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(54) Data receiving apparatus and received data processing method for use therein

(57) A pager has a starting condition memory (9m). In this memory (9m), subprograms which are invalid in normal cases, received data, and subprogram starting conditions which are fulfilled when specific data is input from a key input section, are listed in association with each other. When one of the subprogram starting conditions stored in the starting condition memory (9m) is fulfilled, a corresponding one of the subprograms is started to execute a message display control process, an alarm control process and/or the like.

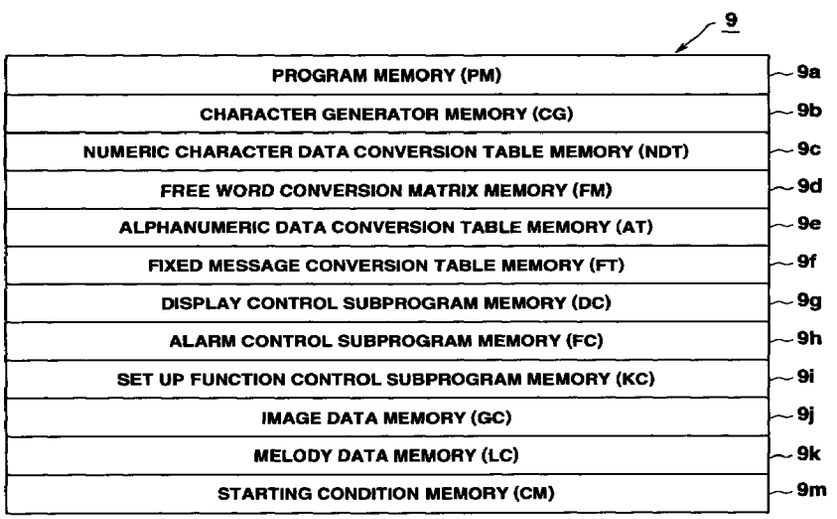


FIG.3

EP 0 869 461 A2

Description

The present invention relates to a data receiving apparatus, which receives communication data and broadcast data, and a received data processing method for use in the data receiving apparatus. In the present invention, the "data receiving apparatus" indicates an apparatus or system having a data receiving function, and encompasses not only a device like a pager solely for receiving information, but also a communication terminal apparatus having a transmitting function, such as a digital portable telephone, and a communication terminal system having a mail server and a personal computer, etc.

The number of people who have for private use communication terminals like pagers and portable telephones is increasing, as well as the number of people who have for business use such communication terminals. In particular, the number of young people who have for private use such communication terminals is increasing. In view of this, a variety of communication services are being practiced, while terminal apparatuses (communication terminals) having various functions are being produced. However, young people tend to easily turn their interests from one thing to another, and they are always asking for new communication and broadcast services and new functions for terminal apparatuses. Young people are also requesting that the services and the functions to be incorporated in terminal apparatuses contain a sort of "play" element.

The present invention has been made in consideration of the above-described circumstances, and it is the first object of the present invention to provide a data receiving apparatus having a function, etc. preset invalid and which are usable by the user of the apparatus. More specifically, it is the first object of the present invention to provide a data receiving apparatus having a function, the presence of which is unrecognized by the user of the apparatus and which can be validated during a normal data receiving process without any special operation by the user, in order to surprise and impress the user.

It is the second object of the present invention to provide a received data processing method which enables the aforementioned function to be validated.

According to one aspect of the present of the present invention having the above-described objects, there is provided a data receiving apparatus comprising:

detection means for detecting first predetermined data in received data; and

control means for, when the detection means detects the first predetermined data, validating at least one specific function preset invalid.

In the above-described data receiving apparatus, the control means may have condition information storage means for storing condition information specifying conditions for the validation of the aforementioned at least one specific function. In this case, one of the above-mentioned conditions is the detection of the first predetermined data by the detection means. When the detection means detects the first predetermined data, the control means determines whether at least one of the other conditions than the detection of the first predetermined data has been satisfied. When the control means determines that at least one of the other conditions has been satisfied, the control means validates the aforementioned at least one specific function.

In the above-described data receiving apparatus, the control means may include determination means for determining whether at least one predetermined condition has been satisfied, when the detection means detects the first predetermined data. In this case, when the determination means determines that the at least one predetermined condition has been satisfied, the control means validates the at least one specific condition.

The at least one predetermined condition mentioned above may refer to the received data.

The at least one predetermined condition described above may be one in which the first predetermined data and second predetermined data are contained in the received data. In this case, when the detection means detects the first predetermined data in the received data, the control means determines whether the second predetermined data is contained in the received data including the first predetermined data. When the control means determines that the second predetermined data is contained in the received data, the control means validates the at least one specific function mentioned previously.

The at least one predetermined condition described above may refer to data attained by performing data processing in the data receiving apparatus.

The determination means may determine whether one of a plurality of predetermined conditions including the aforementioned at least one predetermined condition has been satisfied, when the detection means detects the first predetermined data in the received data. In this case, when the determination means determines that one of the plurality of predetermined conditions has been satisfied, the control means validates the aforementioned at least one specific condition.

The above-described data receiving apparatus may have a plurality of specific functions preset invalid and including the aforementioned at least one specific function, and the first predetermined data may be a plurality of data items each corresponding to at least one of the plurality of specific functions. When the detection means detects at least one of the plurality of data items in the received data, the control means validates at least one of the plurality of specific functions which corresponds to the detected at least one of the plurality of data items, in accordance with a correspondence

between the first predetermined data and the plurality of specific functions.

In the above-described data receiving apparatus, periodically transmitted control data which controls the data receiving apparatus, may contain the first predetermined data.

Identification data which designates the data receiving apparatus, may contain the first predetermined data.

The above-described data receiving apparatus may further comprise display means for displaying a message based on the received data, and

message data representing a message to be displayed on the display means may contain the first predetermined data.

The above-described data receiving apparatus may further comprise display means for displaying a message based on the received data, and control data which controls a mode in which the display means displays the message, may contain the first predetermined data.

In the data receiving apparatus described above, the aforementioned at least one specific function may be the function of displaying the message on the display means in a display mode different from a normal display mode.

The data receiving apparatus may further comprise image storage means for storing image data, and the aforementioned at least one specific function may be the function of displaying the image data stored in the image storage means on the display means.

The data receiving apparatus may further comprise alarm means (in other words, inform means) for generating an alarm (sound, image, message, light, vibration, etc) and the aforementioned at least one specific function may be the function of making the alarm means generate the alarm in an alarm mode different from a normal alarm mode.

The data receiving apparatus may further comprise expansion information storage means for storing expansion information necessary to expand a function preset valid, and the aforementioned at least one specific function may be the function of expanding the function preset valid, in accordance with the expansion information stored in the expansion information storage means.

The data receiving apparatus may further comprise counting means for counting the number of times the data receiving means has received data. When the detection means detects the first predetermined data and in the case where the number counted by the counting means is equal to or greater than a predetermined value, the control means validates the aforementioned at least one specific function.

The data receiving apparatus may further comprise counting means for counting the number of times the data receiving apparatus has received predetermined data. When the number counted by the counting means exceeds a predetermined value, the control means validates the aforementioned at least one specific function.

According to another aspect of the present invention having the above-described objects, there is provided a method for processing received data, the method comprising:

a reception step of receiving a string of data;
a storage step of storing the received string of data;
a detection step of detecting predetermined data in the received string of data; and
a validation step of validating a specific function preset invalid, when the predetermined data is detected in the detection step.

The validation step may include a determination step of, when the predetermined data is detected, determining whether a predetermined condition has been satisfied. In this case, the specific function is validated when it is determined in the determination step that the predetermined condition has been satisfied.

The present invention is illustrated diagrammatically in the following drawings wherein:

Fig. 1 is a block diagram showing the circuit structure of a pager 1 according to the first embodiment of the present invention;
Fig. 2 is a diagram showing the structure of an ID-ROM 8 illustrated in Fig. 1;
Fig. 3 is a diagram showing the structure of a ROM 9 illustrated in Fig. 1;
Fig. 4 is a diagram showing a numeric character data conversion table stored in a numeric character data conversion table memory (NDT) illustrated in Fig. 3;
Fig. 5 is a diagram showing a free word conversion matrix stored in a free word conversion matrix memory (FM) illustrated in Fig. 3;
Fig. 6 is a diagram showing an example of a processing subprogram starting condition table stored in a starting condition memory (CM) illustrated in Fig. 3;
Fig. 7 is a diagram showing the structure of a RAM 10 depicted in Fig. 1;
Fig. 8 is a diagram showing the structure of a setting content management memory (SCM) illustrated in Fig. 7;
Fig. 9 is a diagram showing the structure of a message memory (MM) depicted in Fig. 7;
Fig. 10 is a diagram showing the structure of an address book memory (AM) depicted in Fig. 7;
Fig. 11 is a flowchart explaining a received data processing procedure which is executed by a CPU 7 illustrated in Fig. 1;
Fig. 12 is a diagram showing one example of a message display control executed in the received data processing procedure shown in Fig. 11;
Fig. 13 is a diagram showing another example of the message display control executed in the

received data processing procedure shown in Fig. 11;

Fig. 14 is a diagram showing an example of a set up function control performed in the received data processing procedure shown in Fig. 11;

Fig. 15 is a diagram exemplifying a received message display control and an alarm control which are executed in the received data processing procedure shown in Fig. 11;

Fig. 16 is a diagram showing another example of the processing subprogram starting condition table stored in the starting condition memory (CM) illustrated in Fig. 3;

Fig. 17 is a flowchart explaining a key input control procedure which is executed by the CPU 7 illustrated in Fig. 1;

Fig. 18 is a diagram showing the structure of a ROM 9' according to the second embodiment of the present invention;

Fig. 19 is a diagram showing a processing subprogram starting condition table stored in a starting condition memory (CM) 9m' illustrated in Fig. 18;

Fig. 20 is a diagram showing a background image data table stored in a background image memory (BC) 9n illustrated in Fig. 18;

Fig. 21 is a diagram showing the structure of a RAM 10';

Fig. 22 is a diagram showing the structure of a setting content management memory 10a' depicted in Fig. 18;

Fig. 23 is a diagram showing a background image table stored in a background image display control memory (BIM) 10f depicted in Fig. 21;

Fig. 24 is a diagram shown display positions 11a' designated on a display section 11'; and

Fig. 25 is a diagram exemplifying data which is stored in the background image display control memory (BIM) 10f when the pager 1 according to the second embodiment detects the reception of message data directed to the pager 1;

Fig. 26 is a diagram exemplifying a display image which is displayed on the display section 11' when the pager 1 is in a reception standby mode;

Fig. 27 is a diagram exemplifying another display image which is displayed on the display section 11' when the pager 1 is in a reception mode;

Fig. 28 is a diagram exemplifying a background image which is displayed on the display section 11' after the display image illustrated in Fig. 27 is displayed;

Fig. 29 is a flowchart showing the steps which the CPU 7 carries out between steps S11 and S12 included in the received data processing procedure shown in Fig. 11; and

Fig. 30 is a diagram showing a data structure according to an advanced radio-paging scheme.

First Embodiment

A pager which adopts the advanced radio paging scheme RCT STD-43 will now be described as the first embodiment of the present invention, with reference to drawings.

Fig. 30 shows the data structure according to the above-mentioned advanced radio paging scheme.

In Fig. 30, reference numeral 50 denotes the structure of cycle data transmitted over a period of 1 hour. The cycle data is made up of fifteen cycle data items numbered "0" to "14", and each cycle data item is transmitted over four minutes.

Reference numeral 51 denotes the structure of each cycle data item. Each cycle data item is made up of one hundred and twenty-eight frames numbered "0" to "128".

Each frame has a length of 1.875 seconds, and thirty-two frames are transmitted per minute.

Reference numeral 52 represents the data structure of each frame. Each frame is made up of eight parts according to data type, i.e., a sync portion 1 (S1) 52A, frame information (FI) 52B, a sync portion 2 (S2) 52C, block information (BI) 52D, an address field (AF) 52E, a vector field (VF) 52F, a message field (MF) 52G and idle blocks (IB) 52H.

Reference numeral 53 represents the block structure of each frame. The eight parts forming each frame are grouped into two, i.e., a sync signal section 53A and an interleaved block section 53B. The first three parts, that is, the sync portion 1 (S1) 52A, the frame information (FI) 52B and the sync portion 2 (S2) 52C, are included in the sync signal section 53A, while the next five parts, that is, the block information (BI) 52D, the address field (AF) 52E, the vector field (VF) 52F, the message field (MF) 52G and the idle blocks (IB) 52H, are included in the interleaved block section 53B.

112-bit data which is modulated by a binary FSK (Frequency Shift Keying) system and which is transmitted at the speed of 1600 BPS, has been set in the sync portion 1 (S1) 52A. The 112-bit data set in the sync portion 1 (S1) 52A specifies to which of the following four frame types (the combinations of modulation schemes and transmission speeds) the interleaving of the interleaved block section 53B corresponds:

Binary FSK / 1600 BPS (1600 BPS - 2 Level)
Binary FSK / 3200 BPS (3200 BPS - 2 Level)
Quadrature FSK / 3200 BPS (3200 BPS - 4 Level)
Quadrature FSK / 6400 BPS (6400 BPS - 4 Level)

32-bit data which is modulated by the binary FSK system and which is transmitted at the speed of 1600 BPS, has been set in the frame information (FI) 52B.

The data set in the frame information (FI) 52B contains data representing the frame number (No.) assigned to the frame, the cycle number (No.) assigned to the cycle data containing the frame, etc. In the case

where the above cycle data is transmitted a plurality of times, the data set in the frame information (FI) 52B also contains data specifying the number of transmission times.

Data for synchronizing the data set in the interleaved block section 53B and transmitted subsequently in the frame type defined in the sync portion 1 (S1) 52A, with the reception timing of the pager, has been set in the sync portion 2 (S2) 52C.

The word numbers (Nos.) specifying the starting points of the address field (AF) 52E and vector field (VF) 52F of the interleaved block section 53B, the number of words forming each of the address field (AF) 52E and the vector field (VF) 52F, etc. have been set in the block information (BI) 52D. The block information (BI) 52D also contains real time information data (real time data representing "month. day and year" or "second, minute and hour") determined periodically.

32-bit or 64-bit address data specifying the receiver of the caller has been set in the address field (AF) 52E.

Vector data has been set in the vector field (VF) 52F which forms a pair together with the address field (AF) 52E. The vector data represents the word number (No.) specifying the starting point of the message field (MF) 52G which will be explained later, the number of words forming the message field (MF) 52G. the length of message data contained in the message field (MF) 52G. the data type of the message field (MF) 52G, etc.

The message data of the data format defined in the vector field (VF) has been set in the message field (MF) 52G.

The idle blocks (IB) 52H are unused blocks. When the frame has an empty part, a bit pattern constituted by a series of bits "0" or a series of bits "1" is set in the idle blocks (IB) 52H of the frame.

Plural cycle data, each of which has been organized as shown in Fig. 30, are multiplexed having four different phases a, b, c and d, and are transmitted. A service proprietor, if adopts paging scheme RCR STD-43, can multiplex and transmit plural 1-frame data containing different messages at a time through utilization of one or more of the above-described phases, or can transmit message data of all of the phases to one pager at a time.

Pagers for use in a paging system employing paging scheme RCR STD-43 will now be described with reference to Figs. 1 to 17.

The pager 1 illustrated in Fig. 1 has an antenna 1, a receiving section 3, a decoder 4, a buffer memory 5, a deinterleave circuit 6, a CPU 7, an ID-ROM 8, a ROM 9, a RAM 10, a display section 11, an EL back light 12, a driver 13, a key input section 14 (a to d), a driver 15, a speaker 16, an LED 17 and a vibrator 18, all being connected to each other via a bus 19. Reference numeral 20 denotes a power source battery.

The antenna 2 receives a radio signal having a frequency modulated in a 280 (MHz) band from a base station (now shown) of a service proprietor, and outputs the received radio signal to the receiving section 3.

The receiving section 3 connected to the decoder 4 is intermittently driven in accordance with a control signal output from the decoder 4.

The receiving section 3 demodulates and detects received data from the radio signal which the antenna 2 has received, and outputs the received data to the decoder 4.

The decoder 4 discriminates the frame type of the received data, based on the frame type data set in the sync portion 1 (S1) 52A, generates a control signal in accordance with the result of the discrimination, and outputs the control signal to the receiving section 3 in order to drive and control the receiving section 3. Furthermore, the decoder 4 converts, to 8-bit parallel data, the frame data directed to the pager 1 and sequentially supplied from the receiving section 3, and outputs the parallel data to the buffer memory 5.

The buffer memory 5 has a memory area in which the 1-frame data (the interleaved block section 53B) converted to the parallel data is temporarily stored. This memory area is utilized in restoring the interleaved parallel data and performing BCH correction.

As regards the parallel data sequentially output from the buffer memory 5, the deinterleave circuit 6 carries out the process of restoring the interleaved data as received, in accordance with the frame type data set in the sync portion 1 (SD1) 52A.

The deinterleave circuit 6 executes the restoring process only in the case where the interleaved block section 53B has a data structure of "3200 BPS (binary/quadrature) 16 bits" or "6400 BPS (quadrature) 32 bits". In the case of 1600 BPS (binary), the deinterleave circuit 6 does not execute the restoring process, since the received data has already been restored through the serial-to-parallel conversion performed by the decoder 4.

The CPU 7 is a central processing unit which controls the individual parts of the pager 1 in accordance with various control programs stored in the ROM 9, and includes an internal block 7a which measures the current time (year, month, day, hour, minute, second). Specifically, the CPU 7 performs the initial processing at the time the pager 1 is turned on as a result of the sliding operation of the main switch 14a. Thereafter, the CPU 7 executes the received data processing procedure (refer to Fig. 11) which will be described later.

Furthermore, when executing the received data processing procedure with respect to received real time information data and data directed to the pager 1, the CPU 7 refers to the individual "starting conditions" shown in the starting condition table (Fig. 6) stored in the starting condition memory 9m of the ROM 9 which will be explained later. When the CPU 7 determines that one of the starting conditions in the starting condition table has been fulfilled, the CPU 7 rewrites the corresponding flag information stored in the setting content management memory 10a of the RAM 10, reads out the

corresponding subprogram from one of various program memories 9g, 9h and 9i, and starts the read-out subprogram to execute one of control processes which are invalid in normal cases, such as display control processes in which the display section 11 is controlled, alarm control processes (in other words, informing process) in which the speaker 16, the LED 17 and the vibrator 18 are controlled to generate an alarm (sound, image, message, light, vibration, etc), set up function control processes in which a message memory 10b and an address book memory 10c which will be described later are extended, etc.

Moreover, after the pager 1 has been turned on, the CPU 7 executes a key input control procedure (Fig. 17) which will be described later, in accordance with the content of the depressing operation (the cancel instructing operation) of the main switch 14a and the content of the predetermined depressing operations of specific keys, i.e., a Memory key 14b, a Select key 14c and a Set key 14d.

