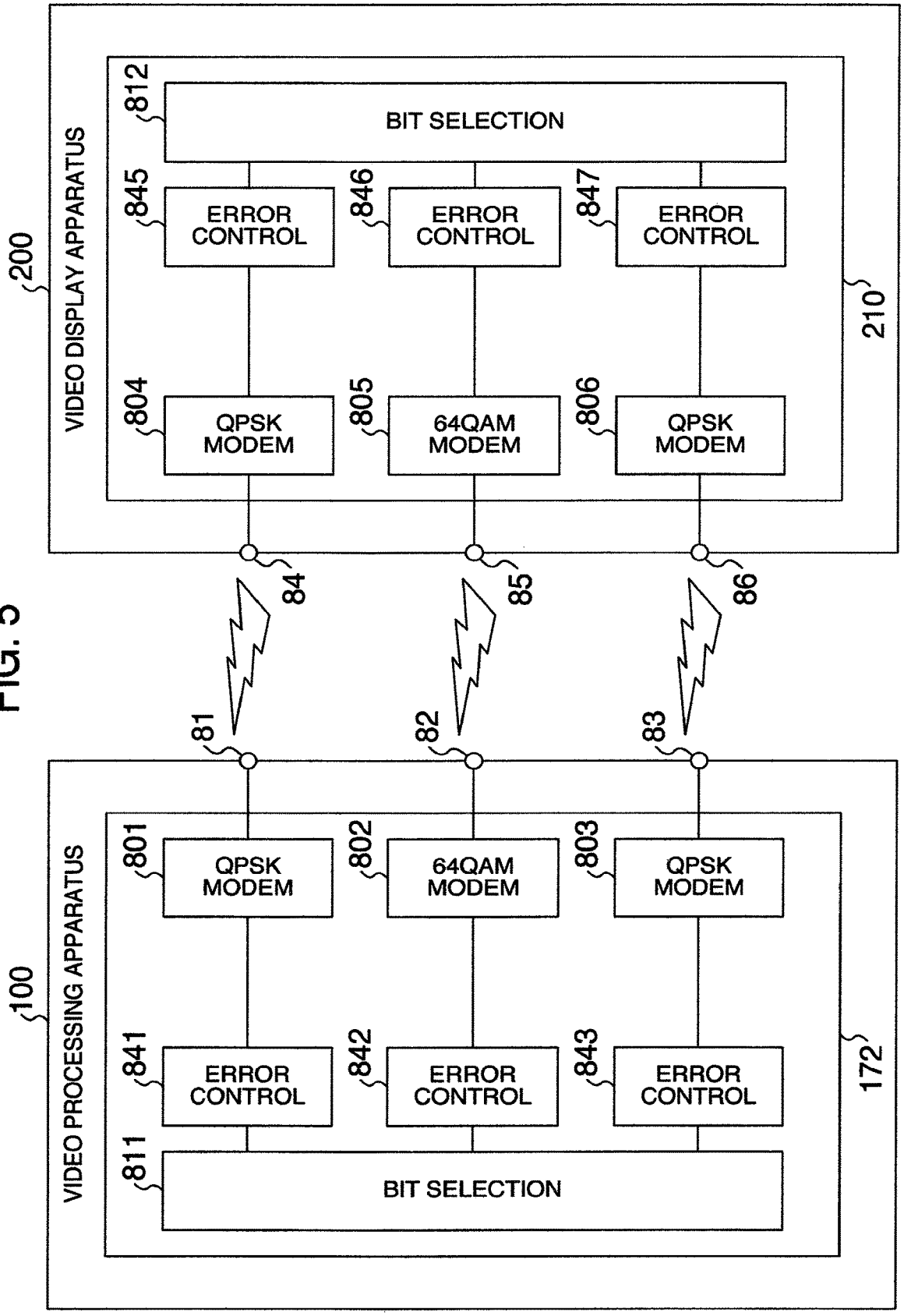

200
VIDEO DISPLAY APPARATUS
210
812
BIT SELECTION
845
ERROR CONTROL
846
ERROR CONTROL
847
ERROR CONTROL
804
QPSK MODEM
805
64QAM MODEM
806
QPSK MODEM
84
85
86
81
82
83
100
VIDEO PROCESSING APPARATUS
172
801
QPSK MODEM
802
64QAM MODEM
803
QPSK MODEM
841
ERROR CONTROL
842
ERROR CONTROL
843
ERROR CONTROL
811
BIT SELECTION

FIG. 6

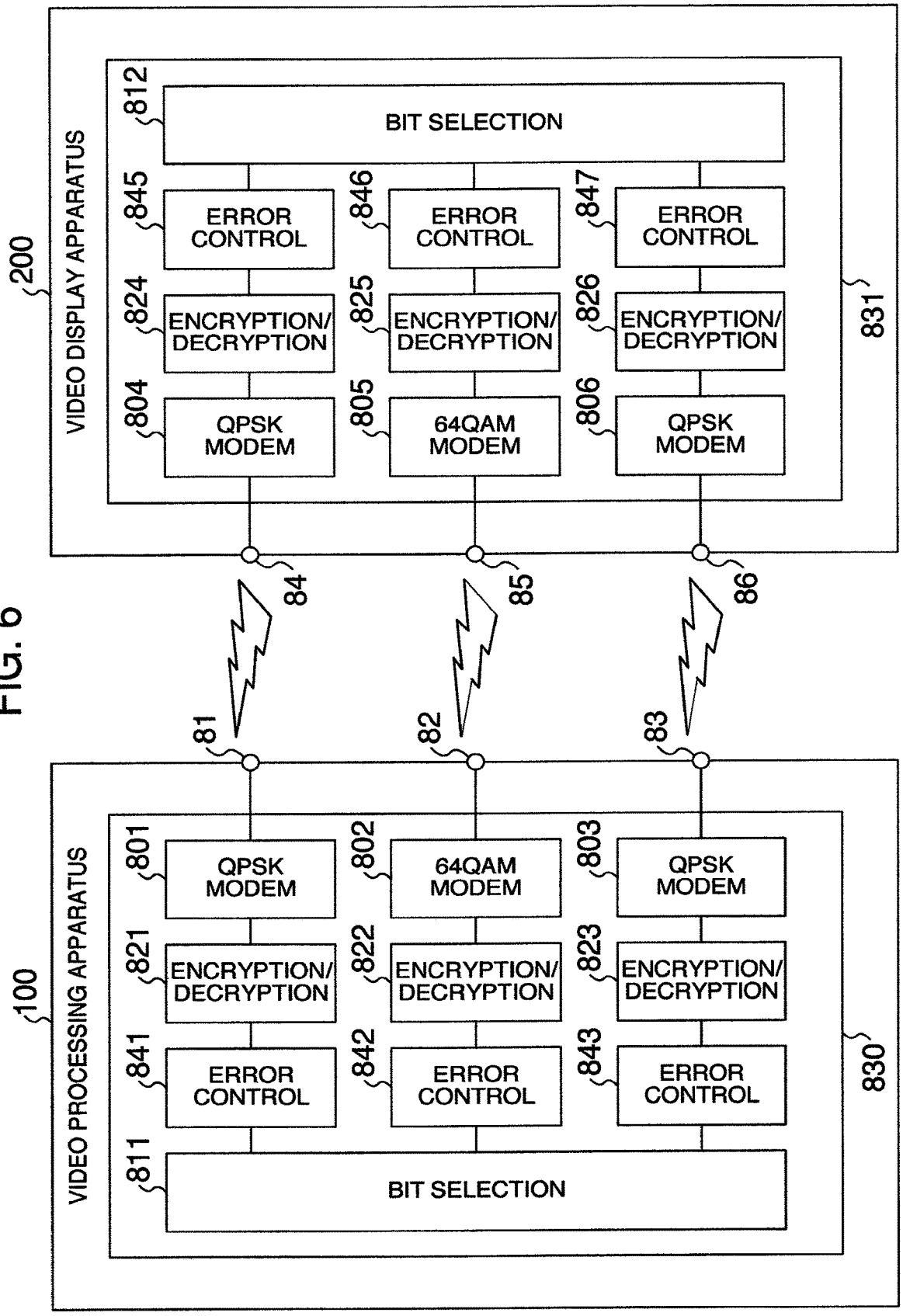

200
VIDEO DISPLAY APPARATUS
812
BIT SELECTION
845
ERROR CONTROL
846
ERROR CONTROL
847
ERROR CONTROL
824
ENCRYPTION/ DECRYPTION
825
ENCRYPTION/ DECRYPTION
826
ENCRYPTION/ DECRYPTION
804
QPSK MODEM
805
64QAM MODEM
806
QPSK MODEM
831
84
85
86
81
82
83
100
VIDEO PROCESSING APPARATUS
801
QPSK MODEM
802
64QAM MODEM
803
QPSK MODEM
821
ENCRYPTION/ DECRYPTION
822
ENCRYPTION/ DECRYPTION
823
ENCRYPTION/ DECRYPTION
841
ERROR CONTROL
842
ERROR CONTROL
843
ERROR CONTROL
811
BIT SELECTION
830

