In doing so, the multiplexing control unit 5110 performs the processes in S77-0, S77-1, ... S77-n in parallel for the n+1 contents from content 0 to content n, such as by generating n+1 tasks and performing multitask processing.

Fig. 31 is a flowchart showing the details of the generation of multiplexing instructions for the presentation information. In this figure, the variable i is the variable used for successively counting content numbers.

The multiplexing control unit 5110 initializes the variable i to "0" (S7612), and then refers to the construction information storage unit 5109 to determine whether the image data for the content whose content number is i has already been multiplexed (S7614, S7616).

The above determination is performed by the multiplexing control unit 5110 checking whether there are any contents with lower content numbers than i which include the same image data as content i. As one example, when this determination is performed using the construction information table 5801 shown in Fig. 12, when the content counter i is "0", the image data "Video0.m2v" is judged as not having been multiplexed, while when the content counter is "1", the present content has the same image data "Video0.m2v" as content 0, so that the multiplexing control unit 5110 judges that this image data has already been multiplexed.

When the image data has already been multiplexed, the multiplexing control unit 5110 does not have the data multiplexed again. When the image data has not been multiplexed, the multiplexing control unit 5110 instructs the multiplexing unit 5112 to multiplex the image data of the content with the content number i (S7618). In doing so, the multiplexing control unit 5110 informs the multiplexing unit 5112 of the multiplexing start position, the PID, and the bit rate. In this case, it informs the multiplexing unit 5112 of the value "0" (the start of the transport stream) as the multiplexing start position.

The multiplexing control unit 5110 also refers to the multiplexing information storage unit 5104 and reads the value of the PID of the component corresponding to the component tag assigned to the image data to be multiplexed, before informing the multiplexing unit 5112 of this value as the PID. In the same way, the multiplexing control unit 5110 refers to the multiplexing information storage unit 5104 and reads the bit rate corresponding to the component tag assigned to the image data to be multiplexed, before informing the multiplexing unit 5112 of this value as the bit rate.

As one example, when multiplexing the image data "Video0.m2v" of the content with the content number "0" in the construction information table 5801, the multiplexing control unit 5110 first refers to the content identifier assigning table 6101 and reads the value "0x00" of the "VE_comp_tag" 6107 for the image data of content 0. After this, the multiplexing control unit 5110 reads the value "0x0096" of the "VE_component(0)_pid" 6011 and the value "4Mbps" of the "VE_component(0)_Bitrate" 6010 from the multiplexing information table 6001 and informs the multiplexing unit 5112 of these values.

In the same way as for image data, the multiplexing control unit 5110 then determines whether the audio data for the content whose content number is i has already been multiplexed (S7620). When the audio data has not been multiplexed, the multiplexing control unit 5110 instructs the multiplexing unit 5112 to multiplex the audio data, while when the audio data has already been multiplexed, the multiplexing control unit 5110 does not have a multiplexing operation performed.

The processes described above are performed for all of the contents. As a result, the multiplexing control unit 5110 issues multiplexing instructions for all sets of image data and audio data with the multiplexing start positions being set at "0".

Fig. 32 is a more detailed flowchart for the generation process of multiplexing instructions for navigation information shown as S77-0, S77-1, ... S77-n in Fig. 30. This flowchart shows the multiplexing instructions for navigation information for the content i, out of the contents from content 0 to content n. As with other contents, these processes are executed in parallel. Here, the variable wp shows the time (seconds) of the multiplexing start position of each navigation information table where the starting point of the transport stream is set at "0". The variable endT, conversely, shows the end time for the repeated multiplexing of the navigation information table with a given version number.

The multiplexing control unit 5110 first initializes the version number v and the multiplexing start position wp to "0" (S7702). The multiplexing control unit 5110 then refers to the storage region of the navigation information table generating unit 5111 and investigates whether there is a navigation information table with the filename "NVT (i,v)" for the content number i, and the version number v (S7704). When no "NVT(i,v)" is present, the multiplexing control unit 5110 terminates the processing. When "NVT(i,v)" is present, the multiplexing control unit 5110 investigates whether a navigation information table with the filename "NVT(i,v+1)" is present (S7708).

When no "NVT(i,v+1)" is present, the multiplexing control unit 5110 reads the value of the valid end time "end_time" from the navigation information table with the filename "NVT(i,v)" and sets it into the variable endT (S7710).

When a navigation information table "NVT(i,v+1)" is present, the multiplexing control unit 5110 compares the value of the valid end time "end_time" of the navigation information table with the filename "NVT(1,v)" given by subtracting "1" from the valid start time "start_time" of the navigation information table with the filename "NVT(i,v+1), before setting the smaller of these values in the variable endT (S7714). As one example, when i=0 and v=0, the navigation information table "NVT(0,0)" is as shown in Fig. 17 and the navigation information table "NVT(0,1)" is as shown in Fig. 19, with the value of the end_time of navigation information table "NVT(0,0)" being "65" and the value of the start_time of navigation

information table "NVT(0,1)" being "70". As a result, the multiplexing control unit 5110 compares the start_time "65" of NVT(0,0) with the end time of NVT(0,1) minus 1 "69" and sets the smaller of these values, "65", into the variable endT. By doing so, the time period during which the navigation information table "NVT(0,0)" becomes the time period between wp=0 and endT=65.

The multiplexing control unit 5110 next calculates the multiplexing end position wp when multiplexing NVT(i,v) according to the equation wp=wp+{S_NVT(i,v)/Bi} and compares this value with the value of the variable endT (S7712). Here, S_NVT(i,v) is the size of the navigation information table NVT(i,v) when converted to a transport stream in accordance with MPEG2 system standards. The variable Bi, meanwhile, is the bit rate assigned to the component used for multiplexing the navigation information table "NVT(i,v), with the value of the bit rate assigned to this component being read from the multiplexing information storage unit 5104.

When the multiplexing end position wp is greater than the variable endT, the multiplexing control unit 5110 adds "1" to the version number v (S7716) and returns to the process in S7704.

When the multiplexing end position wp is equal to or less than the variable endT, the multiplexing control unit 5110 generates a multiplexing instruction for the navigation information table "NVT(i,v)" and sends it to the multiplexing unit 5112. In doing so, the multiplexing control unit 5110 informs the multiplexing unit 5112 of the value of the multiplexing start position wp, the value of the bit rate Bi, the value of the PID, the value of the table_id, the value of the table_extension_id, and the value of the version_no as the multiplexing instruction.

Here, to find the value of the PID, the multiplexing control unit 5110 reads the PID assigned to the component used for multiplexing the navigation information table of the content with the content number i from the multiplexing information storage unit 5104.

The multiplexing control unit 5110 finds the value of the table_id as a value (for example "0x90") which is predetermined for a navigation information table.

The multiplexing control unit 5110 obtains the table_id_extension by reading the value assigned to the "NE_id" of the content with the content number i in the content number assigning table 6101.

The multiplexing control unit 5110 obtains the version_no by reading it from the version number assigning table 6201 shown in Fig. 16.

As one example, for the navigation information table "NVT(0,0)" shown in Fig. 17, the first multiplexing instruction is composed of the multiplexing start position wp=0, PID=0x0092 (="NE_component(0)_pid"), Bi=1Mbps, table_id=0x90, table_id_extension=0x0000 (=NE_id), and version_no=0x00.

After sending a multiplexing instruction to the multiplexing unit 5112, the multiplexing control unit 5110 resets the value of the multiplexing start position wp according to the equation wp=wp+{S_NVT(i,v)/Bi} (S7720), and repeats the processing starting from the determination of the multiplexing end position when the navigation information table with the filename NVT(i,v) has been multiplexed once again (S7712).

On receiving the multiplexing instructions generated as described above, the multiplexing unit 5112 generates a multiplexed stream. After this, the transmission unit 5106 multiplexes this multiplexed stream into a transport stream which it then transmits.

1-3 Overall Construction of the Reception Apparatus 5121

As shown in Fig. 4, the reception apparatus 5121 is composed of a reception unit 5122, a TS (Transport Stream) decoder unit 5123, an AV decoder unit 5124, a received data storage unit 5125, a reception control unit 5126, a signal reception unit 5127, a reproduction unit 5128, a display unit 5129, and an audio output unit 5130. This reception apparatus 5121 is constructed so as to interactively extract a content from the transport stream transmitted by the digital broadcasting apparatus 5101 in accordance with a user operation and to reproduce the extracted content. Here, the received data storage unit 5125 includes a navigation information table storage unit 5132 and a system information table storage unit 5133.

1-3-1 Reception Unit 5122

The reception unit 5122 receives the transport stream indicated by the reception control unit 5126 and outputs it to the TS decoder unit 5123.

1-3-2 TS Decoder Unit 5123

The TS decoder unit 5123 includes a filter condition storage unit 5131 for storing filter conditions that are set by the reception control unit 5126, and operates in accordance with the filter conditions to separate image data and audio data from the transport stream outputted by the reception unit 5122 and output them to the AV decoder unit 5124, as well as separating navigation information tables and writing them into the received data storage unit 5125. The TS

decoder unit 5123 also separates system information tables, such as the PCR (standard clock information) which it outputs to the AV decoder unit 5124.

The filter condition storage unit 5131 stores a plurality of filter conditions. Here, the TS decoder unit 5123 is able to simultaneously perform a plurality of separation operations in accordance with these filter conditions.

Figs. 33A and 33B show examples of the filter conditions stored in the filter condition storage unit 5131. Each line in the filter condition tables 7801, 7807 in these drawings shows a separate filter condition which includes a filter identification number, a PID, a table_id_extension, a version_no, and an output destination.

The "filter identification number" column 7802 is used to store numbers which identify the respective filter conditions. In the present figures, the filter identification number "0" shows the filter condition for separating image data, the filter identification number "1" shows the filter condition for separating audio data, and the filter identification number "2" shows the filter condition for separating navigation information, with the filter conditions with the filter identification numbers "3" onwards being used to separate system information such as the PMT.

The "PID" column 7803 shows the PIDs of the data to be separated.

The "table_id_extension" column 7804 shows the values of the "table_id_extension" identifiers for separating the navigation information and system information.

The "version_no" column 7805 shows the value of the "version_no" which is used when separating navigation information. The entry "-" in this "version_no" column shows that this value is not set for a filter condition, so that separation according to the corresponding filter condition is performed regardless of the value of the "version_no" identifier.

The "output destination" column 7806 shows the output destination to which the separated data is to be outputted.

As one example, the image data separated by the filter condition with the filter identification number "0" shown in Fig. 33A has its output destination given in the "output destination" column 7806 as the AV decoder unit 5124, but has no values set in the "table_id_extension" column 7804 or the "version no" column 7805. Here, since no "table_id_extension" or "version no" is set for image data, neither of these values may be set in the filter condition for image data. Conversely, the value "0x0096" for the image data to be separated is set in the "PID" column 7803. As a result, when the reception unit 5122 receives the transport stream shown in Fig. 29, the TS decoder unit 5123 separates the image data "Video0.m2v" and outputs it to the AV decoder unit 5124.

As another example, the audio data separated by the filter condition with the filter identification number "1" shown in Fig. 33A has its output destination given in the "output destination" column 7806 as the AV decoder unit 5124, but has no values set in the "table_id_extension" column 7804 or the "version no" column 7805. Here, since no "table_id_extension" or "version no" is set for audio data, neither of these values may be set in the filter condition for audio data. Conversely, the value "0x0098" for the audio data to be separated is set in the "PID" column 7803. As a result, when the reception unit 5122 receives the transport stream shown in Fig. 29, the TS decoder unit 5123 separates the audio data "AudioO.m2a" and outputs it to the AV decoder unit 5124.

The navigation information table separated by the filter condition with the filter identification number "2" shown in Fig. 33A has its output destination given in the "output destination" column 7806 as the navigation information table storage unit 5132. Accordingly, the TS decoder unit 5123 writes the separated navigation information table into the navigation information table storage unit 5132. In Fig. 33A, this filter condition of the navigation information table to be separated has the value "0x0092" in the PID column 7803 and the value "0x0000" set in the "table_id_extension" column 7804. However, no value is set for this filter condition in the "version no" column 7805. As a result, when the reception unit 5122 receives the transport stream shown in Fig. 29, the TS decoder unit 5123 separates, depending on the timing of the separation, one of the navigation information tables "NVT (0,0)", "NVT(0,1)", "NVT (0,2)", "NVT (0,3)", and "NVT(0,4)" and writes the separated navigation information table into the navigation information table storage unit 5132, in addition to informing the reception control unit 5126.

The filter condition table 7801 in Fig. 33A shows the filter conditions which are stored in the filter condition storage unit 5131 immediately after an event has been selected by a user, and so stores the filter conditions for the entry content.

The filter condition table 7807 is the same as the filter condition table 7801 described above, with the exception that the value "0x01" has been set in the "version_no" column of the filter condition for navigation information, so that when the reception unit 5122 receives the transport stream shown in Fig. 29, the TS decoder unit 5123 separates only the navigation information table "NVT(0,1)" and writes it into the navigation information table storage unit 5132, in addition to informing the reception control unit 5126. This is to say, the filter condition table 7807 shows filter conditions once the entry content has already been separated.

1-3-3 AV Decoder Unit 5124

The AV decoder unit 5124 has a clock unit (not illustrated) and, in accordance with MPEG2 standard, decodes the video data and audio data outputted by the TS decoder unit 5123 in synchronization and outputs the decoded data to the reproduction unit 5128. This clock unit has a standard clock which is set at the correct value by the PCR (standard

clock information) outputted by the TS decoder unit 5123, and measures the time which is used to ensure that the image data and audio data are decoded with proper synchronization.

1-3-4 Received Data Storage Unit 5125

The received data storage unit 5125 can be composed of RAM (Random Access Memory), for example, and is provided with a navigation information table storage unit 5132, and a system information table storage unit 5133.

The navigation information table storage unit 5132 stores navigation information tables which have been separated by the TS decoder unit 5123. The system information table storage unit 5133 stores the system information tables, such as the NIT, the SDT, the EIT, the PAT, and the PMT which have been separated by the TS decoder unit 5123. It should be noted here that the contents of the system information tables are the same as those shown in Figs. 17 to 27, so that no further explanation will be given.

1-3-5 Signal Reception Unit 5127

The signal reception unit 127 receives signals, such as remote controller operations made by a user, and informs the reception control unit 126 of the received signals. As one example, when a selection signal is received for an event that represents an interactive program out of the transport stream received from the digital broadcasting apparatus 5101, the signal reception unit 5127 outputs the received selection signal to the reception control unit 5126. Also, when an activation signal (described later in this specification) is received from the user, this signal is also outputted to the reception control unit 5126. It should be noted here that these operations may be made using, for example, a "left", "right" and "enter" key on an operation panel provided on the reception apparatus 5121 or on a remote controller. In the latter case, the remote controller sends an appropriate signal to the signal reception unit 5127 when one of the keys is pressed by the user. Of these keys, the "left" and "right" keys may be used to move the selection state in the display of the display unit 5129 to the next displayed button on the left or on the right, with the "enter" key being used to activate the button currently in the selected state.

1-3-6 Reproduction Unit 5128

In accordance with the instructions received from the reception control unit 5126, the reproduction unit 5128 generates an image signal for the image data decoded by the AV decoder unit 5124 and the graphics information outputted by the reception control unit 5126 and outputs the generated image signal to the display unit 5129, as well as outputting audio data decoded by the AV decoder unit 5124 to the audio output unit 130. In generating the image signal, the reproduction unit 5128 superimposes the graphics information outputted by the reception control unit 5126 onto the video data decoded by the AV decoder unit 5124.

1-3-7 Display Unit 5129

The display unit 5129 can be realized by a television monitor and is used to display the images outputted by the reproduction unit 5128.

1-3-8 Audio Output Unit 130

The audio output unit 130 can be realized by a speaker and is used to output the audio signal outputted by the reproduction unit 5128.

1-3-9 Reception Control Unit 5126

The reception control unit 5126 is composed of a CPU, a ROM for storing a program, and a RAM used as a work area. This reception control unit 5126 controls the reception of interactive programs, in addition to controlling the operation of the reception apparatus 5121 as a whole.

1-3-9-1 Reception Control Unit 5126: Outline of the Reception Processing for Interactive Programs

Fig. 36 is a flowchart for the reception processing of interactive programs by the reception control unit 5126.

When the reception apparatus 5121 is switched on, the reception control unit 5126 controls the reception unit 5122 and the TS decoder unit 5123 in accordance with an appropriate procedure for MPEG2 system standard and DVB-SI standard and has the system information tables included in the transport stream written into the system information

table storage unit 5133. At this point, a list of programs may be displayed.

When the user selects an event corresponding to an interactive program in the transport stream using a remote controller or the like, the reception control unit 5126 receives this selection signal via the reception control unit 5126 and refers to the system information tables in the system information table storage unit 5133 to obtain the identifiers of the event, which are namely the original_network_id, the transport_stream_id, the service_id, and the event_id (S8102).

The reception control unit 5126 then refers to the system information tables in the system information table storage unit 5133 and instructs the reception unit 5122 to receive the appropriate transport stream received from the transmission unit 5106, and instructs the TS decoder unit 5123 to separate the PMT corresponding to the selected event. The reception unit 5122 receives the transport stream from the transmission unit 5106 and outputs it to the TS decoder unit 5123. The TS decoder unit 5123 separates the PMT corresponding to the selected event and writes it into the system information table storage unit 5133 in the received data storage unit 5125, as well as notifying the reception control unit 5126. On being notified of the reception of the PMT by the TS decoder unit 5123, the reception control unit 5126 refers to the PMT stored in the system information table storage unit 5133 and obtains the PID of the PCR which it then writes into the filter condition storage unit 5131 (S8104).

The reception control unit 5126 sets the variables of the selected service and event into the variables cur_... as shown below, and clears the values of the cur_VE_comp_tag, the cur_AE_comp_tag, and the cur_NE_id (S8106). These variables (cur_...) are used to store identifiers for the content currently being reproduced.

(Variable cur_..._id)	← (value of _id of selected event)
cur_original_network_id	← original_network_id
cur_transport_stream_id	← transport_stream_id
cur_VE_service_id	← service_id
cur_AE_service_id	← service_id
cur_NE_service_id	← service_id
cur_VE_event_id	← event_id
cur_AE_event_id	← event_id
cur_NE_event_id	← event_id
cur_VE_comp_tag_id	← 0 (cleared)
cur_AE_comp_tag_id	← 0 (cleared)
cur_NE_id	← 0 (cleared)

Following this, the reception control unit 5126 sets the variables of the selected service and event into the variables new_..._id as shown below (S8108). In doing so, the reception control unit 5126 reads the values of the entry_VE_comp_tag, entry_AE_comp_tag, and the entry_NE_id from the PMT stored in the system information table storage unit 5133.