In this case, the CPU 7 refers to the individual "starting conditions" shown in the subprogram starting condition table (Fig. 16) stored in the starting condition memory 9m of the ROM 9, in accordance with the "starting conditions" stored in the key input memory 10e of the RAM 10 and including the content of keystrokes on the key input section 14 and other conditions (the number of operation times, etc.). When the CPU 7 determines that one of the starting conditions in the subprogram starting condition table has been fulfilled, the CPU 7 reads out the corresponding subprogram from the ROM 9, and starts the read-out subprogram to execute one of the control processes which have not been set as normal ones, such as processes for controlling the display section 11, processes for controlling the speaker 16, the LED 17 and the vibrator 18, processes for extending the message memory 10b and the address book memory 10c, etc.

In addition to the above-described processes, the CPU 7 performs the process of sequentially restoring the parallel data stored in the buffer memory 5.

In order to identify four individual addresses or address data preset for use in individual paging in the pager 1 (i.e., the first address, the second address (for a dual call), the third address (for the service of transmitting numbered messages) and the fourth address (for an information service)), the ID-ROM (Identification code ROM) 8 stores the combinations of the 32-bit address data (#A, #B) preset in the pager 1 and the vector type (3-bit information v2, v1, v0) set in the vector field (VF) 52F, in association with paging type ("NP" (numeric pager) or "IP" (information pager)), as shown in Fig. 2.

The vector type is set in accordance with the type of a message to be displayed. When "011" is set as the vector type, a standard numeric message is to be displayed. When "100" is set as the vector type, a numeric message of a special display format is to be displayed. In the case of "110", a message number information service is to be presented, while in the case of "110", an alphanumeric message is to be displayed.

The ROM (Read Only Memory) 9 is an EEPROM (Electrical Erasable Programmable ROM) and includes, as illustrated in Fig 3, a program memory (PM) 9a, a character generator memory (CG) 9b, a numeric character data conversion table memory (NDT) 9c, a free word conversion matrix memory (FM) 9d, an alphanumeric data conversion table memory (AT) 9e, a fixed message conversion table memory (FT) 9f, a display control subprogram memory (DC) 9g, an alarm control subprogram memory (FC) 9h, a set up function control subprogram memory (KC) 9i, an image data memory (GC) 9j, a melody data memory (LC) 9k and a starting condition memory (CM) 9m.

The program memory (PM) 9a has a memory area which stores various control programs for controlling the individual circuits included in the pager 1 and programs for executing the received data processing procedure (Fig. 11), the key input control procedure (Fig. 17), etc. which will be described later.

The character generator memory (CG) 9b has a memory area which stores data, such as alphanumeric characters, symbols, etc., which are necessary to represent a message to be displayed on the display section 11.

When received address data represents addresses (the first to third addresses) for numeric pagers, the message data set in the message field (MF) 52G of the received data is sequentially read out in units of 4 bits (B3, B2, B1, B0), and is converted to numeric character data. The numeric character data conversion table memory (NDT) 9c has a memory area which stores the numeric character data conversion table necessary to convert the message data to the numeric character data.

When a free word definition code is contained in the numeric character data converted from the message data in accordance with the aforementioned numeric character data conversion table, that part of the numeric character data which follows the free word definition code is read out in units of 2 or 3 digits, as shown in Fig. 5. The combinations of the numeric character data read out thus are converted to their corresponding numeric characters. The free word conversion matrix memory (FM) 9d has a memory area which stores the free word conversion matrix necessary to convert the combinations of the numeric characters to the corresponding numeric characters.

According to the first embodiment of the present invention, at the point in time the pager 1 is initially turned on, one hundred combinations "11" to "00" shown in an initial setting area 91 are convertible to numeric characters.

The other combinations of the numeric character data, which are shown in an extended area 92, are unconvertible at the point in time the pager is initially

turned on (the user of the pager 1 is not informed of the presence of the free words shown in the extended area 92).

The extended area 92 has protected five sub areas 92a to 92e, the use of which is not allowed at the point in time the pager 1 is initially turned on.

When a predetermined condition is fulfilled during the received data processing procedure (Fig. 11) and the key input control procedure (Fig. 17) which will be described later, the sub areas 92a to 92e are sequentially released from the protection. When the sub areas are thus released from the protection, it becomes possible to convert the combinations of the numeric character data shown in the released sub areas data to their corresponding illustrations or additional functions.

When the CPU 7 determines during the received data processing procedure that the received address data represents the address (the fourth address) for information pagers, the message data (bit data) set in the message field (MF) 52G of the received data is sequentially read in units of 7 bits, and is converted to alphanumeric data. The alphanumeric data conversion table memory (AT) 9f has a memory area which stores the conversion table (not shown) used to convert the message data to the alphanumeric data.

When the fixed-message definition code "[[" is detected in the numeric character data converted from the message data in accordance with the aforementioned numeric character data conversion table, the 2-digit data of the numeric character data which follows the fixed-message definition code is converted to a fixed phase to be displayed, such as "Good Morning", "Call Me" or the like. The fixed-phrase conversion table memory (FT) 9f has a memory area which stores the fixed-phrase conversion table (not shown) used to convert the alphanumeric data to such a fixed phrase.

The display control subprogram memory (DC) 9g, the alarm control subprogram memory (FC) 9h and the set up function control subprogram memory (KC) 9i are memory areas which store subprograms for performing, during the received data processing procedure (Fig. 11) and the key input control procedure (Fig. 17) which will be described later, various image display control processes, an automatic illumination display control process, an alarm (inform) control process such as alerting (informing) the user with an alarm (melody, sound, message, image, light, vibration, and soon), a set up function control process such as extending the usable area of the free word conversion matrix (Fig. 5) in accordance with whether a predetermined starting condition has been fulfilled.

The image data memory (GC) 9j has a memory area which stores a variety of image data which are displayed on the display section 11 by the subprograms stored in the display control subprogram memory 9g and the set up function control subprogram memory 9i.

The image data memory (LC) 9 has a memory area which stores a variety of melody data which are output from the speaker 16 by the alarm control subprograms stored in the alarm control subprogram memory 9h.

The starting condition memory (CM) 9m has a memory area which stores a processing subprogram starting condition table (Figs. 6 and 16) in which the names of the subprograms to be started during the received data processing procedure (Fig. 11) and the key input control procedure (Fig. 17) which will be described later, such as display control subprograms, alarm control subprograms and set up function control subprograms, are shown in association with the starting conditions of all those subprograms.

In the subprogram starting condition table of Fig. 6, the subprogram name "Display Control Subprogram I", for example, is shown in association with the subprogram address "1".

The "Display Control Subprogram I" starts when the CPU 7 determines that received message data (numeric character data) contains the free word definition code "--"(hyphen hyphen), the characters "79" and the free word end code "_" (space) and that the same message data as the received message data has been received five times or more. By the control procedure according to this subprogram, the content of a message based on the received data is displayed.

Furthermore, the subprogram name "Set Up Function Control Subprogram II" is shown in association with the subprogram address "4".

The "Set Up Function Control Subprogram II" is started when the CPU 7 determines that the address data and vector data set in the address field (AF) 52E and the vector field (F) 52F of the received data are "A#" and "111", respectively, and determines that the received message number (No.) is "10". A function is added to the pager 1 in accordance with this subprogram.

The RAM (Random Access Memory) 10 has a setting content management memory (SCM) 10a, a message memory (MM) 10b, an address book memory (AM) 10c, a starting condition fulfillment count memory (DM) 10d and a key input memory (IM) 10e, as illustrated in Pig. 7.

As shown in Fig. 8, the setting content management memory (SCM) 10a has a memory area which manages; through the use of flag information, data representing the maximum number of received data which can be stored in the message memory 10b, data representing the maximum number of data which can be stored in the address book memory 10c, data specifying which area of the free word conversion matrix (Fig. 5) can be used for conversion, the names of the subprograms stored in the display control subprogram memory 9g and which are actually started to display received messages, the names of the subprograms stored in the alarm control subprogram memory 9h and which are actually started to alert (inform) the user with an alarm, the names of the set up function control subprograms stored in the set up function control subprogram mem-

ory 9i and which are actually started, etc.

The setting content management memory 10a has also a memory area which stores data specifying the number of received data currently stored in the message memory 10b of the RAM 10 and data specifying the number of data currently stored in the address book memory 10c.

In Fig. 8 which illustrates the setting content management memory 10a, the values of the flag information show the initial status at the time the pager 1 is initially turned on. In the initial status, the maximum number of received data which can be stored in the message memory 10b of the RAM 10 is "15", while the maximum number of data which can be stored in the address book 10c is "12". Moreover, in the initial status, the conversion using the initial setting area of the free word conversion matrix (Fig. 5) is possible. Furthermore, in the initial status, a "normal display control subprogram" and a "normal alarm control subprogram" are started to effect a normal alarm control.

Moreover, in the initial status, no "Set Up Function Control subprogram" is started.

In the received data processing procedure (Fig. 11) and the key input control procedure (Fig. 17) which will be described later, the CPU 7 rewrites the value of each flag stored in the setting content management memory 10a when any one of the starting conditions in the subprogram starting condition table (Fig. 16) is fulfilled.

The message memory 10b illustrated in Fig. 9 has an initial setting area 101 and an extended area 102. In those memory areas, received data directed to the pager 1 and containing received address data, vector data and message data, the date and time of the reception and additional information (message No. data, etc. used in the numbered message transmission service), can be stored in predetermined numbers and in the ascending order of management numbers (Nos.), as illustrated in Fig. 9.

At the point in time the pager 1 is initially turned on, the maximum number of received data storable in the message memory 10b shown in Fig. 9 is "15", and received data can be stored as data No. 1 to No. 15 in the initial setting area 101 of the message memory 10b. However, a certain starting condition is fulfilled during the received data processing procedure (Fig. 11) and the key input control procedure (Fig. 17), the maximum number of received data storable in the message memory 10b is increased to twenty five.

When received data is stored in the message memory 10b, the corresponding storage flag is changed from "0" to "1". Accordingly, the number of received data which have been stored in the message memory 10b can be understood from the number of storage flags as changed (to "1").

The address book memory (AM) 10c illustrated in Fig. 10 has an initial setting area 111 and an extended area 112. In those memory areas, address book data including names, the distinction of sex, telephone numbers, addresses and birthdays, can be stored in predetermined numbers and in the ascending order of management numbers (Nos.). The sex distinction data stored in the "Sex Distinction" column is "1" in the case of female, and is "0" in the case of male.

At the point in time the pager 1 is initially turned on, the maximum number of address book data storable in the address book memory 10c shown in Fig. 10 is "12", and address book data can be stored as data No. 1 to No. 12 in the initial setting area 111. The extended area 112, in which address book data can be stored as data No. 13 to No. 30, is not usable at the point in time the pager 1 is initially turned on (the user is not informed of the presence of the extended area 112). The extended area 112 is a protected area the use of which is prohibited. When a predetermined condition is fulfilled during the received data processing procedure (Fig. 11) and the key input control procedure (Fig. 17) which will be described later, the extended area 12 is released from the protection, and the maximum number of storable address book data increases to thirty. When address book data is stored the address book memory 10c, the corresponding storage flag is changed from "0" to "1". Therefore, the number of address book data which have been stored in the address book memory 10c can be understood from the number of storage flags as changed (to "1").

The starting condition fulfillment count memory (DM) 10d has a memory area in which time data representing the number of times a starting condition has been fulfilled is stored in association with each of the addresses stored in the subprogram starting condition table. The starting condition fulfillment count memory (DM) 10d has also a memory area which stores total reception time data representing the total number of times the data directed to the pager 1 has been received.

The key input memory (IM) 10e has a memory area which stores the content of the depressing operations of the individual keys on the pager 1 (e.g. data specifying depressed keys, the length of time over which the keys have been depressed, the presence/absence of keys depressed simultaneously, etc.).

The display section 11 has an LCD (Liquid Crystal Display) panel of a dot-matrix type, for example, and displays received messages and moving pictures, etc., based on display data supplied from the driver 13. The EL (Electroluminescent) back light 12 is a light source which radiates light in accordance with a drive signal supplied from the driver 13, and illuminates the LCD panel of the display section 11 with the light from behind that panel. The driver 13 is a circuit which is controlled by the CPU 7 and which drives and controls the display section 11 and the EL back light 12.

The key input section 14 includes the main switch 14a, the Memory key 14b, the Select key 14c and the Set key 14d. For example, the main switch 14a is connected to the positive pole of the battery 20 whose neg-

ative pole is grounded, and detects the ON/OFF switching of the pager 1 and the resetting of an alarm. The Memory key 14b detects the reading of a message based on the message data stored in the message memory (MM) 10b. The Select key 14c detects switching between modes such as a reception standby mode, an informing format setting mode, etc. The SET key 14d detects the setting effected in each mode. Moreover, the Set key 14d outputs various signals to the CPU 7 in accordance with the content of the operations of the individual keys.

The driver 15 is a circuit which is controlled by the CPU 7 and which drives and controls the speaker 16, the LED 17 and the vibrator 18.

The speaker 16 sounds an alarm at the time of reception in response to a drive signal supplied from the driver 15, and generates a predetermined melody sound, etc. in accordance with a display message.

The LED (Light Emitting Diode) 17 lights up or emits light intermittently at the time of reception, in accordance with a drive signal supplied from the driver 15.

The vibrator 18 vibrates at the time of reception, in accordance with a drive signal supplied from the driver 15.

The above is the explanation of the circuit structure employed in the pager 1 of the first embodiment.

The control operations performed by the CPU 17 of the pager 1 will now be described.

First, the received data processing procedure executed by the CPU 7 of the pager 1 will be explained with reference to the flowchart of Fig. 11 and the display examples shown in Figs. 12 to 15.

When the CPU 7 detects that the pager 1 has been turned on by operating the main switch 14a, the CPU 7 immediately starts the initial processing.

The initial processing includes processing such as referring to the values of the flag information stored in the setting content management memory 10a of the RAM 10, determining data storable areas in the message memory 10b and address book memory 10c, determining an area usable for conversion in the free word conversion matrix memory 9d of the ROM 9, etc. After the initial processing, the CPU 7 reads out any program for carrying out the received data processing procedure from the program memory 9a of the ROM 9, and starts the processing procedure.

First of all, the CPU 7 causes the reception section 3 and the decoder 4 to continuously receive data until they detect a self-frame directed to the pager 1. When the reception section 3 and the decoder 4 detect it, the CPU 7 controls them so as to hereafter intermittently receive only such a self-frame directed to the pager 1 and a frame containing real time information data.

(Basically, the real time information data is set in the block information (BI) 52D contained in the frame No. 0 of each cycle data item, and is received once every four minutes.)

Then, the CPU 7 determines whether the real time information data has been received (step S1). When the CPU 7 determines that the real time information data has been received, the CPU 7 acquires the real time information data (step S2). After this, the CPU 7 refers to the "starting conditions" shown in the starting condition table (Fig. 6) stored in the starting condition memory 9m of the ROM 9 (step S3), in accordance with the acquired real time information data and other conditions (such as the number of operation times), and determines whether any one of the starting conditions in the starting condition table has been fulfilled (step S4). When the CPU 7 determines that none of the starting conditions has been fulfilled, it returns to the step 1.

When the CPU 7 determines that one of the starting conditions has been fulfilled, it updates the value of the fulfillment time data which represents the number of times the starting condition has been fulfilled and which the starting condition fulfillment count memory 10d of the RAM 10 stores in association with the subprogram address corresponding to the fulfilled starting condition. Thereafter, the CPU 7 designates the subprogram corresponding to the fulfilled starting condition in the subprogram starting condition table.

Then the CPU 7 updates the value of the associated flag information in each of the "Display Control Subprogram Memory" item, the "Alarm Control Subprogram Memory" item and the "Set Up Function Control Subprogram Memory" item in the setting content management memory 10a (Fig. 8) of the RAM 10, and reads out the designated subprogram (from the display control subprogram memory 9g, the alarm control subprogram memory 9h, or the set up function control subprogram memory 9i), and starts the read-out subprogram (step S5).

Based on the started subprogram, the CPU 7 executes one of various control processes which have not been set as normal ones (the control processes which are invalid at the time the pager 1 is initially turned on), such as the display control processes, the alarm control processes and the set up function control processes, etc. (step S6). When the CPU 7 detects that the subprogram has terminated (step S7), it returns to the step S1.

Explanations will now be made as to what control process the CPU 7 executes in the case where a starting condition has been fulfilled by receiving the real time information data.

Case 1: Subprogram Address "5" (Set Up Function Control Subprogram III)

Let it be assumed that the time data contained in the real time information data received by the pager 1 is "8", and that the number of data stored in the address book memory 10c is "8" at the time of the reception. In this case, the CPU 7 determines that the starting condition corresponding to the subprogram address "5" in the subprogram starting condition table (Fig. 6) has been

fulfilled, and starts the "Function Execution Control Program III" stored in the subprogram address "5".

In the case where the maximum number of data storable in the address book memory 10c of the setting content management memory 10a (Fig. 8) is "12", the CPU 7 increases the maximum number of storable data to "30" in accordance with the "Set Up Function Control Subprogram III", and displays on the display section 11 that the maximum number of storable data has been increased to"30".

When the CPU 7 determines in the step S1 that the real time information data has not been received, then the CPU 7 determines whether a self-frame has been detected (step S8). When the CPU 7 determines that no self-frame has been detected, the CPU 7 returns to the step S1.

When the CPU 7 determines that a self-frame has been detected, the CPU 7 subjects data contained in the self-frame to a reception process (including demodulation, detection, restoration and error correction, etc.) in sequence (step S9), and determines whether the combination of the address data set in the address field (AF) 52E and the vector data set in the vector field (VF) 52F coincides with any one of the addresses (the first to fourth addresses) stored in the ID-ROM 8 (step S10).

When the CPU 7 determines that the combination of the address data and the vector data does not coincide with any one of the addresses stored in the ID-ROM 8, the CPU 7 stops a receiving operation, abandons received data, and returns to the step S1.

When the CPU 7 determines that the combination of the address data and the vector data coincides with any one of the addresses set in the pager 1, the CPU 7 determines that the data contained in the frame is directed to the pager 1, and continues the receiving operation. After the CPU 7 finishes the reception process with respect to the message data set in the message field (MF) 52G, the CPU 7 sequentially stores, in the message memory 10b (Fig. 9), the received data including the received, detected address (the first, second, third or fourth address), the vector data and the message data (step S11).

Furthermore, the CPU 7 updates the value of total reception time data stored in the starting condition fulfillment count memory 10d and representing the total number of reception times of the received data.

Thereafter, based on the received data and other conditions, the CPU refers to the individual "starting conditions" shown in the subprogram starting condition table (Fig. 6) stored in the starting condition memory 9m (step S12), and determines whether any one of the starting conditions has been fulfilled (step S13).

When the CPU 7 determines that none of the starting conditions has been fulfilled, the CPU 7 refers to the "Display Control Subprogram Memory" item and the "Alarm Control Subprogram Memory" item in the setting content management memory 10a, reads out the "normal display control subprogram" and "normal alarm control subprogram" whose flags are "1" from the display control subprogram memory 9g and the alarm control subprogram memory 9h, respectively, and starts the read-out subprograms. Then the CPU 7 executes a normal message display control process and a normal alarm control process (step S14), and thereafter returns to the step S1.

When the CPU 7 determines that one of the starting conditions has been fulfilled, the CPU 7 updates the value of the fulfillment time data which the starting condition fulfillment count memory 10d stores in association with the subprogram address corresponding to the fulfilled starting condition, after which the CPU 7 executes the steps S5 to S7. In the steps S5 to S7, the CPU 7 reads and starts the subprogram corresponding to the fulfilled starting condition shown in the subprogram starting condition table and executes one of the various control processes which have not been set as normal ones, such as the alarm control processes and the set up function control processes, etc. After this, the CPU 7 returns to the step S1.

