

(12) STANDARD PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. **AU 2006285700 B2**

(54) Title
Receiving device

(51) International Patent Classification(s)
A61B 1/00 (2006.01) **A61B 5/07** (2006.01)

(21) Application No: **2006285700** (22) Date of Filing: **2006.09.01**

(87) WIPO No: **WO07/026891**

(30) Priority Data

(31) Number (32) Date (33) Country
2005-255496 **2005.09.02** **JP**

(43) Publication Date: **2007.03.08**

(44) Accepted Journal Date: **2010.06.10**

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(56) Related Art
US 2005/0049488
US 2002/0032366

(19) 世界知的所有権機関
国際事務局



(43) 国際公開日
2007年3月8日 (08.03.2007)

PCT

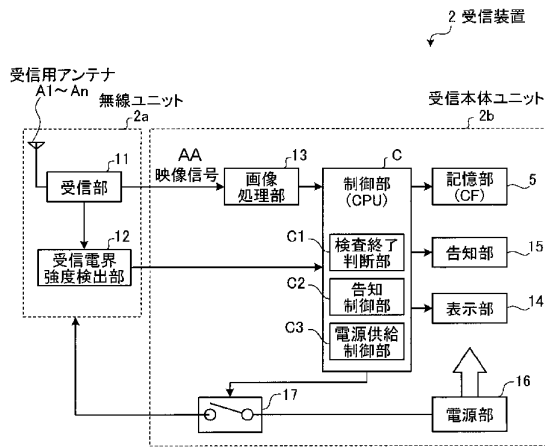
(10) 国際公開番号
WO 2007/026891 A1

- (51) 国際特許分類:
A61B 1/00 (2006.01) A61B 5/07 (2006.01)
- (21) 国際出願番号: PCT/JP2006/317375
- (22) 国際出願日: 2006年9月1日 (01.09.2006)
- (25) 国際出願の言語: 日本語
- (26) 国際公開の言語: 日本語
- (30) 優先権データ:
特願2005-255496 2005年9月2日 (02.09.2005) JP
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- (81) 指定国 (表示のない限り、全ての種類の国内保護が可能): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG,

[続葉有]

(54) Title: RECEIVING DEVICE

(54) 発明の名称: 受信装置



- 2... RECEIVING DEVICE
- 2b... RECEIVING BODY UNIT
- A1-An... RECEIVING ANTENNA
- 2a... WIRELESS UNIT
- 11... RECEIVING SECTION
- 12... SECTION FOR DETECTING RECEIVING FIELD STRENGTH
- AA... VIDEO SIGNAL
- 13... IMAGE PROCESSING SECTION
- C... CONTROL SECTION(CPU)
- C1... SECTION FOR DETERMINING COMPLETION OF EXAMINATION
- C2... INFORMATION CONTROL SECTION
- C3... ELECTRIC POWER SUPPLY CONTROL SECTION
- 5... STORAGE SECTION(CF)
- 15... INFORMATION SECTION
- 14... DISPLAY SECTION
- 16... ELECTRIC POWER SOURCE SECTION

(57) Abstract: Examination is considered to be complete when a predetermined time has passed after the start of the examination by a capsule endoscope (3)(device to be introduced into a subject) and simultaneously when receiving field strength of receiving antennas (A1-An) detected in a predetermined time period is equal to or less than a predetermined value, and such conditions as above are set in advance. Then, whether the predetermined conditions are stratified is determined by an examination completion determination section (C1), and according to the result of the determination, an informing control section (C2) causes an informing section (15) to inform the completion of the examination and, in addition, an electric power supply control section (C3) stops power supply to a wireless unit (2a). As a result, waste of electric power is prevented and the completion of examination by the device to be introduced into a subject is recognized.

(57) 要約: カプセル型内視鏡3(被検体内導入装置)による検査開始から所定時間経過し、かつ所定期間に検出された受信アンテナA1~Anの受信電界強度が所定値以下の場合に検査終了とみなす条件をあらかじめ設定し、この所定条件を満たしたか否かを検査終了判断部C1で判断し、この判断結果に応じて、告知制御部C2が告知部15に検査終了の告知を行わせ、さらに電源供給制御部C3が無線ユニット2aへの電源供給を止めることで、不要な電源消費の防止および被検体内導入装置による検査終了の認識を行う。

WO 2007/026891 A1



BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

KG, KZ, MD, RU, TJ, TM), ヨーロッパ (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:

— 国際調査報告書

(84) 指定国 (表示のない限り、全ての種類の広域保護が可能): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア (AM, AZ, BY,

2文字コード及び他の略語については、定期発行される各PCTガゼットの巻頭に掲載されている「コードと略語のガイダンスノート」を参照。

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RECEIVING APPARATUS

TECHNICAL FIELD

[0001] The present invention relates to a receiving
5 apparatus which acquires transmission data transmitted from
a body insertable device such as a capsule endoscope which
is introduced into a subject body and acquires intra-subject
information, for example.

10 BACKGROUND OF INVENTION

[0002] In recent years, a capsule endoscope having an
imaging function and a radio communication function appears
in a field of endoscope. After being swallowed by a patient,
i.e., a subject (human body), from the mouth for an
15 observation (examination), the capsule endoscope travels
through inside internal organs (body cavities) such as
esophagus, stomach, and small intestine following
peristaltic movements and sequentially captures images using
the imaging function until naturally discharged from a
20 living body of the patient, in other word, during an
observation period.

[0003] During the observation period in which the capsule
endoscope travels through the internal organs, the capsule
endoscope captures images in the body cavities thereby
25 obtaining image data, and sequentially transmits the image
data to an outside of the subject body via radio
communication, for example, using the radio communication
function. The image data received is accumulated in a memory
inside an external receiving apparatus. When the patient
30 carries the receiving apparatus equipped with the radio
communication function and the memory function, the patient
can move freely without inconveniences even after swallowing

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the capsule endoscope and before discharging the same, i.e., even during the observation period. After the observation finishes, a doctor can display images inside 5 the body cavities on a display unit or the like based on the image data accumulated in the memory of the receiving apparatus, and make diagnosis (see Patent Document 1, for example).

[0004] Patent Document 1: Japanese Patent Application Laid-Open No. 2003-19111.

[0005] However, the receiving apparatus according to Patent Document 1 does not have a notifying unit to notify an end of examination. Therefore, even when the capsule endoscope stops sending electric waves due to battery exhaustion and the examination is terminated halfway, for example, the subject does not notice the end of the examination and keeps on carrying the receiving apparatus, whereby physical burden on the subject may increase. In addition, the power supply to a receiving unit in the receiving apparatus does not stop even after the examination terminates, whereby power is consumed in waste.