(Variable new_..._id)	← (value of _id of selected event)
new_original_network_id	← original_network_id
new_transport_stream_id	← transport_stream_id
new_VE_service_id	← service_id
new_AE_service_id	← service_id
new_NE_service_id	← service_id
new_VE_event_id	← event_id
new_AE_event_id	← event_id
new_NE_event_id	← event_id
new_VE_comp_tag_id	← entry_VE_comp_tag
new_AE_comp_tag_id	← entry_AE_comp_tag
new_NE_id	← entry_NE_id

Following this, the reception control unit 5126 performs the content switching process (S8110), clears the value of the content change flag, which shows that content switching is necessary, to "0" (S8112), performs the reproduction control process (S8114) for navigation information (S8114), and repeats these processes to control the reproduction of the interactive program.

1-3-9-2 Reception Control Unit 5126: Content Switching Process

Fig. 37 is a flowchart showing the details of the content switching process (S8110) in Fig. 36.

First, the reception control unit 5126 judges whether the value of the variable new_original_network_id stored by the reception control unit 5126 is the same as cur_original_network_id and whether the value of the variable new_transport_stream_id is the same as the cur_transport_stream_id (S8202). When both are affirmative, the reception control unit 5126 performs the switching process for image data (S8210), the switching process for audio data (S8212), and the switching process for navigation information (S8214) in parallel before terminating the procedure. The details of the switching process for image data, the switching process for audio data, and the switching process for navigation information are given later in this specification.

When the variables are not equal, the reception control unit 5126 refers to the system information tables and performs a switching process for the transport stream identified by the variable new_original_network_stream_id and the variable new_transport_stream_id, in accordance with MPEG2 system standard and DVB-SI standard (S8204). The reception control unit 5126 then sets the value of the variable cur_original_network_id at the variable new_original_network_id, and sets the value of the variable cur_transport_stream_id at the variable new_transport_stream_id (S8206). After this, the reception control unit 5126 clears the values of the variables, cur_VE_service_id, cur_AE_service_id, cur_NE_service_id, cur_VE_event_id, cur_AE_event_id, cur_NE_event_id, cur_VE_comp_tag, cur_AE_comp_tag, and cur_NE_id (S8208), and performs the switching process for image data (S8210), the switching process for audio data (S8212) and the switching process for navigation information (S8214) in parallel before terminating the procedure.

1-3-9-3 Reception Control Unit 5126: Switching Process for Image Data

The following is an explanation of the details of the image data switching processing in S8210 of Fig. 37, with reference to the flowchart in Fig. 38.

First, the reception control unit 5126 judges whether the value of the variable new_VE_service_id stored by the reception control unit 5126 is the same as cur_VE_service_id and whether the value of the variable new_VE_event_id is the same as the cur_VE_event_id (S8302). When both are affirmative, the reception control unit 5126 judges whether the variable new_VE_comp_tag is equal to the cur_VE_comp_tag (S8304). If so, the reception control unit 5126 terminates the processing, or if not, the reception control unit 5126 advances to S8310 in Fig. 38. When the judgement in S8302 is negative, the reception control unit 5126 sets the filter condition for the PMT corresponding to the variables new_VE_service_id and new_VE_event_id in the filter condition storage unit 5131. The TS decoder unit 5123 then separates the desired PMT and stores it in the system information table storage unit 5133, in addition to notifying the reception control unit 5126. On receiving notification of the separation of the PMT, the reception control unit 5126 refers to the received PMT and obtains the PID of the PCR which it sets in the filter condition storage unit 5131 (S8306).

The reception control unit 5126 then sets the value of the variable new_VE_service id into the variable cur_VE_service_id and the value of the variable new_VE_event_id into the cur_VE_event_id (S8308).

In S8310, the reception control unit 5126 refers to the PMT corresponding to the event identified by the variables cur_VE_service_id and cur_VE_event_id in the system information table storage unit 5133 and obtains the PID of the component used for transferring image data that has a component tag equal to the value of the variable new_VE_comp_tag. The reception control unit 5126 then sets this PID into the filter condition for image data in the filter condition storage unit 5131. The TS decoder unit 5123 then separates the image data that corresponds to the value of the new_VE_comp_tag from the transport stream in accordance with this filter condition and outputs the image data to the AV decoder unit 5124. The AV decoder unit 5124 decodes this image data, and the decoded image data is displayed by the display unit 5129 via the reproduction unit 5128 (S8312). The reception control unit 5126 then sets the value of the variable new_VE_comp_tag into the variable cur_VE_comp_tag (S8314) and terminates the process.

1-3-9-4 Reception Control Unit 5126: Switching Process for Audio Data

The following is an explanation of the details of the audio data switching processing in S8212 of Fig. 37, with reference to the flowchart in Fig. 39.

First, the reception control unit 5126 judges whether the value of the variable new_AE_service id stored by the reception control unit 5126 is the same as cur_AE_service_id and whether the value of the variable new_AE_event_id is the same as the cur_AE_event_id (S8402). When both are affirmative, the reception control unit 5126 judges whether the variable new_AE_comp_tag is equal to the cur_AE_comp_tag (S8404). If so, the reception control unit 5126 terminates the process, or if not, the reception control unit 5126 advances to S8410. When the judgement in S8402 is negative, the reception control unit 5126 sets the filter condition for the PMT corresponding to the variables new_AE_service_id and new_AE_event_id in the filter condition storage unit 5131. The TS decoder unit 5123 then

separates the desired PMT and stores it in the system information table storage unit 5133, in addition to notifying the reception control unit 5126 (S8406). The reception control unit 5126 then sets the value of the variable new_AE_service_id into the variable cur_AE_service_id and the value of the variable new_AE_event_id into the cur_AE_event_id (S8408). The reception control unit 5126 then refers to the PMT corresponding to the event identified by the variables cur_AE_service_id and cur_AE_event_id in the system information table storage unit 5133 and obtains the PID of the component used for transferring image data that has a component tag equal to the value of the variable new_AE_comp_tag (S8410). The reception control unit 5126 sets this PID into the filter condition for audio data in the filter condition storage unit 5131. The TS decoder unit 5123 then separates the audio data that corresponds to the value of the new_AE_comp_tag from the transport stream in accordance with this filter condition and outputs the audio data to the AV decoder unit 5124. The AV decoder unit 5124 decodes this audio data, and the decoded audio data is outputted by the audio output unit 5130 via the reproduction unit 5128 (S8412). The reception control unit 5126 then sets the value of the variable new_AE_comp_tag into the variable cur_AE_comp_tag (S8314) and terminates the process.

1-3-9-5 Reception Control Unit 5126: Switching Process for Navigation Information

The following is an explanation of the details of the navigation information switching processing in S8214 of Fig. 37, with reference to the flowchart in Fig. 40.

First, the reception control unit 5126 judges whether the value of the variable new_NE_service_id stored by the reception control unit 5126 is the same as cur_NE_service_id and whether the value of the variable new_NE_event_id is the same as the cur_NE_event id (S8502). When both are affirmative, the reception control unit 5126 judges whether the variable new_NE_id is equal to the cur_NE_id (S8504). If so, the reception control unit 5126 terminates the processing, or if not, the reception control unit 5126 advances to S8510. When the judgement in S8502 is negative, the reception control unit 5126 sets the filter condition for the PMT corresponding to the variables new_NE_service_id and new_NE_event_id in the filter condition storage unit 5131. The TS decoder unit 5123 then separates the desired PMT and stores it in the system information table storage unit 5133, in addition to notifying the reception control unit 5126 (S8506) .

The reception control unit 5126 sets the value of the variable new_NE_service_id into the variable cur_NE_service_id and the value of the variable new NE event id into the cur_NE_event_id (S8508). The reception control unit 5126 then refers to the PMT corresponding to the event identified by the variables cur_NE_service_id and cur_NE_event_id in the system information table storage unit 5133 and obtains the PID of the component used for transferring navigation information that has a component tag equal to the value of the variable new_NE_id (S8510). The reception control unit 5126 sets this PID into the "PID" of the filter condition for navigation information and the value of the variable new_NE_id into the "table_id_extension" of this filter condition in the filter condition storage unit 5131, with the "version_no" being set at unconditional. The TS decoder unit 5123 then separates the navigation information table that corresponds to the value of the new_NE_id from the transport stream in accordance with this filter condition and has this navigation information table stored in the navigation information table storage unit 5132, in addition to notifying the reception control unit 5126. This is to say, the first time a navigation information table is obtained, a navigation information table transferred at that time which is identified by only the PID and the table_id_extension is separated from the transport stream, regardless of the version_no of the navigation information table (S8512). The reception control unit 5126 then sets the value of the variable new_NE_id into the variable cur_NE_id (S8514) and terminates the process.

1-3-9-6 Reception Control Unit 5126: Interactive Control in accordance with the Navigation Information

Fig. 41 is a flowchart showing the interactive control process performed in accordance with the navigation information.

The reception control unit 5126 waits for notification of the separation of a navigation information table from the TS decoder unit 5123 (S8602) and judges whether such notification has been received. When the notification has been received, the processing advances to S8606 or otherwise returns to S8602 (S8604). The reception control unit 5126 reads the version number of the navigation information table stored in the navigation information table storage unit 5132, adds "1" to it, and sets the "version_no" in the filter condition for a navigation information table stored in the filter condition storage unit 5131 (S8606). After this, the reception control unit 5126 resets the variable cur_focus to "0" (S8608). The reception control unit 5126 then reads the navigation information table stored in the navigation information table storage unit 5132 and refers to the object definition table and bitmap table, as well as reading the bitmap data for displaying an image and its display coordinates. In doing so, the reception control unit 5126 reads the bitmap data corresponding to the bitmap index number given in the "focused bitmap" column for the object whose object index number is equal to the value of the variable cur_focus, as well as reading the bitmap data corresponding to the bitmap

index number given in the "normal bitmap" column for objects with other values of the object index number (S8610). Next, the reception control unit 5126 sets the value of the start_time into the variable start_time and the value of the end_time into the variable end_time (S8612).

The reception control unit 5126 then refers to the clock unit of the AV decoder unit 5124 and sets the present time into the variable cur_time (S8614). The reception control unit 5126 then waits until the value of the variable start_time is equal to or greater than the value of the variable cur_time (S8616), while outputting the bitmap data and coordinate values read in S8610 to the reproduction unit 5128. The reproduction unit 5128 superimposes the bitmap data outputted by the reception control unit 5126 onto the image data decoded by the AV decoder unit 5124 at the indicated coordinate position and has the combined image displayed by the display unit 5129 (S8618).

The reception control unit 5126 next determines whether the value of the variable cur_time is equal to or greater than the variable end_time (S8622) and if so, gives the reproduction unit 5128 an indication to stop displaying the current bitmap data (S8624), before returning to S8602. If the judgement in S8622 is negative, the reception control unit 5126 performs a user input process (S8626), the details of which are given later in this specification.

The reception control unit 5126 next judges whether the value of the variable ContentChangeFlag is "1" (S8628). When this is the case, the reception control unit 5126 terminates the reproduction control process for the navigation information. When this is not the case, the reception control unit 5126 judges whether notification of the separation of a new navigation information table has been received from the TS decoder unit 5123 (S8630). When such notification has arrived, the reception control unit 5126 instructs the reproduction unit 5128 to stop displaying the current bitmap data (S8632) and returns to the process in S8606. When the reception control unit 5126 judges that no notification has arrived in S8630, the processing returns to S8622.

1-3-9-7 Reception Control Unit 5126: User I/F Processing according to the Navigation Information

Fig. 42 is a flowchart showing the user I/F processing according to the navigation information.

The reception control unit 5126 first judges whether the user input received from the signal reception unit 5127 is for the "right" key (S8702). When the input is not for the "right" key, the processing advances to S8708. When the input is for the "right" key, the reception control unit 5126 adds "1" to the value of the variable cur_focus. It should be noted here that when the value of the variable cur_focus is equal to the highest value of the object index number in the navigation information table in the navigation information table storage unit 5132, the variable cur_focus is not increased further (S8704). The processing then advances to S8706. The reception control unit 5126 refers to the object definition table and bitmap table in the navigation information table in the navigation information table storage unit 5132 and reads the bitmap data to be displayed on the screen and the coordinates of the display position(s) on the display screen, before outputting these to the reproduction unit 5128. In doing so, the reception control unit 5126 reads the bitmap data corresponding to the bitmap index number given in the "Focused Bitmap" column for the button object whose object index number is equal to the variable cur_focus, and the bitmap data corresponding to bitmap index numbers given in the "Normal Bitmap" column for button objects with other object index numbers. The reproduction unit 5128 superimposes these sets of bitmap data onto the image data decoded by the AV decoder unit 5124 at the indicated coordinate positions and has the combined image displayed by the display unit 5129, thereby completing the user input processing (S8706).

In S8708, the reception control unit 5126 judges whether the user input received from the signal reception unit 5127 is for the "left" key (S8708). When the input is not for the "left" key, the processing advances to S8712. When the input is for the "left" key, the reception control unit 5126 subtracts "1" from the value of the variable cur_focus. It should be noted here that when the value of the variable cur_focus is "0", it is not decreased further (S8710). The processing then advances to step S8706.

In S8712, the reception control unit 5126 judges whether the user input received from the signal reception unit 5127 is for the "enter" key. When the input is for the "enter" key, the processing advances to S8714. When the input is not for the "enter" key, the reception control unit 5126 terminates the user input processing.

In step S8714, the reception control unit 5126 refers to the object definition table in the navigation information table stored in the navigation information table storage unit 5132 to obtain the handler index number of the button object whose object index number is equal to the variable cur_focus. The reception control unit 5126 then refers to the handler definition table and reads the script of the handler corresponding to the obtained handler index number. The reception control unit 5126 judges whether the script is "goto_content" (S8716) and, if not, advances to S8724. When the script is "goto_content", the reception control unit 5126 reads the hyperlink index number of the argument (S8718).

The reception control unit 5126 refers to the hyperlink table in the navigation information table and sets the original_network_id, the transport_stream_id, the VE_service_id, the VE_event_id, the VE_comp_tag, the AE_service_id, the AE_event_id, the AE_comp_tag, the NE_service_id, the NE_event_id, and the NE_id which are the identifiers of the content corresponding to the hyperlink index number read in S8718 into the variables new_original_network_id, new_transport_stream_id, new_VE_service_id, new_VE_event_id, new_VE_comp_tag,

new_AE_service_id, new_AE_event_id, new_AE_comp_tag, new_NE_service_id, new_NE_event_id, and new_NE_id. However, when no value is set in the hyperlink table, which is to say when the identifiers are given as "-", the values of the corresponding variables are left unchanged (S8720). The reception control unit 5126 sets the value of the variable ContentChangeFlag at "1" (S8722) and terminates the user input processing.

In S8724, the reception control unit 5126 judges whether the script is "goto_entry" (S8724), and if not, terminates the user I/F processing. When the script is "goto_entry", the reception control unit 5126 refers to the PMT stored in the system information table storage unit 5133 corresponding to the variables "cur_NE_service_id" and "cur_NE_event_id" and sets the values of the "entry_VE_comp_tag", the "entry_AE_comp_tag", and the "entry_NE_id" into the variables new_VE_comp_tag, new_AE_comp_tag, and new_NE_id, in addition to setting the value of the variable cur_NE_service_id into the variables new_VE_service_id and new_AE_service_id, and the value of the variable new_NE_event_id into the variables new_VE_event_id and new_AE_event_id (S8726), before the processing returns to S8722.

1-3-10 Operation of the Reception Apparatus 5121

The operation of the reception apparatus 5121 described above is described below having been divided into a (1) Selection reception operation for an interactive program, (2) Display operation according to the navigation operation, (3) User I/F processing according to the navigation information, and (4) Content switching processing.

1-3-10-1 (1) Selection Reception Operation for an Interactive Program

When the reception apparatus 5121 is switched on, the reception apparatus 5121 receives the various system information tables included in the transport stream and writes them into the system information table storage unit 5133.

When an interactive program, which is to say an event that has been multiplexed into a transport stream in Fig. 29, has been selected by the user, the reception control unit 5126 obtains the information in the transfer preface, such as the frequency of the transport stream identified by the original_network_id "0x0001" and the transport_stream_id "0x0001", from the NIT (see Fig. 22) stored in the system information table storage unit 5133, and instructs the reception unit 5122 to receive the transport stream.

The reception control unit 5126 then obtains the PID "0x0090" of the PMT of the program whose "program_no" is equal to the service_id "0x0002" from the PAT (see Fig. 23), and sets this in the filter condition for the PMT in the filter condition storage unit 5131. As a result, the TS decoder unit 5123 separates the PMT 7001 shown in Fig. 24 and writes it into the system information table storage unit 5133.

The reception control unit 5126 reads the PID "0x0091" of the PCR stored in the system information table storage unit 5133 and sets it in the filter condition of the PCR in the filter condition storage unit 5131.

The reception control unit 5126 reads the identifiers of the image data, audio data, and navigation information for the entry content and sets these in the filter condition in the filter condition storage unit 5131.

In more detail, the reception control unit 5126 refers to the Entry_Descriptor 7003 shown in Fig. 25 of PMT 7001, and reads the value "0x00" of the "entry_VE_comp_tag". The reception control unit 5126 also reads the value "0x0096" of the PID of the component whose data type is "image data" and which has been assigned the stream_identifier_descriptor whose "component_tag" is "0x00", and sets this PID in the filter condition for image data in the filter condition storage unit 5131.

In the same way, the reception control unit 5126 reads the value "0x00" of the "entry_AE_comp_tag". The reception control unit 5126 also reads the value "0x0098" of the PID of the component whose data type is "audio data" and which has been assigned the stream_identifier_descriptor whose "component_tag" is "0x00", and sets this PID in the filter condition for audio data in the filter condition storage unit 5131.

The reception control unit 5126 also reads the value "0x0000" of the "entry_NE_id" and sets it in the "table_id_extension" of the filter condition for the navigation information table in the filter condition storage unit 5131. After this, the reception control unit 5126 refers to the table 7004 in the PMT 7001 and reads the value "0x0092" of the PID of the component which has been assigned the "NE_Component_Descriptor(0)" 7201 which includes the value "0x0000" between the values of the "min_NE_id" and the "max_NE_id", before setting this value in the "PID" of the filter condition for the navigation information table. Here, the "version_no" in the filter condition is set as unconditional. At this point, the filter condition table stored in filter condition storage unit 5131 is the filter condition table 7801 shown in Fig. 33A.

By doing so, the TS decoder unit 5123 separates the image data "Video0.m2v" and audio data "Audio0.m2a" from the transport stream and outputs them to the AV decoder unit 5124. Here, since the "version_no" of the filter condition is unconditional, one of the navigation information tables "NVT (0,0)", "NVT (0,1)", "NVT (0,2)", "NVT(0,3)", and "NVT (0,4)" is separated and is written into the navigation information table storage unit 5132.