Specific examples of the individual subprograms, each being executed when a corresponding one of the starting conditions has been fulfilled at the time of data reception, will now be described with reference to Figs. 6 to 10 and Figs. 12 to 15.

Case 2: Subprogram Address "1" (Display Control Subprogram I):

When the pager 1 receives the numeric character data " - - 79_012395456957890", the CPU 7 during a message display process analyzes the first two characters "- -" (hyphen hyphen) as a free word definition code, the subsequent characters "79" as data designating the illustration of a telephone, and the subsequent character "_" as a free word end code.

Further, when the CPU 7 detects that the starting condition fulfillment count memory 10d stores, in association with the subprogram address "1" the fulfillment time data whose value is equal to or greater than the value "5" which indicates that the numeric character data has been received five times, the CPU 7 determines that the starting condition corresponding to the subprogram address "1" in the subprogram starting condition table (Fig. 6) has been fulfilled, and starts the "Display Control Subprogram I".

The "Display Control Subprogram 1" is one for displaying a message on the display section 11 on the basis of the received numeric character data, reading out the image data shown in Fig. 12(b) from the image data memory 9j of the ROM 9, and displaying the read-out image data on the display section 11. Further, the CPU 7 controls the display section 11 so as to alternately display the message and the image shown in Fig. 12(b) every predetermined time.

Case 3: Subprogram Address "2" (Display Control Subprogram II)

When the pager 1 receives the numeric character data "- - 276565544764557369 47217731_",the CPU 7 during the message display process analyzes the first two characters "- -" (hyphen hyphen) as a free word definition code, and the subsequent characters "276565544764557369" as the free word message "Good__news!__A. K". Upon detecting the free word message "Good__news!" (the numeric character data "276565544764557369"), the CPU 7 determines that the starting condition corresponding to the subprogram address "2" in the subprogram starting condition table has been fulfilled, and starts the "Display Control Subprogram I".

The "Display Control Subprogram 1" is one for displaying a message on the display section 11 on the basis of the received numeric character data, reading out three images shown in Figs. 13(b), 13(c) and 13(d) from the image data memory 9j of the ROM 9, and displaying the read-out images in succession on the display section 11 (the animation display). The animation display is repeatedly performed after the display of the message and under the control effected by the CPU 7.

Case 4: Subprogram Address "3" (Set Up Function Control Subprogram I)

When the pager 1 receives the numeric character data "00 * 27777-9999", the CPU 7 detects "777" in the numeric character data. Upon detecting "777", the CPU 7 determines that the starting condition corresponding to the subprogram address "3" in the subprogram starting condition table has been fulfilled, and starts the "Set Up Function Control Subprogram I" corresponding to the subprogram address "3".

The "Set Up Function Control Subprogram I" is one for displaying the image of a slot machine on the display section 11 as shown in Fig. 14(b), controlling the display section 11 so that three display windows 11a, 11b and 11c changeably display patterns such as numerals, marks, pictures, etc. in a predetermined order, and stopping the patterns which are strolling in the windows 11a, 11b and 11c, upon detecting the depression of the Memory key 14b, the Select key 14c or the Set key 14d. For example, in the case where the combination of the stopped patterns is "777" as shown in Fig. 14(c), the CPU 7 executes the following process for extending the usable area of the free word conversion matrix:

The CPU 7 refers to pieces of flag information contained in the "Free Word Conversion Matrix" item which the setting content management memory 10a (Fig. 8) of the RAM 10 stores to manage the protection release status of the extended area 92, having five sub areas 92a to 92e, of the free word conversion matrix (Fig. 5). The CPU 7 changes, from "0" to "1", the piece of flag information corresponding to one of the sub areas which have not yet been released from the protection, as a result of which the sub area corresponding to the piece of flag information changed to "1" is released from the protection. Then the CPU 7 displays, on the display section 11, the message which informs that the free words in the sub area released from the protection have become usable, as shown in Fig. 14 (d).

The image data which this slot machine game requires has been stored in the image data memory 9j of the ROM 9, but is not displayed in normal cases. The game which can be played using the pager 1 of this embodiment is not limited to the above-described slot machine game, and other games like a roulette game, a "heads or tails" game and so forth can be played using the pager 1, insofar as they are such a type that the patterns or the like are changeably displayed.

Case 5: Subprogram Address "6" (Display Control Subprogram III and Alarm Control Subprogram I)

When the pager 1 receives numeric character data and detects that the numeric character data contains the data"_○○○○" (a space character and arbitrary 4-digit numeric character data), the CPU 7 determines that the numeric character data satisfies the starting condition corresponding to the subprogram address "6" in the subprogram starting condition table, and starts the "Display Control Subprogram III" and the "Alarm Control Subprogram I".

When the "Display Control Subprogram III" starts, the CPU 7 displays a message on the display section 11 as shown in Fig. 15(a), based on the received numeric character data. After this, the CPU 7 discriminates the numeric character data "_○○○○" as the last four digits of a telephone number, and searches the address book memory 10c of the RAM 10 for telephone number data specifying the telephone number.

When the CPU 7 determines as a result of the search that the address book memory 10c stores the telephone number data, the CPU 7 reads out birthday data associated with name data corresponding to the telephone number data from the address book memory 10c, and determines whether there is a correspondence between the birthday data and date data obtained from an internal clock 7a.

When the CPU 7 determines that there is a correspondence between them, the CPU 7 causes the display section 11 to perform such an animation display as shown in Figs. 15(b), 15(c) and 15(d), based on the name data associated with the birthday data, and the image data read out from the image data memory 9j. Further, the CPU 7 starts the "Alarm Control Subprogram I", reads out melody data associated with the birthday data from the melody data memory 9k, and outputs the melody data through the speaker 16.

Case 6: Subprogram address "8" (Display Control Subprogram V)

When the pager 1 receives numeric character data and detects that the numeric character data contains the data "_○○○○" (a space character and arbitrary 4-digit numeric character data) as in Case 5, the CPU 7 determines that the numeric character data satisfies the starting condition corresponding to the subprogram address "8" in the subprogram starting condition table, and starts the "Display Control Subprogram V".

When the "Display Control Subprogram V" starts, the CPU 7 discriminates the numeric character data "_○○○○" as the last four digits of a telephone number, and searches the address book memory 10c of the RAM 10 for telephone number data specifying the telephone number.

When the CPU 7 determines as a result of the search that the address book memory 10c stores the telephone number data, and determines that the flag information of the corresponding sex distinction data is "1", the CPU 7 displays a message on the display section 11 in a pop font.

Case 7: Subprogram Address "4" (Set Up Function Control Subprogram II)

Let it be assumed that the pager 1 detects that the user is being paged with the third address (for the numbered message transmission service), the message number (No.) affixed to subsequently received data is "10", and the total number of received data stored in the message memory is "10". In this case, when the maximum number of data which can be stored in the message memory of the RAM 10 is "15", the CPU 7 determines that the starting condition corresponding to the subprogram address "4" in the subprogram starting condition table has been fulfilled, and starts the "Set Up Function Control Subprogram II".

When the "Set Up Function Control Subprogram II" starts, the CPU 7 changes, from "0" to "1", a piece of flag information contained in the "Message Memory" item stored in the setting content management memory 10a (Fig. 8), and displays on the display section 11 the message which informs that the maximum number of data which can be stored in the message memory has been increased.

Case 8: Subprogram Address "7" (Display Control Subprogram IV and Alarm Control Subprogram II)

Let it be assumed that the pager 1 detects that the user is being paged with any one of the first to third addresses, and subsequently received data contains a message or a series of characters "URGENT" (or "Urgent"). In this case, the CPU 7 determines that the starting program corresponding to the subprogram address "7" in the subprogram starting condition table has been fulfilled, and starts the "Alarm Control Subprogram II".

When the "Alarm Control Subprogram II" starts, the pager 1 alerts the user with an alarm for use in case of urgency.

When the pager 1 receives data containing such a message in the period of time from 6:00 p.m. to 2:00 a.m., the CPU 7 further starts the "Display Control Subprogram IV" and lights up the EL back light 12 when displaying the message.

Case 9: Subprogram Address "9" (Display Control Program I')

Let it be assumed that the pager 1 detects the reception of the address data "#A" or "B#", and the total reception time data stored in the starting condition fulfillment count memory (DM) 10d represents a predetermined number of times ("50", for example, counting the aforementioned reception of the address data). In this case, the CPU 7 starts the "Display Control Subprogram I'".

When the "Display Control Subprogram I'" starts, the CPU 7 executes the following process for extending the usable area of the free word conversion matrix:

The CPU 7 refers to pieces of flag information contained in the "Free Word Conversion Matrix" item which the setting content management memory 10a (Fig. 8) of the RAM 10 stores to manage the protection release status of the extended area 92, having five sub areas 92a to 92e, of the free word conversion matrix (Fig. 5). The CPU 7 changes, from "0" to "1", the piece of flag information corresponding to one of the sub areas which have not yet been released from the protection, as a result of which the sub area corresponding to the piece of flag information changed to "1" is released from the protection. Then the CPU 7 displays, on the display section 11, the message which informs that the free words in the sub area released from the protection have become usable, as shown in Fig. 14(d).

The above are the explanations of the steps by which the CPU 7 starts the subprograms during the received data processing procedure.

The key input control procedure which the CPU 7 of the pager 1 executes will now be described with reference to the subprogram starting condition table shown in Fig. 16 and the flowchart shown in Fig. 17.

Fig. 16 is a diagram showing another example of the processing subprogram starting condition table stored in the starting condition memory 9m of the ROM 9. The subprogram starting condition table depicted in Fig. 16 is one in which the names of the subprograms to be started in the key input control procedure which will be described later, i.e., the display control subprograms, the alarm control subprograms and the set up function control subprograms, are shown in association with the starting conditions of all those subprograms.

When the CPU 7 detects that the Memory key 14b has been depressed once during the reception standby mode and that the Select key 14c has been depressed twice in succession and the Set key 14d has been depressed five times in succession within a predetermined period of time (e.g. ten seconds) after the depression of the Memory key 14b, the CPU 7 determines that the starting condition corresponding to the subprogram address "11" has been fulfilled, and starts the "Set Up Function Control Subprogram I". The CPU 7 enlarges the function of the pager 1 in accordance with this subprogram.

Fig. 17 is a flowchart showing the key input control procedure executed by the CPU 7. When the CPU 7 detects the depression (the cancel instructing operation) of the main switch 14a and the depressions of the Memory Key 14b, the Select key 14c and the SET key 14d after the pager 1 has been turned on, the CPU 7 reads out the subprograms associated with the key input control procedure, and starts the key input control procedure.

Firstly, the CPU 7 analyzes the depressed keys (step S21), and stores operation information (specifying the depressed keys, the length of time over which the keys have been depressed, the presence/absence of simultaneously depressed keys, etc.) in the key input memory 10e of the RAM 10 (step S22).

Thereafter, based on the operation information stored in the key input memory 10e and other conditions, the CPU 7 refers to the individual "starting conditions" shown in the subprogram starting condition table (Fig. 16) stored in the starting condition memory 9m (step S23), and determines whether any one of the starting conditions has been fulfilled (step S24). When the CPU 7 determines that none of the starting conditions has been fulfilled, the CPU 7 executes a normal key input process in accordance with the depressed keys (step S25), after which the CPU 7 returns to the step S1.

When the CPU 7 determines that one of the starting conditions has been fulfilled, the CPU 7 updates the value of the fulfillment time data which the starting condition fulfillment count memory 10d stores in association with the subprogram address corresponding to the fulfilled starting condition. After this, as well as in the steps S5 to S7, the CPU 7 reads and starts the subprogram corresponding to the fulfilled starting condition contained in the subprogram starting condition table (step S26), and executes a corresponding one of the various control processes which have not been set as normal ones, such as the display control processes, the alarm control processes and the set up function control processes, etc. (step S27). When the subprogram terminates (step S28), the CPU 7 returns to the step S21. The CPU 7 ends the key input control procedure in the case where no key depression is detected throughout a predetermined length of time or in the case where the input of an interruption instruction is detected.

Specific examples of the control processes, each being executed when a corresponding one of the starting conditions has been fulfilled at the time of data reception, will now be described.

Case 10: Subprogram Addresses "11" and "12" (Set Up Function Control Subprogram I)

When the CPU 7 of the pager 1 detects that the Memory key 14b has been depressed and that the Select key 14c has been depressed twice in succession and the Set key 14d has been depressed five times in succession within a predetermined period of time after the depression of the Memory key 14b, or when the CPU 7 detects at the time of the detection of the depression of the Select key 14c that the current time data represents a series of three or more equal numbers as in the case of "3(o'clock):11(minutes):11(seconds)", the CPU 7 determines that the starting condition corresponding to the subprogram addresses "11" and "12" in the subprogram starting condition table (Fig. 16) has been fulfilled, and starts the "Set Up Function Control Subprogram I" explained previously, in order to extend the usable area of the free word conversion matrix.

As regards the subprogram address "12", the CPU 7 may start the "Set Up Function Control Subprogram I" either when the CPU 7 determines that the Select key 14c has been depressed at the same timing as that of the reception of the real time information data (the real time information data is received once every four minutes) or when the CPU 7 determines to display a specific message, stored in the message memory of the RAM 10, at the same timing as that of the reception of the real time information data

Case 11: Subprogram Address "13" (Set Up Function Control Program II')

Let it be assumed that the CPU 7 detects the depression of the Set key 14d and again detects the depression of the Set key 14d within a predetermined period of time (e.g. ten seconds), and the total number of received data stored in the message memory is "10". In this case, the CPU 7 starts the "Set Up Function Control Subprogram II'" when the maximum number of data which can be stored in the message memory of the RAM 10 is "15".

When the "Set Up Function Control Subprogram II'" starts, the CPU 7 changes, from "0" to "1", a piece of flag information contained in the "Message Memory" item stored in the setting content management memory 10a (Fig. 8), in order to increase the maximum number of data which can be stored in the message memory. The CPU 7 thereafter displays on the display section 11 the message which informs that the maximum number of data which can be stored in the message memory has been increased.

The above are the explanations of the steps by

which the CPU 7 executes the key input control procedure.

As described above, according to the pager 1 of the first embodiment, when the CPU 7 determines that one of the starting conditions in the subprogram starting condition table of the starting condition memory 9m has been fulfilled, based on the data received by the data reception section which includes the antenna 2, the receiving section 3, the decoder 4, the buffer memory 5, the deinterleave circuit 6, the ID-ROM 8, etc., the CPU 7 reads out the fulfilled subprogram from the ROM 9, and starts the read-out subprogram. In accordance with this subprogram, the CPU 7 carries out a corresponding one of the control processes (specific functions preset in the pager 1 and which are invalid at the time the pager 1 is initially turned on) which have not been set as normal ones, such as the display control processes, the alarm control processes and the set up function control processes.

Thus, the CPU 7 can execute, in response to the data reception, the control processes preset in the pager 1 and which are invalid at the time the pager 1 starts a normal operation (at the time the pager 1 is initially turned on).

Second Embodiment

In the first embodiment, when the CPU 7 of the pager 1 determines, at the time of the data reception or the key input procedure, that one of the subprogram starting conditions has been fulfilled, the CPU 7 operates a corresponding one of the specific functions preset in the pager 1 and which are invalid at the point in time the pager 1 is initially turned on, and the CPU 7 changes an alerting/displaying mode or enlarges the image display function or another set function of the pager 1 so that the user or subscriber can utilize the pager 1 as a communication tool which provides him/her with a sort of "play" element.

In the second embodiment, when received data satisfies a predetermined condition, the CPU 7 of the pager 1 automatically determines background image data to be displayed while the pager 1 is in the reception standby mode.

The pager 1 of the second embodiment has substantially the same structure as that of the first embodiment shown in Fig. 1.

However, the ROM 9, the RAM 10 and the display section 11 shown in Fig. 1 are modified and employed as the ROM 9', the RAM 10' and the display section 11' in the second embodiment. The entire structure of the pager 1 of the second embodiment is not illustrated in the accompanying drawings, and only the modified contents will be hereinafter explained in detail.

The ROM 9' is an EEPROM and includes, as illustrated in Fig. 18, the program memory (PM) 9a, the character generator memory (CG) 9b, the numeric character data conversion table memory (NDT) 9c, the free word conversion matrix memory (FM) 9d, the alphanumeric data conversion table memory (AT) 9e, the fixed message conversion table memory (FT) 9f, the display control subprogram memory (DC) 9g, the alarm control subprogram memory (FC) 9h, the set up function control subprogram memory (KC) 9i, the image data memory (GC) 9j and the melody data memory (LC) 9k, as in the case of the ROM 9 of the first embodiment which is shown in Fig. 3. The ROM 9' of the second embodiment further includes a starting condition memory (CM) 9m' and a background image memory (BC) 9n.

The starting condition memory (CM) 9m' has a memory area which stores a subprogram starting condition table (Fig. 19) wherein the names of the subprograms which can be started during the received data processing procedure (Fig. 11) explained in relation to the first embodiment, such as the display control subprograms, the alarm control subprograms and the set up function control subprograms, are listed in association with the starting conditions of all those subprograms.

When the CPU 7 detects that received data contains the free word definition code "- -" (hyphen hyphen), the free word message "BUILD" (the numeric character data "2241293224"), the keyword (prestored in the background image memory (BC) 9n and shown in Fig. 20) associated with the free word message, and the two-digit number specifying the display position in which image data is to be displayed, the CPU 7 starts the "Display Control Subprogram VI" referred to the subprogram starting condition table, and displays a background image on the display section 11 in accordance with the "Display Control Subprogram VI".

The background image memory (BC) 9n has a memory area which stores a background image data table (Fig. 20) wherein background images which can be displayed while the pager 1 is in the reception standby mode are listed in association with their storage addresses in the image data memory (GC) 9j and their keywords.

In the background image data table of Fig. 20, image data representing the image of a Rouse, for example, is listed in association with the GC storage address "11" and the keyword "HOUSE" (the numeric character data "2811413936").

Similarly, image data representing the image of a moon is listed in association with the GC storage address "14" and the keyword "MOON" (the numeric character data "33353534).

The RAM 10' illustrated in Fig. 21 includes the message memory (MM) 10b, the address book memory (AM) 10c the starting condition fulfillment count memory (DM) 10d and the key input memory (IM) 10e, as in the case of the RAM 10 of the second embodiment which is illustrated in Fig. 7. The RAM 10' further includes a setting content management memory (SCM) 10a' and a background image display control memory (BIM) 10f.

The setting content management memory (SCM)

10a' has a memory area which manages, through the use of flag information, data representing the maximum number of received data which can be stored in the message memory 10b, data representing the maximum number of data which can be stored in the address book memory 10c, data specifying which area of the free word conversion matrix (Fig. 5) can be used for conversion, the subprograms stored in the display control subprogram memory 9g and which are actually started to display received messages, the subprograms stored in the alarm control subprogram memory 9h and which are actually started to inform the user of the reception of data with an alarm, the set up function control subprograms stored in the set up function control subprogram memory 9i and which are actually started, etc.