[0006] In view of the foregoing, it is desirable to provide a receiving apparatus which can prevent unnecessary power consumption. It is also desirable to make it possible to recognize the end of examination by the body insertable device.

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SUMMARY OF THE INVENTION

[0006a] A receiving apparatus comprising:

a receiver which receives transmission data transmitted from a body insertable device which is introduced into a subject body to acquire intra-subject information for an examination;

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a determiner which determines whether a predetermined

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condition is satisfied to determine that the examination is complete; and

a power supply controller which controls so that power supply at least to the receiver is cut according to a result
5 of determination by the determiner; and

a notifier which notifies that the examination is complete according to the result of determination by the determiner.

[0007] According to one embodiment of the present
10 invention, a receiving apparatus includes a receiver which receives transmission data transmitted from a body insertable device; a determiner which determines whether a predetermined condition to determine that an examination completes is satisfied or not; and a power supply controller
15 which controls so that power supply at least to the receiver is cut according to a result of determination by the determiner.

[0008] The receiving apparatus may further include a notifier which notifies that the examination completes
20 according to the result of determination by the determiner.

[0009] In the receiving apparatus, the receiver may receive the transmission data transmitted from the body insertable device using a receiving antenna, and the receiving apparatus may further include a received electric-
25 field strength detector which detects received electric-field strength of the receiving antenna, and the determiner may determine that the predetermined condition to determine that the examination completes is satisfied, when a predetermined time period has passed since the examination
30 starts, and when the received electric-field strength detected by the received electric-field strength detector during a predetermined time period is not higher than a

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predetermined value.

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[0010] In the receiving apparatus, the receiver may receive image data as the transmission data from the body insertable device, and the receiving apparatus may further include an image reception detector which detects that the receiver fails to receive the image data, and the determiner determines that the predetermined condition to determine that the examination completes is satisfied, when the predetermined time period has passed since the examination starts, and when the image reception detector does not detect the reception of the image data for a predetermined time period.

[0011] In the receiving apparatus, the receiver may receive image data as the transmission data from the body insertable device, and the receiving apparatus may further include a color distribution detector which detects color distribution of the image data received by the receiver, and the determiner may determine whether the predetermined condition to determine that the examination completes is satisfied or not based on the color distribution detected by the color distribution detector.

[0012] In the receiving apparatus, the determiner may regard a start of power supply to the apparatus or a first reception of the transmission data transmitted from the body insertable device by the receiver after the power supply starts, as the start of the examination, and the determiner may regard as that the predetermined time period has passed, when the determiner detects that the predetermined time period has passed after counting of time starts from a start of the examination, or when the determiner detects that a number of transmission data transmitted from the body insertable device at a predetermined transmission rate reaches to a predetermined number.

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[0013] According to embodiments of the present invention, the predetermined condition to determine that the examination completes is set in advance, and the determiner
5 determines whether the predetermined condition is satisfied or not, and cuts the power supply to the receiver, which receives the transmission data from the body insertable device, according to the result of determination, whereby an unnecessary power consumption can be prevented.

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BRIEF DESCRIPTION OF DRAWINGS

[0013a] Preferred embodiments of the present invention are hereinafter described, by way of example only, with reference to the accompanying drawings, wherein:

15 [0014] FIG. 1 is a schematic diagram of an overall structure of a wireless in-vivo information acquiring system;

FIG. 2 is a block diagram of a structure of a receiving apparatus according to a first embodiment;

20 FIG. 3 is a flowchart of an operation of the receiving apparatus shown in FIG. 2;

FIG. 4 is a block diagram of a structure of a receiving apparatus according to a second embodiment;

25 FIG. 5 is a flowchart of an operation of the receiving apparatus shown in FIG. 4;

FIG. 6 is a block diagram of a structure of a receiving apparatus according to a third embodiment; and

FIG. 7 is a flowchart of an operation of the receiving apparatus shown in FIG. 6.

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EXPLANATIONS OF LETTERS OR NUMERALS

[0015] 1 Subject

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- 2 Receiving apparatus
- 2a Radio unit
- 2b Main receiving unit
- 3 Capsule endoscope
- 5 4 Display device
- 5 Portable recording medium (storage unit)
- 11 Receiving unit
- 12 Received electric-field strength detector
- 13 Image processor
- 10 14 Display unit
- 15 Notifying unit
- 16 Power supply unit
- 17 Switching unit
- 18 Image reception detecting unit
- 15 19 Color distribution detecting unit
- A1 to An Receiving antenna
- C Control unit
- C1 Examination completion determining unit
- C2 Notification controller
- 20 C3 Power supply controller

DETAILED DESCRIPTION

[0016] Exemplary embodiments of a receiving apparatus according to the present invention will be described in
 25 detail below with reference to the drawings of FIGS. 1 to 7. It should be noted that the present invention is not limited to the embodiments and that various modifications can be made without departing from the scope of the present invention.

30 First Embodiment

[0017] FIG. 1 is a schematic diagram of an overall structure of a wireless in-vivo information acquiring

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system. The wireless in-vivo information acquiring system includes a capsule endoscope as an example of a body insertable device. As shown in FIG. 1, the wireless in- vivo information acquiring system includes a capsule endoscope 3 which is inserted into a subject 1, captures images inside body cavities, and transmits data such as image signals to a receiving apparatus 2, the receiving apparatus 2 which receives the image data of inside the body cavities when the image data is transmitted from the capsule endoscope 3 by radio, a display device 4 which displays images inside the body cavities based on the image

signals received by the receiving apparatus 2, and a portable recording medium 5 which serves for data transfer between the receiving apparatus 2 and the display device 4. The receiving apparatus 2 includes a radio unit 2a which
5 has plural receiving antennas A1 to An attached to an outer surface of the subject body 1, and a main receiving unit 2b which performs, for example, processing of radio signals received by the plural receiving antennas A1 to An. The radio unit 2a and the main receiving unit 2b are detachably
10 connected via a connector or the like. Each of the receiving antennas A1 to An may be provided in a jacket which the subject 1 can wear, for example, and may be indirectly attached to the subject 1 when the subject 1 wears the jacket. Here, the receiving antennas A1 to An
15 may be detachable from the jacket.

[0018] The display device 4 serves to display images such as images captured by the capsule endoscope 3 inside the body cavities. The display device 4 has a configuration like a workstation to display images based on
20 the data obtained from the portable recording medium 5. Specifically, the display device 4 may directly display the image on a Cathode Ray Tube (CRT) display, liquid crystal display, or the like. Alternatively, the display device 4 may output the image onto other media as in a printer.