FIG. 7

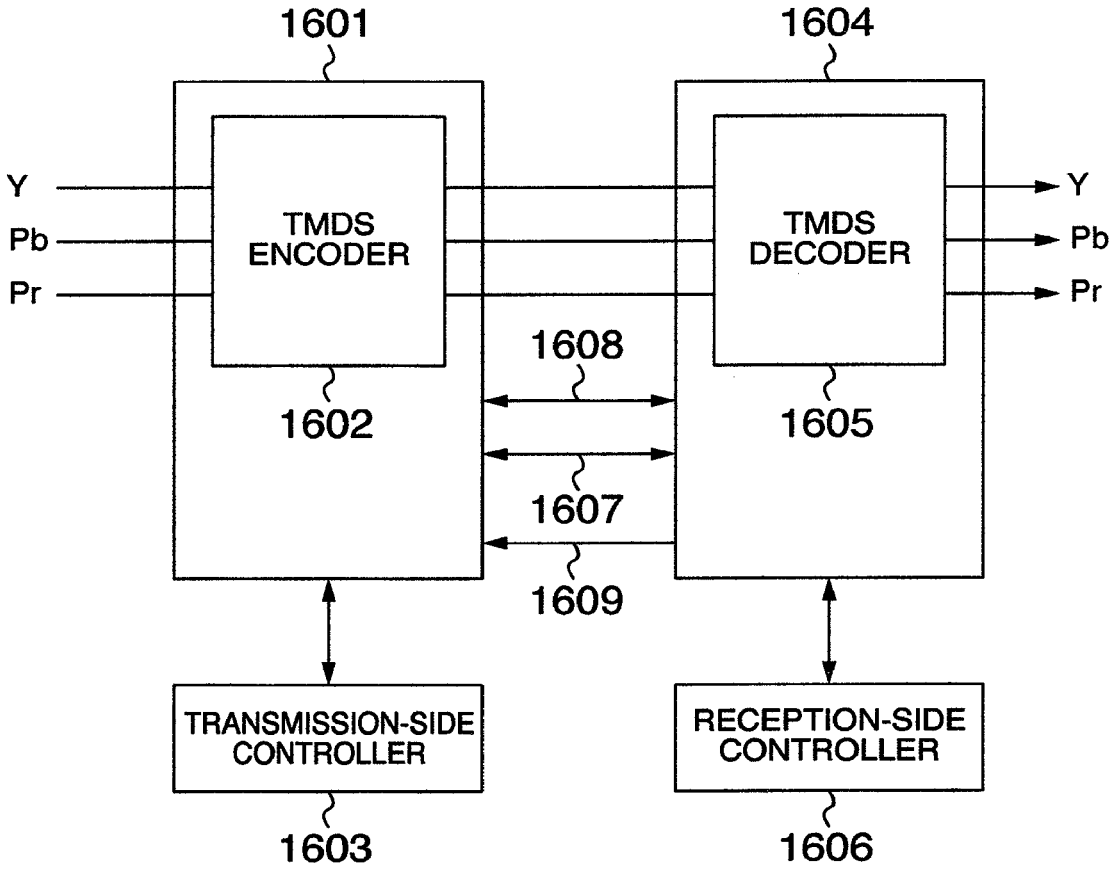

1601
1604
Y
Pb
Pr
TMDS ENCODER
TMDS DECODER
Y
Pb
Pr
1608
1602
1605
1607
1609
TRANSMISSION-SIDE CONTROLLER
RECEPTION-SIDE CONTROLLER
1603
1606

FIG. 8

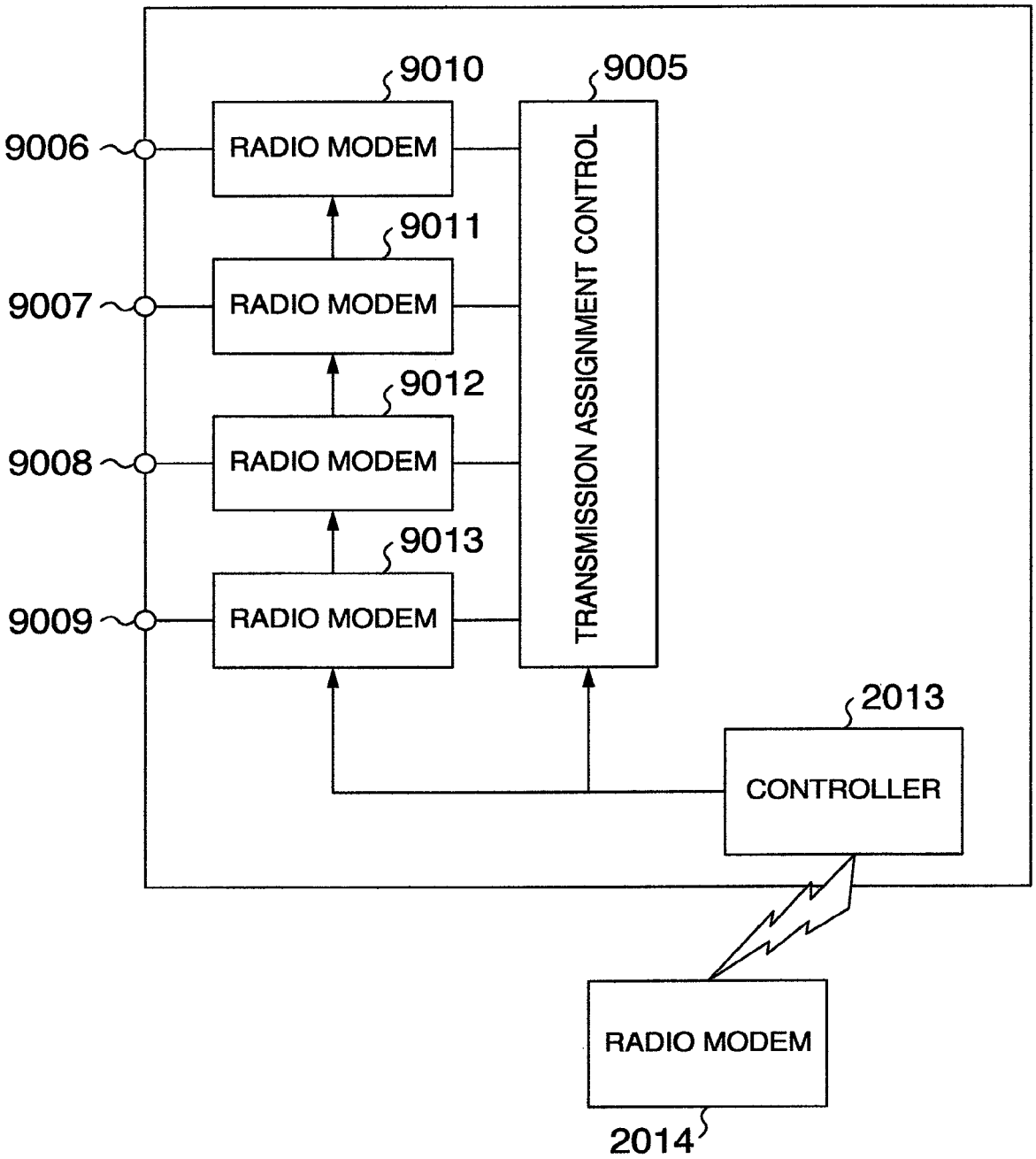

9010
9005
9006
RADIO MODEM
TRANSMISSION ASSIGNMENT CONTROL
9011
9007
RADIO MODEM
9012
9008
RADIO MODEM
9013
9009
RADIO MODEM
2013
CONTROLLER
RADIO MODEM
2014

FIG. 9

SCHEME	SCHEME 1	SCHEME 2
BANDWIDTH	6MHz	6MHz
CARRIER MODULATION SCHEME	64QAM	QPSK
CONVOLUTION CODE	3/4	2/3
GUARD INTERVAL	1/8	1/8
TRANSMISSION CAPACITY	17Mbps	5Mbps

FIG. 10

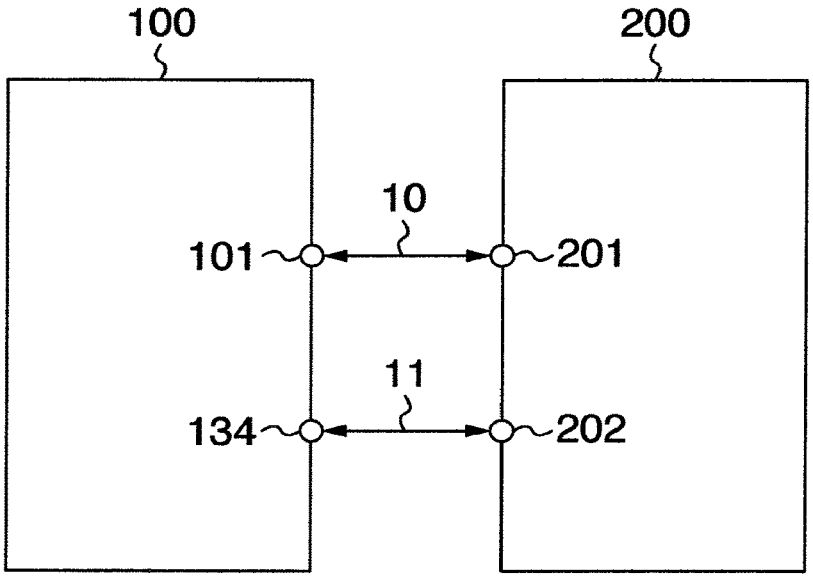
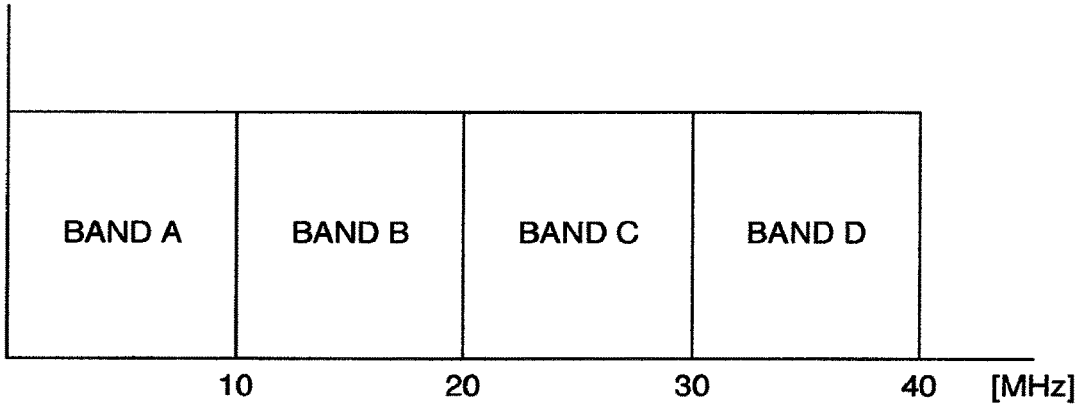


FIG. 11



INFORMATION PROCESSING APPARATUS AND INFORMATION PROCESSING METHOD

INCORPORATION BY REFERENCE

The present application is a continuation of U.S. patent application Ser. No. 16/738,059, filed Jan. 9, 2020, which is a continuation of U.S. patent application Ser. No. 16/269,662, filed Feb. 7, 2019, which is a continuation of U.S. patent application Ser. No. 15/891,085, filed on Feb. 7, 2018, (now, U.S. Pat. No. 10,244,284), which is a continuation of U.S. patent application Ser. No. 15/208,886, filed on Jul. 13, 2016 (now, U.S. Pat. No. 10,129,590), which is a continuation of U.S. patent application Ser. No. 12/260,410, filed on Oct. 29, 2008 (now, U.S. Pat. No. 9,420,212), which claims priority to Japanese Patent Application No. 2007-306750, filed on Nov. 28, 2007, the contents of all of which are hereby incorporated by reference into this application.