The reception control unit 5126 reads the separated navigation information table in the navigation information table

storage unit 5132, adds one to the version number assigned to the separated navigation information table, and writes the resulting value into the "version_no" of the filter condition for the navigation information table in the filter condition storage unit 5131. When this addition of "1" results in the value exceeding 31, the resulting value is reset to "0".

As one example, when the navigation information table 6301 with the filename "NVT(0,0)" shown in Fig. 17 is separated by the TS decoder unit 5123 based on the filter condition table 7801 shown in Fig. 33A, the reception control unit 5126 receives notification of the separation of this navigation information table and reads this navigation information table 6301 from the navigation information table storage unit 5132. The reception control unit 5126 then adds "1" to the value "0" of the version number and sets the value "0x01" into the "version_no" of the filter condition of the navigation information table in the filter condition storage unit 5131. At this point, the filter condition table stored by the filter condition storage unit 5131 is the same as the filter condition table 7807 shown in Fig. 33B.

Here, since the TS decoder unit 5123 only separates the navigation information with the version number following the version number of the navigation information table currently being reproduced, the reception control unit 5126 does not need to confirm whether the content has changed every time new navigation information is received, thereby reducing the load of the reception control unit 5126.

1-3-10-2 (2) Display Operation According to the Navigation Operation

The reception control unit 5126 controls the display for objects (buttons and pictures) included in a navigation information table in accordance with the navigation information table separated by the process described above.

Based on the separated navigation information, the reception control unit 5126 initializes the variable cur_focus to "0" and refers to the object definition table 6302 of the navigation information table NVT (0,0) shown in Fig. 17 and the bitmap table 6305 and reads the X coordinate "20" and the Y coordinate "400" shown in the row for the object index number "0" and bitmap data corresponding to the bitmap index number "1" shown in the "Focused Bitmap" column. The reception control unit 5126 also reads the X coordinate "200" and the Y coordinate "400" shown in the row for the object index number "1" and bitmap data corresponding to the bitmap index number "2" shown in the "Normal Bitmap" column.

Following this, the reception control unit 5126 outputs the bitmap data and coordinates it has read to the reproduction unit 5128 when the present time reaches the value "5" of the "start_time" in the time information table 6306.

Meanwhile, the image data 5201 ("Video0.m2v") and the audio data 5203 ("Audio0.m2a") separated by the TS decoder unit 5123 are decoded by the AV decoder unit 5124 and are outputted to the reproduction unit 5128.

The reproduction unit 5128 superimposes the bitmap data outputted by the reception control unit 5126 onto the image data 5201 outputted by the AV decoder unit 5124 and outputs a combined image signal.

The display image for this case is shown in Fig. 34A. This display image 7901 in Fig. 34A corresponds to the scene 01b in Fig. 5, with the "Details for Osaka" button and "Go to Kanto" button being displayed as bitmap images which are superimposed on the image. Of these, the button "Details for Osaka" is displayed in the selected state in accordance with the variable cur_focus.

This display continues until the user makes a content switching operation, or until the value "65" of the "end_time" in the time information table 6306 of the navigation information table NVT (0,0) is reached. When the present time reaches the value of "end_time", the same display operation as described above is performed when the start time for the navigation information table NVT (0,1) of the next version is reached.

1-3-10-3 (3) User I/F Processing According to the Navigation Information

The following example starts with scene 01b, which is to say the display image shown in Fig. 34A, being displayed.

On receiving a signal for a user operation from the signal reception unit 5127 and judging that the signal is for the "right" key, the reception control unit 5126 updates the value of the variable cur_focus to "1". The reception control unit 5126 then refers to the navigation information table storage unit 5132 and reads the bitmap data corresponding to the bitmap index number "3" given in the "Focused Bitmap" column for the button object with the object index number "1" in the navigation information table NVT (0,0) shown in Fig. 17. The reception control unit 5126 outputs this bitmap data together with the X coordinate "200" and the Y coordinate "400" to the reproduction unit 5128. The reception control unit 5126 also obtains the bitmap data for the button objects whose object index numbers do not agree with the value "1" of the variable cur_focus, and outputs this data in the same way to the reproduction unit 5128.

As a result, the "Details for Osaka" button 02b is displayed in the non-selected state, with the "Go to Kanto" button 03b changing to the selected state.

Here, if the user presses the "left" button, the value of the variable cur_focus is updated back to "0" and the display returns to the state shown in Fig. 34A.

When the user operation signal is for the "enter" key, the reception control unit 5126 refers to the navigation information table storage unit 5132 and reads the script in the handler of the button object whose object index number is

equal to the variable cur_focus "0" in the navigation information table NVT (0,0) shown in Fig. 17. In the present case, the script is "goto_content(Hyperlink Index0) so that the reception control unit 5126 reads the identifiers of the content for the link destination corresponding to the hyperlink index number given as the argument of the script, and performs the content switching process described below.

1-3-10-4 (4) Content Switching Process

The following is an explanation of when the user operation signal is for the "enter" key during a display of the display image shown in Fig. 34A, which is to say the case when switching between scene 01b in content 0 of Fig. 5 and scene IIb of content 1.

In the present case, the reception control unit 5126 reads the various identifiers for the link destination content corresponding to the hyperlink index number "0" in the navigation information table NVT (0,0). Here, apart from "NE_id", all of these identifiers are "-", so that the transport stream identifier, the service identifiers and event identifiers for the image data, audio data and navigation information, and the identifiers for the image data, and audio data for the link destination are all the same as those for the content currently being displayed. This is to say, the image data and audio data for the link destination content are the same as those for the currently displayed content, so that only the navigation information is different.

The reception control unit 5126 reads the value "0x0001" of the identifier "NE_id" of the navigation information and sets it into the "table_id_extension" of the filter condition for the navigation information table in the filter condition storage unit 5131. After this, the reception control unit 5126 refers to the table 7004 in the PMT 7001 in the system information table storage unit 5133 and reads the value "0x0093" of the PID of the component which has been assigned the "NE_Component_Descriptor(1)" 7201 which includes the value "0x0001" between the values of the "min_NE_id" and the "max_NE_id", before setting this value in the "PID" of the filter condition for the navigation information table. Here, the "version_no" in the filter condition is set as unconditional.

The TS decoder unit 5123 then separates the navigation information table "NVT(0,1)" shown in Fig. 18 in accordance with the filter condition set above and writes it into the navigation information table storage unit 5132, in addition to notifying the reception control unit 5126.

The reception control unit 5126 adds "1" to the version number "0" assigned to the separated navigation information table NVT(0,1) and sets this value in the "version_no" column of the filter condition. This is in readiness for an updating of the version number of the navigation information.

In accordance with the navigation information table NVT(1,0) stored in the navigation information table storage unit 5132, the reception control unit 5126 performs (2) the display operation and (3) the user I/F processing. The display screen displayed in accordance with "NVT(1,0)" is shown in Fig. 34B. Here, the image data and audio data are the same as those shown in Fig. 34A, although different button text information is displayed due to the difference in navigation information.

The following is a description of the case when, during a display of the display screen 7903 shown in Fig. 34C by the display unit 5129, the user presses the "enter" key on the remote controller, so the content switching is performed between scene 01e of content 0 and scene IIe of content 1.

In this case, the filter condition in the filter condition storage unit 5131 is set by the reception control unit 5126 so that the "PID" is "0x0093", the "table_id_extension" is "0x0001", and the "version_no" is unconditional. As a result, the TS decoder unit 5123 separates the navigation information table "NVT(1,1)" shown in Fig. 20 from the transport stream shown in Fig. 29 and writes it into the navigation information table storage unit 5132. In accordance with the navigation information table NVT(1,1), the reception control unit 5126 performs (2) the display operation and (3) the user I/F processing so that the display screen 7904 shown in Fig. 34D is displayed.

The following is a description of the case when, during a display of the display screen 8001 shown in Fig. 35A by the display unit 5129, the user presses the "enter" key on the remote controller, so the content switching is performed between scene 01a of content 0 and scene 21a of content 2.

The reception control unit 5126 refers to the object definition table 6302 and the handler definition table 6303 in the navigation information table 6301 in the navigation information table storage unit 5132 and reads the script "goto_content" and the index number "1" of the argument of the script.

The reception control unit 5126 then reads the identifier of the content which is the link destination corresponding to this index number "1" from the hyperlink table 6304. The reception control unit 5126 judges that the identifier of the transport stream to which the link destination content belongs, and the service and event identifiers of the image data, audio data, and navigation information of the link destination content are the same as the present content, and so does not perform the processing for obtaining a PMT. Since the identifiers for the image data, audio data, and navigation information are different, the reception control unit 5126 performs the appropriate processing for switching the reception of these.

The reception control unit 5126 reads the value "0x01" of the "VE_comp_tag" identifier of the image data and

refers to the table 7004 in the PMT 7001 in the system information table storage unit 5133 to find the value "0x0097" of the PID of the component whose data type is "image data" and which has been given the stream_identifier_descriptor whose "component_tag" is "0x01". The reception control unit 5126 then sets this value "0x0097" in the "PID" column of the filter condition for image data in the filter condition storage unit 5131.

The reception control unit 5126 reads the value "0x01" of the "AE_comp_tag" identifier of the audio data and refers to the table 7004 in the PMT 7001 in the system information table storage unit 5133 to find the value "0x0099" of the PID of the component whose data type is "audio data" and which has been given the stream_identifier_descriptor whose "component_tag" is "0x01". The reception control unit 5126 then sets this value "0x0099" in the "PID" column of the filter condition for audio data in the filter condition storage unit 5131.

The reception control unit 5126 reads the value "0x01" of the "NE_id" identifier of the navigation information and, in addition to setting this in the "table_id_extension" of the filter condition for navigation information in the filter condition storage unit 5131, refers to the table 7004 in the PMT 7001 to find the value "0x0094" of the PID of the component which has been given the "NE_Component_Descriptor(2)" which includes the value "0x0002" between the "min_NE_id" and the "max_NE_id", and sets this value in the "PID" column of the filter condition for the navigation information table. In doing so, the reception control unit 5126 sets the "version_no" of the filter condition for the navigation information table as "unconditional".

The TS decoder unit 5123 separates the navigation information table 6701 with the filename "NVT(2,0)" shown in Fig. 21 from the transport stream shown in Fig. 29 and stores it in the navigation information table storage unit 5132, in addition to informing the reception control unit 5126. As a result, the display unit 5129 displays an image identical to that shown as display image 8002 in Fig. 35B.

1-3-11 Example of Content Construction using Scripts

In the interactive program shown in Fig. 5, each of contents 0-3 has one navigation information table. Putting this into other words, there is a one-to-one relationship between navigation information tables and contents. The following are examples of a content construction where a one-to-many relationship is established between the navigation information tables and the contents using the scripts in each navigation information table and a content construction where a one-to-one relationship is established.

Fig. 43 shows a different example of an interactive program which is composed of the four contents 10 to 13.

The presentation information which forms the compositional elements of contents 10 to 13 are the video data "Video1.m2v" and the audio data "Audio1.m2a" shown in Figs. 6A and 6B. This is to say, the four contents 10 to 13 share the same video data "Video1.m2v" and audio data "Audio1.m2a".

The sets of navigation information which are compositional elements of contents 10 to 13 have the following two data constructions.

The first data construction is where the sets of navigation information correspond one-to-one with the contents, which is shown in Figs. 44 to 47.

The navigation information "Navi10-1.nif" shown in Fig. 44 corresponds to each scene in content 10 shown in Fig. 43. Each of the buttons "North Osaka", "Central Osaka", and "South Osaka" in each scene in content 10 is expressed by the button objects with the object index numbers 0, 1, 2 in the object definition table in the navigation information "Navi10-1.nif". These buttons "North Osaka", "Central Osaka", and "South Osaka" are also linked to contents 11, 12, and 13, respectively, as shown in the handler definition table and hyperlink table.

The navigation information "Navi11-1.nif" shown in Fig. 45 corresponds to each scene in content 11 shown in Fig. 43. The text information "Weather Information for North Osaka" in each scene in content 11 is expressed by the picture object for object index number 1 in the object definition table. The "return" button is expressed by a button object with the object index number 0, and is linked to content 10. This is also the case for the navigation information "Navi12-1.nif" shown in Fig. 46 and the navigation information "Navi13-1.nif" shown in Fig. 47.

In this first data construction, the buttons, the sets of text information, and links between contents for contents 10-13 are expressed by a data construction composed of four sets of navigation information "Navi10-1.nif", "Navi11-1.nif", "Navi12-1.nif", and "Navi13-1.nif".

Fig. 48 shows an example set of navigation information in the second data construction where a single set of navigation information corresponds to many contents.

The navigation information "Navi10_13-1.nif" shown in Fig. 48 corresponds to each of the scenes in the four contents 10 to 13 shown in Fig. 43, and expresses all of the objects which are expressed by the four sets of navigation information in Figs. 44 to 47.

The object definition table in Fig. 48 has seven objects with the object index numbers 0-6 that correspond to the button objects and picture objects shown in Figs. 44 to 47, with the present object definition table also including a "visibility" column. This "visibility" column in the object definition table is used to show whether an object is to be displayed, which is to say whether the object in question is valid, when switching to content 10 from another content.

Here, the valid objects are buttons and text information expressed as bitmaps, with a handler (script) being executed when a button is activated by a user operation. Invalid objects are not displayed and their handlers are ignored.

As a result of this object definition table, when reproduction of the contents is commenced, only the objects with the object index numbers 0-2 are valid, so that the buttons for "North Osaka", "Central Osaka", and "South Osaka" given by the bitmap index numbers 0-5 are displayed, with one button being in the selected state and the other two being in the normal (non-selected) state. In this way, content 10 shown in Fig. 43 is reproduced.

The scripts in the handler definition table are programs for performing content switching between the four contents. These scripts are composed of "hide_object()" instructions for preventing the display of objects (invalidating), and "show_object()" instructions for having objects displayed (validating).

As one example, when the "North Osaka" button in content 10 is selected and activated by the user, the handler (with handler index number 0) corresponding to the "North Osaka" button object (object index 0) is activated. The script in this handler invalidates the button objects with the object index numbers 0, 1, and 2, which is to say the buttons for "North Osaka", "Central Osaka", and "South Osaka". On the other hand, the button object with the object index number "3", which is to say the "return" button is validated, as is the picture object with the object index number "4", which is to say the text information "Weather Information for North Osaka".

As a result, the display switches from content 10 in Fig. 43 to content 11. Similar switching processes are also performed when the buttons "Central Osaka" and "South Osaka" are selected and activated by the user during the reproduction of content 10.

As another example, when the user selects and activates the "return" button during the reproduction of content 11, 12 or 13, the handler (with handler index number 3" for the "return" button object (with the object index number 3) is activated. By executing the script in this handler, the three button objects with the object index numbers 0-2, which is to say the buttons for "North Osaka", "Central Osaka", and "South Osaka", are validated, with the other objects (button object 3, picture objects 4-6) being invalidated. As a result, the display switches to content 10 shown in Fig. 43.

As described above, a plurality of objects can be written into one set of navigation information, with the programs being given as scripts for giving the combinations of objects to be displayed (which is to say the valid objects). Putting this into other words, a plurality of contents can be achieved by a single set of navigation information. When doing so, the reception apparatus 5121 no longer needs to receive a new set of navigation information when switching between contents, so that the system can respond more quickly to user operations.

1-3-12 Modifications

As shown by the multiplexing information table 6001 in Fig. 14 of the present embodiment, the bit rate (NE_component_(x)_bitrate) of a navigation information table was set at IMbps for each content, although it is also possible for different values to be set depending on the data included in each content. As one example, contents which are expected to be heavily used by viewers, such as a content used as a main menu, may be set a higher bit rate. As a specific example, in the interactive program shown in Fig. 5, contents 0 and 1 may be set a higher bit rate than contents 2 and 3.

It is also possible for bit rates to dynamically change across the reproduction period of a content. As one example, for link destination contents whose reference probability increases or decreases with time, the assigned bit rate may dynamically change as the version number changes for the present content.

As one example, the bit rate in the multiplexing information table 6001 may dynamically change. When this is the case, the multiplexing instructions sent from the multiplexing control unit 5110 to the multiplexing unit 5112 will include the bit rates given in this multiplexing information table 6001, so that the multiplexing frequency of the navigation information can also be dynamically changed.

Here, if every set of navigation information is assigned the same bit rate (which is when each set of navigation information is assigned one PID), the multiplexing control unit 5110 may count the number of times multiplexing instructions are generated for the navigation information tables, with, for example, multiplexing instructions being generated for the navigation information of contents 0-3 at a ratio of 2:1:1:1.

The present embodiment also describes the case when the image data is displayed using the full screen of the display unit 5129 of the reception apparatus 5121, although a smaller size may alternatively be used. As one example, when the image data is reduced to 1/4 of the size of the screen, the bit rate required for transferring image data can be reduced to one quarter, so that the total number of contents can still be increased when there is an upper limit for the bit rate which may be assigned to the interactive program. When doing so, the image data may be still be combined with objects described in the navigation information to give the reproduced image. It is also possible for contents to be composed of a simultaneous display of between two and four quarter-screen sets of video data.

In the present embodiment, interactive programs are described as being broadcast using digital satellite broadcasting, although they may instead be broadcast from a cable TV (CATV-Cable Television Service) broadcasting station.

In the present embodiment, each navigation information table was described as having a time information table

where the valid start time "start_time" showing when the navigation information becomes valid and the valid end time "end_time" showing when it ceases to be valid are defined as relative times where the start time of the broadcasting into which the applications stored in the transmission data storage unit 102 are multiplexed is set as "0". The reception control unit 5126 of the reception apparatus 5121 is also described as referring to the clock unit of the AV decoder unit 5124 which measures time in synchronization with the information in the PCR multiplexed into the transport stream (where the multiplexing unit 5112 of the digital broadcasting apparatus 5101 sets the initial value of the transport stream at "0") and judging whether the valid start time or valid end time of each set of navigation information has been reached. However, it is also possible, for example, for the reception apparatus 5121 to be provided with a clock unit which measures absolute time, with the reception control unit 5126 referring to this clock unit to obtain the present absolute time, before reading the start time (absolute time) of an event from the event information in the EIT stored in the system information table generating unit 5105 and subtracting the event start time from the present absolute time to obtain a relative broadcasting start time (given as "0") for the event, which it then uses to judge the valid start time and valid end time of each set of navigation information.