The setting content management memory 10a' has also a memory area which stores data specifying the number of received data currently stored in the message memory 10b of the RAM 10' and data specifying the number of data currently stored in the address book memory 10c.

In Fig. 22 which illustrates the setting content management memory 10a, the values of the flag information show the initial status at the time the pager 1 is initially turned on. In the initial status, the maximum number of received data which can be stored in the message memory 10b of the RAM 10' is "15", while the maximum number of data which can stored in the address book 10c is "12".

In the second embodiment, the value of the flag information, stored in the setting content management memory 10a' in association with the "Display Control Subprogram VI" which corresponds to the subprogram address "10" in the subprogram starting condition table 9m' shown in Fig. 19, is constantly "1" (this value indicates that the "Display Control Subprogram VI" can be started).

The background image display control memory (BIM) 10f has a memory area which stores a background image table (Fig. 23). In this background image table, the storage addresses of the background image data stored in the image data memory (GC) 9j and which can be displayed when the mode of the pager 1 is changed form the reception mode to the reception standby mode, are listed together with data specifying the positions in which the background image data are displayed. More specifically, in the background image table shown in Fig. 23, the storage addresses of the background image data in the image data memory (GC) 9j are listed in association with the display positions 11a' (numbered 01 to 22 in Fig. 24) designated on the display section 11'.

The display section 11' has an LCD panel of the dot-matrix type, for example, and displays messages, images (moving pictures), etc., based on the received data supplied from the driver 13 illustrated in Fig. 1.

The display positions designated on the screen of the display section 11 are as shown in Fig. 24. The screen of the display section 11' is made up of display blocks arranged in four rows and in eleven columns, and 2-digit numbers (01 to 22) are assigned to the display blocks (the display positions 11a hatched in Fig. 24). Based on the table stored in the background image display control memory (BIM) 10f, image data are displayed in their corresponding display positions.

The above are the explanations of the structural differences between the second embodiment and the first embodiment of the present invention.

The operation of the pager 1 according to the second embodiment will now be described.

Case 12: Subprogram Address "10" (Display Control Subprogram VI)

In the same procedure as the received data processing procedure (Fig. 11) of the first embodiment, the display section 11' displays images such as those illustrated in Fig. 26 while the pager 1 is in the reception standby mode.

To be specific, when the pager 1 receives the numeric character data "--2224129322447333535340096_", the CPU 7 during the message display process analyzes the first two characters "- -" as a free word definition code the subsequent characters "22241293224" as the free word message "BUILD", the characters "33353534" as the keyword "MOON" (the keyword (Fig. 20) associated with the free word message), the characters "0096" as the free word "01", and the last character "_" as a free word end code.

As a result of the analysis, the CPU 7 displays the message "BUILD MOON 01" on the display section 11' as shown in Fig. 27. The CPU 7, which has detected the free word message "BUILD" and the keyword "MOON" set in the background image memory (BC) 9n, determines that the starting condition corresponding to the subprogram address "10" in the subprogram starting condition table (Fig. 19) has been fulfilled, and starts the "Display Control Subprogram VI".

In this "Display Control Subprogram VI", the GC storage address "14" which has been set in the background image memory (BC) 9n in association with the keyword "MOON", is set in the background image display control memory (BIM) 10f by the CPU 7, in association with the display position "01" specified after the message "BUILD MOON", as shown in Fig. 25. When the CPU 7 detects the operation of (any key of) the key input section 14, the CPU 7 changes the display image currently displayed on the display section 11' to that to be displayed while the pager 1 is in the reception standby mode, and displays background image data 11b' in the display position "01" as illustrated in Fig. 28, based on the data set in the background image control memory (BIM) 10f as shown in Fig. 25 (in Fig. 28, the image of a moon is displayed in the display position "01").

When displaying new background image data in that display position in association with which the GC storage address has already been set in the background image display control memory (BIM) 10f, the GC storage address is replaced with that of the new background image data.

As described above, according to the pager 1 of the second embodiment which has a data reception section (reception means) including the antenna 2, the receiving section 3, the decoder 4, the buffer memory 5, the deinterleave circuit 6, the ID-ROM 8, etc., when the CPU 7 (detection means and control means) detects, in data received by the data reception section, predetermined message data stored in the subprogram starting condition table of the starting condition memory 9m, the CPU 7 reads out the Display Control Subprogram VI from the ROM 9' as the subprogram associated with the message data, and starts the read-out subprogram. In accordance with the read-out Display Control Subprogram VI, the CPU 7 displays a background image in a predetermined display position on the display section 11'.

Thus, a background image to be displayed on the pager 1 of the user can be determined by himself/herself, but also such a background image can be determined by the message data received from the pager 1 of another user. This enhances the pleasure of exchanging messages between the sender and the receiver with their pagers 1.

The present invention is not limited to the above-described embodiments.

For example, since the ROM 9 of the pager 1 is formed of an EEPROM, a subprogram starting condition and a subprogram to be started may be transmitted by radio from the paging system and may be stored in the pager 1.

Fig. 29 is a flowchart showing the process which the CPU 7 carries out in that case. (The steps shown in the flowchart of Fig. 29 are interposed between the steps S11 and S12 included in the received data processing procedure shown in the flowchart of Fig. 11.)

In the above case, when the CPU 7 detects a subprogram address and alteration data (for changing the relationship between a starting condition and a subprogram or for altering the subprogram) in received data (set in any one of the block information (FI) 52B, the vector field (VF) 52F and the message field (MF) 52G) (step S31), the CPU 7 rewrites data stored in the starting condition memory (CM) 9m, the display control subprogram memory (DC) 9g, the alarm control subprogram memory (FC) 9h and the set up function control subprogram memory 9i in accordance with the control contents of the received data (step S32), resets the flag information corresponding to the storage address of the rewritten subprogram at "0", and terminates the present process.

When the CPU 7 does not detect the above-described data in the received data, it goes to the step S12 as the normal proccssing procedure.

The steps shown in the flowchart of Fig. 29 permit a service proprietor to send a new function to the pager 1 and to write the new function in the pager 1, and enables the service proprietor to constantly provide a new communication service to the user.

In the first and second embodiments, the present invention is applied to the pager 1 which is connected via a radio signal to the paging system which is an example of the data communication system. However, the present invention is not limited thereto, and is applicable also to paging receivers employing an NTT scheme and a POCSAG scheme.

Further, according to the above-described embodiments, the present invention is applied to paging receivers. However, the present invention is applicable also to an FM teletext broadcast receiver which can receive a teletext broadcast, a PDA (Personal Digital Assistant) utilized in an MCA data communication system like a teleterminal system, portable telephones having a data communication function, such as a cellular phone, a PHS phone and a smart phone, and an electronic mail system, etc.

Claims

1. A data receiving apparatus characterized by comprising:

   detection means (7) for detecting first predetermined data in received data; and
   control means (7) for, when said detection means detects said first predetermined data, validating at least one specific function preset invalid.

2. The data receiving apparatus according to claim 1, characterized in that:

   said control means (7) has condition information storage means (9m) for storing condition information specifying conditions for the validation of said at least one specific function, and one of said conditions is the detection of said first predetermined data by said detection means (7);
   when said detection means (7) detects said first predetermined data, said control means (7) determines whether at least one of the other conditions than the detection of said first predetermined data has been satisfied; and
   when said control means (7) determines that at least one of said other conditions has been satisfied, said control means (7) validates said at least one specific function.

3. The data receiving apparatus according to claim 1, characterized in that:

said control means (7) includes determination means (7) for determining whether at least one predetermined condition has been satisfied, when said detection means (7) detects said first predetermined data; and

when said determination means (7) determines that said at least one predetermined condition has been satisfied, said control means (7) validates said at least one specific condition.

4. The data receiving apparatus according to claim 3, characterized in that said at least one predetermined condition refers to the received data.

5. The data receiving apparatus according to any one of claims 3 and 4, characterized in that:

said at least one predetermined condition is a condition in which said first predetermined data and second predetermined data are contained in the received data;

when said detection means (7) detects said first predetermined data in the received data, said control means (7) determines whether said second predetermined data is contained in the received data including said first predetermined data; and

when said control means (7) determines that said second predetermined data is contained in the received data, said control means (7) validates said at least one specific function.

6. The data receiving apparatus according to claim 3, characterized in that said at least one predetermined condition refers to data attained by performing data processing in said data receiving apparatus.

7. The data receiving apparatus according to any one of claims 3 to 6, characterized in that:

when said detection means (7) detects said first predetermined data in the received data, said determination means (7) determines whether one of a plurality of predetermined conditions which include said at least one predetermined condition has been satisfied; and

when said determination means (7) determines that one of said plurality of predetermined conditions has been satisfied, said control means (7) validates said at least one specific condition.

8. The data receiving apparatus according to any one of claims 1 to 7, characterized in that:

said data receiving apparatus has a plurality of specific functions preset invalid and including said at least one specific function, said first predetermined data are a plurality of data items each corresponding to at least one of said plurality of specific functions; and

when said detection means (7) detects at least one of said plurality of data items in the received data, said control means (7) validates at least one of said plurality of specific functions which corresponds to the detected at least one of said plurality of data items, in accordance with a correspondence between said first predetermined data and said plurality of specific functions.

9. The data receiving apparatus according to any one of claims 1 to 8, characterized in that periodically transmitted control data which controls said data receiving apparatus, contains said first predetermined data.

10. The data receiving apparatus according to any one of claims 1 to 8, characterized in that identification data which designates said data receiving apparatus, contains said first predetermined data.

11. The data receiving apparatus according to any one of claims 1 to 10, characterized in that:

said data receiving apparatus further comprises display means (11) for displaying a message based on the received data; and

message data representing a message to be displayed on said display means (11) contains said first predetermined data.

12. The data receiving apparatus according to claim 6, characterized in that:

said data receiving apparatus further comprises display means (11) for displaying a message based on the received data; and

control data which controls a mode in which said display means (11) displays the message, contains said first predetermined data.

13. The data receiving apparatus according to claim 6, characterized in that said at least one specific function is a function of displaying the message on said display means (11) in a display mode different from a normal display mode.

14. The data receiving apparatus according to claim 6, characterized in that:

said data receiving apparatus further comprises image storage means (9) for storing image data; and

said at least one specific function is a function

of displaying the image data stored in said image storage means (9) on said display means (11).

15. The data receiving apparatus according to any one of claims 1 to 14, characterized in that:

said data receiving apparatus further comprises alarm means (11, 16, 17, 18) for generating an alarm; and
said at least one specific function is a function of making said alarm means (11, 16, 17, 18) generate the alarm in an alarm mode different from a normal alarm mode.

16. The data receiving apparatus according to any one of claims 1 to 15, characterized in that:

said data receiving apparatus further comprises expansion information storage means (9) for storing expansion information necessary to expand a function preset valid; and
said at least one specific function is a function of expanding said function preset valid, in accordance with the expansion information stored in said expansion information storage means (9).

17. The data receiving apparatus according to any one of claims 1 to 16, characterized in that:

said data receiving apparatus further comprises counting means (7) for counting the number of times said data receiving means has received data; and
when said detection means (7) detects said first predetermined data, said control means (7) validates said at least one specific function in a case where the number counted by said counting means (7) is equal to or greater than a predetermined value.

18. The data receiving apparatus according to any one of claims 1 to 16, characterized in that:

said data receiving apparatus further comprises counting means (7) for counting the number of times said data receiving apparatus has received predetermined data; and
said control means (7) validates said at least one specific function when the number counted by said counting means (7) exceeds a predetermined value.

19. A method for processing received data, characterized by comprising:

a reception step (S9) of receiving a string of data;
a storage step (S11) of storing the received string of data;
a detection step (S12 and S13) of detecting predetermined data in the received string of data; and
a validation step (S5 and S6) of validating a specific function preset invalid, when the predetermined data is detected in said detection step (S12 and S13).

20. The method according to claim 19, characterized in that said validation step (S5 an S6) includes a determination step (S12 and S13) of, when the predetermined data is detected, determining whether a predetermined condition has been satisfied, and said specific function is validated when it is determined in said determination step that the predetermined condition has been satisfied.

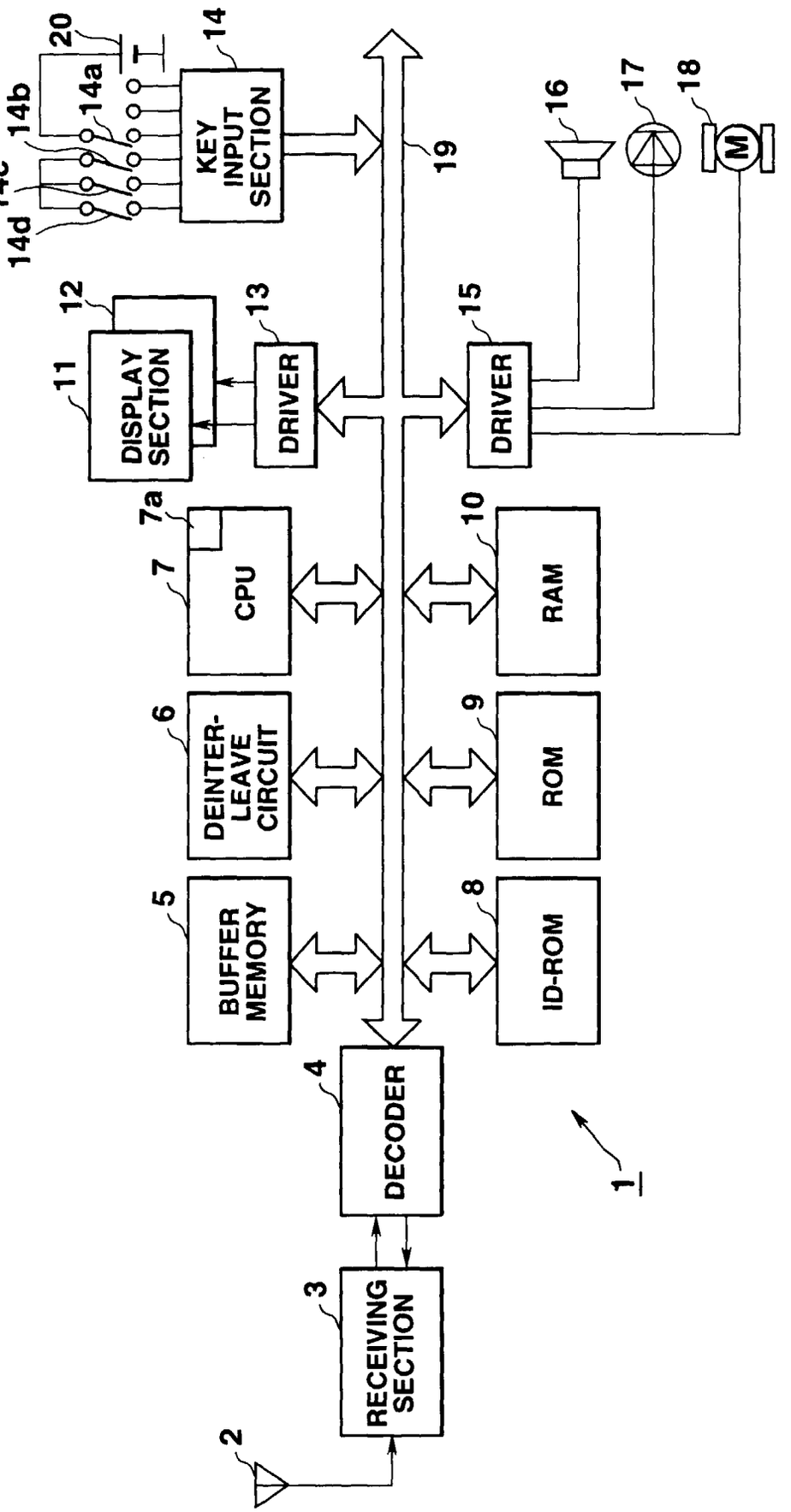

20
14
14b
14a
14c
14d
KEY INPUT SECTION
19
16
17
18
M
12
11
DISPLAY SECTION
13
DRIVER
15
DRIVER
7a
7
CPU
10
RAM
6
DEINTER-LEAVE CIRCUIT
9
ROM
5
BUFFER MEMORY
8
ID-ROM
4
DECODER
1
3
RECEIVING SECTION
2

FIG.1

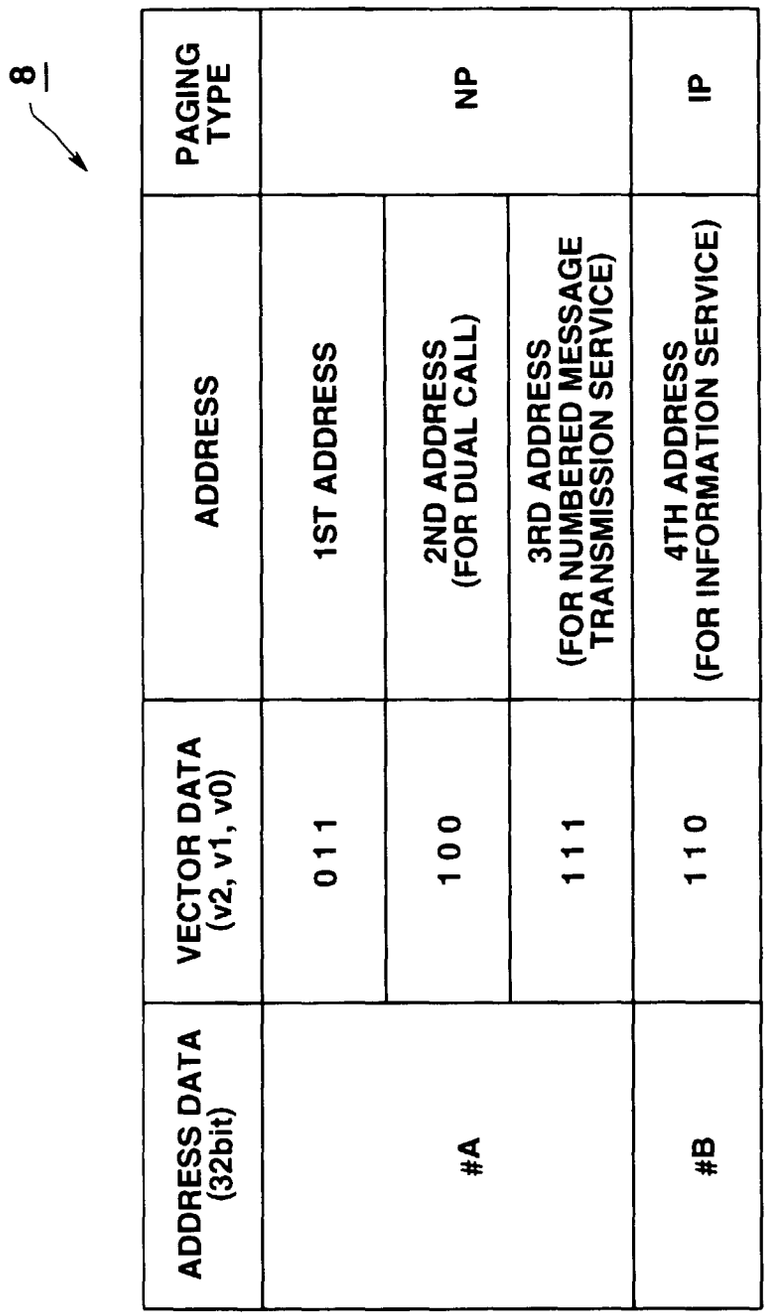

8
ADDRESS DATA (32bit)
VECTOR DATA (v2, v1, v0)
ADDRESS
PAGING TYPE
#A
0 1 1
1ST ADDRESS
NP
1 0 0
2ND ADDRESS (FOR DUAL CALL)
1 1 1
3RD ADDRESS (FOR NUMBERED MESSAGE TRANSMISSION SERVICE)
#B
1 1 0
4TH ADDRESS (FOR INFORMATION SERVICE)
IP