BACKGROUND OF THE INVENTION

The present invention relates to a technique to establish connections between a plurality of apparatuses and networks by radio.

To connect a video processing apparatus to a video display apparatus as another video processing apparatus to view videos, there has been employed a method to establish analog connections therebetween to transmit video and audio signals. However, as digital apparatuses have been widely spread, there is employed, to prevent picture quality deterioration and to protect copyright of contents to be viewed, a method in which digital connections are established between the apparatuses and video and audio signals are encrypted to be transmitted therebetween.

High Definition Digital Multimedia Interface (HDMI) is known as an example of an interface for digital transmission. According to the HDMI, the base band signal and the audio signal of high definition are time-division multiplexed and the resultant signal is encrypted through HDCP for transmission thereof.

A conventional technique in which digitized video and audio signals are multiplexed for transmission as above is described in, for example, JP-A-2007-202115.

SUMMARY OF THE INVENTION

According to the HDMI, which is developed on assumption of uses for connections between apparatuses installed in a house of a family, consideration has not been given to connections with the internet and a network in the family or a home network while viewing high-quality videos. It is therefore an object of the present invention, devised to overcome the difficulty, to provide a technique wherein while presenting on a display apparatus videos of high picture quality obtained from portable video processing apparatuses such as a camera and a cellular phone, it is possible to communicate with the internet and/or a home network.

According to one aspect of the resent invention, there is provided a display apparatus including a first radio communication unit capable of receiving video information by radio from an external video processing apparatus, a second radio communication unit capable of connecting by radio to a network, and a connection assignment control unit for controlling assignment of connection by radio transmission for each of the first and second radio communication units.

The control unit assigns connection of the first radio communication unit with higher priority and controls the assignment of the transmission rate, for example, such that the transmission rate between the first radio communication unit and the external video processing apparatus is more than the transmission rate between the second radio communication unit and the network.

According to another aspect of the present invention, there is provided a video processing apparatus including a first radio communication unit capable of transmitting video information by radio to an external display apparatus, a second radio communication unit capable of connecting by radio to a network, and a connection assignment control unit for controlling assignment of connection by radio transmission for each of the first and second radio communication units. The control unit assigns connection of the first radio communication unit with higher priority and controls the assignment of the transmission rate, for example, such that the transmission rate between the first radio communication unit and the external video display apparatus is more than the transmission rate between the second radio communication unit and the network.

In the display apparatus constructed as above, the first radio communication unit can communicate video information of high picture quality with an external video processing apparatus. The second radio communication unit can connect by radio to the internet and a home network. The controller controls the transmission rate of the radio transmitter module to be assigned to the first radio communication unit and can change the transmission rate of the radio transmitter module to be assigned to the second radio communication unit. It is possible for the controller to determine and to control the radio transmission rates to be assigned to the first and second radio communication units. The controller controls the operation such that the assignment to the first radio communication module to conduct transmission to receive video information from an external video processing apparatus is carried out with higher priority. Therefore, it is possible that video information of high picture quality is continuously fed from the video processing apparatus to the video information apparatus as well as information is transmitted from the internet and a home network. There can be hence provided a video display apparatus having high serviceability.

According to the present invention, it is possible to communicate with a network while displaying videos of high picture quality obtained by a video processing apparatus.

Other objects, features and advantages of the invention will become apparent from the following description of the embodiments of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram showing an example of an embodiment of a video processing apparatus **100** according to the present invention;

FIG. **2** is a block diagram showing an example of an embodiment of a video display apparatus **200** according to the present invention;

FIG. **3** is a block diagram showing another example of an embodiment of a video display apparatus **200** according to the present invention;

FIG. **4** is a diagram showing an example of a radio modulator and demodulator or modem of the video processing apparatus **100**;

FIG. **5** is a block diagram showing an example of a system in which two video processing apparatuses are wirelessly connected to each other;

FIG. **6** is a block diagram showing another example of a system in which two video processing apparatuses are wirelessly connected to each other;

FIG. **7** is a diagram showing an example of structure of the HDMI;

FIG. **8** is a diagram showing an example of a radio modem of the video display apparatus;

FIG. **9** shows a diagram showing an example of transmission parameters of a radio modem in the embodiment;

FIG. **10** is a diagram showing connections between the video processing apparatus **100** and the video display apparatus **200** in the embodiment of the present invention; and

FIG. **11** is a diagram showing an example of assignment of bands in another example of a radio modem shown in FIGS. **4** and **8**.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Referring now to the drawings, description will be given of an embodiment according to the present invention.

First Embodiment

FIG. **10** shows an embodiment of the present invention. In this example, the system includes two video processing apparatuses, i.e., a video processing apparatus **100** which is, for example, a portable video processing apparatus capable of receiving a digital broadcast signal via a base station antenna for cellular phones or a broadcast transmission tower and a video display apparatus **200** such as a tuner capable of receiving a digital broadcast signal from a broadcast transmission tower. These apparatuses are connected, for example, via a bidirectional interface **10** to each other. Resultantly, a video signal of high picture quality and other information items and signals can be bidirectionally communicated therebetween. On the other hand, between a terminal **134** of the video processing apparatus **100** and a terminal **202** of the video display apparatus **200**, signals from the internet and a home network are communicated by radio. The frequency bands used for the transmission between the terminals **134** and **202** are limited to predetermined frequency bands. This increases the radio wave resource efficiency and prevents the problem of interference with other apparatuses.

In the embodiment, the portable video processing apparatus **100** is specifically, for example, a digital camera, a video camera, a cellular phone, a game machine, or a personal media player.

FIG. **1** shows a concrete example of the video processing apparatus **100** employed in the first embodiment of the present invention. This is a specific configuration of the apparatus **100** shown in FIG. **10**. In FIG. **1**, an imaging device **110** receives a moving or still picture supplied via an optical system to convert the picture into en electric signal. To transmit a moving picture, a compression circuit **111** employs a compression method, e.g., Moving Picture Experts Group 2 (MPEG2), MPEG4, or AVC/H.264. To transmit a still picture, the compression circuit **111** employs a compression method, e.g., Joint Photographic Experts Group (JPEG). The compression circuit **111** efficiently bit-compresses the received image.

A microphone **112** converts sound into an electric signal. A compression circuit **113** uses a compression method such as an MPEG audio to efficiently bit-compress the received audio signal.

A multiplexer circuit **116** receives the bit-compressed video and audio signals from the compression circuits **111** and **113** and various information items from a microprocessor **115**. By use of the information items, the multiplexer **116** multiplexes the signals according to a predetermined format. When a still picture is shot, the audio signal is not obtained in an ordinary case. However, it is also possible to multiplex an audio signal in synchronism with the still picture shooting operation.

The information items from the microprocessor **115** include, for example, positional information (horizontal positions, vertical positions on the right, and vertical positions on the left), date, and exposure information at shooting.

In FIG. **1**, the multiplexed signal from the multiplexer **116** is fed via an encryption/decryption circuit **140** to be stored in a storage **130**. The storage **130** may be, for example, a hard disk device, an optical disk device, or a semiconductor memory device. The type of the storage **130** may be determined according to, for example, a storage capacity, a size of the storage **130**, easiness of removing a storage medium, and/or a price of the storage **130** according to necessity. It is also possible to store the multiplexed signal via a signal processing circuit **124** and a memory interface **120** in a memory **121**.

When information is shot by a particular person, copyright of the information belongs to the person. Hence, ordinarily, such information is not required to be encrypted for the storage thereof. However, the storage medium having stored information by the storage **130** may be lost. It will be more safe if the multiplexed signal from the multiplexer **116** is once encrypted by the encryption/decryption circuit **140** to be stored in the storage **130** or the memory **121**.

The video processing apparatus **100** may also support the use of a removable memory or include a cellular phone function or a radio Local Area Network (LAN) function. The memory interface **120** is an interface for a removable memory **121**. When video and audio contents of still and moving pictures are recorded by another apparatus in the memory **121** and the memory **121** is connected to the interface **120**, the contents can be recorded via the signal processing circuit **124** and the encryption/decryption circuit **140** into the storage **130**.

In this situation, the signal processing circuit **124** checks to determine whether or not the copyright of the contents recorded in the memory **121** is protected and whether or not the duplication thereof is prohibited. According to the detected condition, the encryption/decryption circuit **140** encrypts the contents and moves the encrypted contents in the storage **130**.

Similarly, audio and video contents of still and moving pictures are received as inputs by a radio interface **122**. The contents are stored via the signal processing circuit **124** and the encryption/decryption circuit **140** in the storage **130**. Also, according to conditions of the copyright protection and the replication restriction, the contents are encrypted by the encryption/decryption circuit **140**, as required.

When it is desired to reproduce a content stored in the storage **130** to view the reproduced content, the user selects the content by an input key or a remote control, not shown. The selected content is read from the storage **130** to be decoded by the encryption/decryption circuit **140** and is then separated by a demultiplexer circuit **141** into an audio signal and a video signal.

When a broadcast program is received by a broadcast receiver **180**, the encrypted signal encrypted for the broadcast is decrypted by the encryption/decryption circuit **140**. If encryption is required to store the signal, the signal is accordingly encrypted by the circuit **140** to be stored in the storage **130** and the memory **121**. To immediately view the received broadcast program in real time, the signal is separated by the demultiplexer **141** into a video signal and an audio signal.

The separated and compressed video signal is decompressed by a decompression circuit **142** to be fed to a signal processing circuit **150**. The circuit **150** conducts a scanning-line conversion for the video signal on the basis of the number of scanning lines of a display **160** to output the resultant video signal to the display **160**. The separated and compressed audio signal is decompressed by a decompression circuit **143** to be delivered to an audio output device **161**. Since the video processing apparatus **100** includes the display **160** and the audio output device **161**, it is possible to immediately view the broadcast program without externally connecting any video display apparatus. In a situation wherein the period of time required for the decompression varies between the video and audio signals and/or a time difference exists between the video display and the audio output due to presence or absence of the scanning-line conversion, if the audio signal is advanced in time relative to the video signal, the user particularly perceives an uncomfortable feeling. To overcome the difficulty, the audio signal is delayed, for example, in the decompression processing, namely, a lip-sync operation is carried out. This removes the uncomfortable feeling due to the difference in time between the video and audio signals.