25 [0019] The portable recording medium 5 can be attached to and detached from the main receiving unit 2b and the display device 4, and information can be retrieved from or recorded into the portable recording medium 5 while the portable recording medium 5 is attached to the main
30 receiving unit 2b and the display device 4. In the embodiments, the portable recording medium 5 is attached to the main receiving unit 2b and records data transmitted from the capsule endoscope 3 while the capsule endoscope

travels in the body cavities of the subject body 1. After the capsule endoscope 3 is discharged from the subject body 1, in other words, after the imaging inside the subject body 1 is finished, the portable recording medium 5 is removed from the main receiving unit 2b and attached to the display device 4, then the display device 4 reads out the data recorded in the portable recording medium 5. Since the portable recording medium 5 including a Compact Flash (registered trademark) memory or the like transfers data between the main receiving unit 2b and the display device 4, the subject 1 can move more freely during the imaging inside the body cavities, and the time required for data transfer to the display device 4 can be shortened. Here, the portable recording medium 5 is employed for data transfer between the main receiving unit 2b and the display device 4. A manner of data transfer, however, is not limited thereto. For example, the main receiving unit 2b may include other embedded type of recording device, such as a hard disk, and may be connected to the display device 4 by a cable or by radio transmission for data transfer.

[0020] The radio unit 2a and the main receiving unit 2b will be described with reference to FIG. 2. FIG. 2 is a block diagram of a structure of the receiving apparatus 2 according to a first embodiment. The radio unit 2a receives radio signals transmitted from the capsule endoscope 3 and demodulates the received radio signals into base band signals. As shown in FIG. 2, the radio unit 2a includes receiving antennas A1 to An, a receiving unit 11 as a receiver which amplifies and demodulates radio signals received by the receiving antenna, which is selectively connected via switching under the control of a control unit C described later, among the receiving antennas A1 to An, and a received electric-field strength detector 12 which

detects received electric-field strength of the receiving antennas A1 to An connected via switching.

[0021] The main receiving unit 2b receives and processes the base band signals obtained after the demodulation in the radio unit 2a. As shown in FIG. 2, the main receiving unit 2b includes an image processor 13 connected in a subsequent stage of the receiving unit 11, a display unit 14 which displays image data processed by the image processor 13, the portable recording medium 5, a notifying unit 15 which serves as a notifier that notifies an end of examination, the control unit C which controls each of the above mentioned elements, a power supply unit 16 which includes a battery, for example, that supplies power to the main receiving unit 2b and the radio unit 2a, and a switching unit 17 which connects the radio unit 2a and the power supply unit 16.

[0022] The control unit C controls each elements in the receiving apparatus 2, and includes an examination completion determining unit C1 which serves as a determiner that determines that the capsule endoscope 3 swallowed by the subject 1 finishes the examination, a notification controller C2 which controls the operation of the notifying unit 15, and a power supply controller C3 which controls the power supply from the power supply unit 16 to the radio unit 2a.

[0023] The receiving unit 11 supplies image signals, which are base band signals obtained through the amplification and demodulation of the radio signals supplied from the receiving antennas, into the image processor 13, and supplies a signal indicating the received electric-field strength of the radio signal received by the receiving antenna to the received electric-field strength detector 12. The received electric-field strength detector

12 detects the received electric-field strength of the receiving antenna based on the above signal and outputs the detected strength to the main receiving unit 2b.

[0024] The image data processed by the image processor
5 13 is stored in the portable recording medium 5 under the control of the control unit C, and displayed on the display unit 14 as necessary. The received electric-field strength signals supplied from the received electric-field strength detector 12 are taken into the control unit C. The
10 examination completion determining unit C1 has an internal timer (not shown) for counting. The examination completion determining unit C1 determines that the examination starts when the power supply to the apparatus starts, for example, and activates the timer to start counting. On detecting
15 that the count reaches a predetermined number indicating a predetermined time period has passed, the examination completion determining unit C1 determines that the predetermined time period has passes.

[0025] For example, the examination completion
20 determining unit C1 may determine that the examination starts when the receiving unit 11 receives the transmission data from the capsule endoscope 3 for the first time after the power is on. Further, the examination completion determining unit C1 may determine that the predetermined
25 time period has passed when the examination completion determining unit C1 detects that the number (number of frames) of transmission data (image data) transmitted from the capsule endoscope 3 at a predetermined transmission rate reaches a predetermined number, for example. Since
30 the examination in the body cavities of the subject (human body) 1 with the use of the capsule endoscope 3 usually takes approximately eight hours, the predetermined time period set for the above determination on the completion of

the examination may be set to eight hours, for example.

[0026] Further, the examination completion determining unit C1 takes in the information on the received electric-field strength as detected by the received electric-field strength detector 12. When the predetermined time period passes after the examination starts, and the received electric-field strength detected by the received electric-field strength detector 12 during a predetermined time period is not higher than a predetermined value, the examination completion determining unit C1 determines that a predetermined condition to determine that the examination completes is satisfied.

[0027] The notifying unit 15 includes, for example, an LED, LCD, and speaker, and is controlled by the notification controller C2. The notification controller C2 takes in the result of determination by the examination completion determining unit C1. When the result of determination by the examination completion determining unit C1 satisfies the predetermined condition to determine that the examination completes, the notification controller C2 controls the operation of the notifying unit 15 to make the LED lighten, to make the LCD display a notification, or to make the speaker notify by sound, thereby notifying the user of the completion of the examination. The notifying unit 15 can be replaced with the display unit 14. Then, the notification controller C2 may control the display 14 to present the notification on the screen.

[0028] The power supply controller C3 takes in the result of determination by the examination completion determining unit C1. When the result of determination satisfies the predetermined condition to determine that the examination completes, the power supply controller C3 controls the operation of the switching unit 17 and render

the switching unit 17 off-state, thereby disconnect the power supply unit 16 from the radio unit 2a. Thus, the power supply controller C3 stops the power supply from the power supply unit 16 to the radio unit 2a.

5 [0029] An operation of the receiving apparatus will be described with reference to the flowchart of FIG. 3. In FIG. 3, the examination completion determining unit C1 determines that the examination has started based on the power supply to the apparatus, for example (step S101), and
10 determines whether the count after the examination start reaches the predetermined time period (step S102). When the examination completion determining unit C1 determines that the predetermined time period has passed since the examination starts in step S102 (Yes in step S102), the
15 examination completion determining unit C1 determines whether the received electric-field strength taken in from the received electric-field strength detector 12 during the predetermined time period is equal to or lower than the predetermined value or not (step S103).

20 [0030] When the examination completion determining unit C1 determines that the received electric-field strength is not higher than the predetermined value in step S103 (Yes in step S103), the examination completion determining unit C1 outputs the result of determination to the notification
25 controller C2 and the power supply controller C3. Then, the notification controller C2 controls the notifying unit 15 and makes the notifying unit 15 performs the notification in the above described manner (step S104). Then, the power supply controller C3 controls the switching
30 unit 17 and turns the same into the off-state, thereby cutting the power supply from the power supply unit 16 to the radio unit 2a, in particular to the receiving unit 11 which consumes large power (step S105).