When the valid start time and valid end time in the time information table are given as absolute times, and the reception control unit 5126 is provided with a clock unit for measuring absolute time, it should be obvious that the reception control unit 5126 may refer to this clock unit which measures absolute time and judge the valid start time and valid end time of each set of navigation information.

When the management of the valid time periods of each set of navigation information does not need to be especially precise, the reception control unit 5126 of the reception apparatus 5121 need not judge the valid start time and valid end time of each set of navigation information, so that when notification of the separation of a new navigation information table is received from the TS decoder unit 5123, the reception control unit 5126 may invalidate the present navigation information table and validate this new navigation information table.

Navigation information which does not include a time information table may alternatively be transmitted. In such a case, the time information table of each set of navigation information may be stored separately to the navigation information, such as in the construction information storage unit, with the multiplexing control unit being constructed to refer to the time information tables when generating multiplexing instructions.

Finally, while the present embodiment describes the case where the image data and audio data to be broadcast are stored beforehand in the presentation information storage unit 5107 of the digital broadcasting apparatus 5101, it is also possible for a video camera and an encoder for real-time compressing the images shot by the camera to be provided, so that the output of the encoder may then be stored in the presentation information storage unit 107 in real-time.

Second Embodiment

In the present embodiment, a digital broadcasting apparatus for achieving interactive programs composed of page-based contents is described.

The fundamental principles for the realization of interactive programs composed of page-based contents are explained below with reference to Figs. 49 to 51, prior to the description of the construction of the digital broadcasting system of the present embodiment.

Fig. 49 shows several examples of "contents" which are displayed by the display screen of a receiver apparatus, with these example contents representing weather forecasts. Here, the example contents 151 to 153 show weather forecasts for the whole of Japan (153) and for different regions (151, 152). The arrows 154 to 157 which have been drawn between pairs of these contents 151 to 153 show the switching of display which can be performed in response to user operations.

When the content 153 which gives the weather forecast for the whole of Japan is being displayed on the display screen, if the user makes a selection and confirmation operation for the button 161 which represents "Tokyo", the display on the display screen will switch as shown by the arrow 154 to content 151 which shows the weather forecast for Tokyo. Should the user then select and confirm the "Return" button 158, the display screen will switch from the content 151 to the content 153, as shown by the arrow 155.

In the same way, if the user selects and confirms the button 161 representing "Osaka" in the content 153, the display screen will switch from the content 153 to the content 152, as shown by the arrow 156. Once again, should the user then select and confirm the "Return" button 159, the display screen will switch from the content 152 to the content 153, as shown by the arrow 157. In order to perform these display switching operations, the contents 151 to 153 are provided with the buttons 158 to 161. Here, in addition to these buttons, each content may also include buttons for switching to the stream-based contents which were described in the first embodiment.

In order to allow the user to make display switching operations which switch the display between contents, the transmission apparatus transmits each content according to the procedure described below.

Fig. 50 is a pictorial representation of the transmission data which is transmitted by the transmission apparatus.

The transmission data 165 is made up of data representing a plurality of contents, and is repeatedly transmitted in its entirety. This transmission data 165 is composed of a plurality of sets of image data 166, 167, 168 ... and a plurality of sets of navigation information 169, 170, 171 ... corresponding to the sets of image data.

Each set of image data (166 onwards) is composed of a main image of one of the contents (151 onwards) which is to be displayed on the display screen of the reception apparatus. Here, the same example weather forecasts are shown in the drawings.

Each set of navigation information is 169 to 171 includes a set of bitmap data 172 to 174 such as a button which is superimposed on the corresponding image 166 to 168, a set of script information 175 to 177 which describes the operations to be executed in accordance with user operations, and a set of hyperlink information 178 to 180 which shows the contents which can be switched to as a result of a display switching operation made by the user.

As examples, the content 151 shown in Fig. 49 is composed of the image data 166 and the navigation information 169. In the same way, the content 152 shown in Fig. 49 is composed of the image data 167 and the navigation information 170, while the content 153 is composed of the image data 168 and the navigation information 171. Putting this into other words, each set of image data (such as 166) has a corresponding set of navigation information (such as 169).

Fig. 51 is a pictorial representation of the transmission of the transmission data 165 by the transmission apparatus. As shown in Fig. 51, the transmission apparatus repeatedly transmits the transmission data. From this it can be seen that the transmission data 165 is cyclically transmitted.

It should be noted here that while the image data and navigation information have been illustrated in frame format, the image data and corresponding navigation information are in fact digitized and multiplexed together, before being transmitted as an MPEG2 transport stream. Figs. 50 and 51 are therefore somewhat different from the actual transmission data which is transmitted by the present system.

Also, while not illustrated in the drawings, each of the transmitted sets of image data 166 onwards is assigned identification information to distinguish the image data from the other sets of image data. In the same way, each set of navigation information 169 onwards is also assigned identification information to distinguish the navigation information from the other navigation information.

The receiver apparatus refers to these sets of identification information in the transmission data 165 and obtains the image data and navigation information which include the appropriate identification information. The obtained information is then reproduced and displayed as one content, such as the content 151 shown in Fig. 49. Here, the obtained navigation information, such as the navigation information 171, is stored in readiness for user operations.

The following is a description of the digital broadcasting system to which the present embodiment relates, with reference to the drawings.

2-1 Outline of the Construction

Fig. 52 shows the construction of the digital broadcasting system of the second embodiment of the present invention. This digital broadcasting system is composed of a data transmission apparatus 101 and a plurality of data reception apparatuses 121.

The data transmission apparatus 101 is constructed to multiplex data for a plurality of paged-based contents, which feature hyperlinks to one another, into an MPEG2 transport stream and repeatedly transmit the multiplexed data. This data transmission apparatus 101 is composed of a transmission data storage unit 102, a data multiplexing unit 103, a multiplexing information storage unit 104, a system information table generating unit 105, and a transmission unit 106.

The data reception apparatus 121 is constructed to selectively obtain and reproduce a content from the MPEG2 transport stream transmitted by the data transmission apparatus 101, in accordance with an interactive operation made by the user. This data reception apparatus 121 is composed of a reception unit 122, a TS decoder unit 123, an AV decoder unit 124, a received data storage unit 125, a reception control unit 126, a signal reception unit 127, a reproduction unit 128, a display unit 129, and an audio output unit 130.

2-2 Data Transmission Apparatus 101

2-2-1 Construction of Transmission Data Storage Unit 102

The transmission data storage unit 102 is composed of a recording medium such as a magnetic disc, and stores data for a plurality of contents which compose one interactive program and construction information. This transmission data storage unit 102 includes a presentation information storage unit 107, a navigation information storage unit 108, and a construction information storage unit 109. Here, an "interactive program" refers to an "event" or "program" which is included in the MPEG2 transport stream used as the transmission data.

The transmission data storage unit 102 separately stores the image data (presentation information) and the navigation information in the transmission data 165 shown in Fig. 50. The transmission data storage unit 102 further stores

a composition correspondence table which shows the correspondence between sets of image data and navigation information.

2-2-1-1 Presentation Information Storage Unit 107

The presentation information storage unit 107 stores presentation information, such as image data and audio data, which is included in each content. Figs. 53A and 53B show sets of still image data which are examples of the presentation information for contents 153 and 151. Fig. 53A shows the still image data 201 which is given the filename "still5.m2v", while Fig. 53B.shows the still image data 202 which is given the filename "still1.m2v". These sets of still image data 201, 202 are stored having been digitally encoded according to IS/IEC 13818-2 (MPEG2 video) standard. However, other encoding methods for image data may be used.

2-2-1-2 Navigation Information Storage Unit 108

The navigation information storage unit 108 stores the navigation information which is included in the transmitted contents. This navigation information can include hyperlink information for links to other contents, and describes objects which allow the user to interactively select link destinations. An example of this navigation information is shown in Fig. 54, with the figure showing the navigation information 301 of content 153 which has been given the filename "navi5.nif".

It should be noted that information showing that the still image data 201 shown in Fig. 53A and the navigation information 301 shown in Fig. 54 form one content 153 is given in the construction correspondence table 501 shown in Fig. 56. This is described in more detail later in this text.

The navigation information 301 includes an object definition table 302, a handler definition table 303, a hyperlink table 304, and a bitmap table 305 which are each given in table format. This navigation information 301 differs from the navigation information 5301 shown in Fig. 7 in that it does not include a time information table, but is otherwise effectively the same and so will not be described in detail. Also, in Fig. 54, the "object index", the "handler index" the "hyperlink index", and the "bitmap index" have each been abbreviated to "index".

2-2-1-3 Construction Information Storage Unit 109

The construction information storage unit 109 stores the construction information table and the entry information. The construction information table is information showing a combination of the presentation information and navigation information for each content. The entry information is information showing an entry content.

The construction information table 501 shown in Fig. 56 stores information which shows a combination of the presentation information and navigation information for each content, with each corresponding content number. These content numbers are used to identify each content among the plurality of contents stored in the transmission data storage unit 102. As shown in Fig. 56, the first line of construction information table 501 is for the content with the content number "0", which is composed of a combination of the still image data with the filename "still0.m2v" which is stored in the presentation information storage unit 107 and the navigation information with the filename "navi0.nif" which is stored in the navigation information storage unit 108. This is also the case for the other lines in the construction information table 501.

The entry information 502 shown in Fig. 56 shows that the entry content representing the first content to be displayed in the application stored in the transmission data storage unit 102 is the content with the content number "5".

2-2-2 Multiplexing Information Storage Unit 104

The multiplexing information storage unit 104 stores assigning information for resources, such as identifiers and areas when multiplexing the transmission data stored in the transmission data storage unit 102 into an MPEG2 transport stream for broadcasting, in the form of a multiplexing information table. An example of this multiplexing information table 601 is shown in Fig. 57.

The item "Bit_Rate" stored on line 1 of multiplexing information table 601 shows the assigned transfer rate when multiplexing the transmission data stored in the transmission data storage unit 102 into an MPEG2 transport stream. Here, 6Mbps is assigned as the transfer rate.

The "original_network_id", the "transport_stream_id", the "service_id", and the "event_id" on lines 2 through 5 of the multiplexing information table 601 are the same as those in Fig. 14, and so will not be described.

Lines 6 through 10 of the multiplexing information table 601 show the values of the PIDs assigned to each of the components which compose the event when the application stored in the transmission data storage unit 102 is multiplexed into a broadcast MPEG2 transport stream as an event. It should be noted here that PMT_PID and PCR_PID represent the values of the PIDs which are assigned to the PMT (Program Map Table) and PCR (Program Clock

Reference), respectively. These are explained later in this text.

The NE_component_pid (navigation information component packet identifier) shows the value of the PID assigned to the component into which the navigation information stored in the navigation information storage unit 108 of the transmission data storage unit 102 is multiplexed.

The VE_information_component_pid (stream correspondence information component packet identifier) shows the value of PID assigned to the components into which the stream correspondence table generated by the stream correspondence information table generating unit 111 (described later in this text) is multiplexed.

The VE_component_pid (image data component identifier) shows the value of the PID assigned to the component into which the image data stored in the presentation information storage unit 107 is multiplexed.

It should be noted that in the present embodiment, the NE_component_pid, the VE_information_component_pid and the VE_component_pid are each assigned only one PID, although it is also possible for each to be assigned a plurality of PIDs. This is to say, while Fig. 54 shows the case when the NE_component_pid is "0x0082", the VE_information_component_pid is "0x0083", and the VE_component_pid is "0x0084", the NE_component_pid can be additionally assigned the value "0x0085", the VE_information_component_pid the value "0x0086", and the VE_component_pid the value "0x0087".

Also, while not present in the present embodiment, when audio information is included in the transmission data, an AE_information_component_pid and an AE_component_pid will also be assigned.

2-2-3 Construction of the Data Multiplexing Unit 103

The data multiplexing unit 103 is composed of a multiplexing control unit 110, a stream correspondence information table generating unit 111, an identifier information appending unit 112, a navigation information table generating unit 113, and a multiplexing unit 114.

The data multiplexing unit 103 performs the processing described below to generate the transmission data 165 shown in Fig. 51.

2-2-3-1 Multiplexing Control Unit 110 (part 1)

On being activated by the transmission unit 106, the multiplexing control unit 110 first reads the construction information table 501 and the multiplexing information table 601 stored in the construction information storage unit 109 and the multiplexing information storage unit 104, before generating an identifier assigning table which assigns an image data identifier VE_id and a navigation information identifier NE_id to each content number of contents in the digital broadcast.

Fig. 58 shows content identifier assigning table 701 which is an example of this content identifier assigning table. Here, each column in the content identifier assigning table 701 is the same as those in Fig. 15 of the first embodiment, with these identifiers being mainly used in the present embodiment for page-based contents. The "VE_id" 709 is the identifier for uniquely identifying a set of image data in a page-based content in one of the events. The "AE_id" 713 is the identifier for uniquely identifying a set of audio data. The "NE_id" 710 is the identifier for uniquely identifying a set of navigation information in one of the events.

In the present embodiment, "VE_id", "AE_id", and "NE_id" are used for identifying each page-based content. In the first embodiment, meanwhile, a "VE_comp_tag", an "AE_comp_tag", and an "NE_id" are used for identifying each stream-based content. As a result, the "VE_comp_tag" and "AE_comp_tag" columns in the present table are set at "-".

In the present embodiment, the "VE_id" 709 and "NE_id" 710 are assigned the same value as the content number 702. However, the values of "VE_id" 709 and "NE_id" 710 do not need to match the value of the content number 702, so long as each they are assigned different values for each pairing of a set of image data and set of navigation information.

In the present embodiment, no audio data is present, so that no identifiers are assigned to "AE_svc_id" 711, "AE_event_id" 712, "AE_id" 713 and "-" is written into the table. When audio data is present, these values are assigned in the same way as for the image data and navigation information.

On completing the generation of the content identifier assigning table 701, the multiplexing control unit 110 generates the display image information identifier assigning table which assigns values to "PID", "component tag", and "stream_ID". An example of this display image information identifier assigning table, display image information identifier assigning table 801, is shown in Fig. 59. In the display image information identifier assigning table 801, the "VE_id" 709 is the same as that assigned in the content identifier assigning table 701, while the "PID" 803 is assigned the same value (here, the value "0x0084") as the "VE_component_pid" 607 in the multiplexing information table 601. Each "component_tag" 802 is assigned the same value for each value of the "PID" 803 (so that in the present example "0x00" is assigned to the "component_tag" 802 for each value "0x0084" of the "PID" 803). Each entry in the "stream_id" 804 column is assigned a hexadecimal value which is cyclically incremented by "1" between "e0" and "ef". Finally, the

filename of the image data which is identified by this value of "VE_id" 709 and which is stored in the presentation information storage unit 107 is written into the image data file column 805.

It should be noted here that when a plurality of identifiers are assigned to the VE_component_pid of Fig. 57, the "PID" and "stream id" can be assigned in the manner described below. First, each value of "PID" is set by extracting one value from the VE_Component pid, while the "stream id" is set a hexadecimal value which is incremented between "e0" and "ef". After each set of stream ids, a new VE_component_pid is extracted from the multiplexing information table and is set in the "PID" 803. When there are no more new values of VE_component_pid, the process returns to the value of the VE_component_pid that was assigned first. Here, a different value is set in the "component tag" 802 for each PID 803.

In the present embodiment, all sixteen of the possible values between "e0" and "ef" are used as values of the stream_id for image data, although it is equally possible for only some of such possible values to be used. For audio data, thirty-two hexadecimal values between "c0" and "df" may be used for stream_ids in accordance with MPEG2 standard.

It should be noted that the value of the "component_tag" 802 is used to indirectly refer to the "PID". As described above, the "component_tag" 802 may be set any values which one-to-one correspond to values of the PID, with the correspondence between component tags and PIDs being written into the PMT which is described later in this text. Here, if the value of the PID is not found directly from the navigation information or stream correspondence information, but is instead indirectly found using the "component_tag", it becomes no longer necessary to change the navigation information or stream correspondence information when multiplexing the data with other programs, even when the value of the PID is changed by the transmission unit 106 (described later).

On completing the generation of the display image information identifier assigning table 801, the multiplexing control unit 110 gives an indication to the stream correspondence information table generating unit 111 to generate the stream correspondence table, an indication to the identifier information appending unit 112 to add the identifier VE_id to private area of the image data, and an indication to the navigation information table generating unit 113 to generate a navigation information table.

2-2-3-2 Identifier Information Appending Unit 112

On receiving an indication from the multiplexing control unit 110 to add identifier information, the identifier information appending unit 112 retrieves the image data stored in the presentation information storage unit 107. The identifier information appending unit 112 then writes the image data identifier VE_id into the private area of the retrieved image data bitstream. It should be noted here that the identifier information appending unit 112 obtains this identifier VE_id by referring to the display image information identifier assigning table 801 generated by the multiplexing control unit 110. The identifier information appending unit 112 then adds a filename to the image data bitstream with the appended VE_id and stores it in a storage region (not illustrated).

Fig. 60 shows a bitstream 901 which is an example of the image data with the filename "VE(5)" to which identifier information has been appended. This bitstream 901 is encoded according to MPEG2 standard, with the value "0x0005" of the VE_id being recorded in the user data area 903 of the picture header 902. The still image data 201 shown in Fig. 53A, meanwhile, is recorded in the picture data area 904. Once identifier information has been appended to every set of image data, the identifier information appending unit 112 gives the multiplexing control unit 110 an indication showing that the appending process has been completed.

It should be noted here that while the present embodiment describes the case when the VE-id is written into the user data area, it may instead be written into any area which may be used for recording private data.

2-2-3-3 Navigation Information Table Generating Unit 113

On receiving an indication to generate the navigation information table, the navigation information table generating unit 113 reads the navigation information stored in the navigation information storage unit 108. When the read navigation information includes a hyperlink table, the navigation information table generating unit 113 refers to the content identifier assigning table 701 for the information regarding link destinations which are expressed using content numbers. The navigation information table generating unit 113 then converts all of the identifiers to generate the navigation information table. When no hyperlink table is included, the navigation information table generating unit 113 generates the navigation information table using the original navigation information as it is, changing only the filenames. The generated navigation information is then stored in a storage area (not-illustrated).

Fig. 61 shows the generated navigation information table 1001 which has the filename "NVT(5)". This navigation information table 1001 has been generated from the navigation information with the filename "navi5.nif" which was shown in Fig. 54. The navigation information table 1001 includes the object definition table 1002, the handler definition table 1003, the hyperlink table 1004, and the bitmap table 1005.

Fig. 62 shows the navigation information table 1101 for the filename "NVT(1)". This navigation information table 1101 has been generated from the navigation information "navil.nif" shown in Fig. 55, and does not include a hyperlink table, so none has been shown.

On completing the generation of the navigation information table, the navigation information table generating unit 113 gives the multiplexing control unit 110 notification of such.