FIG.2

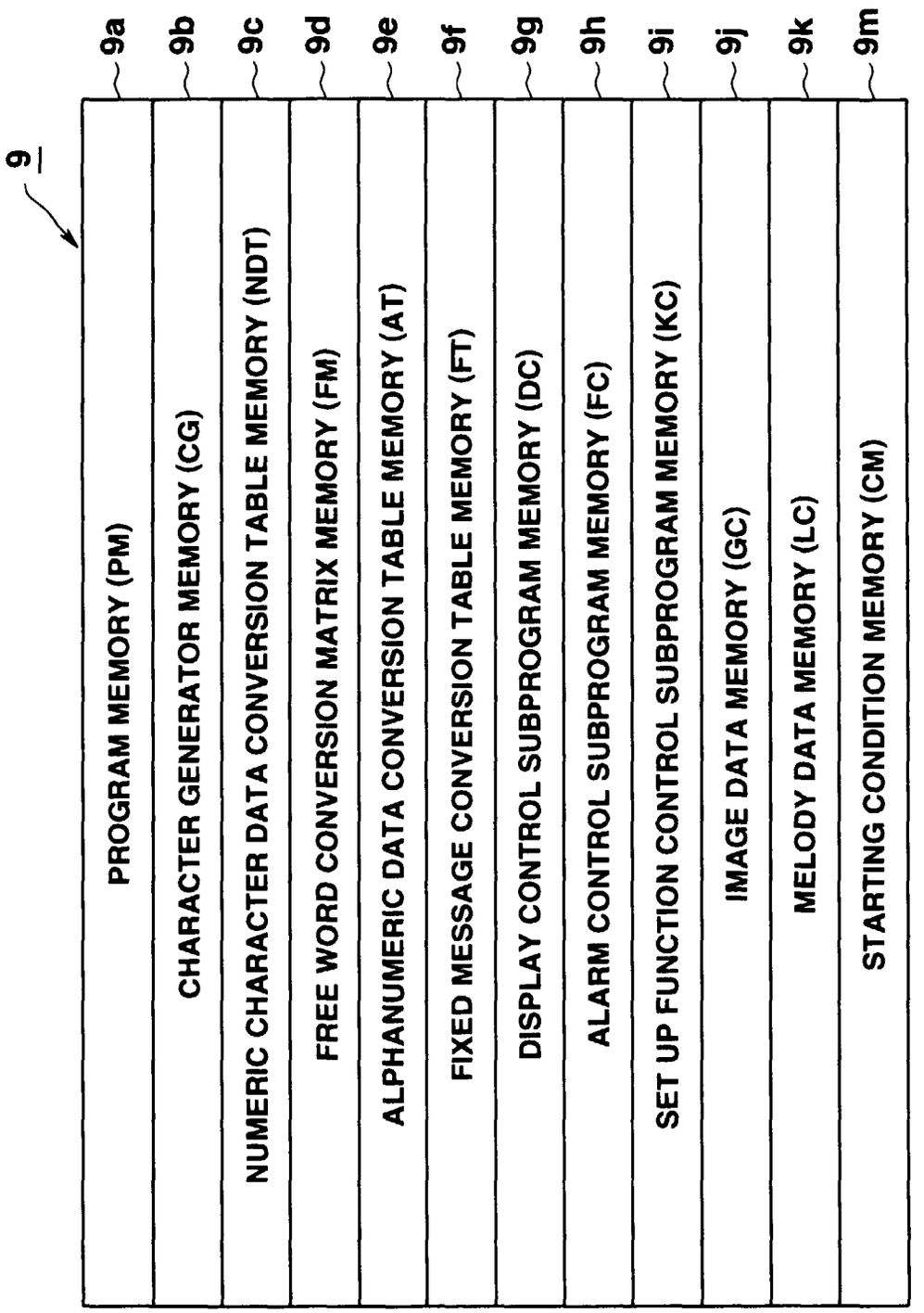

9
9a
PROGRAM MEMORY (PM)
9b
CHARACTER GENERATOR MEMORY (CG)
9c
NUMERIC CHARACTER DATA CONVERSION TABLE MEMORY (NDT)
9d
FREE WORD CONVERSION MATRIX MEMORY (FM)
9e
ALPHANUMERIC DATA CONVERSION TABLE MEMORY (AT)
9f
FIXED MESSAGE CONVERSION TABLE MEMORY (FT)
9g
DISPLAY CONTROL SUBPROGRAM MEMORY (DC)
9h
ALARM CONTROL SUBPROGRAM MEMORY (FC)
9i
SET UP FUNCTION CONTROL SUBPROGRAM MEMORY (KC)
9j
IMAGE DATA MEMORY (GC)
9k
MELODY DATA MEMORY (LC)
9m
STARTING CONDITION MEMORY (CM)

FIG.3

9c

NUMERIC CHARACTER DATA	B3	B2	B1	B0
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
U	1	0	1	1
SPACE (_)	1	1	0	0
HYPHEN (—)	1	1	0	1
[	1	1	1	0
]	1	1	1	1

FIG.4

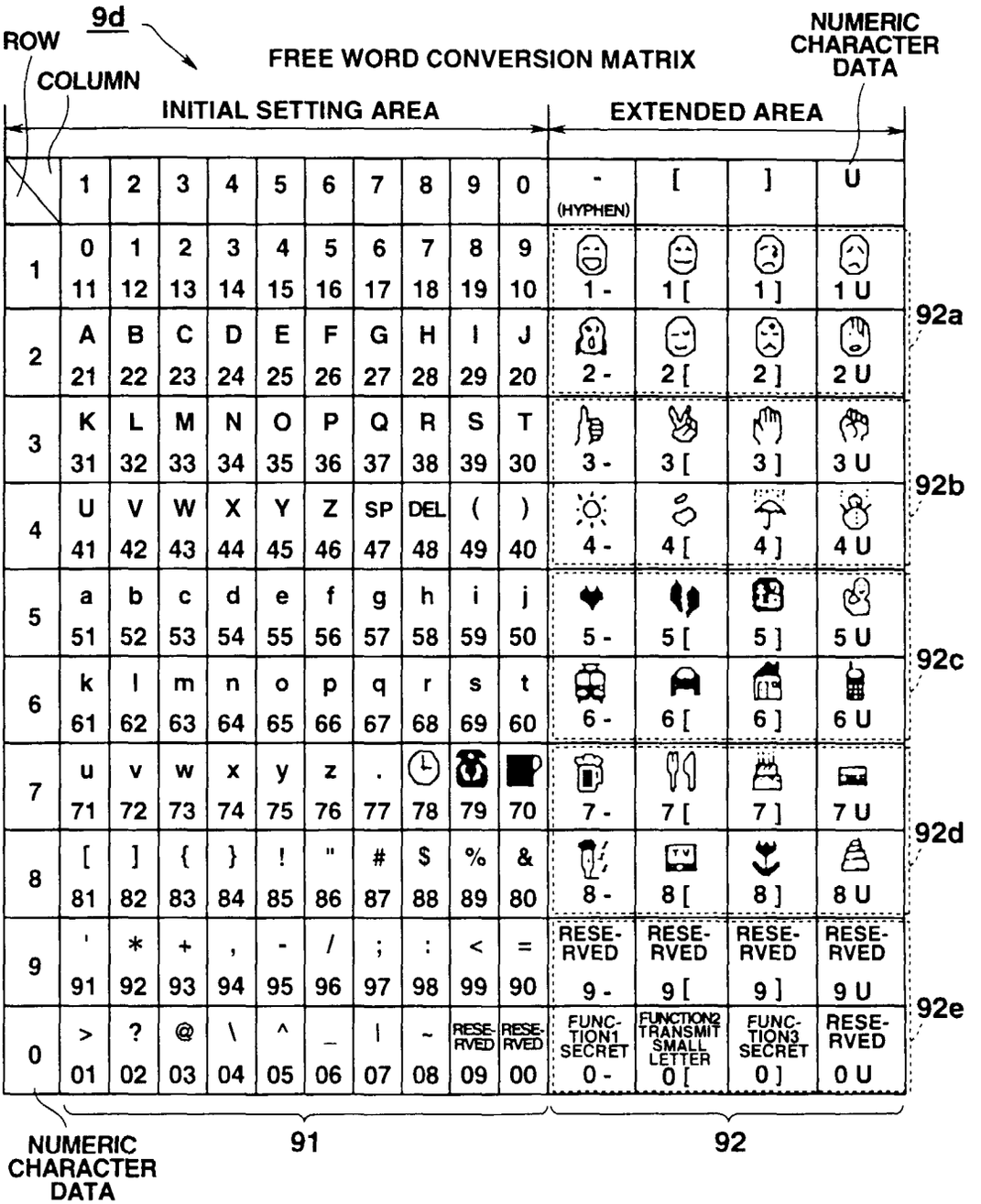

9d
ROW
COLUMN
FREE WORD CONVERSION MATRIX
NUMERIC CHARACTER DATA
INITIAL SETTING AREA
EXTENDED AREA
1 2 3 4 5 6 7 8 9 0 - (HYPHEN) [ ] U
1 0 1 2 3 4 5 6 7 8 9 11 12 13 14 15 16 17 18 19 10 1 - 1 [1] 1 U
2 A B C D E F G H I J 21 22 23 24 25 26 27 28 29 20 2 - 2 [2] 2 U
3 K L M N O P Q R S T 31 32 33 34 35 36 37 38 39 30 3 - 3 [3] 3 U
4 U V W X Y Z SP DEL ( ) 41 42 43 44 45 46 47 48 49 40 4 - 4 [4] 4 U
5 a b c d e f g h i j 51 52 53 54 55 56 57 58 59 50 5 - 5 [5] 5 U
6 k l m n o p q r s t 61 62 63 64 65 66 67 68 69 60 6 - 6 [6] 6 U
7 u v w x y z . 71 72 73 74 75 76 77 78 79 70 7 - 7 [7] 7 U
8 [ ] { } ! " # $ % & 81 82 83 84 85 86 87 88 89 80 8 - 8 [8] 8 U
9 ' * + , - / ; : < = 91 92 93 94 95 96 97 98 99 90 RESE-RVED 9 - RESE-RVED 9 [RESE-RVED 9] RESE-RVED 9 U
0 > ? @ \ ^ _ | ~ RESE-RVED RESE-RVED 01 02 03 04 05 06 07 08 09 00 FUNC-TION1 SECRET 0 - FUNCTION2 TRANSMIT SMALL LETTER 0 [FUNC-TION3 SECRET 0] RESE-RVED 0 U
92a
92b
92c
92d
92e
NUMERIC CHARACTER DATA
91
92

FIG.5

SUBPROGRAM ADDRESS

SUBPROGRAM STARTING CONDITION TABLE 9m

No.	SUBPROGRAM STARTING CONDITION				SUBPROGRAM SUBPROGRAM ADDRESS
	ADDRESS DATA	VECTOR DATA	MESSAGE	OTHERS	
1			FREE WORD DEFINITION CODE (- -) + (NUMERIC CHARACTER DATA) + (_(SPACE))	MESSAGE DATA RECEIVED FIVE TIMES OR MORE	DISPLAY CONTROL SUBPROGRAM I ALTERNATELY DISPLAY RECEIVED MESSAGE AND IMAGE SHOWN IN FIG.12B
2			FREE WORD DEFINITION CODE (- -) + 27656554476 4557369		DISPLAY CONTROL SUBPROGRAM II DISPLAY RECEIVED MESSAGE AND PERFORM ANIMATION DISPLAY AS SHOWN IN FIGS.13B, 13C AND 13D
3			777 (NUMERIC CHARACTER DATA)		SET UP FUNCTION CONTROL SUBPROGRAM I DISPLAY IMAGE OF SLOT MACHINE AS SHOWN IN FIG.14 AFTER DISPLAY OF RECEIVED MESSAGE, AND EXTEND USABLE AREA OF FREE WORD CONVERSION MATRIX IN CASE OF PATTERN COMBINATION "777" DISPLAYED UPON SWITCH OPERATION
4	# A	1 1 1		MESSAGE NUMBER "10"	SET UP FUNCTION CONTROL SUBPROGRAM II INCREASE NUMBER "10"IN MESSAGE NUMBERING SERVICE AND TOTAL NUMBER OF DATA STORED IN MESSAGE MEMORY ARE EQUAL TO EACH OTHER
5				REAL TIME INFOR-MATION DATA	SET UP FUNCTION CONTROL SUBPROGRAM III INCREASE MAXIMUM NUMBER OF STORABLE ADDRESS BOOK DATA TO 30 WHEN NUMBER SPECIFIED BY TIME DATA AND TOTAL NUMBER OF STORED DATA ARE EQUAL TO EACH OTHER
6			_XXXX (SPACE CHARACTER + 4-DIGIT NUMERIC CHARACTER DATA)		DISPLAY CPNTROL SUBPROGRAM III AND ALARM CONTROL SUBPROGRAM I SEARCH ADDRESS BOOK MEMORY FORDATA ON CORRESPONDING PERSON, PERFORM ANIMATION DISPLAY AS SHOWN IN FIGS.15B, 15C AND 15D,AND OUTPUT MELODY DATA THROUGH SPEAKER IN CASE OF COINCIDENCE BETWEEN BIRTHDAY DATA AND DATE DATA
7			SERIES OF CHARACTERS "URGENT" CONTAINED IN TO-BE-DISPLAYED MESSAGE		DISPLAY CONTROL SUBPROGRAM IV AND ALARM CONTROL SUBPROGRAM II ALERT USER WITH ALARM FOR USE IN CASE URGENCY AND AUTOMATICALLY LIGHT UP BACK LIGHT WHEN DISPLAYING MESSAGE DURING PERIOD OF 6:00P.M. TO 2:00A.M.
8	# A		_XXXX (SPACE CHARACTER AND 4-DIGIT NUMERIC CHARACTER DATA)		DISPLAY CONTROL SUBPROGRAM V SEARCH ADDRESS BOOK MEMORY FOR DATA ON CORRESPONDING PERSON AND DISPLAY RECEIVED MESSAGE IN POP FONT IN CASE OF SEX DISTINCTION DATA "1"(FEMALE)
9	# A # B			TOTAL RECEPTION TIME DATA REPRESENTING PREDETER-MINED NUMBER	SET UP FUNCTION CONTROL SUBPROGRAM I' EXTEND USABLE AREA OF FREE WORD CONVERSION MATRIX AFTER DISPLAY OF RECEIVED MESSAGE
⋮	⋮	⋮	⋮	⋮	⋮

FIG.6

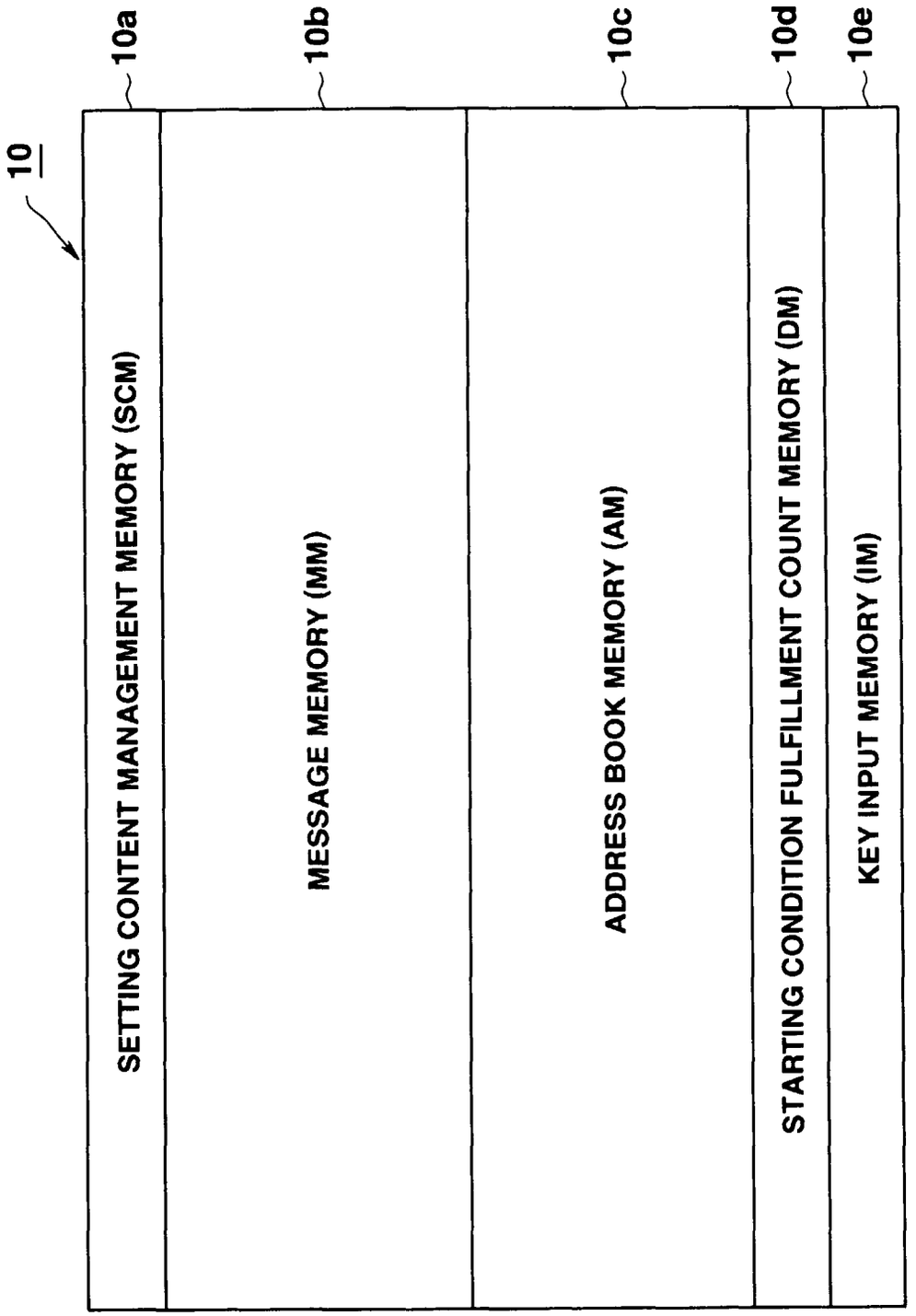

10
10a
10b
10c
10d
10e
SETTING CONTENT MANAGEMENT MEMORY (SCM)
MESSAGE MEMORY (MM)
ADDRESS BOOK MEMORY (AM)
STARTING CONDITION FULFILLMENT COUNT MEMORY (DM)
KEY INPUT MEMORY (IM)