Description will now be given of a situation wherein the video processing apparatus **100** is employed as a cellular phone. For example, a voice of a conversation is inputted to the audio input/output section **126** to produce an electric signal. For the signal, a telephone signal processing circuit **125** executes predetermined signal processing and modulation processing. The resultant signal is transmitted via an antenna, not shown, to a base station of the cellular phone. An audio signal sent from the base station is received by an antenna, not shown, to be fed to the telephone signal processing circuit **125**. For the signal, the circuit **125** executes predetermined signal processing and demodulation processing. The resultant signal is fed to the audio I/O section **126** to be reproduced as a voice. The video processing apparatus **100** can also receive a content of a moving picture transmitted from the base station of the cellular phone. The content is received by an antenna, not shown, to be delivered via the telephone signal processing circuit **125** to the signal processing circuit **124**. The content is similarly processed as above by the encryption/decryption circuit **140**. The resultant signal of the content is fed to a display and an audio output unit incorporated in the video processing apparatus **100** to be viewed/listened by the user. The content thus processed may also be fed via a terminal **101**, a connection cable **10**, and a terminal **201** to an external video display apparatus **200** to be displayed on a large-sized screen. While viewing the content, it is possible to record the content in a recording medium incorporated in the video processing apparatus **100** or a recording medium, e.g., a memory **121** connected thereto, for example, to view the content later. The memory **121** may also be used as a recording medium to record a movie and the like.

Similarly, a program broadcast from a broadcast transmission tower is received by a broadcast receiver **180** of the video processing apparatus **100** to be viewed by the apparatus **100** or to be stored in a recording medium, not shown, incorporated in the apparatus **100** or a recording medium, e.g., the memory **121** connected thereto. Also, the content may be fed via the terminal **101**, the cable **10**, and the terminal **201** to the video display apparatus **200** to be viewed by the user.

In addition, by installing an imaging device **110** and a microphone **112** in the video processing apparatus **100**, still and moving pictures can be shot together with audios and can be stored in an incorporated recording medium, not shown, and/or the memory **121**. The videos and audios stored in the recording medium and/or the memory **121** may be fed via the terminal **101** to the video display apparatus **200** to be enjoyed by the user.

When the user views video and audio signals by use of the external video display apparatus **200**, the apparatus **200** confirms scanning lines which the apparatus **200** can support. If the scanning lines match those of the video signals to be displayed, the signals are immediately outputted in real time. Otherwise, the scanning lines of the video signals are converted by a signal processing circuit **150** into the required scanning lines to be fed to a multiplexer circuit **170**. In the circuit **170**, the video signals are multiplexed on the time axis, with the audio signals processed by a signal processing circuit **151**. The circuit **151** compresses the audio signals on the time axis during a period corresponding to the blanking period of the video signals and conducts a time adjusting operation to carry out the lip-sync operation according to the necessity. The video and audio signals multiplexed by the multiplexer circuit **170** are delivered to an encryption circuit **171**. For the signals, the circuit **171** carries out encryption for the transmission of the signals between the video processing apparatus **100** and the video display apparatus **200** and outputs the resultant signals via a video interface circuit **131**, a transmission rate assignment controller **1001**, and the terminal **101** to the video display apparatus **200**. On the other hand, the terminal **134** is connected to a network such as the internet as described above and is used to wirelessly communicate videos and other information items obtained from the network by use of a radio modem circuit **1003**. The information from the network is demodulated by the circuit **1003** to be fed via the transmission rate assignment controller **1001** to an interface circuit **133** and is delivered therefrom to a microprocessor **115**. The microprocessor **115** determines the type of the information from the network. If the information is, for example, a video stream compressed in a predetermined format, the microprocessor **115** feeds the video stream to the demultiplexer circuit **141** and the decompression circuit **143**. For the video stream, the circuits **141** and **143** conduct processing as described above. The resultant signals are presented on the display **160**. According to necessity, the audio information obtained from the network is reproduced by the audio output device **161**. If the information from the network is an update program of an application program or an Operating System (OS), the microprocessor **115** executes addition and storage processing for new software or executes update processing for the associated program. Although the processing of the network information is executed by the microprocessor **115** to process video information in the embodiment, it is also possible to arrange a microprocessor to dedicatedly process the network information.

The controller **132** controls the transmission rate assignment control circuit **1001** on the basis of time control information of the video signal to variably control the transmission rate of the radio modem circuit **1002**. At the

same time, the controller **132** variably controls the transmission rate of the radio modem circuit **1003** for radio communication with a network such as the Internet. According to the embodiment, in the assignment of the transmission rate to the demodulation circuits **1002** and **1003**, the controller **132** gives preference to the demodulation circuit **1002**. In other words, the transmission rate of the demodulation circuit **1002** is more than that of the modem circuit **1003**. Hence, within the limited range of bands for the radio transmission, the modem **1002** can transmit video information without deteriorating the video quality of the video information having high picture quality. The band of radio signals from the terminal **101** and that of radio signals from the terminal **134** are fixed. Therefore, if the band of signals from the terminal **101** is expanded, that of signals from the terminal **134** narrows to slightly lower the communication speed of the network. However, this rarely influences the system operation since information regarding the network is less frequently exchanged as compared with video information sent from the video processing apparatus **100**.

When the signal from the terminal **101** is to be stored in the destination thereof, the compressed signal is transmitted without decompressing the signal. In the operation, the encryption/decryption circuit **140** delivers the compressed signal to the encryption circuit **171**. The circuit **171** conducts predetermined encryption for the signal and then outputs the resultant signal via the video interface circuit **131**, the transmission rate assignment controller **1001**, and the terminal **101**. Also in this situation, the control circuit **132** variably controls the transmission rate of the radio modem **1002** in association with the time control information of the video signal. As a result, the radio modem **1002** can send the video information without deteriorating the video quality of the video information having high picture quality.

In the description above, the video and audio signals obtained from the imaging device **110** and the microphone **112** and the contents inputted from the memory **121** and the radio interface **122** are once stored in the storage **130** to be thereafter reproduced. However, if the storing of the signals and the contents are not required or are immediately viewed, the signals and the contents are demultiplexed by the demultiplexer **141** without conducting the encryption and decryption for the storage by the encryption/decryption circuit **140**. Resultantly, the videos and audios can be enjoyed by use of the display **160** and the audio output device **161** of the video processing apparatus **100**. Also, it is possible to enjoy the videos and audios by a receiver externally connected via the wired interface circuit **131** to the apparatus **100**.

Description will now be specifically given of one technical aspect of the embodiment, namely, the transmission rate assignment control circuit **1001** and the radio demodulation circuits **1002** and **1003**. The modem circuits **1002** and **1003** conduct demodulation through Orthogonal Frequency Division Multiplexing (OFDM). In the example, the modem **1002** is a first radio communication unit which wirelessly sends video information and audio information to the external video display apparatus **200** and which receives data and information by radio therefrom. The modem **1002** is connected via the transmission rate assignment controller **1001** to the interface circuit **131** which communicates with the video display apparatus **200**. On the other hand, the modem **1003** is a second radio communication unit which connects to (accesses) a network, e.g., the Internet or a home network to wirelessly communicate various information including video signals, audio signals, and data therewith. The modem **1003** is connected via the transmission rate assignment controller **1001** to the interface circuit **133** for networks. The controller **1001** variably controls, according to a control signal from the controller **132**, the transmission rates respectively of the modems **1002** and **1003** by variably setting the modulation/demodulation methods, the frequency bands, and the number of carriers respectively for the modems **1002** and **1003**. In short, the controller **132** controls distribution of the radio transmission rate of each modem by controlling the transmission rate assignment controller **1001**. As a specific example of operation in which the transmission rate is controlled by changing parameters including the demodulation method and the frequency band, FIG. **9** shows the difference in the transmission rate between two schemes.

According to the embodiment, the controller **132** and the transmission rate assignment controller **1001** control the radio transmission assignment such that the radio transmission rate of the modem **1002** to send the video information of high picture quality by radio to the video display apparatus **200** takes precedence over the radio transmission rate of the modem **1003** to connect to a network for communication. That is, the radio transmission rate of the modem **1002** is more than that of the modem **1003**. For example, in a situation wherein the modem **1002** transmits video information to the display apparatus **200** and the modem **1003** simultaneously connects to the Internet to receive Internet information, the controller **132** controls the operation to continuously supply videos with high picture quality to the user, specifically, to set the transmission scheme of the modem **1002** to, for example, "scheme **1**" shown in FIG. **9**. For the radio modem **1003**, the controller **132** sets the transmission scheme thereof to "scheme **2**" of FIG. **9**. As can be seen from FIG. **9**, the transmission capacity of scheme **1** is 17 Megabits per second (Mbps) which is more than three times that of scheme **2** (5 Mbps). As above, in the limited transmission capacity for radio transmission, a higher transmission rate is assigned to the communication with the display apparatus **200** in the embodiment. It is hence possible that the user continuously views videos with high picture quality on the display apparatus **100**. Naturally, the variable control of the transmission rate is not limited to the example shown in FIG. **9**.

The controller **132** and the transmission rate assignment controller **1001** may variably control the radio transmission assignment to the modems **1002** and **1003** in response to an indication from the user. For example, in a situation wherein the user issues an indication to transmit video information by radio via the modem **1002** to the display apparatus **200** while acquiring information from the Internet according to scheme **1** of FIG. **9** by use of the modem **1003**, the controller **132** outputs a control signal to the assignment controller **1001** such that the transmission scheme of the modem **1003** is changed from scheme **1** to scheme **2** of FIG. **9** and that of the modem **1002** is set to scheme **1** of FIG. **9** conduct communications. The transmission rate of the modem **1002** may be variably changed according to fineness or precision of the video information sent from the modem **1002** to the display apparatus **200**. For example, if the fineness of the video information is altered from SD (640×480) to HD (1980×1080), the controller **132** instructs the assignment controller **1001** to heighten the transmission rate of the modem circuit **1002**. It is preferable in the operation that the transmission rate of the modem **1003** is lowered in association with the variable control of the transmission rate of the modem **1002**.

The transmission rates of the radio modems **1002** and **1003** may also be variably controlled by a communication technique using a plurality of antennas such as a Multi-Input Multi-Output (MIMO) scheme.

Referring next to FIG. **4**, description will be given of other examples of the transmission rate assignment controller and the radio modem. FIG. **4** shows only part of the system associated with the transmission rate assignment control. In FIG. **4**, the same functional constituent components as those of FIG. **1** are assigned with the same reference numerals.