2-2-3-4 Stream Correspondence Information Table Generating unit 111

On receiving an indication from the multiplexing control unit 110 to generate a stream correspondence table, the stream correspondence information table generating unit 111 refers to the display image information identifier assigning table 801 and generates a stream correspondence table for each set of image data. These stream correspondence tables are used to extract sets of image data from the stream transmitted to the data reception apparatus 121 from the data transmission apparatus 101.

Fig. 63A shows the stream correspondence table [VET(5)] 1201 which is used by the data reception apparatus 121 to extract the image data "VE(5)". The item "first_pts" in this stream correspondence table 1201 represents the reproduction starting time information in units of one ninety-thousandth of one second for the time at which the first frame in the corresponding image data is to be reproduced. This "first_pts" can be obtained, as one example, using the formula given below as Formula 1.

Formula 1

$$first\_pts(N) = \left[\sum_{x=0}^{N} \{S\_VE(x) + S\_NVT(x) + S\_VET * R\} / B \right] * 90000$$

Here, S_VE(x) is the size when the image data VE(x) stored in a storage area of the identifier information appending unit 112 has been converted into a transport stream packet in accordance with MPEG2 system standards. S_NVT(x) is the size when the navigation information table NVT(x) stored in a storage area of the navigation information table generating unit 113 has been converted into a transport stream packet. S_VET is the size when one stream correspondence table stored in a storage area of the stream correspondence information table generating unit 111 has been converted into a transport stream packet. Here, these sizes are expressed as numbers of bits. Here, the variable "R" represents the number of times a stream correspondence table has been multiplexed, and is an integer in the range from "1" to "(P*S)". The variable "P" is the number of PIDs which have been assigned to each component which has been allocated by the multiplexing information storage unit 104 for transferring the image data, the value of P being "1" in the present embodiment. The variable "S" represents the number of different stream_id values which are used in the display image information identifier assigning table 801, with this being "16" in the present embodiment. Finally, the variable "B" represents the bit rate, which is "6Mbps" in the present embodiment.

It should be noted here that the S_VE(x) is found by the adding the sizes of the PES packet header and the trailer information which are required by each PES packet, and the sizes of the transport packet header and trailer information part which are required by each transport packet to the size of VE(x). S_NVT(x) is found by adding the sizes of the section header and trailer header required by each section and the sizes of the transport packet header and trailer information part which are required by each transport packet to the size of NVT(x). S_VET, meanwhile, is found by adding the sizes of the section headers and the like to the size of the VET, in the same way as S_NVT(x). It should be noted here that in the present embodiment, all of the VETs are of the same size. A detailed description of the PES packet, the transport packet, and the sections is given in the documentation for MPEG2 system standard.

The "last_pts" in the stream correspondence table 1201 gives information for the time at which the final frame in the corresponding image data is to be reproduced as the reproduction end time. This "last_pts" is expressed in units of 1/90000 of one second. In the present embodiment, the image data is composed of still images, so that the "last_pts" (reproduction end time information) is the same as the "first_pts".

The "component_tag" and "stream_id" in stream correspondence table 1201 are set at the values of the component_tag and the stream_id assigned to the corresponding image data by referring to the display image information identifier assigning table 801.

Fig. 63B shows the first stream correspondence table 1202 for the image data, while Fig. 63C shows the fifteenth stream correspondence table 1203 for the image data.

It should be noted here that the time "0" which is the standard for the "first_pts" and the "last_pts" in the stream correspondence tables 1201, 1202, and 1203 is the time at which the data stored in the transmission data storage unit

102 is first multiplexed into the transport stream and transmitted.

In the present embodiment, the stream correspondence information table generating unit 111 is described as referring to the display image information identifier assigning table 801 and writing the value of the assigned component_tag into the stream correspondence table, although the value of the assigned VE_component_pid in the multiplexing information table 601 may be directly written in place of the value of the VE_component_pid.

2-2-3-5 Multiplexing Control Unit 110 (part 2)

On receiving notification from the identifier information appending unit 112, the navigation information table generating unit 113, and the stream correspondence information table generating unit 111 indicating that they have completed their respective processes, the multiplexing control unit 110 determines the number of contents "T" to be used as the unit for repetition. Here, put simply the number of contents used as the unit for repetition T is a total given by adding the number M of contents included in the transmission data 165 to the number of dummy contents, or more precisely is set at T where $M \leqq P*S*n=T$ with M as the total number of contents stored in the construction information storage unit 109. As described above with reference to Formula 1, "P" is the number of PIDs which are assigned to a component for transferring the image data by the multiplexing information storage unit 104, while "S" is the number of stream_ids. Also, "n" is the smallest integer which enables the condition $M \leqq T$ to be satisfied. In the present embodiment, P=1, S=16, and M=63, so that T=64. Note here that when the number of contents T in each repetition is greater than the total number of contents M, the multiplexing control unit 110 multiplexes T-M null packets of a size which is at least equal to the smallest content after first multiplexing all of the contents into the transport stream. By doing so, it is possible to maintain at least a predetermined interval D (at least (P*S-1) times the size of the smallest content) between the multiplexing positions of the image data and the stream correspondence table corresponding to the image data.

The multiplexing control unit 110 uses Formula 2 below to find the length L of one cycle of the number of contents T in each repetition. The value L is expressed in units of 1/90000 of one second and is the length of the transport stream when multiplexing all of the contents and null packets of a size equivalent to (T-M) contents into the transport stream at the bit rate B stored in the multiplexing information storage unit 104.

Formula 2

$$L = \left[\left[\sum_{x=0}^{M-1} \{S\_VE(x)+S\_NVT(x)+S\_VET*R\} + \{S\_VE(0)+S\_NVT(0)+S\_VET*R\}*(T-M) \right] / B \right] *90000$$

As described above, M and T are the total number of contents and the number of contents in one repetition, with S_VE(x), S_NVT(x), S_VET, R, and B being the same as defined in Formula 1.

The multiplexing control unit 110 sets the content counter i at "0" and sets the multiplexing start position pointer wp at "0". This value of "wp" shows the time from the first information position of the contents multiplexed into the transport stream.

The multiplexing control unit 110 next sets the value of the VET counter j at "0". The value of this VET counter j is then used to find the cycle number C and the content number N. The cycle number C is the integer of the quotient given by $\{i+(P*S)-1-j\} \div T$, while the content number is the remainder of $\{i+(P*S)-1-j) \div T$. Following this, the multiplexing control unit 110 judges whether an Nth stream correspondence table VET(N) is stored in the stream correspondence information table generating unit 111, and if so, adds a value, which is a multiple of length L of one cycle of the number of contents T in one repetition and a number of cycles C, to the "first_pts" and "last_pts" of VET(N).

The multiplexing control unit 110 then instructs the multiplexing unit 114 to multiplex VET(N) into the transport stream. In doing so, the multiplexing control unit 110 informs the multiplexing unit 114 of the multiplexing start position wp and the bit rate B, as well as the value of the "VE_information_component_pid" in the multiplexing information table 601 as the PID value and the value of the "VE_id" corresponding to the content number N in the content identifier assigning table 701 as the table_id_extension.

When VET(N) is not stored in the stream correspondence information table generating unit 111, the multiplexing control unit 110 instructs the multiplexing unit 114 to multiplex a null packet with the same size as S_VET, and informs

the multiplexing unit 114 of the multiplexing start position wp and the bit rate B.

After instructing the multiplexing unit 114 to perform multiplexing, the multiplexing control unit 110 calculates the multiplexing start position wp using the equation wp=wp+S_VET/B. After this, the multiplexing control unit 110 adds "1" to the value of the VET counter j and judges whether the VET counter j coincides with the value of the number of repeated multiplexing R in the stream correspondence table. When the values match, the multiplexing control unit 110 recalculates the number of cycles C and the contents number N, before continuing with the multiplexing process for VET(N).

On judging that the values do not match, the multiplexing control unit 110 calculates the number of cycles C and the contents number N according to the method described above and judges whether there is a content with the content number N stored in the identifier information appending unit 112 or in the navigation information table generating unit 113. On judging that such a content is being stored, the multiplexing control unit 110 instructs the multiplexing unit 114 to multiplex VE(N). At this point, the multiplexing control unit 110 informs the multiplexing unit 114 of the values of the multiplexing start position wp, the bit rate Bv(N), the PID, and the stream_id. Here, to find the values of the PID and the stream_id, the multiplexing control unit 110 fetches the values of the PID and of the stream_id from "PID" and the "stream_id" assigned to the image data whose "VE_id" is "N" from the display image information identifier assigning table 801. On the other hand, the multiplexing control unit 110 calculates the bit rate Bv(N) according to Formula 3 below.

Formula 3

$$\text{bit rate } Bv(N)=\{S\_VE(N)*B\}/\{S\_VE(N)+S\_NVT(N)\}$$

The symbols in the above Formula 3 are the same as those in Formula 1.

The multiplexing control unit 110 also instructs the multiplexing unit 114 to multiplex NVT(N). In doing so, the multiplexing control unit 110 informs the multiplexing unit 114 of the values of the multiplexing start position wp, the bit rate Bn(N), the PID, and the table_id_extension. Here, to find the value of the PID, the multiplexing control unit 110 refers to the multiplexing information storage unit 104 and extracts the PID which has been assigned to the component assigned to the transfer of the navigation information. To find the value of the table_id_extension, the multiplexing control unit 110 extracts the value of "NE_id" assigned to the contents identifier N from the content identifier assigning table 701. The multiplexing control unit 110, calculates the bit rate Bn(N) according to Formula 4 given below.

Formula 4

$$\text{Bit rate } Bn(N) = \{S\_NVT(N)*B\}/\{S\_VE(N)+S\_NVT(N)\}$$

The symbols in the above Formula 3 are the same as those in Formula 3.

The multiplexing control unit 110 next finds the multiplexing start position wp according to the formula

$$[wp = wp + \{S\_VE(N)+S\_NVT(N)\}/B].$$

When content N is not stored, the multiplexing control unit 110 instructs the multiplexing unit 114 to multiplex a null packet of a size given as S_VE(0)+S_NVT(0). In doing so, the multiplexing control unit 110 informs the multiplexing unit 114 of the multiplexing start position wp.

While the above explanation gives the size of a null packet to be multiplexed as the combined size of S_VE(0) and S_NVT(0) for content number "0", the size of the null packet may instead be set at a size S_VE(k) + S_NVT(k) where this represents the smallest combined size out of all of the contents.

The multiplexing control unit 110 next finds the multiplexing start position wp according to the formula

$$[wp = wp + \{S\_VE(0)+S\_NVT(0)\}/B].$$

The multiplexing control unit 110 next adds "1" to the value of the content counter i, recalculates the value of the VET counter j, and repeats the processing from the multiplexing of VET(N) onwards.

2-2-3-6 Multiplexing Unit 114

The multiplexing unit 114 multiplexes the transmission data 165 shown in Fig. 51 into an MPEG2 transport stream. Figs. 64 and 65 show model representations of multiplexed streams where identification information has been added to the data shown in Fig. 51. This is described in detail below.

When instructed by the multiplexing control unit 110, the multiplexing unit 114 multiplexes data into an MPEG2 transport stream using a method which has been standardized according to MPEG2 system standards. On receiving instructions from the multiplexing control unit 110 to multiplex a stream correspondence table VET(N), the multiplexing unit 114 reads the stream correspondence table VET(N) from the stream correspondence information table generating unit 111 and multiplexes it into the transport stream at a position starting from the indicated multiplexing start position wp, using the indicated PID, table_id_extension, and bit rate B. On receiving an indication from the multiplexing control unit 110 to multiplex the image data VE(N), the multiplexing unit 114 reads the image data which has been appended with the corresponding identifier from the identifier information appending unit 112 and multiplexes the image data into the transport stream at a position starting from the indicated multiplexing start position wp, using the indicated PID, stream_id, and bit rate Bv(N). On receiving an indication from the multiplexing control unit 110 to multiplex the navigation information NVT(N), the multiplexing unit 114 reads the navigation information table from the navigation information table generating unit 113 and multiplexes it into the transport stream at a position starting from the indicated multiplexing start position wp, using the indicated PID, table_id_extension, and bit rate Bn(N). Also, on receiving an indication from the multiplexing control unit 110 to multiplex a null packet, the multiplexing unit 114 multiplexes a null packet of the indicated size at a position starting from the multiplexing start position wp at the indicated bit rate.

The multiplexing unit 114 multiplexes the PCR at the front of the generated transport stream with the initial value "0", using the PCR_PID indicated by the multiplexing control unit 110.

Fig. 64 shows an example of a transport stream generated by the multiplexing unit 114. Here, the 63 contents stored in the transmission data storage unit 102 have been multiplexed into this transport stream 1701. These 63 sets of image data have been assigned the values "0x0084" shown in the multiplexing information table 601 as their PID, with each set of image data having been assigned a value which has been cyclically incremented between "OxeO" and "Oxef".

Each stream correspondence table VET(N) has been assigned the value "0x0083" given in the multiplexing information table 601 as its PID, and a value each to the image data identifier "VE_id" as its table_id_extension. As shown in Fig. 64, one stream correspondence table VET(N) is multiplexed for each set of image data VE(N). Accordingly, the number of repeated multiplexing R for the stream correspondence table is "1".

The sixty-three navigation information tables NE(0) to NE(62) are multiplexed by the multiplexing unit 114 having been each assigned the value "0x0082" given in multiplexing information table 601 as their PID, and the value of the navigation information identifier "NE_id" as their table_id_extension. PCRs 1702, which include standard information for time, are also multiplexed into the transport stream.

As one example, the transmission data 165 shown in Fig. 51 extends between the stream correspondence table VET(15) to the null packet 1705.

Each stream correspondence table VET(N) in the transport stream 1701 is multiplexed at a position at the equivalent of fifteen sets of image data ahead of the corresponding image data VE(N). Since each set of image data is cyclically assigned one of sixteen stream_ids, no image data which has the same PID and stream_id as image data VE(N) will be multiplexed between the stream correspondence table VET(N) and the corresponding image data VE (N). As a result, the data reception apparatus 121 is able to extract the desired image data VE(N) from the transport stream by first obtaining the stream correspondence table VET(N) and then separating the first set of image data in the transport stream which has been assigned the indicated PID and stream_id, out of the many sets of image data with this PID and stream_id.

As one example, there is no image data with the PID "0x0084" and the stream_id "OxeO" between the stream correspondence table VET(16) 1703 and the image data VE(16) 1704. Accordingly, despite there being four sets of image data VE(0), VE(16), VE(32), and VE(48) with the same PID "0x0084" and stream_id "OxeO", the data reception apparatus 121 will separate only the first set of image data with the indicated PID and stream_id which appears after the stream correspondence table VET(16) 1703, which means that the desired image data VE(16) will be obtained.

The transport stream 1701 is also composed so that data equivalent to fifteen contents is multiplexed between each stream correspondence table VET(N) and its corresponding image data VE(N). Accordingly, it can be ensured that the time D taken from the appearance of the stream correspondence table VET(N) to the appearance of the corresponding image data VE(N) is at least the time taken by the transmission of fifteen contents of the smallest size. Accordingly, if the data reception apparatus 121 can perform the necessary processes for the interpretation of the stream correspondence table and the preparation for separating the image data within this time period D, proper reproduction of the desired image data can be ensured. In the present example, a null packet 1705 whose size is equivalent to one content has been multiplexed into the transport stream 1701 to ensure that time D is maintained at a value

equivalent at least the transmission time of fifteen contents, even at a part of the transport stream near the end of a transmission cycle. By doing so, it can be ensured that a time interval which is equivalent to the transmission of a least fifteen of the smallest contents is present, even when a stream correspondence table VET(N) and its corresponding image data VE(N) are in different transmission cycles, such as VET(0) 1706 and VE(0) 1707 in Fig. 64.

Fig. 65 shows an example of the transport stream generated by the multiplexing unit 114 when the number of repeated multiplexing R for the stream correspondence tables is "16".

The transport stream 1711 is constructed so that each stream correspondence table VET(N) is multiplexed sixteen times between a position which is the equivalent of fifteen contents ahead of the corresponding image data VE(N) and the multiplexing start position of this image data VE(N). As a result, the data reception apparatus 121 first obtains the stream correspondence table and, in reproducing the corresponding image data VE(N), can reproduce the desired image data faster the shorter the time D between the stream correspondence table VET(N) and the corresponding image data. However, if the time D is reduced, the data reception apparatus 121 has to interpret the stream correspondence table and perform the necessary preparations for the separation of the image data faster. Here, if each stream correspondence table is repeatedly multiplexed, as shown in the transport stream 1711, the data reception apparatus 121 will be able to obtain the stream correspondence table from a position which is close to the image data when the load of the data reception apparatus 121 is light, allowing high-speed reproduction, or from a position which is further from the image data when the load of the data reception apparatus 121 is great. By performing such control, proper reproduction of the image data can be maintained.

On generating a transport stream, such as transport stream 1701 shown in Fig. 64, the multiplexing unit 114 outputs the stream in order to the transmission unit 106.

2-2-4 System Information Table Generating unit 105

The system information table generating unit 105 refers to the multiplexing information storage unit 104 and generates the NIT (Network Information Table), the EIT (Event Information Table), the SDT (Service Description Table), the PAT (Program Association Table), and the PMT (Program Map Table). These tables compose the program specification information which is used by the data reception apparatus 121 in selecting a program. These tables are the same as those generated by the system information table generating unit 5105 in the first embodiment, so that the following explanation will instead focus on the generated results (which is to say the system information tables) in the present embodiment.

Figs. 66A to 66C show examples of the NIT, SDT, and EIT generated by the system information table generating unit 105.

Figs. 67 and 68 show examples of the PAT and PMT generated by the system information table generating unit 105.

Figs. 69A to 69D show the details of the Entry_descriptor, the NE_Component_Descriptor, the VE_Component_Descriptor, and the stream_identifier_descriptor generated by the system information table generating unit 105.

Figs. 69A to 69D show the details of the Entry_descriptor, the NE_component_descriptor, the VE_Information_descriptor, and the stream_identifier descriptor generated by the system information table generating unit 105.

The "Entry_descriptor" in Fig. 69A is used to record the values of the "entry_VE_id", "entry_AE_id", and the "entry_NE_id". These show that the entry content is a page-based content. This differs from the "Entry_Descriptor" shown in Fig. 73 of the first embodiment which indicates an entry content which is a stream-based content. This to say, the "Entry_Descriptor" shown in Fig. 73 is used to record values of the "entry_VE_comp_tag", "entry_AE_comp_tag", and the "entry NE id" which show that the entry content is a stream-based content.