[0031] As can be seen from the foregoing, the receiving apparatus according to the first embodiment determines that the examination completes when the predetermined time period has passed after the examination starts and the
5 received electric-field strength detected during the predetermined time period is not higher than the predetermined value, and notifies the examination completion. Thus, it is possible to recognize that the examination by the capsule endoscope completes. Therefore,
10 the receiving apparatus can be removed from the subject when the examination completes, whereby the physical burden on the subject can be decreased.

[0032] In addition, in the first embodiment, on determining that the examination completes, the examination
15 completion determining unit stops the power supply to the radio unit, whereby the radio unit can be prevented from consuming the power (battery) unnecessarily.

Second Embodiment

[0033] FIG. 4 is a block diagram of a structure of the
20 receiving apparatus 2 according to a second embodiment. The receiving apparatus 2 of the second embodiment is different from the receiving apparatus of the first embodiment in that the receiving apparatus of the second
25 embodiment includes an image reception detecting unit 18 in the radio unit 2a in place of the received electric-field strength detector, and the image reception detecting unit 18 serves as an image reception detector which detects when the receiving unit 11 fails to receive the image data for a
30 predetermined time period. Accordingly, the examination completion determining unit C1 of the second embodiment takes in the result of detection of the image data detected by the image reception detecting unit 18, and determines

that a predetermined condition to determine that the examination completes is satisfied when the predetermined time period has passed after the examination starts and there is no image data reception (frame reception) for the
5 predetermined time period.

[0034] An operation of the receiving apparatus of the second embodiment will be described with reference to the flowchart of FIG. 5. In FIG. 5, the examination completion determining unit C1 determines whether the examination
10 starts, and then, whether the predetermined time period has passed after the examination starts, similarly to the first embodiment (steps S201, S202). When the examination completion determining unit C1 determines that the predetermined time period has passed after the examination
15 starts in step S202 (Yes in step S202), the examination completion determining unit C1 go on to determine whether the receiving unit 11 fails to receive image data for the predetermined time period or not (step S203).

[0035] When the examination completion determining unit
20 C1 determines that the receiving unit 11 fails to receive the image data in step S203 (Yes in step S203), the examination completion determining unit C1 supplies the result of determination to the notification controller C2 and the power supply controller C3. The notification
25 controller C2 controls the notifying unit 15 and makes the notifying unit 15 perform the notification in the above described manner (step S204). The power supply controller C3 controls the switching unit 17 and turns the switching unit 17 into the off-state, thereby cutting the power
30 supply from the power supply unit 16 to the radio unit 2a (step S205).

[0036] Thus, in the second embodiment, the receiving apparatus determines that the examination completes when

the predetermined time period has passed after the examination starts, and the receiving unit fails to receive the image data for the predetermined time period, and notifies the completion of the examination, whereby it is possible to recognize the completion of the examination by the capsule endoscope. Therefore, the receiving apparatus can be removed from the subject when the examination completes similarly to the first embodiment, and the physical burden on the subject can be reduced.

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10 [0037] Further, in the second embodiment, on determining that the examination completes, the examination completion determining unit stops the power supply to the radio unit. Therefore, the radio unit can be prevented from consuming the power (battery) unnecessarily similarly to the first
15 embodiment.

Third Embodiment

[0038] FIG. 6 is a block diagram of a structure of the receiving apparatus 2 according to a third embodiment. The receiving apparatus 2 of the third embodiment is different from the receiving apparatus of the first embodiment in that the receiving apparatus of the third embodiment includes a color distribution detecting unit 19 in the main receiving unit 2b in place of the received electric-field detector, and the color distribution detecting unit 19 serves as a color distribution detector which detects color distribution of the image data processed by the image processor 13. Accordingly, the examination completion determining unit C1 takes in the result of detection of the color distribution of the image data by the color distribution detecting unit 19, and determines that a predetermined condition to determine that the examination completes is satisfied when the detected color distribution

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does not match with a predetermined color distribution.

[0039] The color distribution detecting unit 19 detects color distribution of each image contained in a series of images processed by the image processor 13. For example, 5 the color distribution detecting unit 19 detects an average color. Specifically, the captured image of the organ, in which the examined region resides, shows different color distribution based on the type of the organs. For example, when the average color of the processed image is pale blue, 10 the examined region is esophagus; when the average color of the processed image is red, the examined region is stomach; when the average color of the processed image is yellow, the examined region is small intestine; and when the average color of the processed image is orange, the 15 examined region is large intestine. It is possible to extract substantially uniform color distribution from images of each organ by detecting the average color of each frame, even when the images captured while the capsule endoscope travels through one organ contain noises.

[0040] The examination completion determining unit C1 20 stores a predetermined average color corresponding to each examined region which is an examination target, and compares the average color detected by the color distribution detecting unit 19 with the stored 25 predetermined average color, thereby determining whether the examination completes or not. In comparing the average color, the examination completion determining unit C1 may compare the processed images of the examined region based on color components constituting the average color of the 30 processed image, for example, based on each value of a red color component R, a green color component G, and a blue color component B.

[0041] An operation of the receiving apparatus will be

described with reference to the flowchart of FIG. 7. In FIG. 7, the examination completion determining unit C1 determines whether the examination starts, similarly to the first embodiment (step S301). Then, the image processor 13
5 processes the received image data, and the color distribution detecting unit 19 detects the color distribution (average color) of the processed image (step S302), and further, the examination completion determining unit C1 determines whether the detected average color is
10 identical with the stored predetermined average color or not (step S303).

[0042] When the examination completion determining unit C1 determines that the detected average color is different from the predetermined average color of the examined region
15 in step S303 (No in step S303), the examination completion determining unit C1 supplies the result of determination to the notification controller C2 and the power supply controller C3. In response, the notification controller C2 controls the notifying unit 15 and makes the notifying unit
20 15 perform the notification in the above described manner (step S304). The power supply controller C3 controls the switching unit 17 and turns the switching unit 17 into the off-state, thereby cutting the power supply from the power supply unit 16 to the radio unit 2a (step S305).

25 [0043] As can be seen from the foregoing, in the third embodiment, the receiving apparatus determines that the examination completes when the color distribution of the processed image is different from the predetermined color distribution of the examined region, and notifies the
30 completion of the examination, whereby it is possible to recognize the completion of the examination by the capsule endoscope. Therefore, similarly to the first and the second embodiments, the receiving apparatus can be removed

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from the subject when the examination completes, and the physical burden on the subject can be reduced.