In FIG. **4**, radio modem circuits **5001** to **5004** are modems having respective fixed transmission capacity values and differ from each other only in the frequency band for transmission. The modems **5001** to **5004** respectively have bands A to D as shown in FIG. **11**. Terminals **101** and **5005** to **5007** are input terminals to receive signals and are arranged respectively for radio modems **5001** to **5004**. In operation, the modems **5001** to **5004** may be appropriately combined with each other. For example, according to necessity, the modems **5001** and **5002** are employed to transmit video information and the modems **5003** and **5004** are utilized to communicate with the network such as the Internet. That is, while the interface circuit **131** wirelessly transmits video information and audio information via the modems **5001** and **5002** to the video display apparatus **200**, the interface circuit **133** conducts communication via the modems **5003** and **5004** with the network. In a situation wherein a wide band is required to transmit video information of high picture quality (e.g., video information of HD resolution), the modems **5001** to **5003** are assigned to send video information and only the modem **5004** is assigned to communicate with the network such as the Internet. Specifically, the interface circuit **131** transmits video and audio information by radio via the modems **5001** to **5003** to the display apparatus **200**, and the interface circuit **133** communicates with the network via the modem **5004**. As a result, video information of high picture quality can be continuously transmitted and it is also possible to communicate with the Internet. Particularly, the broadcast signal is required to be presented by synchronizing the time information sent from the broadcasting station with that on the receiver side. According to the present invention, the time information can be appropriately controlled without deteriorating the quality of the video information.

FIG. **2** shows a specific configuration of the video display apparatus **200** of FIG. **10**. In FIGS. **2** and **10**, the same constituent components are assigned with the same reference numerals and detailed description thereof will be avoided. Description will be given of a situation wherein an uncompressed baseband signal of a moving picture is inputted via the terminal **201**. The signal from the external video processing apparatus **100** thus received via the terminal **201** is demodulated by a radio modem circuit **2015** to be supplied via a transmission rate assignment controller **2017** and an input/output interface circuit **2011** to a decryption circuit **211**. In operation, a controller **2013** drives the assignment controller **2017** to vary the transmission rate of the modem **2015** according to that of the video information delivered from the video processing apparatus **100**. Resultantly, an input/output interface circuit **2011** can receive the video information of high picture quality at preset timing.

The decryption circuit **211** is associated with encryption by the encryption circuit **171** shown in FIG. **1** and decrypts a signal encrypted by the circuit **171**. The decrypted signal is fed to a demultiplexer circuit **250**, and then video and audio signals obtained from the demultiplexer **250** are inputted to signal processing circuits **251** and **252**, respectively. For the received video signal, the circuit **251** conducts a scanning-line conversion and a resolution conversion according to the number of pixels displayable by a display **260**. The circuit **252** decompresses on the time axis the audio signal which is compressed and multiplexed on the time axis by use of the blanking of the video signal. According to necessity, the circuit **252** carries out the lip-sync operation and the sound quality adjustment. Signals outputted respectively from the circuits **251** and **252** are inputted respectively to a display **260** and an audio input/output unit **270** to be viewed by the user.

Description will now be given of operation when a compressed moving-picture signal is received via the terminal **201**. This operation aims at storing the moving-picture signal in a storage **230** incorporated in the apparatus **200**.

The signal received from the terminal **201** is delivered via the wired input/output interface circuit **2011** to the decryption circuit **211**. The circuit **211** corresponds to the encryption circuit **171** shown in FIG. **2** and decrypts a signal encrypted by the circuit **171**. The decrypted signal is inputted to an encryption/decryption circuit **240**. The circuit **240** reads copy control information of the content to be stored and encrypts the content for the storage thereof according to the information. The encrypted signal is stored in the storage **230** in the compressed state.

In a situation wherein the user views the compressed signal received via the terminal **201** while storing the signal in the storage, a signal corresponding to a compressed signal decrypted by the encryption/decryption circuit **211** is fed from the encryption/decryption circuit **240** to a demultiplexer circuit **241**. In the circuit **241**, the signal is separated into a compressed video signal and a compressed audio signal. The separated video and audio signals are decompressed respectively by decompression circuits **242** and **243** to baseband signals to be respectively supplied to the signal processing circuits **251** and **252**. Signals outputted respectively therefrom are delivered respectively to the display and the audio output unit **270** to be viewed by the user.

When a content stored in the storage **230** is reproduced to be viewed by the user, information items such as titles of the contents stored in the storage **230** are presented on the display **260**. When the user selects one of the contents, a signal of the selected content is fed from the storage **230** to the encryption/decryption circuit **240**. The circuit **240** decrypts the encrypted signal of the content to input the resultant signal to the demultiplexer **241**. The signal of the content is thereafter similarly processed as described above to be viewed by the user.

It is possible to similarly reproduce contents stored in a memory **221**. As in the reproduction of contents stored in the storage **230**, the user selects one of the contents stored in a memory **221** to view the content. The selected content is transferred via a memory interface **220** and a signal processing circuit **224** to the encryption/decryption circuit **240**. Specifically, the circuit **224** executes processing necessary to read the content from the memory **221** to input compressed and multiplexed video and audio signals of the content to the circuit **240**. Subsequent signal processing is similar to the processing executed after the content is read from the storage **230**.

As in the operation to store a content in the storage **230**, it is possible to store the content in the memory **221**. Although detailed description of the associated processing will be avoided, the content encrypted by the encryption/decryption circuit **240** is stored via the signal processing circuit **224** and the memory interface **220** into the memory **221**.

To view or to store a content transmitted by radio, the system executes processing in a similar way. A compressed content received by radio is fed via a radio interface **222** and the signal processing circuit **224** to the encryption/decryp-

tion circuit **240**. The circuit **240** decrypts the signal encrypted for the radio transmission. Subsequent processing is similar to the processing executed at reproduction of the signal from the storage **230**.

When an uncompressed baseband signal is received from the terminal **201** or **202**, the content can be efficiently stored in the storage **230** and the memory **221**. Description will be given of operation in this situation.

The content inputted from the terminal **201** is transferred via the input/output interface **2011**, the decryption circuit **211** and the demultiplexer circuit **250** to be separated into a video signal and an audio signal. The video and audio signals thus separated are fed via a replication control circuit **280** to compression circuits **281** and **282**. The circuit **280** reads, from the content, multiplexed replication control information to determine whether or not replication of the content is allowed. As the control information, a bit may be assigned to a designated field. Or, by using electronic watermark, the information may be superimposed onto video or audio information. Information inputted from the network to the terminal **202** is also processed in a similar fashion as above.

The compression circuit **281** compresses the video signal by use of a compression scheme, e.g., MPEG2, MPEG4, or AVC/H.264. The compression circuit **282** compresses the audio signal according to a compression scheme, e.g., MPEG Audio. The compressed video and audio signals are inputted to a multiplexer circuit **283** to be multiplexed. The multiplexed signal is fed to the encryption/decryption circuit **240** to be thereafter similarly stored in the storage **230** and/or the memory **221**. As a result, the content can be efficiently recorded therein for a long period of time according to copyright information.

On the other hand, the signal from a network such as the Internet received via the terminal **202** is demodulated by a radio modem circuit **2016** to be supplied via a transmission rate assignment controller circuit **2017** and an input/output interface circuit **2012** to a microprocessor **279**. The type of information of the video information from the network is determined. If the information is, for example, a video stream compressed in a predetermined format, the system transfers the information to demultiplexer circuit **241** and the decompression circuits **242** and **243**. After the information is processed by these circuits in a similar way as described above, an image of the information is presented on the display **260**. According to necessity, audio information obtained from the network is reproduced by the audio output unit **261**. If the information from the network is an update program for an application program, an operating system OS, or the like, the microprocessor **279** adds and stores new software and/or updates an associated program. It is also possible that the function of the microprocessor **279** is installed in the controller **2013** to configure one unified module including the microprocessor **279** and the controller **2013**.

In the operation, the controller **2013** controls the transmission rate assignment controller **2017** to vary the transmission rate of the radio modem **2015** in association with the transmission rate of the video information received from the video processing apparatus **100**. Since the transmission rate of the radio modem **2015** to receive the video information from the apparatus **100** takes precedence over that of the modem **2016** in the transmission rate assignment, the transmission rate of the modem **2016** is lower than that of the modem **2015**. In the embodiment as described above, the transmission rate of the modem **2015** to receive the video information from the apparatus **100** is higher than that of the modem **2016** to communicate with the network. Therefore, within the limited range of bands for the radio transmission, it is possible to obtain the high-quality video information from the external video processing apparatus **100** without deteriorating the video quality. The band of radio signals received by the terminal **201** and that of radio signals inputted to the terminal **202** are fixed. Hence, if the band of signals from the terminal **201** is expanded, that of signals from the terminal **202** narrows. This slightly lowers the communication speed of the network. However, this rarely influences the system operation since information regarding the network is less frequently exchanged as compared with video information sent from the video processing apparatus **100**.

Next, description will be specifically given of one technical aspect of the embodiment, namely, the transmission rate assignment controller **2017** and the radio modems **2015** and **2016**. The modems **2015** and **2016** carry out OFDM modulation/demodulation. In the example, the modem **2015** is a first radio communication unit which wirelessly receives video information and audio information from the external video processing apparatus **100** and which sends data and information by radio to the apparatus **100**. The modem **2015** is connected via the transmission rate assignment controller **2017** to the interface circuit **2011** which communicates with the video display apparatus **200**. On the other hand, the modem **2016** is a second radio communication unit which connects to (accesses) a network, e.g., the Internet or a home network to wirelessly communicate various information including video signals, audio signals, and data with the network. The modem **2016** is connected via the transmission rate assignment controller **2017** to the interface circuit **2012** for networks. The controller **2017** variably controls, according to a control signal from the controller **2013**, the transmission rates respectively of the modems **2015** and **2016** by variably designating the modulation/demodulation methods, the frequency bands, and the number of carriers respectively for the modems **2015** and **2016**. In other words, the controller **2013** controls distribution of the radio transmission rate of each modem by controlling the transmission rate assignment controller **2017**. As a specific example of operation in which the transmission rate is controlled by changing parameters including the demodulation method and the frequency band, FIG. **9** shows the difference in the transmission rate between two schemes.