2-2-5 Transmission Unit 106

The transmission unit 106 includes a scheduler, and is activated by the multiplexing control unit 110 at a predetermined time before the transmission start time of an event, such as five minutes before transmission. When the transmission start time is reached, the transmission unit 106 repeatedly multiplexes information such as the NIT, PAT, PMT, SDT, and EIT generated by the system information table generating unit 105 into the transport stream outputted by the multiplexing unit 114 at a predetermined interval using predetermined PIDs in accordance with DVB-SI standard and MPEG2 system standard. The transmission unit 106 then performs modulation and other processes, before transmitting the data to a plurality of data reception apparatuses 121.

Fig. 70 gives a model representation of a multiplexed transport stream 1801. In this example, the NIT 1802, the PAT 1803, the PMT 1804, the SDT 1805, and the EIT 1806 have been additionally multiplexed into the transport stream 1706 multiplexed by the multiplexing unit 114.

2-2-6 Operation of the Data Transmission Apparatus 101

The following is a description of the operation of the data transmission apparatus 101 in the present embodiment, with reference to Figs. 71 through 73.

The multiplexing control unit 110 first generates the identifier assigning table which assigns a VE_id and an NE_id for each content number (S1902). Next, the multiplexing control unit 110 generates the display image information identifier assigning table 801 (S1904), before instructing the identifier information appending unit 112 to append the identifier information, instructing the navigation information table generating unit 113 to generate the navigation information table, and instructing the stream correspondence information table generating unit 111 to generate the stream correspondence table.

The identifier information appending unit 112 appends image data identifiers to the private area of the bit stream of image data stored in the presentation information storage unit 107 and stores the appended data. After appending identifiers to every set of image data, the identifier information appending unit 112 notifies the multiplexing control unit 110 of the completion of its processing (S1906).

The navigation information table generating unit 113 generates navigation information tables from the navigation information stored in the navigation information storage unit 108. After completing the generation of all navigation information tables, the navigation information table generating unit 113 notifies the multiplexing control unit 110 of the completion of its processing (S1908).

The stream correspondence information table generating unit 111 refers to the display image information identifier assigning table 801 generated by the multiplexing control unit 110 and generates the stream correspondence tables. On completing the generation of all of the stream correspondence tables, the stream correspondence information table generating unit 111 notifies the multiplexing control unit 110 of the completion of its processing (S1910).

The system information table generating unit 105 then generates the various system information tables, such as the NIT, the SDT, the EIT, the PAT, and the PMT (S1912).

The multiplexing control unit 110 determines the number of contents T in one repetition when the contents are multiplexed into a transport stream (S1914). Here, the multiplexing control unit 110 calculates the length L of one cycle composed of T contents in units of one ninety-thousandth of one second (this being the length of the transport stream when all contents plus a null packet of a size equivalent to (M-T contents) is multiplexed at the bit rate B stored in the multiplexing information storage unit 104)(S1916). The multiplexing control unit 110 then informs the multiplexing unit 114 of the PCR_PID and instructs the multiplexing unit 114 to multiplex the PCR (S1918). Following this, the multiplexing control unit 110 sets both the content counter i and the multiplexing start position pointer wp at "0" (S2002) .

The multiplexing control unit 110 then sets the VET counter j at "0" (S2004). The multiplexing control unit 110 also finds the number of cycles C and content number N. Here, the number of cycles is given as the quotient (integer part) of the sum {i+(P*S)-1-j}, while the content N is given as the remainder (integer) (S2006).

The multiplexing control unit 110 then judges whether the stream correspondence table VET(N) is stored in the storage area of the stream correspondence information table generating unit 111 (S2008), and if so, adds a value given as C*L to the values of first_pts and last_pts of VET(N) (S2010).

The multiplexing control unit 110 instructs the multiplexing unit 114 to multiplex the stream correspondence table VET(N) into the transport stream, and informs the multiplexing unit 114 of the multiplexing start position wp, the bit rate B, the PID, and the table_id_extension (S2018), before proceeding to step S2014.

When the multiplexing control unit 110 judges in step S2008 that the stream correspondence table VET(N) is not stored in the stream correspondence information table generating unit 111, the multiplexing control unit 110 instructs the multiplexing unit 114 to multiplex a null packet which is the same size as S_VET, at the same time informing the multiplexing unit 114 of the multiplexing start position wp and the bit rate B. The multiplexing unit 114 then multiplexes a null packet into the transport stream (S2108) and the processing proceeds to step S2014.

In step S2014, the multiplexing control unit 110 calculates the multiplexing start position wp as wp=wp + {S_VET/B} and adds "1" to the value of the VET counter "1" (S2015). The multiplexing control unit 110 then compares the value of the VET counter j with the value of the number of repeated multiplexing R of the stream correspondence table VET (N) (S2016). Here, when j=R, the processing proceeds to S2120, while when j<R the processing returns to step S2006.

In step S2102, the multiplexing control unit 110 sets the number of cycles C at the quotient (integer part) of i/T, and sets the content number N at the remainder (integer). Following this, the multiplexing control unit 110 refers to the content identifier assigning table in the construction information storage unit 109 and judges whether a content with this content number N is present (S2104). If so, the multiplexing control unit 110 instructs the multiplexing unit 114 to multiplex the bit stream of the image data VE(N). At this point, the multiplexing control unit 110 calculates the bit rate Bv(N) and informs the multiplexing unit 114 of this bit rate Bv(N), together with the multiplexing start position wp and the values of the "PID" and the "stream_id" which are written in the display image information identifier assigning table 801. The multiplexing unit 114 then multiplexes this image data VE(N) into the transport stream (S2106).

The multiplexing control unit 110 then instructs the multiplexing unit 114 to multiplex the navigation information

table NVT(N). In doing so, the multiplexing control unit 110 calculates the bit rate Bn(N) and informs the multiplexing unit 114 of this bit rate Bn(N), the multiplexing start position wp, the PID, and the table_id_extension. The multiplexing unit 114 then multiplexes the navigation information table NVT(N) into the transport stream (S2108).

The multiplexing control unit 110 then recalculates the multiplexing start position according to the formula wp = wp + {S_VE(N)+S_NVT(N)}/B (S2110). The multiplexing control unit 110 then adds "1" to the content counter i (S2112), and the processing returns to S2004.

When the multiplexing control unit 110 judges in step S2104 that there is no content with the content number N, the multiplexing control unit 110 instructs the multiplexing unit 114 to multiplex a null packet of a size given as S_VE (N) + S_NVT(N), while informing the multiplexing unit 114 of the multiplexing start position wp and the bit rate B. The multiplexing unit 114 then multiplexes a null packet of the indicated size into the transport stream (S2114).

The multiplexing control unit 110 recalculates the multiplexing start position wp according to the formula wp = wp + {S_VE(0)+S_NVT(N)}/B (S2116) and the processing returns to S2112.

When executing the above processing, the NIT, the RAT, and other tables will be multiplexed into the multiplexed stream shown in Fig. 64 for an example where the number of repeated multiplexing R for each stream correspondence table VET(N) is "1", or into the multiplexed stream shown in Fig. 65 for an example where the number of repeated multiplexing R is "16", so that a transport stream such as that shown in Fig. 70 will be transmitted.

2-2-7 Summary

As described above, the data transmission apparatus 101 of the present embodiment assigns identifiers to the image data and navigation information which compose each content and multiplexes them into a transport stream which it transmits repeatedly.

Here, identifiers for image data and navigation information of contents connected by hyperlinks, supplementary image information for displaying menus and the like, and script for performing switches of display are included in the navigation information. As a result, the data reception apparatus 121 can selectively extract and reproduced contents, thereby realizing an interactive display which uses only a one-directional communication path.

2-2-8 Additional Information

2-2-8-1

It should be noted here that while the above embodiment has described the case where the image data is composed of still images, it is also possible for the image data to be moving pictures (video). When the image data is video, Formula 1 used for calculating the "first_pts" and "last_pts", Formula 2 used for calculating the length L of the stream, Formula 3 used for calculating the bit rate Bv(N) assigned to the image data Bv(N), Formula 4 used for calculating the bit rate Bn(N) assigned to the navigation information table NVT(N), and the formula used by the multiplexing control unit 110 to recalculate the multiplexing start position wp after the multiplexing of the image data VE(N) and the navigation information table NVT(N) are changed to the formulas given below.

When the image data is video, the bit rate Bv(N) assigned to the image data VE(N) is decided by estimating the increase when converting the bit rate which is predetermined for a video elementary stream to a transport stream. Here, the navigation information table NVT(N) is assigned a remaining bit rate given by subtracting the bit rate Bv(N) assigned to the video data VE(N) from the overall bit rate.

When doing so, the "first_pts" of the image data VE(N) is calculated according to Formula 5 below.

Formula 5

$$\text{first\_pts}(N) = \left[\sum_{x=0}^{N-1} \{ MAX(S\_VE(x)/Bv(x), S\_NE(x)/(B-Bv(x)) + (S\_VET*R/B) \} + S\_VE\_FIRST(N)/Bv(x) + (S\_VET*R/B) \} \right] * 90000$$

Here, Bv(x) is the bit rate assigned to the image data VE(x), S_VE_FIRST(N) is the size of the first frame of the

image data VE(x) when converted into the transport stream in accordance with MPEG2 system standard, and MAX {A,B} represents the largest values of A and B, respectively.

For video, the "last_pts" does not match the "first_pts". Here, the "last_pts" can be found according to Formula 6 below.

Formula 6

$$last\_pts(N)=first\_pts(N)+\{(N\_FRAME(x)/Frame\_per\_sec)*90000\}$$

Here, N_FRAME(x) is the number of frames in video data VE(x), while Frame_per_sec is the number of frames reproduced in one second (which can be 29.97 for NTSC standard, for example).

When doing so for a video image, the multiplexing control unit 110 informs the multiplexing unit 114 of VE(x) and NE(x), before recalculating the multiplexing start position wp according to Formula 7 below.

Formula 7

$$wp = wp + MAX(S\_VE(x)/Bv(x), S\_NE(x)/(B-Bv(x)))$$

2-2-8-2

It should be noted here that the data transmission apparatus 101 is constructed so that the multiplexing unit 114 successively generates the transport stream 1701 during the transmission of an event, although the multiplexing unit 114 may generate a transport stream of one cycle length L and store it beforehand, so that when the transmission unit 106 transmits to the data reception apparatus 121, this transport stream is repeatedly read and repeatedly transmitted having been subjected to predetermined processing.

2-2-8-3

In the present embodiment, the corresponding sets of image data and navigation information are multiplexed at the same time, although this need not be the case. As described above, the navigation information table and the corresponding image data are separated from each other, so that they may be multiplexed at different times.

2-3 Data Reception Apparatus 121

As described above with reference to Fig. 49, the data reception apparatus 121 interactively selects contents from the MPEG2 transport stream transmitted by the data transmission apparatus 101 in accordance with user operations and reproduces them.

2-3-1 Reception Unit 122

The reception unit 122 receives the MPEG2 transport stream which corresponds to the transport stream identifier indicated by the reception control unit 126, and outputs it to the TS decoder unit 123.

2-3-2 TS Decoder Unit 123

The TS decoder 123 includes a filter condition storage unit 131 for storing the filter conditions set by the reception control unit 126, and operates in accordance with these filter conditions so as to only separate image data or audio data with a specified identifier from the transport stream outputted by the reception unit 122. The TS decoder unit 123 outputs the separated data to the AV decoder unit 124. The TS decoder unit 123 also separates table data with a specified identifier and outputs the table data to an area maintained in the received data storage unit 125, in accordance with the identifier. The TS decoder unit 123 separates a PCR (standard clock information) with the specified identifier and outputs it to the AV decoder unit 124. Here, the filter condition storage unit 131 is capable of simultaneously storing a plurality of filter conditions, and the TS decoder unit 123 is capable of simultaneously performing a plurality of separating operations.

Figs. 74A and 74B show examples of the filter condition tables stored in the filter condition storage unit 131. Each line in filter condition table 2201 is one filter condition. The "filter identification column" 2202 is used for recording

numbers which identify each filter condition. The "start/stop" column 2203 is set so that the entry "start" denotes the started state of a filter condition, while the entry "stop" denotes the stopped state of a filter condition. The TS decoder unit 123 executes separating processes based on the filter conditions in the started state, and does not preform separating based on filter conditions in the stopped state. The "PID" column 2204 is used to record the value of the PID of the data separated by each filter condition. The "stream_id" column 2205 is used to record the value of the stream_id of the data separated by each filter condition. The "table_id_extension" column 2206 is used to record the value of the table_id_extension of the data separated by each filter condition. When the entries in the "PID" column 2204, the "stream_id" column 2205, and the "table_id_extension" column 2206 are all set the value "-", unconditional separating, which is to say separating regardless of the value of the identifiers, will be performed. Finally, the "output destination" column 2207 is used to record the output destination to which the separated data is to be outputted.

The line corresponding to the filter identification number "0" in the filter condition table 2201 shows the filter condition for image data. The entry in the "output destination" column 2207 for this line indicates the AV decoder unit 124, with it not being possible to set an entry in the "table_id_extension" column 2206. The entries in the "PID" column 2204 and in the "stream_id" column 2205 are set at the values of the PID and stream_id of the image data which is to be separated by the reception control unit 126.

The line corresponding to the filter identification number "1" shows the filter condition for audio data. The entry in the "output destination" column 2207 for this line indicates the AV decoder unit 124, with it not being possible to set an entry in the "table_id_extension" column 2206. The entries in the "PID" column 2204 and in the "stream_id" column 2205 are set at the values of the PID and stream_id of the audio data which is to be separated by the reception control unit 126.

The line corresponding to the filter identification number "2" in the filter condition table 2201 shows the filter condition for the stream correspondence table VET. The entry in the "output destination" column 2207 for this line indicates the stream correspondence information table storage unit 132, with it not being possible to set an entry the "stream_id" column 2205. The entries in the "PID" column 2204 and in the "table_id_extension" column 2206 are set at the values of the PID and table_id_extension of the stream correspondence table which is to be separated by the reception control unit 126.

The line corresponding to the filter identification number "3" in the filter condition table 2201 shows the filter condition for the navigation information table. The entry in the "output destination" column 2207 for this line indicates the navigation information table storage unit 133, with it not being possible to set an entry the "stream_id" column 2205. The entries in the "PID" column 2204 and in the "table_id_extension" column 2206 are set at the values of the PID and table_id_extension of the navigation information table which is to be separated by the reception control unit 126.

The entry in the "start/stop" column 2203 for each filter condition is set at "start" or "stop" by the reception control unit 126 to set the separating process of the TS decoder unit 123 into a started state or stopped state for each filter condition.

In addition to the information described above, the filter condition storage unit 131 also stores filter conditions for the system information tables, such as the NIT, the SDT, the EIT, the PAT, and the PMT, and the PCR (standard clock information). These conditions have not been illustrated.

When the filter condition for image data corresponding to filter identification number "0" and the condition for audio data corresponding to filter identification number "1" are set in the stopped state in the filter condition table 2201 by the reception control unit 126, the TS decoder unit 123 does not separate image data or audio data.

Here, suppose that the filter condition for the stream correspondence table VET corresponding to filter identification number "2" has been set by the reception control unit 126 so that the value in the "PID" column 2204 is "0x0083", the value in the "table_id_extension" column 2206 is "0x0005", and the started state is set in the "start/stop" column 2203. In this case, the TS decoder unit 123 separates the stream correspondence table VET(5) from the transport stream 1801 (shown in Fig. 70) transmitted from the transmission unit 106, in accordance with this filter condition. The TS decoder unit 123 stores the separated stream correspondence table VET(5) in the stream correspondence information table storage unit 132 and notifies the reception control unit 126. Here, the content of VET(5) is as shown in Fig. 63A.

Next, suppose that the filter condition for the navigation information table NVT corresponding to filter identification number "3" has been set by the reception control unit 126 so that the value in the "PID" column 2204 is "0x0082", the value in the "table_id_extension" column 2206 is "0x0005", and the started state is set in the "start/stop" column 2203. In this case, the TS decoder unit 123 separates the navigation information table NVT(5) from the transport stream 1801 (shown in Fig. 70) transmitted from the transmission unit 106, in accordance with this filter condition. The TS decoder unit 123 stores the separated navigation information table NVT(5) in the navigation information table storage unit 133 and notifies the reception control unit 126. Here, the content of the navigation information table NVT(5) is as shown in Fig. 61.

Next, in filter condition table 2208, suppose that the filter condition for the image data corresponding to filter identification number "0" has been set by the reception control unit 126 so that the value in the "PID" column is "0x0084", the value in the "stream_id" column is "0xe5", and the started state is set in the "start/stop" column. In this case, the

TS decoder unit 123 separates the image data VE(5), the image data VE(21), the image data VE(37), and the image data VE(53) in order from the transport stream 1801 (shown in Fig. 70) transmitted from the transmission unit 106, in accordance with this filter condition. The TS decoder unit 123 outputs the separated sets of image data to the AV decoder unit 124. Here, out of these four sets of image data, the first set of image data to be separated will depend on the timing at which the reception control unit 126 sets the started condition for the filter condition. Also, by setting the stopped condition at the proper timing, the reception control unit 126 can have the TS decoder unit 123 separate only the first out of these four sets of image data and output it to the AV decoder unit 124.

2-3-3 AV Decoder Unit 124

The AV decoder unit 124 includes a clock unit which is not illustrated. This clock unit is synchronized to a standard time using the value of the PCR outputted by the TS decoder unit 123, and is used to measure time which is used as the standard for synchronized decoding of image data and audio data.

On receiving image data and/or audio data from the TS decoder unit 123, the AV decoder unit 124 reads the identifier of the image data and/or audio data written in the private area, in accordance with an indication from the reception control unit 126, and notifies the reception control unit 126 of the identifier(s). Next, the AV decoder unit 124 decodes the image data and/or audio data in predetermined units in accordance with an indication from the reception control unit 126 and outputs the decoded data to the reproduction unit 128 in synchronization with the clock unit, before informing the reception control unit 126 of the completion of the decoding.

2-3-4 Construction of the Received Data Storage Unit 125

The received data storage unit 125 can be composed of RAM (Random Access Memory), for example, and is provided with a stream correspondence information table storage unit 132, a navigation information table storage unit 133, and a system information table storage unit 134.

The stream correspondence information table storage unit 132 stores stream correspondence tables which have been separated by the TS decoder unit 123. The navigation information table storage unit 133 stores navigation information tables which have been separated by the TS decoder unit 123. The system information table storage unit 134 stores the system information tables, such as the NIT, the SDT, the EIT, the PAT, and the PMT, which have been separated by the TS decoder unit 123.

2-3-5 Signal Reception Unit 127

The signal reception unit 127 receives signals, such as remote controller operations made by a user, and informs the reception control unit 126 of the received signals.