[0044] Similarly to the first and the second embodiments, on determining that the examination completes, the
5 examination completion determining unit of the third embodiment stops the power supply to the radio unit, whereby the radio unit can be prevented from consuming the power (battery) unnecessarily.

[0045] In the third embodiment, the predetermined
10 condition for the examination completion determining unit C1 to determine that the examination completes may be, for example, that the predetermined time period has passed since the examination starts, and that the average color detected by the color distribution detecting unit 19 is different
15 from the predetermined average color. Alternatively, the condition may be that the average color detected by the color distribution detecting unit 19 for a predetermined time period is different from the predetermined average color.

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INDUSTRIAL APPLICABILITY

[0046] The receiving apparatus according to the present invention is useful for a medical observation apparatus which is introduced into an interior of a human body and
25 employed for an observation of an examined region, and in particular, suitable for preventing unnecessary power consumption.

[0047] Throughout this specification and the claims which follow, unless the context requires otherwise, the word
30 "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not

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the exclusion of any other integer or step or group of integers or steps.

[0048] The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A receiving apparatus comprising:

5 a receiver which receives transmission data transmitted from a body insertable device which is introduced into a subject body to acquire intra-subject information for an examination;

10 a determiner which determines whether a predetermined condition is satisfied to determine that the examination is complete; and

a power supply controller which controls so that power supply at least to the receiver is cut according to a result of determination by the determiner; and

15 a notifier which notifies that the examination is complete according to the result of determination by the determiner.

2. The receiving apparatus according to claim 1, wherein the receiver receives the transmission data transmitted from the body insertable device using a receiving antenna, the
20 receiving apparatus further comprising:

a received electric-field strength detector which detects received electric-field strength of the receiving antenna, wherein

25 the determiner determines that the predetermined condition is satisfied to determine that the examination is complete when a predetermined time period has passed since the examination starts, and when the received electric-field strength detected by the received electric-field strength detector during a predetermined time period is not higher
30 than a predetermined value.

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3. The receiving apparatus according to claim 1, wherein the receiver receives the transmission data transmitted from the body insertable device using a receiving antenna, the receiving apparatus further comprising:

5 a received electric-field strength detector which detects received electric-field strength of the receiving antenna, wherein

the determiner determines that the predetermined condition is satisfied to determine that the examination is complete when a predetermined time period has passed since the examination starts, and when the received electric-field strength detected by the received electric-field strength detector during a predetermined time period is not higher than a predetermined value.

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4. The receiving apparatus according to claim 1, wherein the receiver receives image data as the transmission data from the body insertable device, the receiving apparatus further comprising:

20 an image reception detector which detects that the receiver fails to receive the image data, wherein

the determiner determines that the predetermined condition is satisfied to determine that the examination is complete when the predetermined time period has passed since the examination starts, and when the image reception detector does not detect the reception of the image data for a predetermined time period.

5. The receiving apparatus according to claim 1, wherein the receiver receives image data as the transmission data from the body insertable device, the receiving apparatus further comprising:

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a color distribution detector which detects color distribution of the image data received by the receiver, wherein

5 the determiner determines whether the predetermined condition is satisfied to determine that the examination is complete based on the color distribution detected by the color distribution detector.

6. The receiving apparatus according to claim 2, wherein
10 the determiner regards a start of power supply to the receiving apparatus or a first reception of the transmission data transmitted from the body insertable device by the receiver after the power supply starts as the start of the examination, and the determiner regards that the
15 predetermined time period has passed when the determiner detects that the predetermined time period has passed after counting of time starts from a start of the examination, or when the determiner detects that a number of transmission data transmitted from the body insertable device at a
20 predetermined transmission rate reaches to a predetermined number.

7. The receiving apparatus according to claim 4, wherein
25 the determiner regards a start of power supply to the receiving apparatus or a first reception of the transmission data transmitted from the body insertable device by the receiver after the power supply starts as the start of the examination, and the determiner regards that the
predetermined time period has passed when the determiner
30 detects that the predetermined time period has passed after counting of time starts from a start of the examination, or when the determiner detects that a number of transmission

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data transmitted from the body insertable device at a predetermined transmission rate reaches to a predetermined number.

5 8. The receiving apparatus according to claim 3, wherein the determiner regards a start of power supply to the receiving apparatus or a first reception of the transmission data transmitted from the body insertable device by the receiver after the power supply starts as the start of the
10 examination, and the determiner regards as that the predetermined time period has passed when the determiner detects that the predetermined time period has passed after counting of time starts from a start of the examination, or when the determiner detects that a number of transmission
15 data transmitted from the body insertable device at a predetermined transmission rate reaches to a predetermined number.