FIG.7

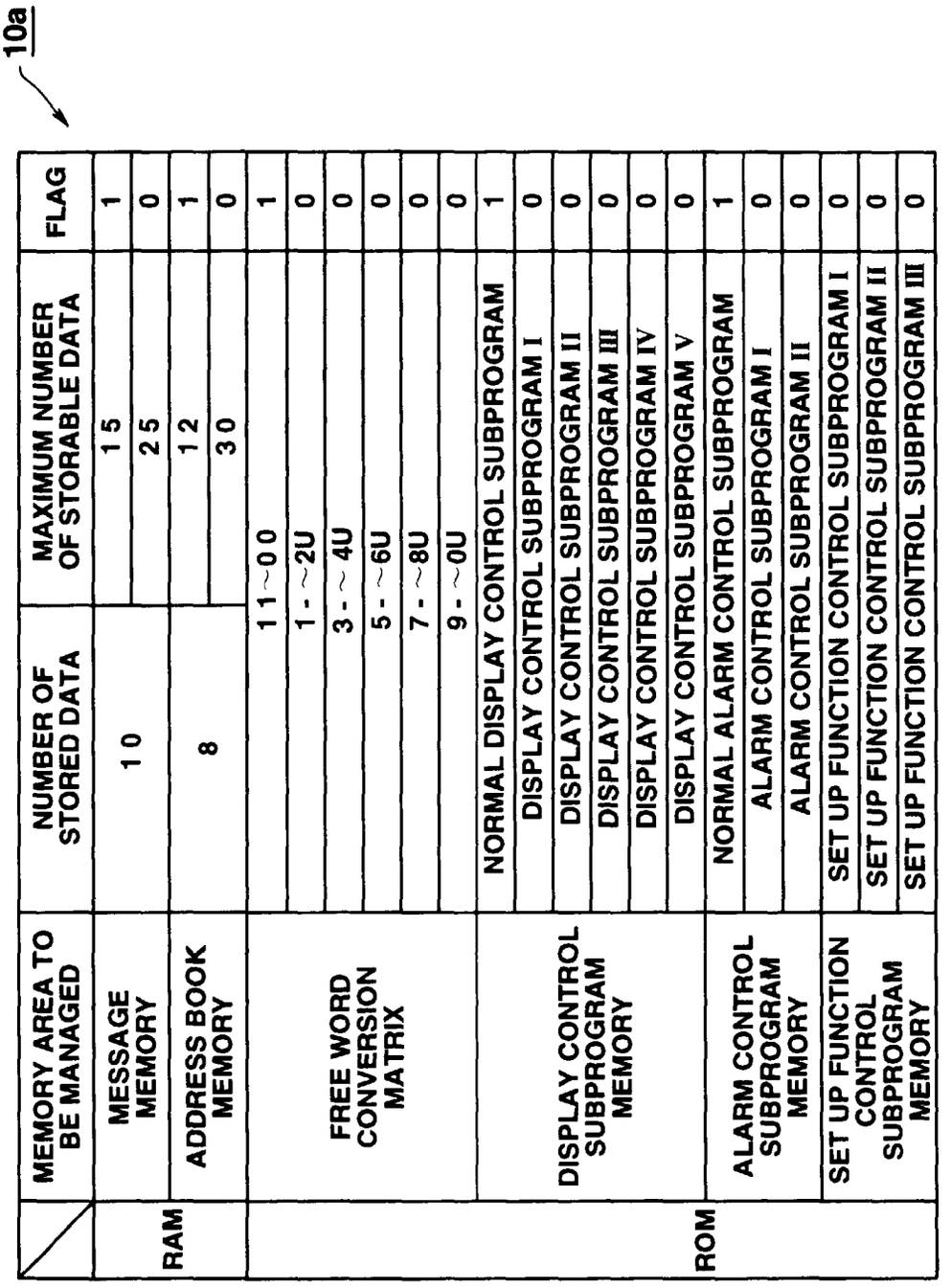

10a
RAM
ROM
MEMORY AREA TO BE MANAGED
NUMBER OF STORED DATA
MAXIMUM NUMBER OF STORABLE DATA
FLAG
MESSAGE MEMORY
10
15
1
25
0
ADDRESS BOOK MEMORY
8
12
1
30
0
FREE WORD CONVERSION MATRIX
11~00
1
1 - ~2U
0
3 - ~ 4U
0
5 - ~6U
0
7 - ~8U
0
9 - ~0U
0
DISPLAY CONTROL SUBPROGRAM MEMORY
NORMAL DISPLAY CONTROL SUBPROGRAM
1
DISPLAY CONTROL SUBPROGRAM I
0
DISPLAY CONTROL SUBPROGRAM II
0
DISPLAY CONTROL SUBPROGRAM III
0
DISPLAY CONTROL SUBPROGRAM IV
0
DISPLAY CONTROL SUBPROGRAM V
0
ALARM CONTROL SUBPROGRAM MEMORY
NORMAL ALARM CONTROL SUBPROGRAM
1
ALARM CONTROL SUBPROGRAM I
0
ALARM CONTROL SUBPROGRAM II
0
SET UP FUNCTION CONTROL SUBPROGRAM MEMORY
SET UP FUNCTION CONTROL SUBPROGRAM I
0
SET UP FUNCTION CONTROL SUBPROGRAM II
0
SET UP FUNCTION CONTROL SUBPROGRAM III
0

FIG.8

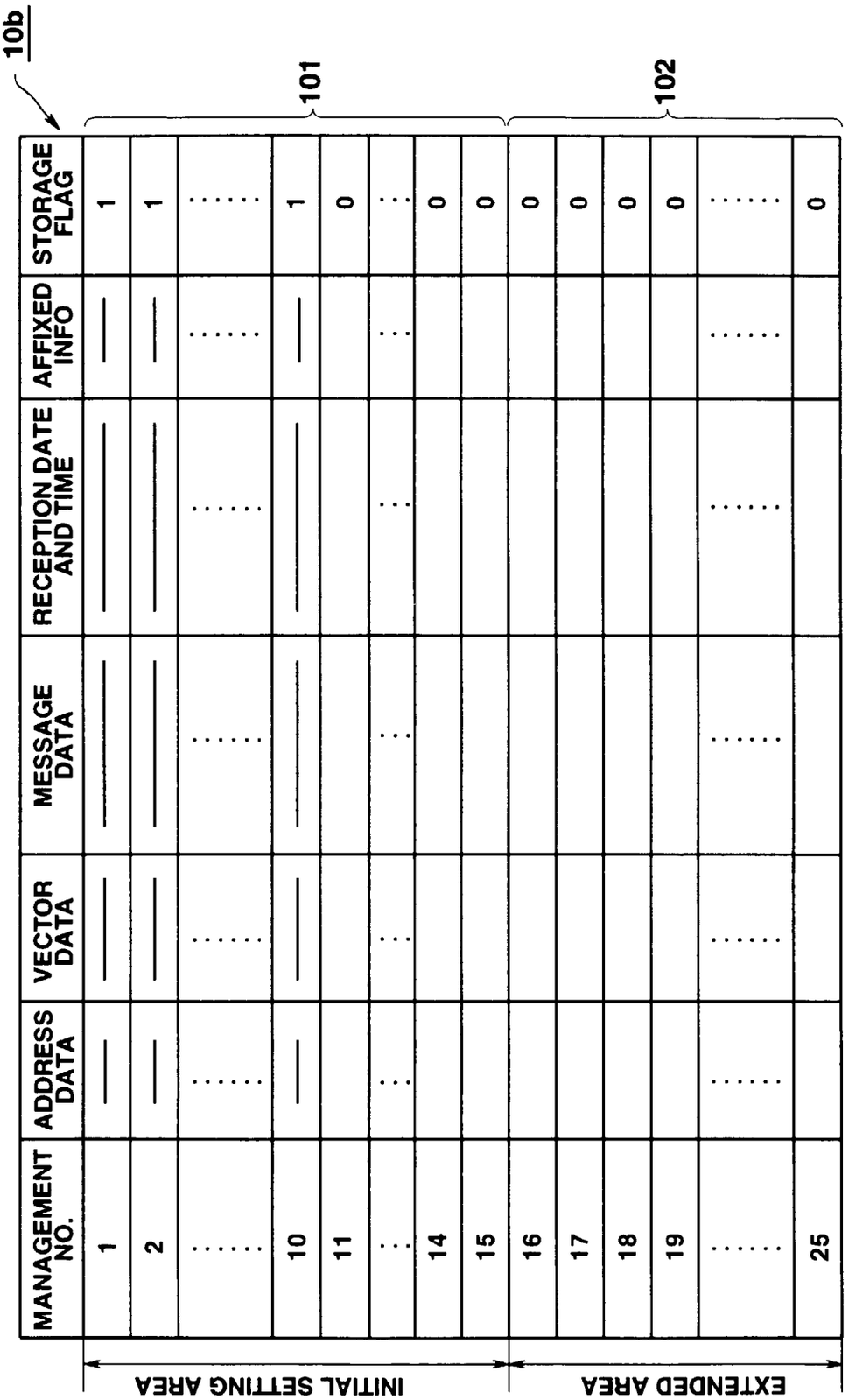

10b
101
102
MANAGEMENT NO.
ADDRESS DATA
VECTOR DATA
MESSAGE DATA
RECEPTION DATE AND TIME
AFFIXED INFO
STORAGE FLAG
INITIAL SETTING AREA
EXTENDED AREA

FIG.9

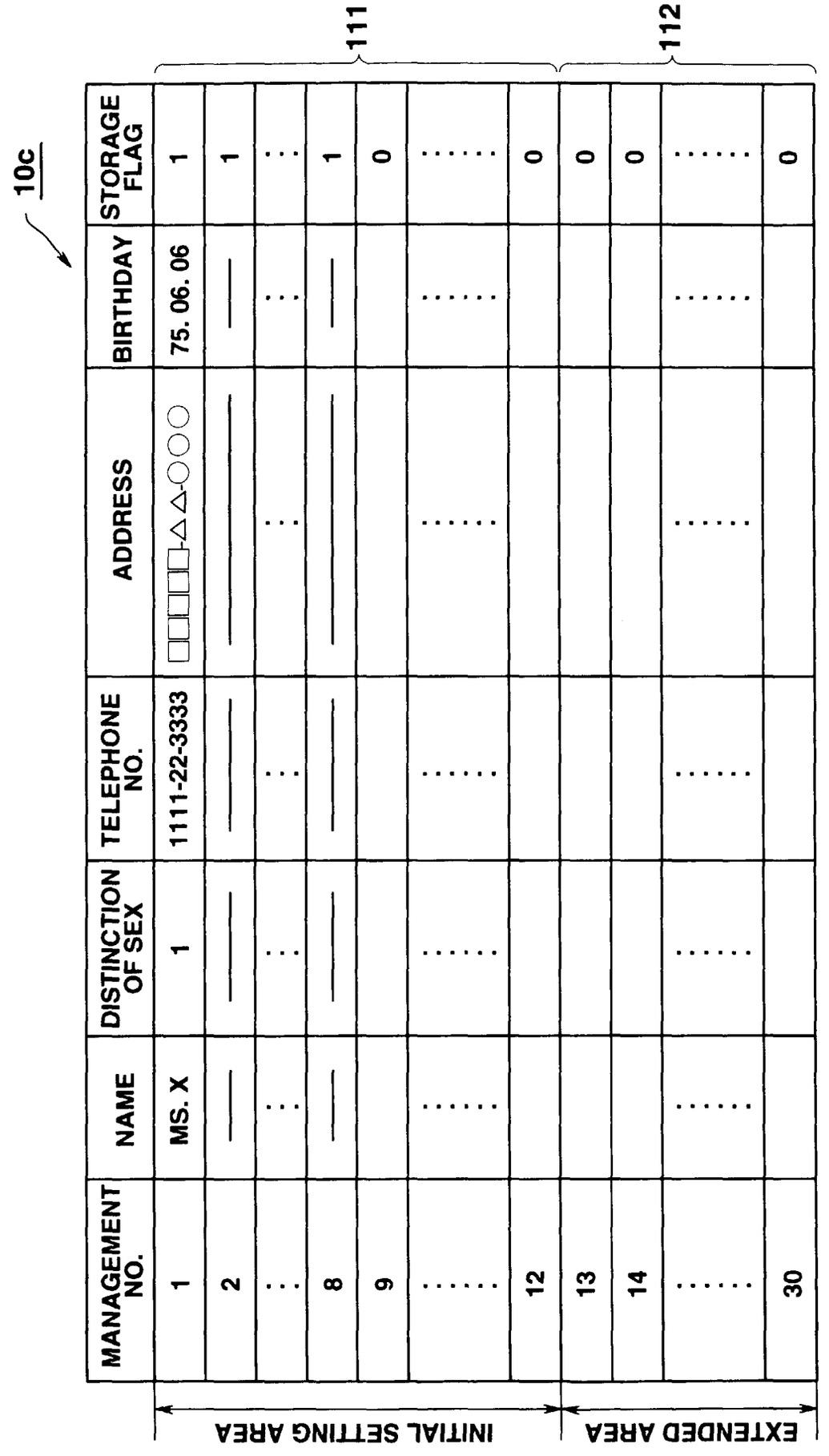

10c
111
112
INITIAL SETTING AREA
EXTENDED AREA
MANAGEMENT NO.
NAME
DISTINCTION OF SEX
TELEPHONE NO.
ADDRESS
BIRTHDAY
STORAGE FLAG
1
MS. X
1
1111-22-3333
□□□□□-△△-○○○
75. 06. 06
1
2
——
——
——
——
——
——
1
8
——
——
——
——
——
——
1
9
0
12
0
13
0
14
0
30
0

FIG.10

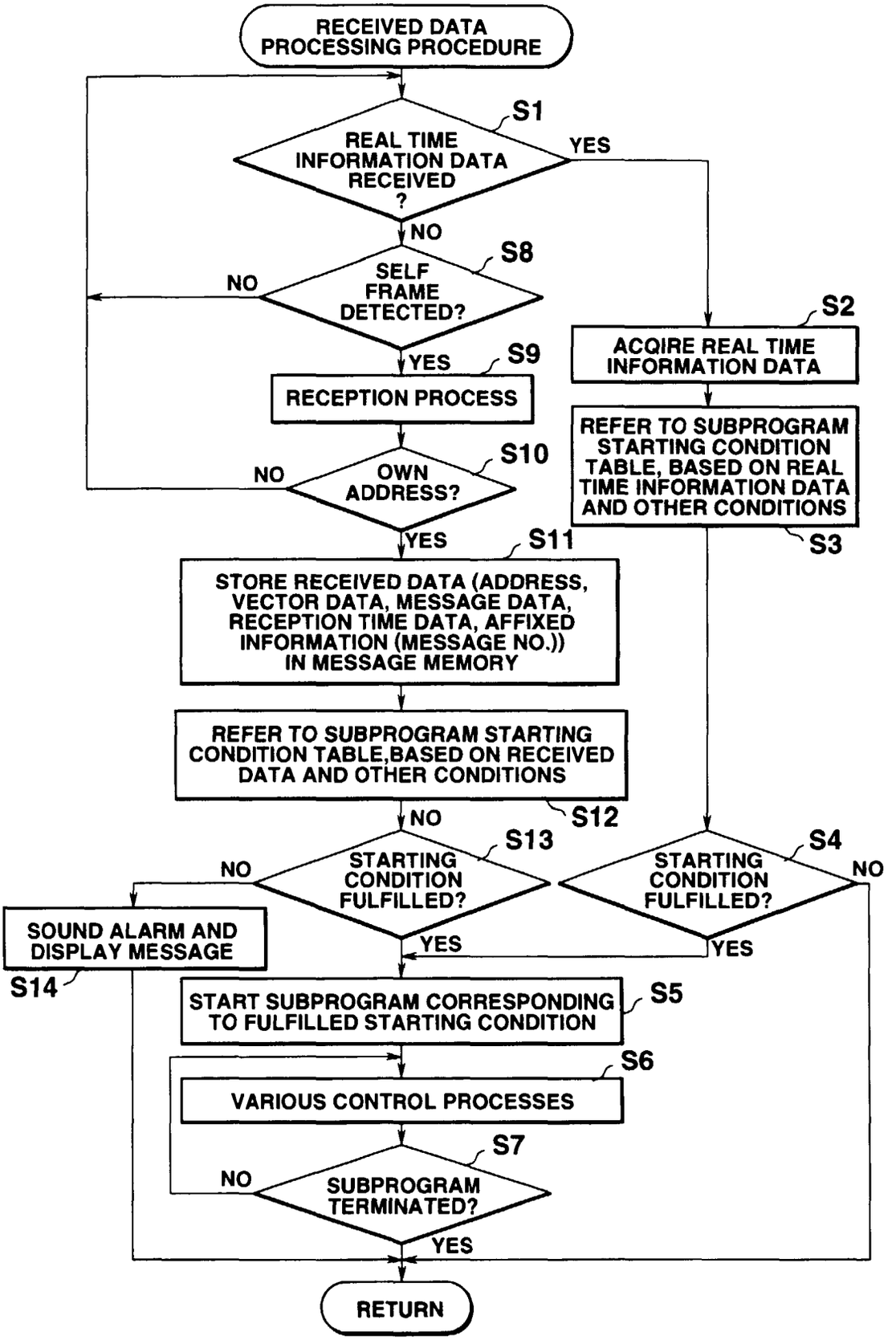

RECEIVED DATA PROCESSING PROCEDURE
S1
REAL TIME INFORMATION DATA RECEIVED ?
YES
NO
S8
SELF FRAME DETECTED?
NO
YES
S9
RECEPTION PROCESS
S10
OWN ADDRESS?
NO
YES
S11
STORE RECEIVED DATA (ADDRESS, VECTOR DATA, MESSAGE DATA, RECEPTION TIME DATA, AFFIXED INFORMATION (MESSAGE NO.)) IN MESSAGE MEMORY
REFER TO SUBPROGRAM STARTING CONDITION TABLE,BASED ON RECEIVED DATA AND OTHER CONDITIONS
S12
NO
S13
STARTING CONDITION FULFILLED?
NO
SOUND ALARM AND DISPLAY MESSAGE
S14
YES
S2
ACQIRE REAL TIME INFORMATION DATA
REFER TO SUBPROGRAM STARTING CONDITION TABLE, BASED ON REAL TIME INFORMATION DATA AND OTHER CONDITIONS
S3
S4
STARTING CONDITION FULFILLED?
NO
YES
START SUBPROGRAM CORRESPONDING TO FULFILLED STARTING CONDITION
S5
S6
VARIOUS CONTROL PROCESSES
S7
SUBPROGRAM TERMINATED?
NO
YES
RETURN