2-3-6 Reproduction Unit 128

The reproduction unit 128 superimposes graphics information included in the navigation information table outputted from the reception control unit 126 and image data decoded by the AV decoder unit 124 in accordance with indications from the reception control unit 126. The reproduction unit 128 outputs this combined image to the display unit 129. The reproduction unit 128 also outputs audio data decoded by the AV decoder unit 124 to the audio output unit 130.

2-3-7 Display Unit 129

The display unit 129 can be realized by a CRT (Cathode Ray Tube) or liquid crystal display, and is used to display the images outputted by the reproduction unit 128. Examples of such display are the contents 151, 152, and 153 shown in Fig. 49.

2-3-8 Audio Output Unit 130

The audio output unit 130 can be realized by a speaker, and is used to output the audio signal outputted by the reproduction unit 128.

2-3-9 Construction of the Reception Control Unit 126

The reception control unit 126 controls the reception unit 122 and has it receive a desired transport stream. On receiving a user operation signal via the signal reception unit 127, the reception control unit 126 refers to the navigation

information table presently stored in the navigation information table storage unit 133 and sets the filter condition for the next navigation information table and the filter condition for the stream correspondence table for obtaining the image data in the filter condition storage unit 131 of the TS decoder unit 123. The reception control unit 126 then refers to the stream correspondence table which has been newly separated by the TS decoder unit 123 and stored in the stream correspondence information table storage unit 132, and sets the filter condition for the image data in the filter condition storage unit 131.

The reception control unit 126 judges whether the image data which has been separated by the reception control unit 126 is the appropriate image data by referring to the image data identifier written into the private area of the image data. When the image data is the appropriate image data, the reception control unit 126 has the image data decoded and outputted to the reproduction unit 128. When the image data is not the appropriate image data, the reception control unit 126 changes the filter condition in the filter condition storage unit 131 and gives another indication for the separation of a stream correspondence table.

The reception control unit 126 also reads bitmap data for objects included in the navigation information table separated by the TS decoder unit 123. The reception control unit 126 also informs the reproduction unit 128 of this data and has the reproduction unit 128 combine the bitmap data with the image data.

2-3-9-1 Initial Control

The reception control unit 126 is composed of a CPU and a program for controlling the CPU. When the user makes an initial selection of an event stored in the transmission data storage unit 102 and multiplexed into the transport stream transmitted by the transmission unit 106 of the data transmission apparatus 101, the reception control unit 126 first refers to the system information tables in accordance with a procedure which is standardized according to the DVB-SI and MPEG2 system standards which are generally used by satellite digital broadcast reception apparatuses. The reception control unit 126 then instructs the reception unit 122 to receive a transport stream transmitted by the transmission unit 106 and instructs the TS decoder unit 123 to separate the PMT corresponding to the event selected by the user.

The reception control unit 126 then refers to the PMT stored in the system information table storage unit 134 and obtains the identifier of the PCR, and sets this identifier in the filter condition storage unit 131. The reception control unit 126 also obtains the identifiers of the image data and the navigation information of the entry content and respectively sets these in the filter condition of the stream correspondence table and the filter condition of the navigation information table in the filter condition storage unit 131.

The reception control unit 126 then refers to the PMT stored in the system information table storage unit 134 and obtains the PIDs of the component which is used to transfer the stream correspondence table and the component which is used to transfer the navigation information table. The reception control unit 126 then respectively sets these PIDs in the filter condition of the stream correspondence table and the filter condition of the navigation information table in the filter condition storage unit 131, in addition to setting both of these filter conditions into the started state.

On receiving notification from the TS decoder unit 123 indicating that the stream correspondence table has been separated, the reception control unit 126 sets the filter condition for the stream correspondence table in the filter condition storage unit 131 into the stopped state. Following this, the reception control unit 126 refers to the stream correspondence table in the stream correspondence information table storage unit 132 and reads the value of the "stream_id" for the image data, before setting the filter condition for image data in the filter condition storage unit 131. After this, the reception control unit 126 refers to the stream correspondence table in the stream correspondence information table storage unit 132 and reads the value of the "component_tag", and refers to the PMT in the system information table storage unit 134 and obtains the value of the PID which corresponds to the "component_tag" it has read. The reception control unit 126 then sets this PID in the filter condition for the image data in the filter condition storage unit 131, and sets this filter condition into the started state.

2-3-9-2 Judgement of Validity of Image Data

The data transmission apparatus 101 is constructed to transmit a plurality of different sets of image data with the same values of the PID and stream_id, so that having transmitting a stream correspondence table corresponding to a given set of image data, a predetermined time later the data transmission apparatus 101 will send a different set of image data with the same PID and stream_id as the given set of image data. This being the case, if the reception control unit 126 can complete the setting of the filter condition for the image data within a predetermined time period after receiving the stream correspondence table, the TS decoder unit 123 will be able to separate the desired image data without error and output it to the AV decoder unit 124.

Following this, the reception control unit 126 obtains the value of the image data identifier written into the private area of the image data outputted from the TS decoder unit 123 via the AV decoder unit 124. The reception control unit

126 then investigates whether this value matches the identifier of the image data to be obtained. When the values do not match the reception control unit 126 sets the filter condition for the image data in the filter condition storage unit 131 into the stopped state, and sets the PID of the component which transfers the stream correspondence table and the identifier of the image data which it is presently trying to obtain into the filter condition of the stream correspondence table, as well as setting the filter condition for the stream correspondence table into the started condition. It should be noted here that the value of the identifier "table_id_extension" for the stream correspondence table is the same as the value of the identifier "VE_id" for the image data. By doing so, when, for whatever reason, the processing whereby the reception control unit 126 refers to the stream correspondence table and sets the filter condition of the image data is delayed, the mistaken display of other image data can still be avoided.

When the identifier written in the private area of the image data outputted by the TS decoder unit 123 matches the value of the identifier of the image data which the reception control unit 126 is attempting to obtain, the reception control unit 126 refers to the stream correspondence table in the stream correspondence information table storage unit 132 and reads the value of the "first_pts". After this, the reception control unit 126 refers to the clock unit of the AV decoder unit 124 and checks whether notification of the completion of frame decoding has been received from the AV decoder unit 124. When no such notification has been received, the reception control unit 126 sets the filter condition of the image data in the filter condition storage unit 131 into the stopped state, and resets the PID of the component for transferring the stream correspondence table and the identifier of the image data to be obtained, before setting the filter condition of the stream correspondence table into the started state.

By performing the above processes, unintentional reproduction of image data which skips the beginning and starts midway can be avoided, even when, for whatever reason, there is a delay in the reception control unit 126 referring to the stream correspondence table and setting the filter condition for the image data.

When notification of the completion of frame decoding has been received from the AV decoder unit 124, the reception control unit 126 refers to the stream correspondence table in the stream correspondence information table storage unit 132 and reads the value of the "last_pts". After this, the reception control unit 126 refers to the clock unit of the AV decoder unit 124 and, once the time of the read "last_pts" has been reached, sets the filter condition for the image data in the filter condition storage unit 131 into the stopped condition. By doing so, only the desired image data will be separated and outputted to the AV decoder unit 124. As a result, other sets of image data with the same PID and stream_id will not be separated.

2-3-9-3 Generation of Graphics Information

On receiving notification from the TS decoder unit 123 indicating the separation of a navigation information table, the reception control unit 126 sets the filter condition for the navigation information table in the filter condition storage unit 131 into the stopped state. Following this, the reception control unit 126 refers to the object definition table in the navigation information table of the navigation information table storage unit 133 and obtains the display coordinates "X" and "Y" of the button object. For a button whose index number is "0", the reception control unit 126 obtains an index number for a "Focused Bitmap", while for other buttons, the reception control unit 126 obtains an index number for a "Normal Bitmap", before referring to the bitmap table and obtaining bitmap data corresponding to the obtained index number. The reception control unit 126 then uses this bitmap data to generate graphics information for buttons and outputs this graphics information to the reproduction unit 128.

2-3-9-4 Interpretation of User Operations

The reception control unit 126 resets the variable "cur_focus" which represents the index number of the button object which is presently displayed in the selection state to "0".

On receiving a signal for a user operation from the signal reception unit 127, the reception control unit 126 judges whether the signal is for an "Up" user operation, a "Down" user operation, or an "Enter" user operation. When the signal is for an "Up" user operation or a "Down" user operation, the reception control unit 126 adds or subtracts "1" to/from the value of the variable cur_focus. Following this, the reception control unit 126 refers to the navigation information table in the navigation information table storage unit 133 and first refers to the object definition table to obtain the "X" and "Y" display coordinates of the button object. The reception control unit 126 next obtains the index number of the "Focused Bitmap" for the button whose index number corresponds to the value of variable cur_focus and the index numbers of the "Normal Bitmap" for all other buttons, before referring to the bitmap table and obtaining the sets of bitmap data which correspond to these index numbers. The reception control unit 126 generates graphics information for buttons using the obtained bitmap data and outputs the graphics information to the reproduction unit 128.

When the signal is for an "Enter" user operation, the reception control unit 126 refers to the object definition table in the navigation information table NVT in the navigation information table storage unit 133 and obtains the index number of handler of the button object whose index number matches the value of cur_focus. The reception control

unit 126 then refers to the handler definition table and reads the instruction word from the handler that corresponds to the index number. When the instruction word is "goto_content", the reception control unit 126 reads the index number which is the argument of this instruction word and refers to the hyperlink table, before reading the identifier of the content which is the link destination corresponding to the read index number as the identifier of the next content to be reproduced.

When the instruction word is "goto_entry" the reception control unit 126 refers to the system information table storage unit 134 to find the PMT of the event to which the navigation information table of the currently reproduced content belongs, and reads the identifier of the entry content as the identifier of the next content to be reproduced.

2-3-9-5 Setting of the Filter Conditions

When the identifier of the next content to be reproduced is equal to the identifier of the content presently being reproduced, the reception control unit 126 performs no action. When the original_network_id and transport_stream_id of the next content to be reproduced are different to the transport stream presently being received, the reception control unit 126 refers to the system information table and instructs the reception unit 122 to receive the desired transport stream, in accordance with a predetermined procedure for MPEG2 system standard and DVB-SI standard. On receiving instruction which indicate the reception of a transport stream which belongs to a different network, the reception unit 122 performs the necessary processes, such as the changing of the orientation of an antenna, and receives the indicated transport stream.

When the event to which the image data for the next content to be displayed belongs is different to the event to which the image display of the presently display content belongs, the reception control unit 126 refers to the system information table as described above and sets the identifier of the PMT of the event to which the image data of the next content belongs into the filter condition storage unit 131 of the TS decoder unit 123.

The TS decoder unit 123 separates the PMT in accordance with the filter condition and stores the PMT in the system information table storage unit 134, before notifying the reception control unit 126.

On receiving notification of the separation of the PMT of the event to which the image data belongs from the TS decoder unit 123, the reception control unit 126 refers to the PMT and sets the value of the "PCR_PID" into the filter condition storage unit 131.

The reception control unit 126 refers to the system information tables as described above and sets the identifier of the PMT of the event to which the navigation information of the next content to be reproduced belongs into the filter condition storage unit 131 in the TS decoder unit 123. This procedure is executed even when the event to which the navigation information of the next content to be reproduced belongs differs from the event to which the navigation information of the presently reproduced content belongs.

When the value of the identifier "VE_id" of the image data of the next content to be displayed is different to the value of the identifier "VE_id" of the image data of the content which is presently being reproduced, the reception control unit 126 refers to the system information table storage unit 134 to find the PMT of the event to which the image data of the next content to be displayed belongs and obtains the PID of the component to which the VE_Information_Component_Descriptor is attached. The reception control unit 126 then sets this PID and the value "VE_id" into the filter condition for the stream correspondence table in the filter condition storage unit 131, in addition to setting this filter condition into the started condition.

When the value of the identifier "NE_id" of the image data of the next content to be displayed is different to the value of the identifier "VE_id" of the image data of the content which is presently being reproduced, the reception control unit 126 refers to the system information table storage unit 134 to find the PMT of the event to which the navigation information of the next content to be displayed belongs and obtains the PID of the component to which the NE_Component_Descriptor is attached. The reception control unit 126 then sets this PID and the value "NE_id" into the filter condition for the navigation information table in the filter condition storage unit 131, in addition to setting this filter condition into the started condition.

2-3-10 Specific Example of Content Display by the Data Reception Apparatus 121

When, as one example, the user initially selects the event multiplexed into the transport stream 1801 (shown in Fig. 70) which is identified by the original_network_id "0x0001", the transport_stream_id "0x0001", the service_id "0x0001", and the event_id "0x0001", the reception control unit 126 refers to NIT 1301 in Fig. 66A and obtains the information for the transfer preface, such as the frequency of the transport stream 1801 identified by the original_network_id "0x0001" and the transport_stream_id "0x0001", in accordance with a procedure which is standardized in accordance with MPEG2 system standard and DVB-SI standard.

Next, the reception control unit 126 instructs the reception unit 122 to receive the transport stream 1801 and refers in the same way to the PAT 1401 in Fig. 67 to obtain the value "0x0080" of the PID of the PMT for the program whose

"program_no" is equal to the service_id (here, "1"). The reception control unit 126 then sets this value in the filter condition for the PMT in the filter condition storage unit 131.

The TS decoder unit 123 separates the PMT 1501 shown in Fig. 68 and stores it in the system information table storage unit 134, before notifying the reception control unit 126. The reception control unit 126 reads the value "0x0081" of the "PCR_PID" from the PMT 1501 stored in the system information table storage unit 134 and sets this value in the filter condition of the PCR in the filter condition storage unit 131. Following this, the reception control unit 126 refers to the Entry_Descriptor (shown in Fig. 69A) of the PMT 1501 and obtains the value "0x0005" of the "entry_VE_id", before setting this in the "table_id_extension" entry of the filter condition for the stream correspondence table in the filter condition storage unit 131. After this, the reception control unit 126 obtains the value "0x0083" of the PID of the component attached to the VE_Information_Component_Descriptor from the PMT 1501 and sets this in the "PID" entry in the filter condition for the stream correspondence table, in addition to setting the filter condition for the stream correspondence table into the started state.

Following this, the reception control unit 126 refers to the Entry_Descriptor (shown in Fig. 69A) of the PMT 1501 and obtains the value "0x0005" of the "entry_NE_id", before setting this in the "table_id_extension" entry of the filter condition for the navigation information table in the filter condition storage unit 131. After this, the reception control unit 126 obtains the value "0x0082" of the PID of the component attached to the NE_Component_Descriptor from the PMT 1501 and sets this in the "PID" entry for the navigation information table, in addition to setting the filter condition for the navigation information table into the started state.

The TS decoder unit 123 separates the stream correspondence table 1201 shown in Fig. 63A, stores it in the stream correspondence information table storage unit 132, and notifies the reception control unit 126, in addition to separating the navigation information table 1001, storing it in the navigation information table storage unit 133, and informing the reception control unit 126.

On receiving notification of the separation the stream correspondence table, the reception control unit 126 refers to the stream correspondence table 1201 in the stream correspondence information table storage unit 132 and obtains the value "0xe5" of the "stream_id" which it then sets as the "stream_id" entry of the filter condition for image data. Following this, the reception control unit 126 obtains the value "0x00" of the "component_tag" from the stream correspondence table 1201, before obtaining the value "0x0084" of the "PID" of the component whose "component_tag" has been appended with the stream_identifier_descriptor of the value "0x00", meaning that its data type is image data. The reception control unit 126 then sets this value "0x0084" in the "PID" entry of the filter condition for image data in the filter condition storage unit 131, in addition to setting this filter condition into the started state.

It should be noted here that when the value of the "PID" is written directly into the stream correspondence table in place of the "component_tag", the reception control unit 126 does not need to refer to the PMT and so can instead obtain the "stream_id" and "PID" directly from the stream correspondence table, before setting the filter condition for the image data in the filter condition storage unit 131.

The TS decoder unit 123 separates the bitstream 901 for the image data shown in Fig. 60 and outputs it to the AV decoder unit 124. This bitstream 901 for the image data has the value "0x0005" of the "VE_id" written into the private area for the still image data 201 shown the Fig. 53A.

The reception control unit 126 receives, via the AV decoder unit 124, notification of the value "0x0005" of the identifier written into the private area of the separated image data, and confirms that this value matches the value "0x0005" set beforehand in the table_id_extension of the stream correspondence table. After this, the reception control unit 126 refers to the clock unit of the AV decoder unit 124 and having confirmed that notification of the successful decoding to image data has been received from the AV decoder unit 124 has been received by the time indicated by the value "112500" of the "first_pts" in the stream correspondence table 1201, waits until the time indicated by the value "112500" of the "last_pts" in the stream correspondence table 1201, before setting the filter condition for image data in the filter condition storage unit 131 into the stopped state.

On receiving notification of the separation of the navigation information table, the reception control unit 126 sets the variable cur_focus at "0", before referring to the navigation information table 1001 in the navigation information table storage unit 133 and obtaining the display coordinates of a button corresponding to the index number "0", the bitmap data corresponding to the index number of the item "Focused bitmap", the display coordinates of a button corresponding to the index number "1", and the bitmap data corresponding to the index number of the item "Normal bitmap". The reception control unit 126 then uses these to generate graphics information for buttons which it outputs to the reproduction unit 128. The reproduction unit 128 superimposes this graphics information outputted by the reception control unit 126 onto the image data outputted by the AV decoder unit 124, and has the display image 2301 shown in Fig. 75A displayed on the display unit 129.

When a "Down" signal is inputted due to a user operation made via a remote controller or the like during the display of display image 2301, the reception control unit 126 receives notification of the "Down" input signal via the signal reception unit 127 and increases the value of "cur_focus" by one to "1". The reception control unit 126 then refers to the navigation information table 1001 in the navigation information table storage unit 133 and obtains the display co-

ordinates corresponding to the index number "0" and the bitmap data corresponding to the index number for the "Normal Bitmap", as well as the display coordinates corresponding to the index number "1" and the bitmap data corresponding to the index number for the "Focused Bitmap", before using this information to generate graphics information for the buttons which it outputs to the reproduction unit 128. The reproduction unit 128 superimposes this graphics information outputted by the reception control unit 126 onto the image data outputted by the AV decoder unit 124, and has the display image 2302 shown in Fig. 75B displayed on the display unit 129.

When an "Enter" signal is inputted due to a user operation made via a remote controller or the like during the display of display image 2301, the reception control unit 126 receives notification of the "Enter" input signal via the signal reception unit 127. The reception control unit 126 then obtains the index number "0" of the handler of the button whose index number ("0") coincides with the value of the variable cur_focus from the object definition table 1002 in the navigation information table 1001 in the navigation information table storage unit 133. The reception control unit 126 refers to the handler definition table 1003 and obtains the script, instruction word "goto_content", and the argument index number "0" which correspond to index number "0".