9. A receiving apparatus substantially as hereinbefore
20 described with reference to the accompanying drawings.

FIG. 1

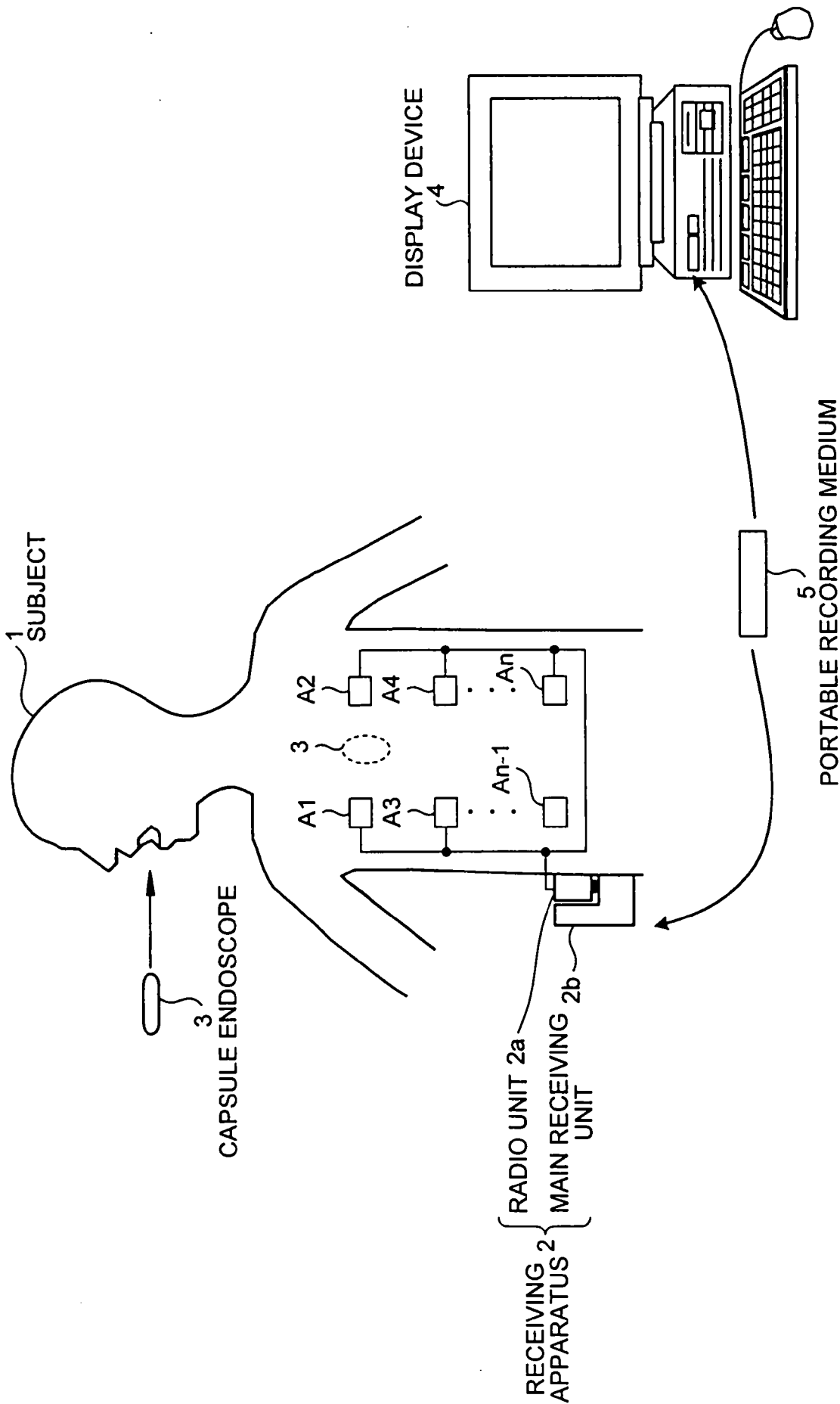


FIG.2

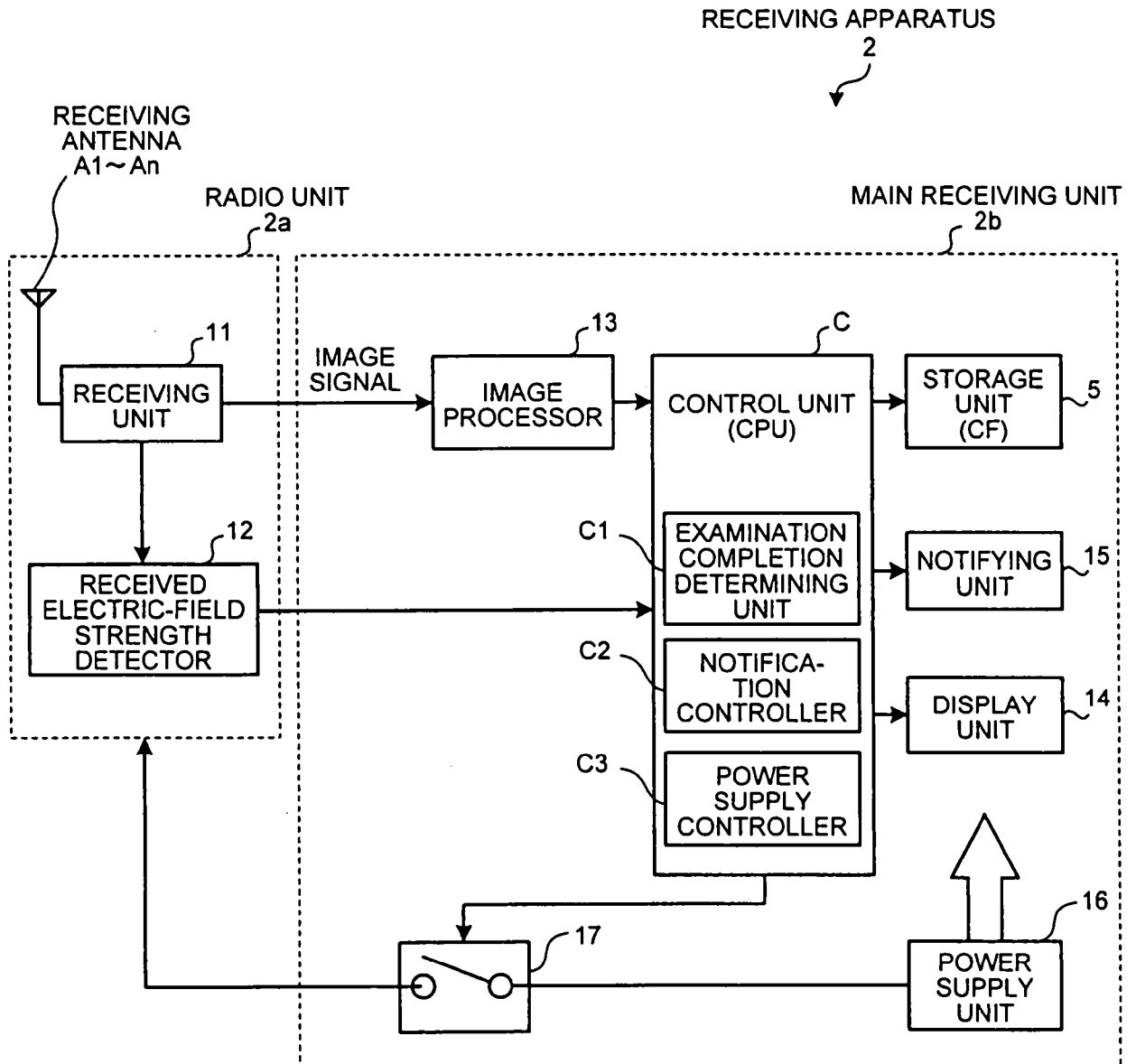


FIG.3

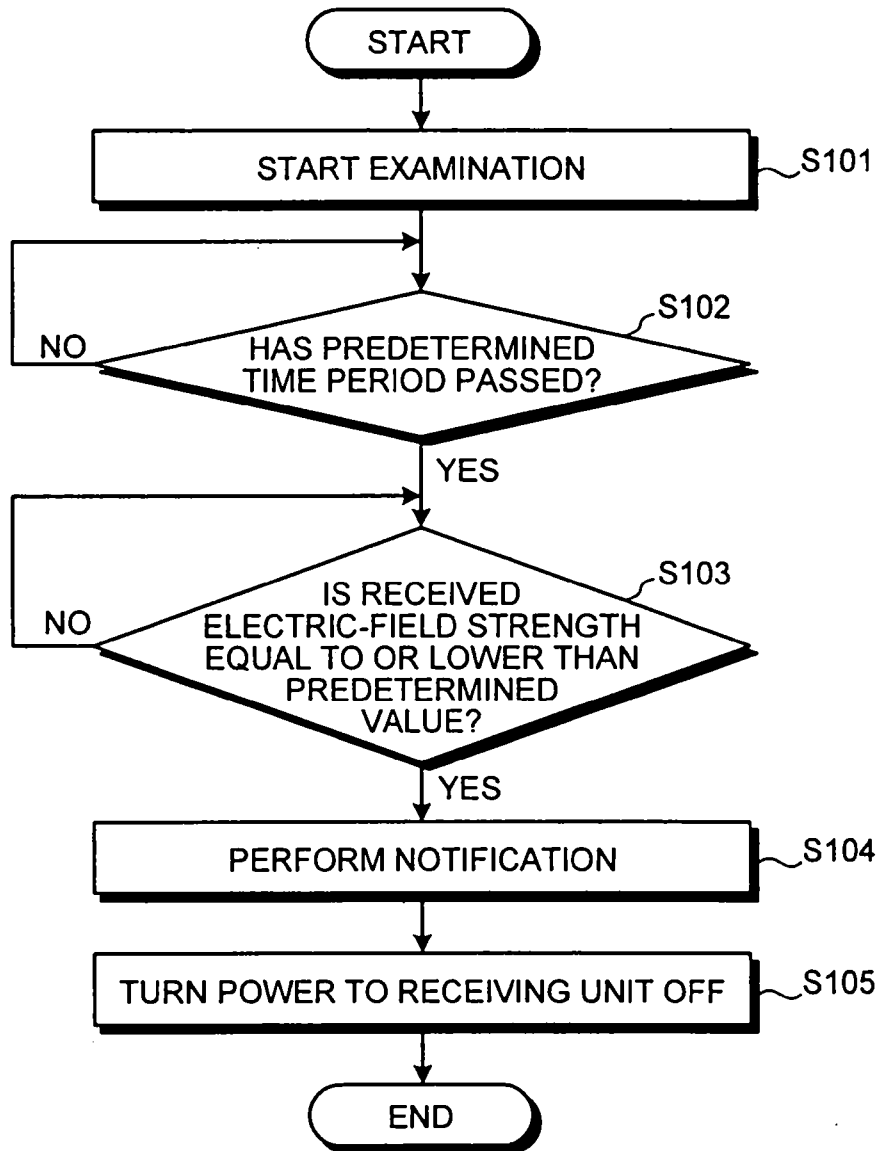


FIG.4