FIG.11

FIG.12A

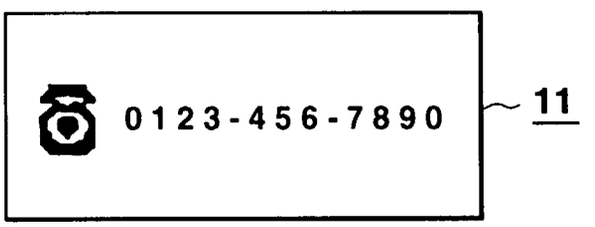


FIG.12B

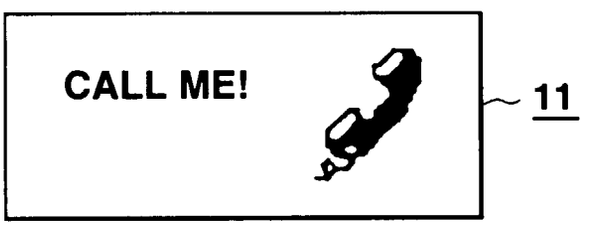


FIG.13A

FIG.13B

FIG.13C

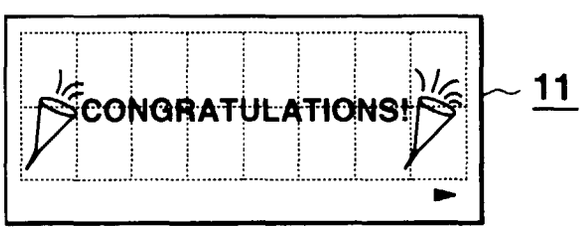


FIG.13D

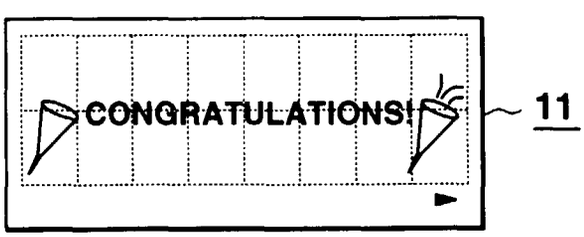


FIG.14A

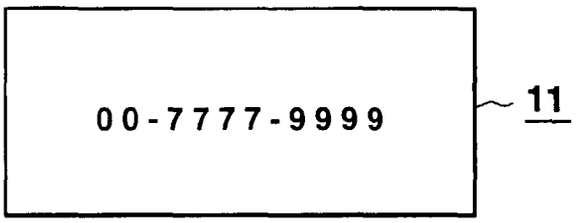


FIG.14B

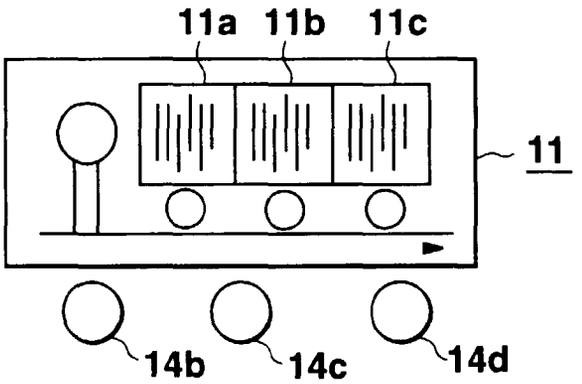


FIG.14C

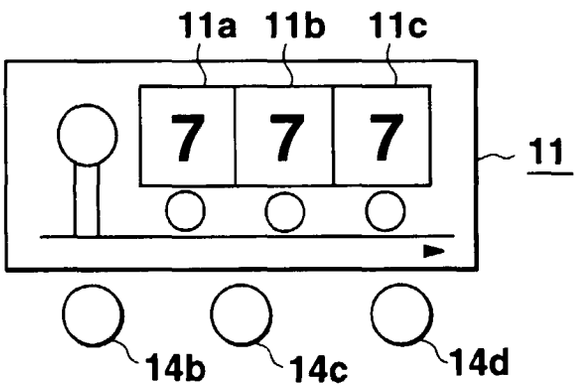


FIG.14D

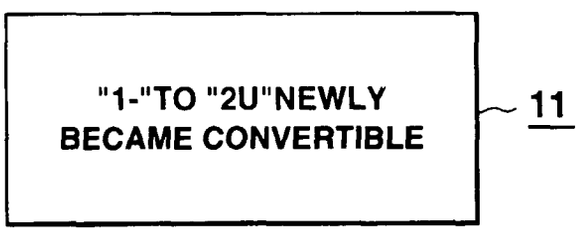


FIG.15A

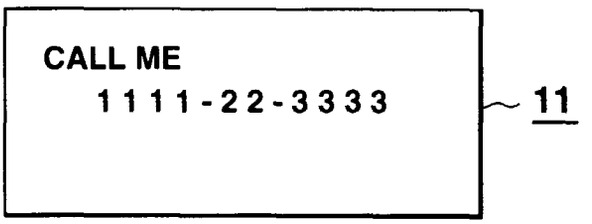


FIG.15B

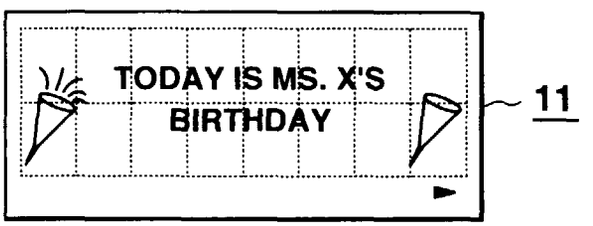


FIG.15C

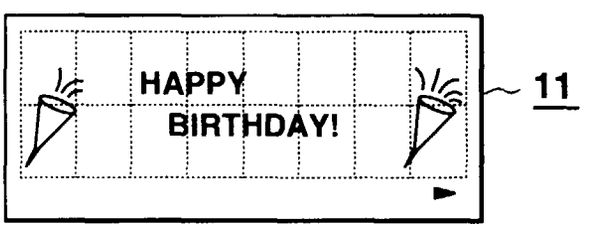
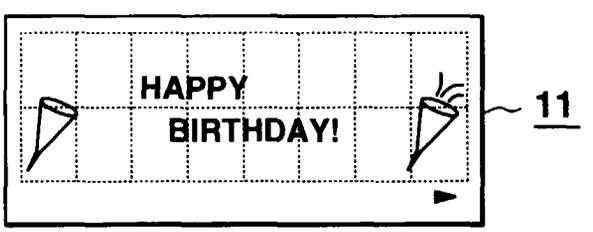


FIG.15D



9m

PROCESSING SUBPROGRAM STARTING CONDITION TABLE

No.	SUBPROGRAM STORAGE ADDRESS		STARTING CONDITIONS SUBPROGRAMS
	KEY INPUT OPERATION	OTHER CONDITIONS	
11	MEMORY KEY 1TIME + SELECT KEY 2TIMES + SET KEY 5TIMES	WITHIN PREDETERMINED PERIOD OF TIME	SET UP FUNCTION CONTROL SUBPROGRAM I DISPLAY IMAGE OF SLOT MACHINE AS SHOWN IN FIG.14 AND EXTEND USABLE AREA OF FREE WORD CONVERSION MATRIX IN CASE OF PATTERN COMBINATION "777" DISPLAYED UPON SWITCH OPERATION
12	SELECT KEY 1TIME	CURRENT TIME DATA REPRESENTING SERIES OF THREE OR MORE EQUAL NUMBERS	
13	SET KEY 2TIMES	TOTAL NUMBER "10" OF RECEIVED STORED DATA	SET UP FUNCTION CONTROL SUBPROGRAM II INCREASE MAXIMUM NOMBER OF STORABLE MESSAGE DATA TO 25
⋮	⋮	⋮	⋮

FIG.16

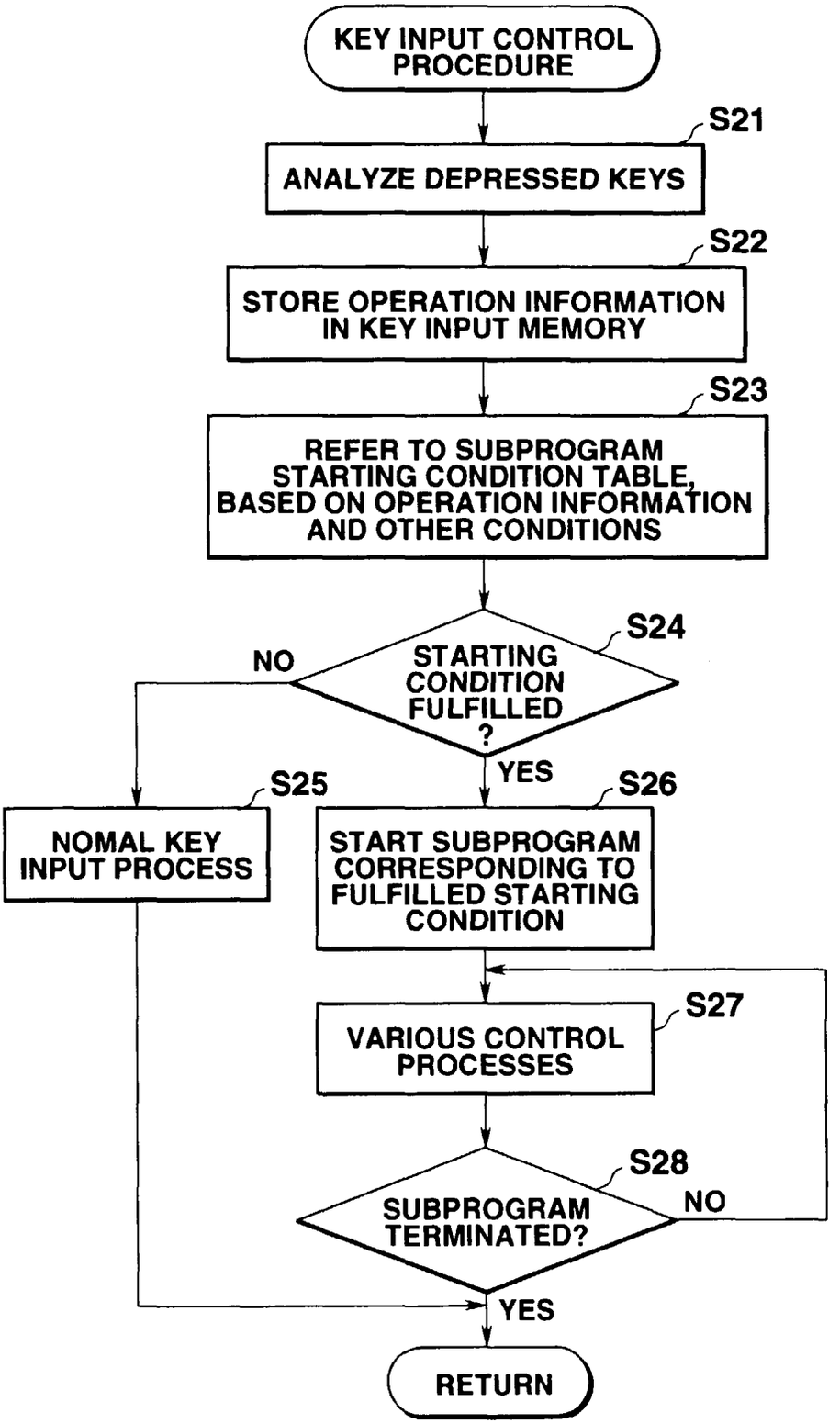

KEY INPUT CONTROL PROCEDURE
S21
ANALYZE DEPRESSED KEYS
S22
STORE OPERATION INFORMATION IN KEY INPUT MEMORY
S23
REFER TO SUBPROGRAM STARTING CONDITION TABLE, BASED ON OPERATION INFORMATION AND OTHER CONDITIONS
S24
STARTING CONDITION FULFILLED ?
NO
YES
S25
NOMAL KEY INPUT PROCESS
S26
START SUBPROGRAM CORRESPONDING TO FULFILLED STARTING CONDITION
S27
VARIOUS CONTROL PROCESSES
S28
SUBPROGRAM TERMINATED?
NO
YES
RETURN

FIG.17

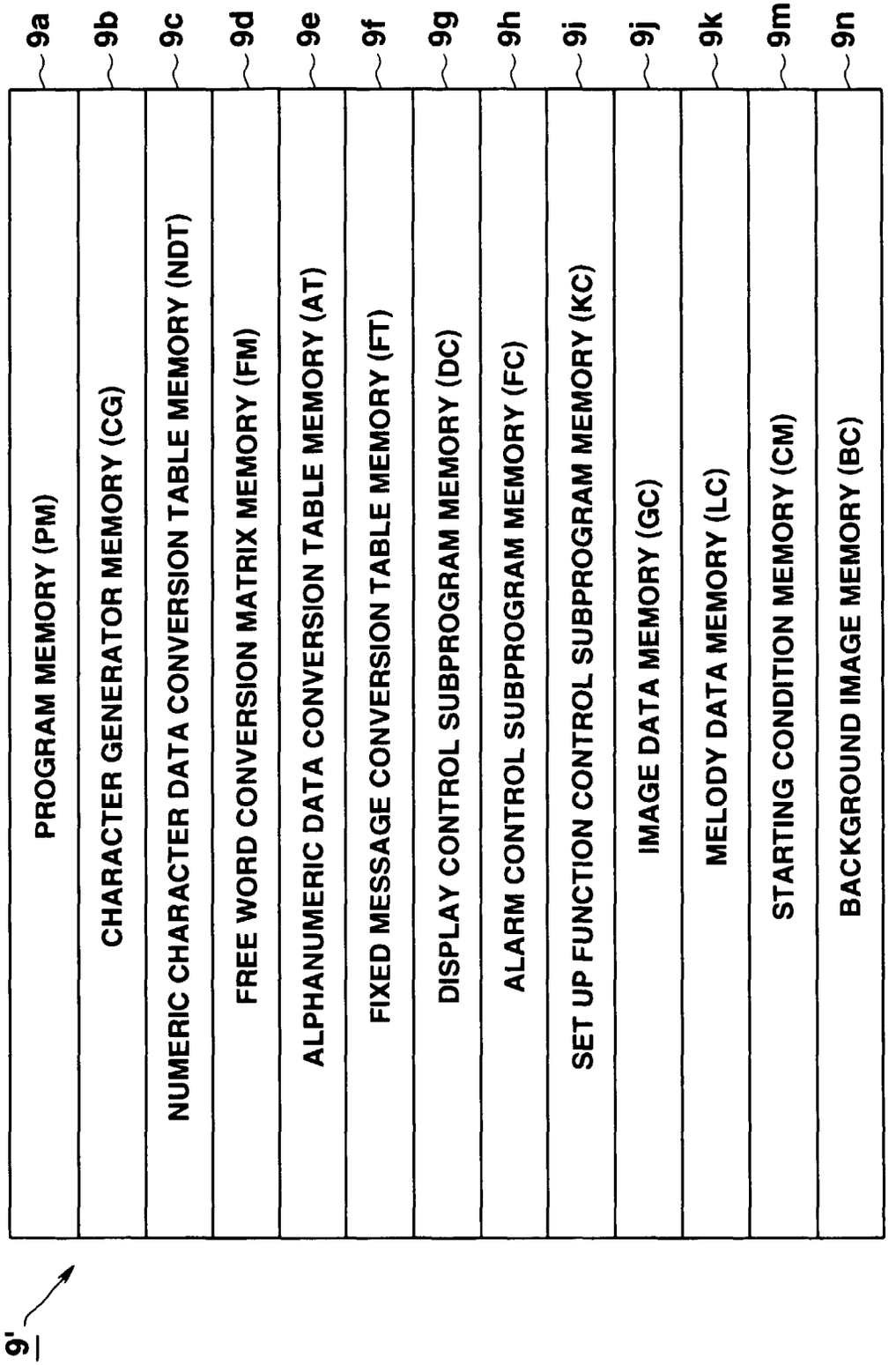

9'
9a
PROGRAM MEMORY (PM)
9b
CHARACTER GENERATOR MEMORY (CG)
9c
NUMERIC CHARACTER DATA CONVERSION TABLE MEMORY (NDT)
9d
FREE WORD CONVERSION MATRIX MEMORY (FM)
9e
ALPHANUMERIC DATA CONVERSION TABLE MEMORY (AT)
9f
FIXED MESSAGE CONVERSION TABLE MEMORY (FT)
9g
DISPLAY CONTROL SUBPROGRAM MEMORY (DC)
9h
ALARM CONTROL SUBPROGRAM MEMORY (FC)
9i
SET UP FUNCTION CONTROL SUBPROGRAM MEMORY (KC)
9j
IMAGE DATA MEMORY (GC)
9k
MELODY DATA MEMORY (LC)
9m'
STARTING CONDITION MEMORY (CM)
9n
BACKGROUND IMAGE MEMORY (BC)

FIG.18

SUBPROGRAM ADDRESS

PROCESSING SUBPROGRAM STARTING CONDITION TABLE 9m'

No.	SUBPROGRAM STARTING CONDITION				SUBPROGRAM SUBPROGRAM ADDRESS
	ADDRESS DATA	VECTOR DATA	MESSAGE	OTHERS	
1			FREE WORD DEFINITION CODE (- -) + (NUMERIC CHARACTER DATA) + (_(SPACE))	MESSAGE DATA RECEIVED FIVE TIMES OR MORE	DISPLAY CONTROL SUBPROGRAM I ALTERNATELY DISPLAY RECEIVED MESSAGE AND IMAGE SHOWN IN FIG.12B
2			FREE WORD DEFINITION CODE (- -) + 27656554476 4557369		DISPLAY CONTROL SUBPROGRAM II DISPLAY RECEIVED MESSAGE AND PERFORM ANIMATION DISPLAY AS SHOWN IN FIGS.13B, 13C AND 13D
3			777 (NUMERIC CHARACTER DATA)		SET UP FUNCTION CONTROL SUBPROGRAM I DISPLAY IMAGE OF SLOT MACHINE AS SHOWN IN FIG.14 AFTER DISPLAY OF RECEIVED MESSAGE, AND EXTEND USABLE AREA OF FREE WORD CONVERSION MATRIX IN CASE OF PATTERN COMBINATION "777" DISPLAYED UPON SWITCH OPERATION
4	# A	1 1 1		MESSAGE NUMBER "10"	SET UP FUNCTION CONTROL SUBPROGRAM II INCREASE NUMBER "10"IN MESSAGE NUMBERING SERVICE AND TOTAL NUMBER OF DATA STORED IN MESSAGE MEMORY ARE EQUAL TO EACH OTHER
5				REAL TIME INFOR-MATION DATA	SET UP FUNCTION CONTROL SUBPROGRAM III INCREASE MAXIMUM NUMBER OF STORABLE ADDRESS BOOK DATA TO 30 WHEN NUMBER SPECIFIED BY TIME DATA AND NUMBER OF STORED DATA ARE EQUAL TO EACH OTHER
6			_XXXX (SPACE CHARACTER + 4-DIGIT NUMERIC CHARACTER DATA)		DISPLAY CPNTROL SUBPROGRAM III AND ALARM CONTROL SUBPROGRAM I SEARCH ADDRESS BOOK MEMORY FORDATA ON CORRESPONDING PERSON, PERFORM ANIMATION DISPLAY AS SHOWN IN FIGS.15B, 15C AND 15D, AND OUTPUT MELODY DATA THROUGH SPEAKER IN CASE OF COINCIDENCE BETWEEN BIRTHDAY DATA AND DATE DATA
7			SERIES OF CHARACTERS "URGENT" CONTAINED IN TO-BE-DISPLAYED MESSAGE		DISPLAY CONTROL SUBPROGRAM IV AND ALARM CONTROL SUBPROGRAM II ALERT USER WITH ALARM FOR USE IN CASE URGENCY AND AUTOMATICALLY LIGHT UP BACK LIGHT WHEN DISPLAYING MESSAGE DURING PERIOD OF 6:00P.M. TO 2:00A.M.
8	# A		_XXXX (SPACE CHARACTER AND 4-DIGIT NUMERIC CHARACTER DATA)		DISPLAY CONTROL SUBPROGRAM V SEARCH ADDRESS BOOK MEMORY FOR DATA ON CORRESPONDING PERSON AND DISPLAY RECEIVED MESSAGE IN POP FONT IN CASE OF SEX DISTINCTION DATA "1"(FEMALE)
9	# A # B			TOTAL RECEPTION TIME DATA REPRESENTING PREDETER-MINED NUMBER	SET UP FUNCTION CONTROL SUBPROGRAM I' EXTEND USABLE AREA OF FREE WORD CONVERSION MATRIX AFTER DISPLAY OF RECEIVED MESSAGE
10			FREE WORD DEFINITION CODE (- -) + (BUILD...)		DISPLAY CONTROL SUBPROGRAM VI READ OUT IMAGE DATA IN ACCORDANCE WITH SUBSEQUENT KEYWORD AND 2-DIGIT NUMERIC CHARACTER DATA, AND DISPLAY READ-OUT IMAGE DATA IN DESIGNATED POSITION DURING RECEPTION STANDBY MODE
⋮	⋮	⋮	⋮	⋮	⋮