In the embodiment, the controller **2013** and the transmission rate assignment controller **2017** control the radio transmission rate assignment so that the radio transmission rate of the modem **2015** to receive the video information of high picture quality by radio from the external video processing apparatus **100** takes precedence over the radio transmission rate of the modem **2016** to connect to a network for communication. In short, the radio transmission rate of the modem **2015** is more than that of the modem **2016**. For example, in a situation wherein the modem **2015** receives video information from the video processing apparatus **100** and the modem **2016** simultaneously connects to the Internet to receive Internet information, the controller **2013** controls the operation to continuously provide videos with high picture quality to the user, specifically, to set the transmission scheme of the modem **2015** to, for example, "scheme **1**" shown in FIG. **9**. For the radio modem **2016**, the controller **2013** sets the transmission scheme thereof to "scheme **2**" shown in FIG. **9**. As can be seen from FIG. **9**, the transmission capacity of scheme **1** is 17 Mbps which is more than three times that of scheme **2** (5 Mbps). Hence, in the limited transmission capacity for radio transmission, a higher trans-

mission rate is assigned to the communication with the video processing apparatus **100** in the embodiment. It is therefore possible that the user continuously watches videos with high picture quality on the display apparatus **100**. Naturally, the variable control of the transmission rate is not limited to the example shown in FIG. **9**.

The controller **2013** and the transmission rate assignment controller **2017** may control the radio transmission assignment to the modems **2015** and **2016** in response to an indication from the user. For example, in a situation wherein the user issues an indication to receive video information by radio via the modem **2015** from the video processing apparatus **100** while acquiring information from the Internet according to scheme **1** of FIG. **9** by use of the modem **2016**, the controller **2013** outputs a control signal to the assignment controller **2017** such that the transmission scheme of the modem **2016** is changed from scheme **1** to scheme **2** of FIG. **9** and that of the modem **2015** is set to scheme **1** of FIG. **9**. The transmission rate of the modem **2015** may be changed according to precision of the video information which is sent from the video processing apparatus **100** to be received by the modem **2015**. For example, the precision of the video information above is changed from SD (640×480) to HD (1980×1080), the controller **2013** instructs the assignment controller **2017** to heighten the transmission rate of the modem circuit **2015**. It is preferable in the operation that the transmission rate of the modem **2016** is lowered in association with the variable control of the transmission rate of the modem **2015**.

The transmission rates of the radio modems **2015** and **2016** may also be variably controlled by a communication technique using a plurality of antennas such as the MIMO scheme.

Referring next to FIG. **8**, description will be given of other examples of the transmission rate assignment controller and the radio modem. FIG. **8** shows only part of the system associated with the transmission rate assignment control. In FIG. **8**, the same functional constituent components as those of FIG. **1** are assigned with the same reference numerals.

In FIG. **8**, a transmission rate assignment controller **9005** operates in a similar way as the transmission rate assignment controller **1001** described above and assigns transmission rates respectively to radio modems **9010** to **9013** according to an instruction from the controller **2013**. The modem circuits **9010** to **9013** are modems having respective fixed transmission capacity values and differ from each other only in the frequency band for transmission. The modems **9010** to **9013** respectively have bands A to D as shown in FIG. **11**. Terminals **9006** and **9007** are input terminals to receive signals and are arranged respectively for radio modems **9010** to **9013**. In operation, the modems **9010** to **9013** may be appropriately combined with each other. For example, under supervision of the assignment controller **9005**, the modems **9010** and **9011** are employed to transmit video information and the modems **9012** and **9013** are utilized for communication with the network such as the Internet depending on cases. That is, while the interface circuit **2011** transmits by radio video information and audio information via the modems **9010** and **9011** to the video display apparatus **200**, the interface circuit **2012** communicates via the modems **9012** and **9013** with the network. In a situation wherein a wide band is required to receive video information of high picture quality (e.g., video information of HD resolution) from the video processing apparatus **100**, the modems **9010** to **9012** are allocated to transmit video information and only the modem **9013** is allocated to communicate with the network such as the Internet. That is, the interface circuit **2011** transmits video and audio information by radio via the modems **9010** to **9012** to the video display apparatus **200**, and the interface circuit **2012** communicates with the network via the modem **9013**. Resultantly, video information of high picture quality can be continuously transmitted and it is also possible to communicate with the Internet. In particular, the broadcast signal is required to be presented by synchronizing the time information sent from the broadcasting station with that on the receiver side. According to the embodiment, the time information can be appropriately controlled without deteriorating the quality of the video information.

Description will now be given supplementally of the High Definition Digital Multimedia Interface (HDMI). FIG. **7** shows an example the HDMI configuration mainly including a transmission side and a reception side. The transmission side includes a transmitter section **1601** and a transmission controller section **1603** to control the transmitter section **1601**. The transmitter section **1601** encodes a video signal (Y, Pb, Pr) and an audio signal to output resultant signals to a receiver section **1604**. Also, the transmitter section **1601** includes a TMDS encoder circuit **1602** which converts the video signal (Y, Pb, Pr) and the audio signal respectively into serial video data and serial audio data. On the other hand, the reception side includes a receiver section **1604** and a reception controller section **1606** to control the receiver section **1604**. The receiver section **1604** receives the video data and the audio data from the transmitter section **1601** and conducts a TMDS decoding operation for the data by a TMDS decoder circuit **1605** to thereby reproduce baseband video data and baseband audio data. A CEC line **1607** is an apparatus control line to transmit a control signal for apparatuses. Display specification information known as "DDC" is transmitted via a DDC line **1608**. The reception side transmits to the transmission side a Hot Plug Detect (HPD) signal **1609** indicating that a connection is established between apparatuses of the transmission and reception sides.

To conduct transmission according to the HDMI standard, apparatuses mutually recognize in a procedure as follows. A physical address is obtained via the DDC line. The physical address is an identification number to discriminate an associated apparatus. By use of a CEC bus for bidirectional connection, a logical address is obtained for bidirectional communication of each apparatus. The logical address is identification information defining a category of each apparatus, e.g., a display or a recording apparatus.

FIG. **5** is a diagram to supplementally explain a radio interface **11** between the video processing apparatus **100** and the video display apparatus **200**. In FIG. **5**, the apparatuses **100** and **200** are almost the same as those described in conjunction with, for example, FIG. **1**. To simplify explanation, for the constituent components of the apparatus **100**, only the radio interface circuit **133** is shown in FIG. **8** and the other constituent components are not shown. For the constituent components of the display apparatus **200**, only the radio input/output interface circuit **2012** is shown and the other constituent components are not shown. The interface circuits **133** and **2012** are bidirectional interfaces.

In FIG. **5**, a channel between antennas **81** and **84** and a channel between antennas **82** and **85** are channels to bidirectionally transmit a video signal, an audio signal, and control signals indicating copyright protection and a replication restriction condition of contents. On the other hand, a channel between antennas **83** and **86** is disposed to transmit an inter-apparatus control signal. Bit selection circuits **811** and **812** receive the video signal, the audio signal, the control signals indicating copyright protection

and a replication restriction condition of contents, and the inter-apparatus control signal. In the demodulation, the QPSK demodulation scheme is more resistive against transmission errors as compared with the 64QAM demodulation scheme. For the transmission efficiency, the 64QAM demodulation scheme is superior to the QPSK demodulation scheme. Description will now be given of a situation wherein a video signal, an audio signal, and control signals indicating copyright protection and a replication restriction condition of contents are fed from the video processing apparatus **100** to the video display apparatus **200**. Assume in the operation that the transmission direction from the apparatus **100** to the apparatus **200** is an uplink direction and the transmission direction from the apparatus **200** to the apparatus **100** is an downlink direction.

To transmit information, the video processing apparatus **100** determines, by a carrier detector circuit, not shown, a state of an associated transmission path, i.e., whether or not the channel is reserved for another apparatus. In the carrier detection, a check is made to determine whether or not a carrier is detected in a predetermined frequency band for a predetermined period of time. If it is detected by the detector that the channel is occupied by another apparatus, the check is again carried out after a lapse of a predetermined period of time to determine whether or not an available channel is present. If such available channel is present, the condition is notified to the microprocessor **115** of the video processing apparatus **100**. The microprocessor **115** outputs from a QPSK modem circuit **803** a channel use request signal as an inter-apparatus control signal to secure the channel use right. Thereafter, the microprocessor **115** sends a transmission request signal to a bit selection circuit **811**. An error control circuit **843** adds an error control bit for error detection and correction to the transmission request signal and then transfers the signal to the QPSK modem **803**. The modem **803** conducts a QPSK modulation for the signal to resultantly transmit a radio signal via the antenna **83** to the display apparatus **200**. The apparatus **200** then receives the radio signal by the antenna **86**, carries out a QPSK demodulation for the signal by a QPSK modem **806**, conducts error detection and correction control for the demodulated signal by an error control circuit **847** to produce an inter-apparatus control signal, and delivers the signal to the bit selection circuit **812**.

The microprocessor in the video display apparatus **200** decodes the inter-apparatus control signal and receives the transmission request signal from the video processing apparatus **100** together with apparatus category information regarding the apparatus **100** (information to identify a category indicating whether the associated apparatus is a display apparatus or a recording apparatus) and an apparatus identification number of the apparatus **100**. An image to urge the user to determine whether or not a connection is established to the video processing apparatus **100** is presented on a display screen of the display apparatus **200**. In response thereto, the user indicates allowance for the connection by using an input device such as a remote controller of the display apparatus **200**. Thereafter, between the apparatuses **100** and **200**, the apparatus category information and the identification number to identify each of the apparatuses are communicated to exchange information to observe the copyright protection and the replication restriction condition of the content. If there does not exist any problem, it is allowed that the apparatuses **100** and **200** are connected to each other. In a situation wherein the connection is meaningless, for example, each of the apparatuses **100** and **200** is an input or output dedicated unit or the copyright protection or the replication restriction condition of the content is not observed, the connecting operation is interrupted and an indication of the condition is displayed on the apparatuses **100** and **200**. Description will now be given of a situation wherein the copyright protection and the replication restriction condition of the content are observed.

By using the video signal, the audio signal, and the control signal indicating the copyright protection and the replication restriction condition of the contents associated with the video and audio signals which are inputted to an interface circuit **172**, two bits are selected from the Most-Significant Byte (MSB) of the video signal so that error detection and correction control bits are added thereto by an error control circuit **841** and the resultant signal is fed to a QPSK modem circuit **801**. The modem circuit **801** conducts a QPSK modulation for the signal and then transmits an associated radio signal from the antenna **81**. To the remaining third to eighth bits, an error control circuit **842** adds error detection and correction control bits to send the resultant signal to a 64QAM modem circuit **802**. The modem **802** carries out a 64QAM modulation for the signal and resultantly transmits a radio signal from the antenna **82**.

In the video display apparatus **200**, a QPSK modem circuit **804** conducts a QPSK demodulation for the signal received via the antenna **84** and an error control circuit **845** carries out error control for the resultant signal to output two high-order bits of the video signal to the bit control circuit **812**. For the remaining signals received via the antenna **85**, a 64QAM modem circuit **805** conducts a 64QAM demodulation. For the resultant signal, an error control circuit **846** carries out error control to output the obtained signal to the bit control circuit **812**.