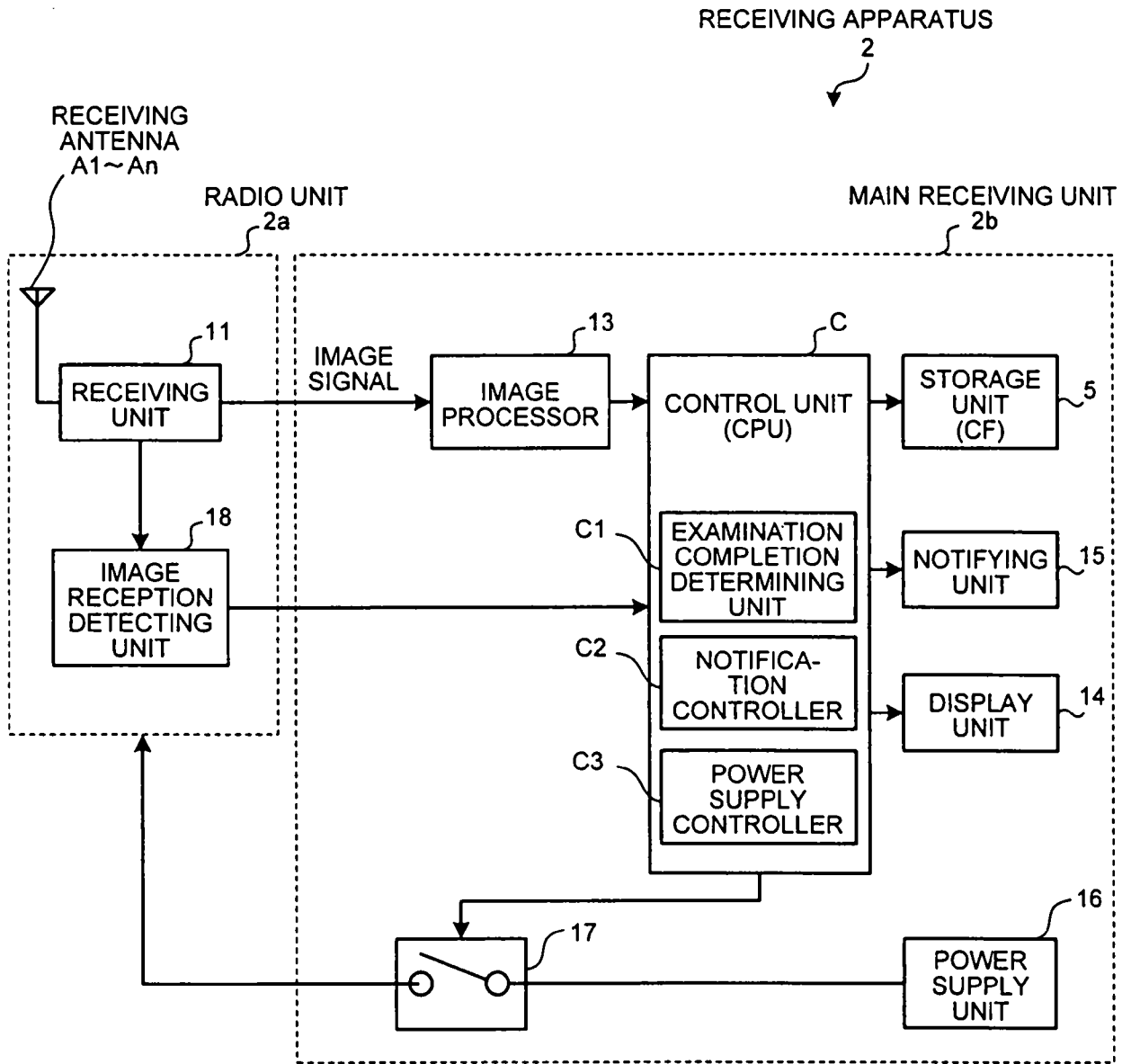


FIG.5

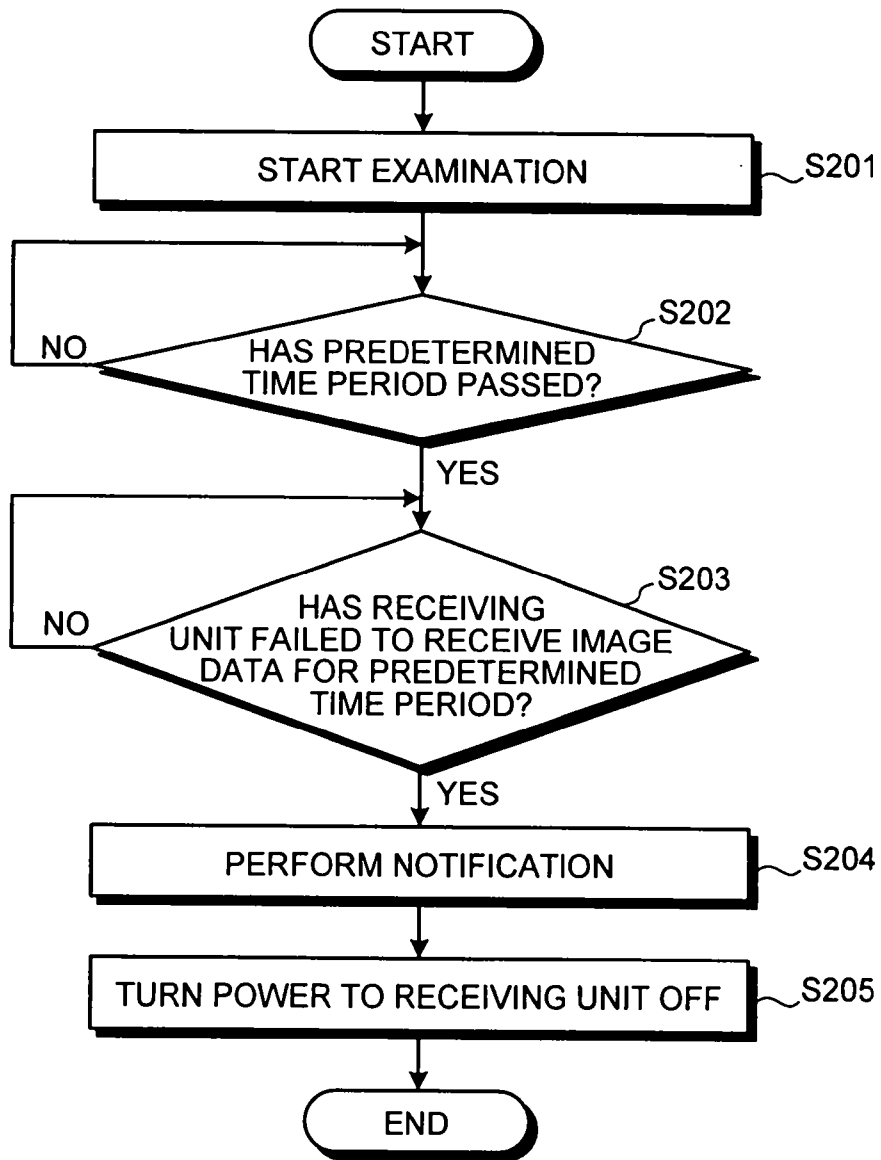


FIG.6

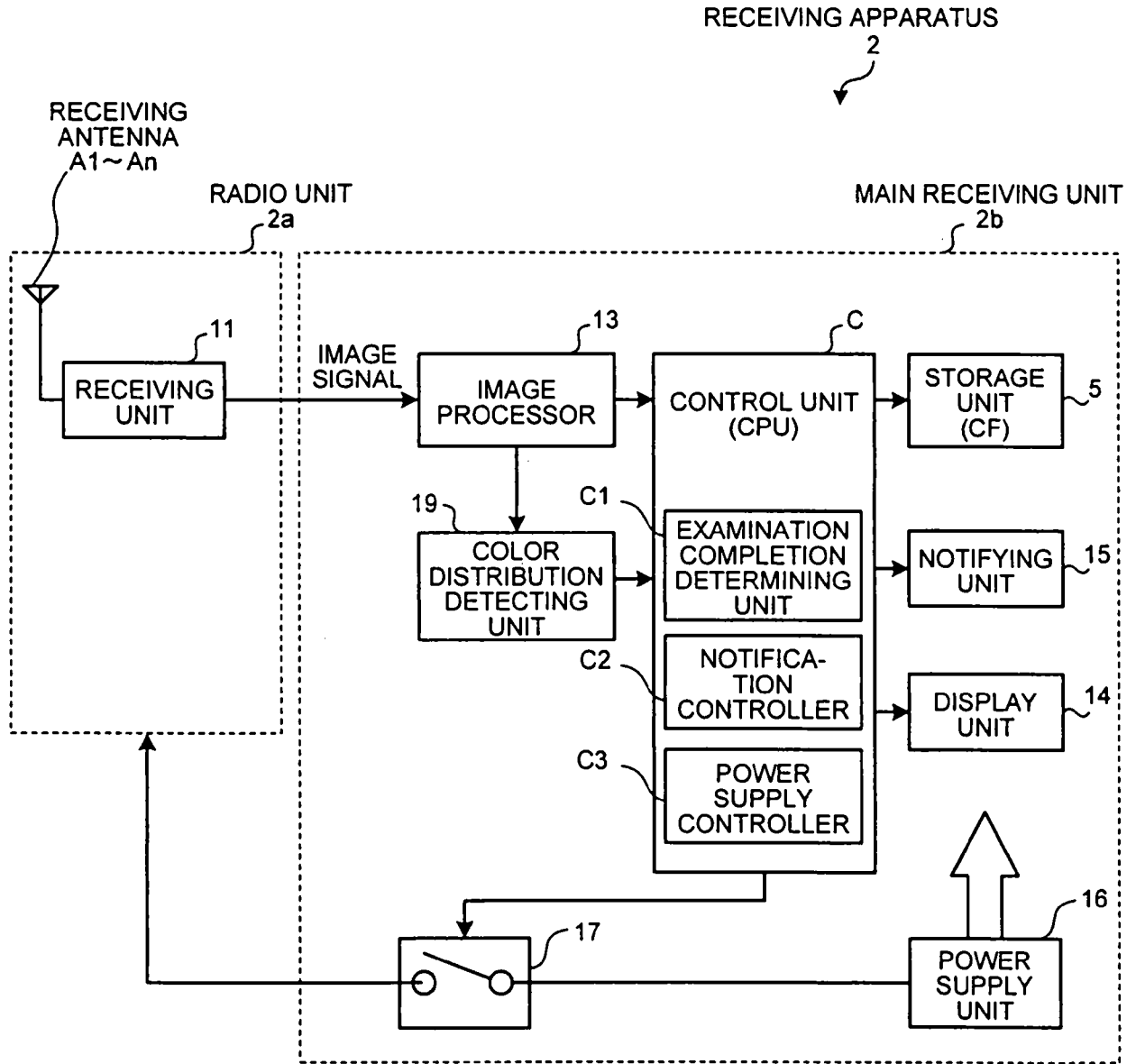


FIG.7