FIG.19

9n

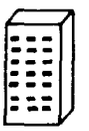
GC STORAGE ADDRESS	KEYWORD	IMAGE DATA
10	BUILDING (2241293224293427)	
11	HOUSE (2811413926)	
12	CITY (23293045)	
13	DOME (24353325)	
14	MOON (33353534)	
15	STAR (39302138)	
16	PLANET (363221342530)	

FIG.20

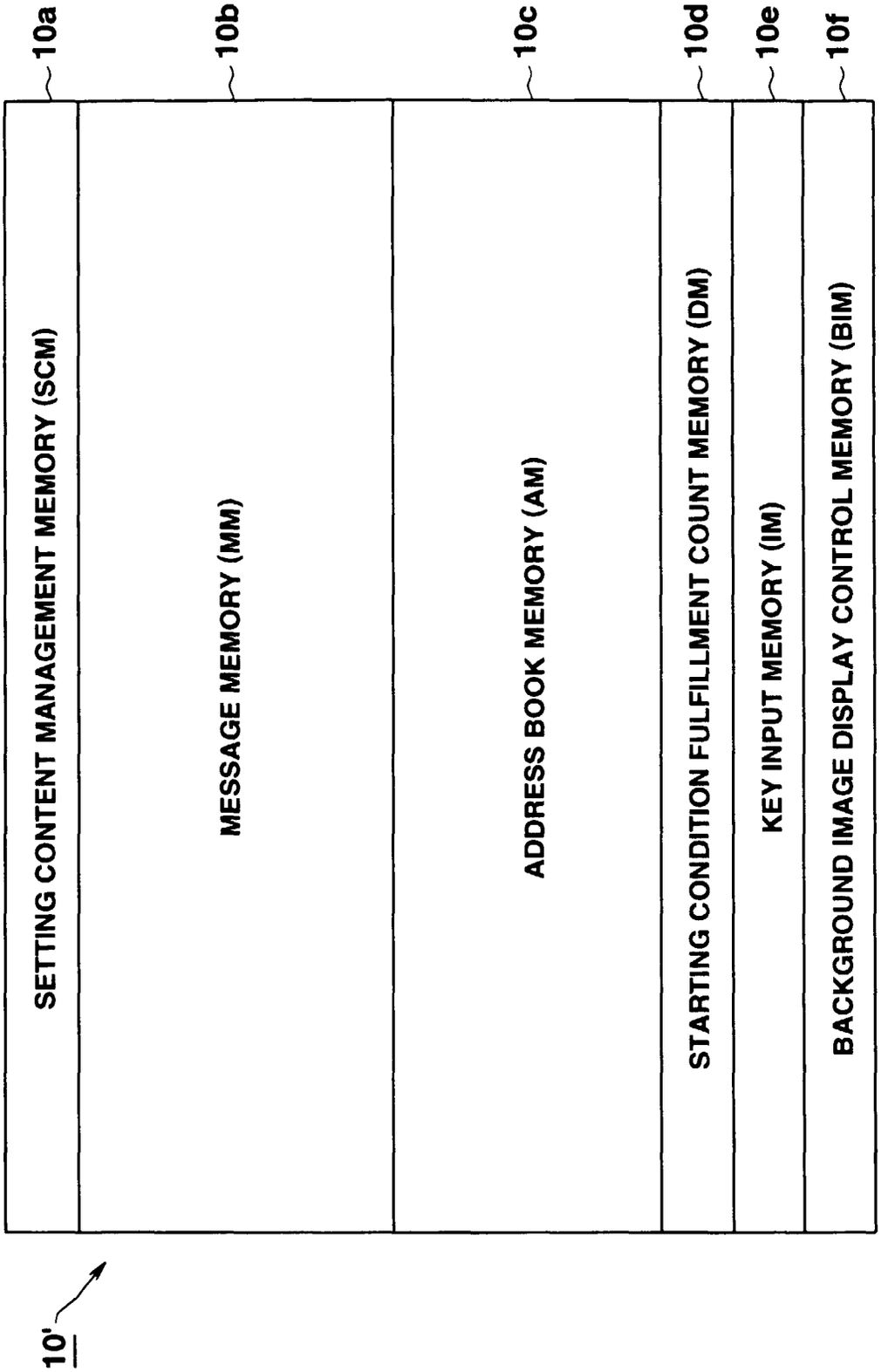

10a
10b
10c
10d
10e
10f
SETTING CONTENT MANAGEMENT MEMORY (SCM)
MESSAGE MEMORY (MM)
ADDRESS BOOK MEMORY (AM)
STARTING CONDITION FULFILLMENT COUNT MEMORY (DM)
KEY INPUT MEMORY (IM)
BACKGROUND IMAGE DISPLAY CONTROL MEMORY (BIM)
10'

FIG.21

10a'

	MEMORY AREA TO BE MANAGED	NUMBER OF STORED DATA	MAXIMUM NUMBER OF STORABLE DATA	FLAG
RAM	MESSAGE MEMORY	10	15	1
			25	0
	ADDRESS BOOK MEMORY	8	12	1
			30	0
ROM	FREE WORD CONVERSION MATRIX	11~00		1
		1- ~ 2U		0
		3- ~ 4U		0
		5- ~ 6U		0
		7- ~ 8U		0
		9- ~ 0U		0
	DISPLAY CONTROL SUBPROGRAM MEMORY	NORMAL DISPLAY CONTROL SUBPROGRAM		1
		DISPLAY CONTROL SUBPROGRAM I		0
		DISPLAY CONTROL SUBPROGRAM II		0
		DISPLAY CONTROL SUBPROGRAM III		0
		DISPLAY CONTROL SUBPROGRAM IV		0
		DISPLAY CONTROL SUBPROGRAM V		0
		DISPLAY CONTROL SUBPROGRAM VI		1
	ALARM CONTROL SUBPROGRAM MEMORY	NORMAL ALARM CONTROL SUBPROGRAM		1
		ALARM CONTROL SUBPROGRAM I		0
		ALARM CONTROL SUBPROGRAM II		0
	SET UP FUNCTION CONTROL SUBPROGRAM MEMORY	SET UP FUNCTION CONTROL SUBPROGRAM I		0
		SET UP FUNCTION CONTROL SUBPROGRAM II		0
		SET UP FUNCTION CONTROL SUBPROGRAM III		0

FIG.22

10f

DESIGNATED DISPLAY POSITION	GC STORAGE ADDRESS
0 1	
0 2	
0 3	
⋮	⋮
2 2	

FIG.23

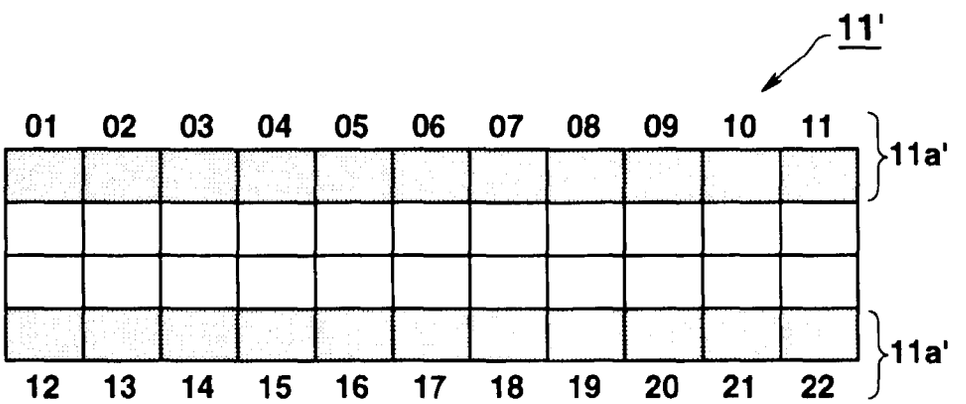


FIG.24

10f

DESIGNATED DISPLAY POSITION	GC STORAGE ADDRESS
0 1	1 4
0 2	
0 3	
⋮	⋮
2 2	

FIG.25

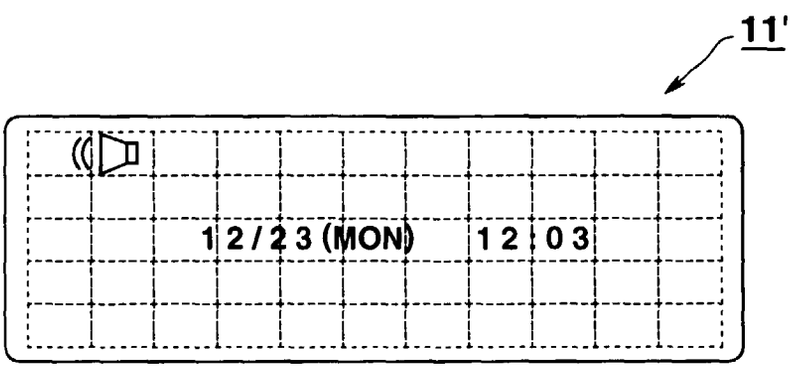


FIG.26

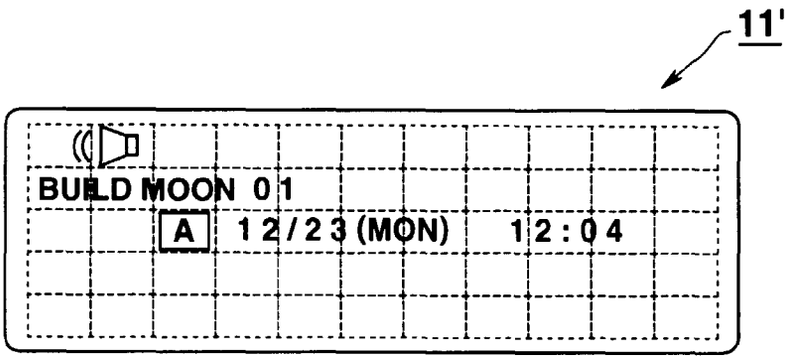


FIG.27

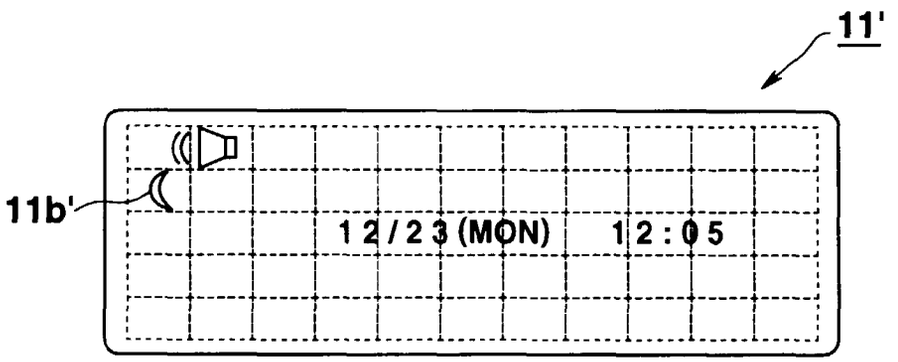


FIG.28

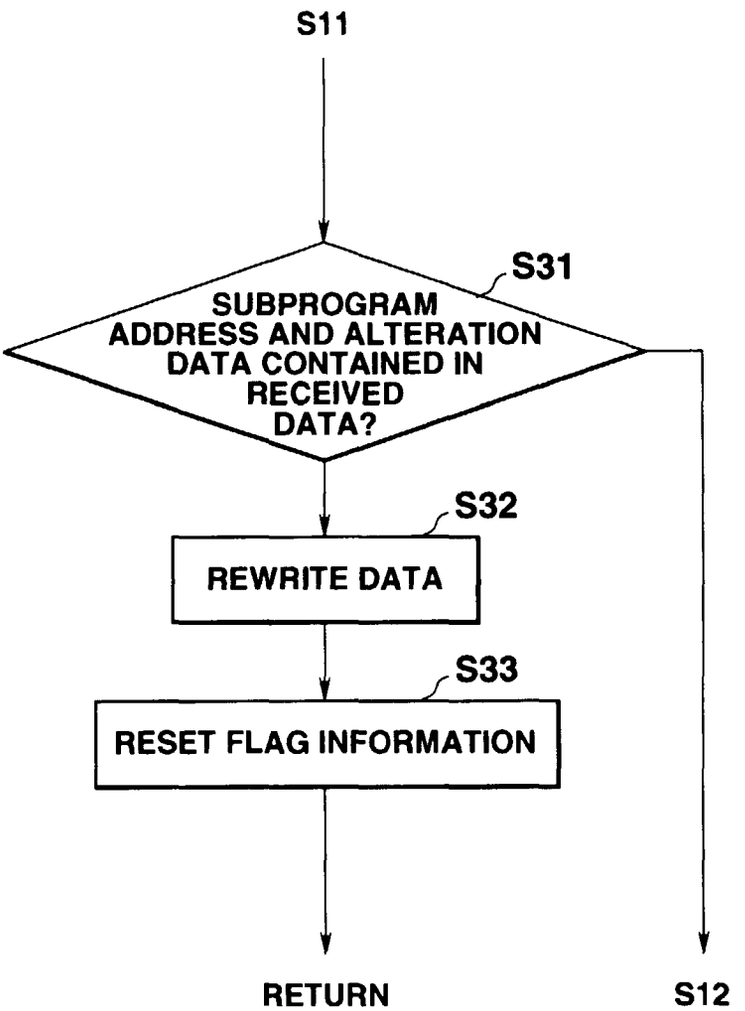

S11
S31
SUBPROGRAM ADDRESS AND ALTERATION DATA CONTAINED IN RECEIVED DATA?
S32
REWRITE DATA
S33
RESET FLAG INFORMATION
RETURN
S12

FIG.29

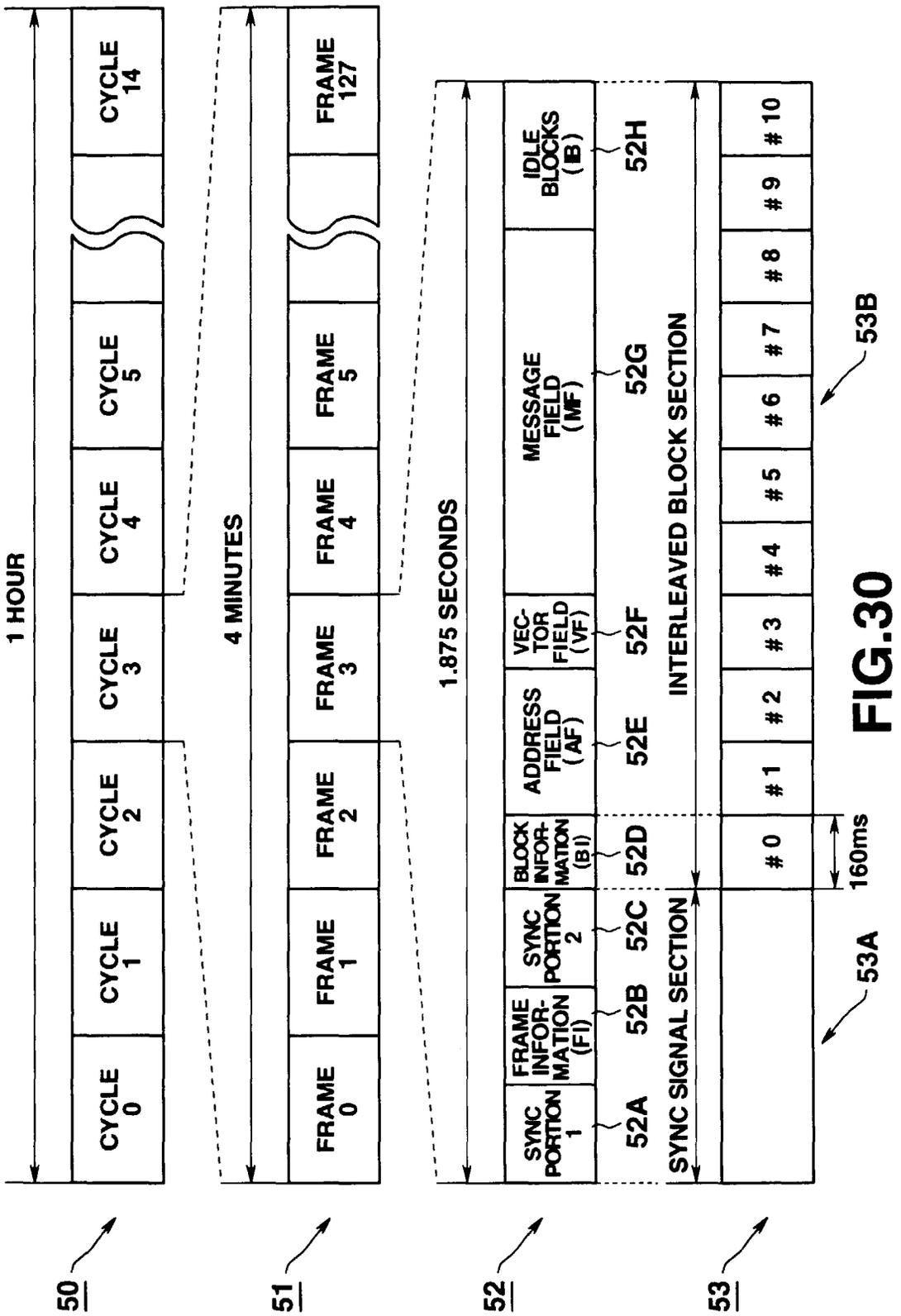

1 HOUR
CYCLE 0
CYCLE 1
CYCLE 2
CYCLE 3
CYCLE 4
CYCLE 5
CYCLE 14
4 MINUTES
FRAME 0
FRAME 1
FRAME 2
FRAME 3
FRAME 4
FRAME 5
FRAME 127
1.875 SECONDS
SYNC PORTION 1
FRAME INFOR-MATION (FI)
SYNC PORTION 2
BLOCK INFOR-MATION (BI)
ADDRESS FIELD (AF)
VEC-TOR FIELD (VF)
MESSAGE FIELD (MF)
IDLE BLOCKS (B)
52A
52B
52C
52D
52E
52F
52G
52H
INTERLEAVED BLOCK SECTION
SYNC SIGNAL SECTION
0
1
2
3
4
5
6
7
8
9
10
160ms
53A
53B
50
51
52
53

FIG.30