Description will now be given of the inter-apparatus control signal. When an inter-apparatus control signal is sent in a downlink direction, i.e., from the video display apparatus **200** to the video processing apparatus **100**, the signal is fed from the bit selection circuit **812** via the error control circuit **847** to the QPSK modem circuit **806** to be demodulated. The demodulated signal is delivered from the antenna **86**. The video processing apparatus **100** receives the signal by the antenna **83** to send the signal to the QPSK modem circuit **803**. For the signal, the circuit **803** conducts a QPSK demodulation. For the demodulated signal, an error detection and correction is carried out by the error control circuit **843** to feed the resultant signal to the bit selection circuit **811**. Conversely, when an inter-apparatus control signal is transmitted in an uplink direction, i.e., from the video processing apparatus **100** to the video display apparatus **200**, the signal is fed from the bit selection circuit **811** via the error control circuit **843** to the QPSK modem circuit **803** to be modulated. The modulated signal is outputted from the antenna **83**. The display apparatus **200** receives the signal by the antenna **86**. For the signal, the modem **806** conducts a QPSK demodulation. For the demodulated signal, the error control circuit **847** conducts an error detection and correction to send the resultant signal to the bit selection circuit **812**. By virtue of the operation, there is obtained an advantage that for the inter-apparatus control signal which is important to construct the system, an erroneous operation is less frequently occurs even in a noisy environment.

In the configuration of the embodiment, for two high-order bits of the digital signal, there can be conducted the transmission highly resistive against noise with a relatively low transmission rate. That is, by using the fact that higher order bits of a video signal more strongly affect the picture quality, two bits are taken out from the video signal in order of MSB and a transmission path using the QPSK modulation

is allocated to the information of these two bits, to thereby preventing deterioration of the picture quality. In a system in which the audio information is more important than the video information, the transmission path using the QPSK modulation may be allocated to important bits, e.g., two high-order bits of the audio signal.

When a human perceives an image on a screen, a higher-frequency is less influential as compared with a lower-frequency component for the frequency component in the horizontal direction of the screen and that in the vertical direction thereof. For a moving object on the screen, it is likely that the human eyes cannot appropriately follow a high-speed movement of the object. By using these tendencies, it is also possible that in the horizontal direction of the screen, the signal is subdivided into a lower-frequency component and a higher-frequency component so that the QPSK modulation is used for the lower-frequency component and the 64QAM modulation is employed for the higher-frequency component. As a result, within the limited transmission bands, the noise resistivity can be increased for important information and the overall transmission capacity is secured. Similarly, it is possible that in the vertical direction of the screen, the signal is subdivided into a lower-frequency component and a higher-frequency component so that the QPSK modulation is used for the lower-frequency component and the 64QAM modulation is employed for the higher-frequency component. Resultantly, within the limited transmission bands, it is possible to heighten the noise resistivity for important information and the overall transmission capacity is secured. Additionally, by combining the operation for the frequency component in the horizontal direction of the screen with that for the frequency component in the vertical direction of the screen, the noise resistivity can be strengthened for desired important information.

In the description above, the error control circuits **841** to **843** add the error control information items to the bits inputted respectively thereto. However, it is also possible that the bits inputted to the circuits **841** to **843** are collectively treated as one word to add error control information to the word. This advantageously leads to a simplified configuration of the error control circuits.

Although detailed description has not been given of the encryption in the embodiment shown in FIG. **5**, it is possible to execute the processing as shown in FIG. **6** by combining the encryption circuit **171** with the interface circuit **172**. FIG. **6** shows an example of the configuration to carry out the encryption in the system of FIG. **5**. The system shown in FIG. **6** includes encryption/decryption circuits **821** to **826**, interface circuits **830** and **831** including encryption, and error control circuits **841** to **847**.

In the example of FIG. **6**, the bit selection circuit **811** selects predetermined bits as in the example shown in FIG. **5**. For the respective bits, the error control circuits **841** and **842** conduct error control. For the resultant signals, the encryption/decryption circuits **821** and **822** respectively carry out encryption. The obtained signals are inputted respectively to the QPSK modem circuit **801** and the 64QAM modem circuit **802** to be demodulated. The signals demodulated respectively by the circuits **801** and **802** are delivered to the encryption/decryption circuits **824** and **825** to be decrypted. The decrypted signals are fed to the bit selection circuit **812** and are therein bit-combined with each other. As a result, the signal processing can be executed according to importance of signals to possibly suppress errors in the processing of more important information. Hence, the signals of information can be efficiently transmitted without deteriorating the picture quality.

It is also possible to further increase transmission efficiency by combining lossless coding with the encryption/decryption circuits **821** to **826**. For example, in the example of FIG. **6**, before executing the encryption processing in the encryption/decryption circuits **821** to **823**, the number of bits to be transmitted is reduced, for example, by use of reversible arithmetic codes based on a statistic property. In the video display apparatus **200**, the received signals are decrypted by the encryption/decryption circuits **824** to **826**. Thereafter, the reversible codes corresponding to the circuits **821** to **823** are decoded to be fed to the error control circuits **845** to **846** for the error detection and correction thereof. The obtained signals are fed to the bit selection circuit **812** to be bit-combined with each other. Since the transmission rate of the information to be transmitted can be lowered by combining the reversible codes as above, the signal can be more efficiently transmitted.

Description will be supplementally given of the encryption. By using AES128 bit encryption in all encryption circuits for the encryption, it is possible to conduct the encryption with high safety for the protection of contents. Moreover, if the AES128 bit encryption is employed for the content encryption circuit **821** and the Data Encryption Standard (DES) encryption is used for the other encryption circuits, there can be easily constructed a system in which the protection of important contents and the processing efficiency are appropriately achieved.

It is also possible to construct a system in which a changeover operation is conducted between the baseband signal transmission and the compressed signal transmission in response to an inter-apparatus control signal. With the configuration, to transmit a compressed signal according to, for example, a content protection request, the error resistivity is enhanced on the transmission path by transmitting the signal using the QPSK modulation. To transmit the baseband signal, the transmission efficiency is increased by using the 64QAM modulation.

The operations of the video processing apparatus **100** and the video display apparatus **200** in FIG. **6** are basically similar to those of the apparatuses **100** and **200** shown in FIG. **5**. To transmit a signal, the video processing apparatus **100** determines the state of an associated transmission path, specifically, detects by a carrier detection circuit, not shown, whether or not the channel to be used is occupied by another apparatus. In the carrier detection, a check is made to determined whether or not a carrier is detected in a predetermined frequency band for a predetermined period of time. If it is detected by the detector that the channel is occupied by another apparatus, the check is again carried out after a lapse of a predetermined period of time to determine whether or not an available channel is present. If such available channel is present, the condition is notified to the microprocessor **115** of the video processing apparatus **100**. The microprocessor **115** outputs from the QPSK modem circuit **803** a channel use request signal as an inter-apparatus control signal to secure the channel use right. Thereafter, the microprocessor **115** sends a transmission request signal to a bit selection circuit **811**.

The error control circuit **843** adds error control bits for error detection and correction to the transmission request signal which is in turn encrypted by an encryption/decryption circuit **823** and then transferred to the QPSK modem **803**. The modem **803** conducts a QPSK modulation for the signal to resultantly transmit a radio signal via the antenna **83** to the display apparatus **200**. The apparatus **200** then

receives the radio signal by the antenna **86**, carries out a QPSK demodulation for the signal by the modem **806**, and decrypts the signal by the encryption/decryption circuit **826**. For the demodulated signal, the error control circuit **847** conducts error detection and correction control to produce an inter-apparatus control signal and delivers the signal to the bit selection circuit **812**. The microprocessor in the video display apparatus **200** decodes the inter-apparatus control signal and receives the transmission request signal from the video processing apparatus **100** together with apparatus category information regarding the apparatus **100** (information to identify a category indicating whether the associated apparatus is a display apparatus or a recording apparatus) and an apparatus identification number of the apparatus **100**. An image to urge the user to determine whether or not a connection is established to the video processing apparatus **100** is presented on a display screen of the display apparatus **200**. In response thereto, the user indicates allowance for the connection by use of an input device such as a remote control of the display apparatus **200**. Thereafter, between the apparatuses **100** and **200**, the apparatus category information and the identification number to identify each of the apparatuses are communicated to exchange information to observe the copyright protection and the replication restriction condition of the content. If there does not exist any problem, it is allowed that the apparatuses **100** and **200** are connected to each other. In a situation wherein the connection is meaningless, for example, each of the apparatuses **100** and **200** is an input or output dedicated unit or the copyright protection or the replication restriction condition of the content is not observed, the connecting operation is interrupted and the status is displayed on the apparatuses **100** and **200**. As above, in a situation wherein the copyright protection and the replication restriction condition of the content are observed, the connection is established to transmit video and audio signals from the video processing apparatus **100** to the video display apparatus **200**.

Second Embodiment

FIG. **3** shows a second embodiment of the present invention and is another configuration of the video display apparatus **200** shown in FIG. **1**. The configuration of FIG. **3** is partially equal to that of FIG. **2**. The same constituent components are assigned with the same reference numerals, and detailed description thereof will be avoided. The apparatus **200** of FIG. **3** includes a decryption circuit **212**, encryption/decryption circuits **245** and **290**, compression/transcoding circuits **291** and **292**, and copy control circuit **293** which is a multiplexing circuit.

In the embodiment of FIG. **3**, when a baseband signal is inputted via the terminal **201** or **202**, the system operates in almost the same way as for the embodiment shown in FIG. **2**. Each of the compression/transcoding circuits **291** and **292** operates as a compression circuit for the baseband signal. When a compressed signal is inputted from the terminal **201** or **202**, the signal is fed via the input/output interface **210** to the encryption/decryption circuit **212** to be decrypted. The signal is then delivered to the demultiplexer circuit **250** to be separated into a compressed video signal and a compressed audio signal. These signals are inputted to the replication control circuit **290**, which determines allowance or rejection of replication of the signals based on information indicating a replication restriction condition. If the replication is allowed, the bit rates of the compressed video and audio signals are lowered by the compression/transcoding circuits **291** and **292** by using, for example, a compression method having high compression efficiency according to necessity. Output signals from the circuits **291** and **292** are multiplexed by the multiplexer circuit **293** to be inputted to the encryption/decryption circuit **245**. In this situation, if the replication is allowed by the replication control circuit **290**, the circuit **245** encrypts the input signal for the storage thereof to store the encrypted signals in the storage **230** and/or the memory **221**. To reproduce the stored signal, the circuit **245** decrypts the signal read from the storage **230** or the memory **221**, and the decrypted signal is separated by the demultiplexer circuit **241** into a video signal and an audio signal. Thereafter, these signals are processed in almost the same way as described above and the user resultantly enjoys the image and the sound. In a situation wherein the user enjoys the image and the sound while storing the signal in the storage **230** or the memory **221**, the signal from the multiplexer **293** is delivered via the encryption/decryption circuit **245** to the demultiplexer **241** to be processed almost in the same way as above. In this case, it is possible to confirm the picture quality of the transcoded signal. To enjoy the image and the sound without storing the signal, the signal is fed from the decryption circuit **212** via the circuit **245** to the demultiplexer **241** to be separated into a video signal and an audio signal. Thereafter, the signals are processed in substantially the same way as described above.

According to the embodiment of FIG. **3**, also in a situation wherein a compressed signal is inputted thereto, by conducting the transcoding for the signal, the signal can be efficiently stored with a high compression ratio. Although the signal processing is carried out by use of circuits such as the compression circuits **111** and **113** in the embodiment, the circuits may be implemented by software means. In this situation, there can also be obtained similar advantages. According to the present invention, the signal processing may be accomplished in any appropriate fashion, that is, the present invention does not particularly limit how to implement the signal processing.

It should be further understood by those skilled in the art that although the foregoing description has been made on embodiments of the invention, the invention is not limited thereto and various changes and modifications may be made without departing from the spirit of the invention and the scope of the appended claims.

The invention claimed is:

1. A video processing apparatus, comprising:

a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the first radio communication circuit capable of transmitting video information by radio or receiving information by radio using the first transmission frequency band;

a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band;

a third radio communication circuit capable of transmitting information and using a third transmission frequency band;

an imaging circuit capable of receiving video information and still picture information via an optical system;

a compression circuit compressing the still picture information using a first type of compression method and the video information using a second type of compression method;

an accumulation circuit capable of accumulating video information received by the imaging circuit; and a controller controlling assignment of connection of each of the first, second, and third radio communication circuits,

wherein the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio,

wherein when an indication from a user indicates to transmit video information using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video,

wherein the controller controls each of the first and second radio communication circuit so that the first radio communication circuit transmits video information while the second radio communication circuit connects to the internet or the home network, and

wherein one of the first, second, or third radio communication circuits receives a signal from the internet indicating that an update for an operating system of the video processing apparatus is available, and the video processing apparatus executes an update process such that an updated operating system of the video processing apparatus is stored in the video processing apparatus after execution of the update process.

2. The video processing apparatus according to claim **1**, wherein, upon receiving an indication to transmit video information accumulated in the accumulation circuit via the first radio communication circuit, the controller assigns connection of the first radio communication circuit prior to connection of the second radio communication circuit.

3. The video processing apparatus according to claim **1**, wherein, upon receiving an indication to transmit video information accumulated in the accumulation circuit via the first radio communication circuit while acquiring information from the internet via the second radio communication circuit, the controller assigns connection of the first radio communication circuit prior to connection of the second radio communication circuit.

4. The video processing apparatus according to claim **1**, further comprising a radio interface capable of receiving video information by radio,

wherein the accumulation circuit accumulates the video information received via the radio interface, and

the first radio communication circuit is further capable of transmitting the accumulated video information.

5. The video processing apparatus of claim **1**, further comprising a fourth radio communication circuit capable of transmitting information and using a fourth transmission frequency band that is different from the first, second, and third transmission frequency bands, wherein the controller controls assignment of connection of each of the first, second, third, and fourth radio communication circuits.

6. The video processing apparatus of claim **1**, wherein the third transmission frequency band is different from the first and second transmission frequency bands.

7. The video processing apparatus of claim **1**, wherein transmitting of the information by the third radio communication circuit comprises transmitting video information to the external device.

8. The video processing apparatus of claim **1**, wherein transmitting of the information by the third radio communication circuit comprises connecting to the internet.

9. The video processing apparatus of claim **1**, further comprising an input device capable of receiving a user's selection of content to be displayed on the video processing apparatus.

10. The video processing apparatus of claim **1**, wherein one of the first, second, or third radio communication circuits receive a signal from the internet indicating that an update for an application of the video processing apparatus is available, and the video processing apparatus executes an application update process such that an updated application of the video processing apparatus is stored in the video processing apparatus after execution of the application update process.

11. The video processing apparatus of claim **1**, further comprising:

a display for displaying a screen requesting user input, wherein the displayed screen prompts the user for a user input that indicates whether the user allows a connection between the first radio communication circuit and the external device to be established, wherein in response to receiving the user input indicating allowance of the connection, the first radio communication circuit transmits the accumulated video information to the external device.

12. The video processing apparatus of claim **1**, wherein the second modulation scheme comprises quadrature amplitude modulation (QAM).

13. The video processing apparatus of claim **1**, wherein the second radio communication circuit is controllable to change from the second modulation scheme to a different modulation scheme.

14. The video processing apparatus of claim **1**, wherein the video processing apparatus comprises a cellular phone.

15. The video processing apparatus of claim **1**, wherein the second and third radio communication circuits conduct demodulation through Orthogonal Frequency Division Multiplexing (OFDM).

16. The video processing apparatus of claim **1**, wherein at least the first radio communication circuit and the third radio communication circuit are implemented as a combined circuit.

17. A method for video processing, comprising:

receiving video information and still picture information via an optical system by an imaging circuit of a video processing apparatus;

compressing the still picture information using a first type of compression method and the video information using a second type of compression method;

accumulating video information received by the imaging circuit;

implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band;

transmitting, using the first transmission frequency band, the video information to an external device by radio, via a first radio communication circuit;

implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band;

connecting, by radio, to an internet or a home network to transmit and receive information using the second transmission frequency band, via a second radio communication circuit;

transmitting, via a third radio communication circuit, information using a third transmission frequency band;

controlling, via a controller, assignment of connection of each of the first, second, and third radio communication circuits, wherein when an indication from a user indicates to transmit video information using the first radio communication circuit, a connection is assigned to the first radio communication circuit for transmitting the video,

wherein the transmitting and connecting is controlled so that the first radio communication circuit transmits video information while the second radio communication circuit connects to the internet or the home network;

receiving, via one of the first, second, or third radio communication circuits a signal from the internet indicating that an update for an operating system is available;

executing the update process; and

storing an updated operating system after execution of the update process.

18. The method of claim **17**, further comprising transmitting, via a fourth radio communication circuit, information using a fourth transmission frequency band that is different from the first, second, and third transmission frequency bands.

19. The method of claim **17**, wherein transmitting of the information by the third radio communication circuit comprises connecting to the internet.

20. The method of claim **17**, further comprising:

receiving, via one of the first, second, or third radio communication circuits a signal from the internet indicating that an update for an application is available;

executing the application update process; and

storing an updated application after execution of the application update process.

21. The method of claim **17**, further comprising:

displaying a screen requesting user input, the displayed screen prompting the user for a user input that indicates whether the user allows a connection between the first radio communication circuit and the external device to be established;

receiving a user input indicating allowance of the connection;

transmitting, via the first radio communication circuit, the accumulated video information to the external device in response to receiving the user input indicating allowance.

22. The method of claim **17**, wherein the second modulation scheme comprises quadrature amplitude modulation (QAM).

23. The method of claim **17**, further comprising controlling the second radio communication circuit to change modulation scheme from the second modulation scheme to a different modulation scheme.

24. The method of claim **17**, further comprising conducting demodulation through Orthogonal Frequency Division Multiplexing (OFDM) via the second and third radio communication circuits.

25. A cellular phone, comprising:

a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and first transmission frequency band, the first radio communication circuit capable of transmitting video information by radio or receiving information by radio using the first transmission frequency band;

a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band;

a third radio communication circuit capable of transmitting information using a third transmission frequency band;

a fourth radio communication circuit capable of transmitting information using a fourth transmission frequency band;

an imaging circuit capable of receiving video information and still picture information via an optical system;

a compression circuit compressing the still picture information using a first type of compression method and the video information using a second type of compression method;

a microphone receiving audio information corresponding to the video information received via the imaging circuit;

an accumulation circuit capable of accumulating video information received by the imaging circuit and audio information received by the microphone, wherein the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio;

a display displaying the video information received by the first radio communication circuit and displaying information received by the second radio communication circuit via the internet or home network;

a controller controlling assignment of connection of each of the first, second, third, and fourth radio communication circuits,

wherein when an indication from a user indicates to transmit video information using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video information,

wherein the controller controls each of the first and second radio communication circuit so that the first radio communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network, and

wherein one of the first, second, or third radio communication circuits receives a signal from the internet indicating that an update for an operating system of the cellular phone is available, and the cellular phone executes an update process such that an updated operating system of the cellular phone is stored in the cellular phone after execution of the update process.

26. The cellular phone of claim **25**, wherein one of the first, second, or third radio communication circuits receive a signal from the internet indicating that an update for an application of the cellular phone is available, and the cellular phone executes an application update process such that an updated application of the cellular phone is stored in the cellular phone after execution of the application update process.

27. The cellular phone of claim 25, wherein the first modulation scheme comprises shift keying modulation and the second modulation scheme comprises quadrature amplitude modulation (QAM).

28. A video processing apparatus, comprising:

a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the first radio communication circuit capable of transmitting video information by radio or receiving information by radio using the first transmission frequency band;

a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band;

a third radio communication circuit capable of transmitting information and using a third transmission frequency band;

means for receiving video information and still picture information via an optical system;

means for compressing the still picture information using a first type of compression method and the video information using a second type of compression method;

means for accumulating video information received by the means for receiving; and

means for controlling assignment of connection of each of the first, second, and third radio communication circuits,

wherein the first radio communication circuit can transmit video information accumulated in the means for accumulating to an external device by radio,

wherein when an indication from the user indicates to transmit video information using the first radio communication circuit, the means for controlling assigns a connection to the first radio communication circuit for transmitting the video,

wherein the means for controlling controls each of the first and second radio communication circuit so that the first radio communication circuit transmits video information while the second radio communication circuit connects to the internet or the home network, and

wherein one of the first, second, or third radio communication circuits receive a signal from the internet indicating that an update for an operating system of the video processing apparatus is available, and the video processing apparatus executes an update process such that an updated operating system of the video processing apparatus is stored in the video processing apparatus after execution of the update process.

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