The reception control unit 126 next refers to the hyperlink table 1004 and fetches the value "0x0001" of the "VE_id" of the content which is the link destination corresponding to the index number "0". The reception control unit 126 sets this extracted value in the "table_id_extension" of the filter condition for the stream correspondence table in the filter condition storage unit 131. The reception control unit 126 then fetches the value "0x0083" of the PID of the component attached to the VE_Information_Component_Descriptor and sets this in the "PID" entry of the filter condition for the stream correspondence table, before setting this filter condition into the started state.

The reception control unit 126 next fetches the value "0x0001" of the "NE_id" of the content which is the link destination corresponding to the index number "0", and sets this fetched value in the "table_id_extension" entry of the filter condition in the navigation information table in the filter condition storage unit 131. After this, the reception control unit 126 fetches the value "0x0082" of the PID of the component attached to the NE_Component_Descriptor from the PMT 1501, and sets this value in the "PID" entry in the filter condition for the navigation information table in the filter condition storage unit 131, before setting the filter condition for the navigation information table into the started state.

The TS decoder unit 123 separates the stream correspondence table 1202 shown in Fig. 63B, stores it in the stream correspondence information table storage unit 132, and notifies the reception control unit 126, in addition to separating the navigation information table 1101 shown in Fig. 62, storing it in the navigation information table storage unit 133, and notifying the reception control unit 126.

On receiving notification of the separation of the stream correspondence table from the TS decoder unit 123, the reception control unit 126 refers to the stream correspondence table 1202 and instructs the TS decoder unit 123 to separate the image data. On receiving notification of the separation of the navigation information table from the TS decoder unit 123, the reception control unit 126 refers to the navigation information table 1101, generates the graphics information for the button, and outputs it to the reproduction unit 128.

The reproduction unit 128 superimposes the graphics information outputted by the reception control unit 126 onto the image data outputted by the AV decoder unit 124 and outputs the display image 2303 shown in Fig. 75C to the display unit 129.

When an "Enter" signal is inputted due to a user operation made via a remote controller or the like during the display of display image 2301, the reception control unit 126 receives notification of the "Enter" input signal via the signal reception unit 127. The reception control unit 126 then refers to the navigation information table 1101 in the navigation information table storage unit 133 and obtains the script, instruction word "goto_entry". After this, the reception control unit 126 obtains the value "0x0005" of the "entry_VE_id" from the PMT 1501 stored in the system information table storage unit 134 and sets this value in the "table_id_extension" entry of the filter condition for the stream correspondence table in the filter condition storage unit 131.

The reception control unit 126 next receives the value "0x0083" of the component attached to the VE_Information_Component_Descriptor from the PMT 1501 and sets this value in the "PID" entry of the filter condition for the stream correspondence table, before setting the filter condition for the stream correspondence table into the started state.

Next, the reception control unit 126 refers to PMT 1501 and fetches the value "0x005" of the "entry_NE_id" which it sets in the "table_id_extension" of the filter condition of the navigation information table in the filter condition storage unit 131. Following this, the reception control unit 126 obtains the value "0x0082" of the PID of the component to which the NE_Component_Descriptor has been attached from the PMT 1501, before setting this value in the "PID" entry of the filter condition for the navigation information table and setting the filter condition for the navigation information table into the started state.

The TS decoder unit 123 separates the stream correspondence table 1201 shown in Fig. 63A, stores it in the stream correspondence information table storage unit 132, and notifies the reception control unit 126, in addition to separating the navigation information table 1001 shown in Fig. 61, storing it in the navigation information table storage unit 133, and notifying the reception control unit 126.

On receiving notification of the separation of the stream correspondence table from the TS decoder unit 123, the reception control unit 126 refers to the stream correspondence table 1201 and instructs the TS decoder unit 123 to separate the image data. On receiving notification of the separation of the navigation information table from the TS decoder unit 123, the reception control unit 126 refers to the navigation information table 1001, generates the graphics information for the button, and outputs it to the reproduction unit 128.

The reproduction unit 128 superimposes the graphics information outputted by the reception control unit 126 onto the image data outputted by the AV decoder unit 124 and outputs the display image 2303 shown in Fig. 75A to the display unit 129.

2-3-11 Operation of the Data Reception Apparatus 121

The following is an explanation of the operation of the data reception apparatus 121, with reference to the flowcharts in Figs. 76 to 79.

2-3-11-1 Entire Operation

The following is a description of the entire operation procedure for the data reception apparatus 121 with reference to Fig. 76.

When the user switches the data reception apparatus 121 on, the reception control unit 126 operates in accordance with a predetermined procedure for MPEG2 system standard and DVB-SI standard to control the reception unit 122 and the TS decoder unit 123 so that the system information tables are received, with the reproduction unit 128 having a program table displayed on the display unit 129 to enable the user to select a program using an operation unit such as a remote controller. On receiving a selection signal from the operation unit via the signal reception unit 127, the reception control unit 126 selects an event out of the transmission data stored in the transmission data storage unit 102 sent in the transport stream transmitted by the transmission unit 106 of the data transmission apparatus 101. In doing so, the reception control unit 126 obtains the identifier of the event, the original_network_id, the transport_stream_id, the service_id, and the event_id (S2402).

When an event which has been multiplexed into the transmission data stored in the transmission data storage unit 102 is selected, the reception control unit 126 operates in accordance with a predetermined procedure for MPEG2 system standard and DVB-SI standard to refer to the system information tables. The reception control unit 126 then instructs the reception unit 122 to receive the transport stream transmitted by the transmission unit 106 and instructs the TS decoder unit 123 to separate the PMT corresponding to the selected event. The reception unit 122 receives the transport stream transmitted by the transmission unit 106 and outputs it to the TS decoder unit 123. The TS decoder unit 123 separates the PMT corresponding to the selected event and writes it into the system information table storage unit 134 in the received data storage unit 125, before notifying the reception control unit 126. On receiving notification of the reception of the PMT from the TS decoder unit 123, the reception control unit 126 refers to the PMT in the system information table storage unit 134 and obtains the PID of the PCR, before storing it in the filter condition storage unit 131 (S2404).

The reception control unit 126 sets the original_network_id of the selected event in the variable cur_original_network_id and set the transport_stream_id of the selected event into the variable cur_transport_stream_id. The reception control unit 126 also sets the service id of the selected service into the variable cur_VE_service_id and the variable cur_NE_service_id, sets the event_id of the selected event into the variable cur_VE_event_id and the variable cur_NE_event_id, and clears the variable cur_VE_id and the variable cur_NE_id. These variables indicate the information for the identifiers of the content which is currently being reproduced (S2406).

The reception control unit 126 next sets the original_network_id of the selected event in the variable new_original_network_id, sets the transport_stream_id of the selected event into the variable new_transport_stream_id, sets the service_id into the variable new_VE_service_id and the variable new_NE_service_id, and sets the event_id of the selected event into the variable new_VE_event_id and the variable new_NE_event_id. The reception control unit 126 also refers to the PMT in the system information table storage unit 134 and sets the respective values of the entry_VE_id and the entry_NE_id into the variable new_VE_id and the variable new_NE_id (S2408).

Following this, the reception control unit 126 performs the content switching processing. The details of the contents switching processing are given later in this specification (S2410).

The reception control unit 126 next clears the value of the content change flag, which shows the content switching is necessary, to zero (S2412).

After this, the reception control unit 126 waits for notification from the signal reception unit 127 of an input of a signal for a selection operation made the user (S2414). When a signal is inputted from the signal reception unit 127, the reception control unit 126 processes the user input signal. The details of this processing are given later in this

specification (S2416). The reception control unit 126 then judges whether the content change flag is set at "1" (S2418), and if so the processing returns to step S2410, or otherwise returns to step S2414.

2-3-11-2 Content Switching Processing

The following is an explanation of the details of the contents switching processing in S2410, with reference to the flowchart in Fig. 77.

First, the reception control unit 126 judges whether the value of the variable new_original_network_id stored by the reception control unit 126 is the same as cur_original_network_id and whether the value of the variable new_transport_stream_id is the same as the cur_transport_stream_id (S2502). When both are affirmative, the reception control unit 126 performs the switching process for image data (S2504) and the switching process for navigation information (S2506) in parallel before terminating the procedure. When the variables are not equal, the reception control unit 126 refers to the system information tables and performs a switching process for the transport stream identified by the variable new_original_network_stream_id and the variable new_transport_stream_id (S2508), sets the value of the variable cur_original_network_id at the variable new_original_network_id, sets the value of the variable cur_transport_stream_id at the variable new_transport_stream_id, clears the values of the variables, cur_VE_event_id, cur_VE_id, cur_NE_event_id, cur_NE_id (S2510), and performs the switching process for image data (S2504) and the switching process for navigation information (S2506) in parallel before terminating the procedure.

2-3-11-3 Image Data Switching Processing

The following is an explanation of the details of the image data switching processing in S2504, with reference to the flowchart in Fig. 78.

First, the reception control unit 126 judges whether the value of the variable new_VE_service_id stored by the reception control unit 126 is the same as cur_VE_service_id and whether the value of the variable new_VE_event_id is the same as the cur_VE_event_id (S2602). When both are affirmative, the reception control unit 126 judges whether the variable new_VE_id is equal to the cur_VE_id (S2604). If so, the reception control unit 126 terminates the processing, or if not, the reception control unit 126 advances to S2610. When the judgement in S2602 is negative, the reception control unit 126 refers to the system information tables corresponding to the variables new_VE_service id and new_VE_event_id and instructs the TS decoder unit 123 to separate the PMT corresponding to the event identified by the variables new_VE_service_id and new_VE_event_id. The TS decoder unit 123 separates the indicated PMT and writes it into the system information table storage unit 134 of the received data storage unit 125, before notifying the reception control unit 126. On receiving notification of the separation of the PMT from the TS decoder unit 123, the reception control unit 126 refers to the received PMT and obtains the PID of the PCR which it then sets in the filter condition storage unit 131 (S2606). The reception control unit 126 then sets the value of the variable new_VE_service_id in the variable cur_VE_service_id and the value of the variable new_VE_event_id into the cur_VE_event_id (S2608).

The reception control unit 126 next refers to the PMT corresponding to the event identified by the variables cur_VE_service_id and cur_VE_event_id in the system information table storage unit 134 and obtains the PID of the component attached to the VE_Information_Component_Descriptor and sets the value of the variable new_VE_id as the table_id_extension in the filter condition for the stream correspondence table. The reception control unit 126 also sets this filter condition into the started condition. The TS decoder unit 123 then separates the stream correspondence table VET corresponding to the value of the variable new_VE_id from the transport stream in accordance with the filter condition, stores it in the stream correspondence information table storage unit 132, and notifies the reception control unit 126 (S2610).

The reception control unit 126 interprets the stream correspondence table VET in the stream correspondence information table storage unit 132 which was obtained in step S2610 and sets the value of "first_pts" in the variable firstPTS and the value of "last_pts" in the variable "lastPTS", before obtaining the values of the "stream_id" and the "component_tag" (S2612). Following this, the reception control unit 126 resets the value of the flag "first flag", which shows whether the decoding of the first frame of image data is complete, to zero (S2614).

After this, the reception control unit 126 refers to the PMT corresponding to the event identified by the variables cur_VE_service_id, cur_VE_event_id in the system information table storage unit 134, and obtains the PID of the component which transfers data of the data type "image data" and which has been given a stream_identifier_descriptor of the same value as the "component_tag" obtained in S2612. The reception control unit 126 sets this PID and the "stream_id" obtained in S2612 in the filter condition for image data in the filter condition storage unit 131, and sets this filter condition for image data into the started state. The TS decoder unit 123 then separates the image data in accordance with this filter condition and outputs it to the AV decoder unit 124 (S2616).

The reception control unit 126 sends a message to the AV decoder unit 124 and so obtains the value of the image

data identifier written into the private area of the image data separated by the TS decoder unit 123, which it then compares with the value of the variable new_VE_id (S2618). When these values match, the processing advances to S2620, while when they do not match, the processing switches to S2619.

The reception control unit 126 sets the filter condition for image data in the filter condition storage unit 131 into the stopped state (S2619), and the processing returns to S2610.

On completing the decoding of the image data outputted by the TS decoder unit 123, the AV decoder unit 124 notifies the reception control unit 126 of the completion of decoding. The reception control unit 126 judges whether it has received a decoding completion signal (S2620). When it has, the processing advances to S2622, or if not, the processing advances to S2624.

The reception control unit 126 sets the value of the flag first_flag at "1" (S2622).

The reception control unit 126 refers to the value of the clock unit of the AV decoder unit 124 and obtains the present time expressed in units of one ninety-thousandth of one second. The reception control unit 126 then compares the obtained value with the value of the variable firstPTS (S2624). When the value of the present time is greater than or equal to the value of the variable firstPTS, the processing advances to S2626, while when it is less than firstPTS, the processing advances to S2628. The reception control unit 126 judges whether the value of the flag first_flag is "1" (S2626). When the value of first_flag is "0", the processing proceeds to S2619, while when the value is "1", the processing advances to S2628.

In step S2628, the reception control unit 126 refers to the value of the clock unit of the AV decoder unit 124 and obtains the present time expressed in units of one ninety-thousandth of one second. The reception control unit 126 then compares the obtained value with the value of the variable lastPTS. When the value of the present time is less than the variable lastPTS, the processing returns to S2620. When, however, the value of the present time is greater than or equal to the value of the variable lastPTS, the reception control unit 126 sets the filter condition for the image data in the filter condition storage unit 131 into the stopped state (S2630) and sets the variable cur_VE_id at the value of the variable new_VE_id (S2632). The reception control unit 126 then terminates the reproduction processing of the image data.

2-3-11-4 Switching Process for Navigation Information

The following is an explanation of the details of the navigation information switching processing in S2506, with reference to the flowchart in Fig. 79.

First, the reception control unit 126 judges whether the value of the variable new_NE_service_id stored by the reception control unit 126 is the same as cur_NE_service_id and whether the value of the variable new_NE_event_id is the same as the cur_NE_event_id (S2702). When both are affirmative, the reception control unit 126 judges whether the variable new_NE_id is equal to the cur_NE_id (S2704). If so, the reception control unit 126 terminates the processing, or if not, the reception control unit 126 advances to S2706. When the judgement in S2702 is negative, the reception control unit 126 refers to the system information tables corresponding to the variables new_NE_service_id and new_NE_event_id and instructs the TS decoder unit 123 to separate the PMT corresponding to the event identified by the variables new_NE_service_id and new_NE_event_id. The TS decoder unit 123 separates the indicated PMT and writes it into the system information table storage unit 134 of the received data storage unit 125, before notifying the reception control unit 126 (S2708).

The reception control unit 126 sets the value of the variable new_NE_service_id in the variable cur_NE_service_id and the value of the variable new_NE_event_id into the variable cur_NE_event_id (S2710).

In S2706, the reception control unit 126 refers to the PMT corresponding to the event identified by the variables cur_NE_service_id and cur_NE_event_id in the system information table storage unit 134 and obtains the PID of the component attached to the NE_Component_Descriptor and sets the value of the variable new_NE_id as the table_id_extension in the filter condition for the navigation information table. The reception control unit 126 also sets this filter condition into the started condition. The TS decoder unit 123 then separates the navigation information table NVT corresponding to the value of the variable new_NE_id from the transport stream in accordance with the filter condition, stores it in the navigation information table storage unit 133, and notifies the reception control unit 126 (S2706).

The reception control unit 126 next refers to the object definition table in the navigation information table NVT in the navigation information table storage unit 133 which was obtained in S2706 and obtains the display coordinates "X", "Y" of the button object. The reception control unit 126 next obtains the index number of the "Normal Bitmap" and refers to the bitmap table so that it can obtain the bitmap data corresponding to this index number. The reception control unit 126 uses this bitmap data to generate graphics information for buttons which it outputs to the reproduction unit 128. The reproduction unit 128 superimposes this graphics information onto the image data decoded by the AV decoder unit 124 and has the combined image displayed on the display unit 129 (S2712).

The reception control unit 126 resets the variable cur_focus which expresses the index number of the button object

currently in the selected state to zero (S2714). The reception control unit 126 then refers to the object definition table of the navigation information table NVT obtained in S2706 and obtains the display coordinates "X", "Y" of the button object which has an index number equal to the value of the variable cur_focus. The reception control unit 126 next obtains the index number of the "Focused Bitmap" and refers to the bitmap table so that it can obtain the bitmap data corresponding to this index number. The reception control unit 126 sets the bitmap of the button with the index number corresponding to the value of the variable cur_focus as the bitmap for the selected state and generates graphics information for the button objects which it outputs to the reproduction unit 128. The reproduction unit 128 superimposes this graphics information onto the image data decoded by the AV decoder unit 124 and has the combined image displayed on the display unit 129 (S2716). The reception control unit 126 then sets the variable cur_NE_id at the value of the variable new_NE_id (S2718) and completes the switching processing for navigation information.

2-3-11-5 Processing for a User Input Signal

The following is an explanation of the details of the processing for a user input signal in S2416, with reference to the flowchart in Fig. 80.

The reception control unit 126 first judges whether the user input reported by the signal reception unit 127 was an "up" signal. When it is an "up" signal, the processing advances to S2804, or if not, the processing advances to S2808 (S2802). In S2804, the reception control unit 126 reduces the value of the variable cur_focus by one. However, when the value of the variable cur focus is already at zero, it is not reduced further and stays at zero.

The reception control unit 126 refers to the object definition table of the navigation information table NVT which was obtained in S2706 and which is stored in the navigation information table storage unit 133, and obtains the display coordinates "X", "Y" of the button object whose index number is equal to the variable cur_focus. Next, the reception control unit 126 obtains the index number of the "Focused Bitmap" and refers to the bitmap table so that it can obtain the bitmap data corresponding to this index number. Based on this information, the reception control unit 126 sets the bitmap of the button with the index number corresponding to the value of the variable cur_focus as the bitmap in the selected state, as well as setting the bitmap for the button corresponding to the index number which corresponds to the value of cur_focus as the bitmap in the normal state, before generating graphics information for the button objects and outputting the graphics information to the reproduction unit 128. The reproduction unit 128 superimposes the graphics information on the image data decoded by the AV decoder unit 124 and has the combined image displayed on the display unit 129 (S2806), and the reception control unit 126 terminates the user input processing.

In S2808, the reception control unit 126 judges whether the user input reported by the signal reception unit 127 was a "down" signal. When it is a "down" signal, the processing advances to S2810, or if not, the processing advances to S2812 (S2802). In S2810, the reception control unit 126 increases the value of the variable cur_focus by one. However, when the value of the variable cur_focus is already equal to the highest value out of the identifiers of the button objects in the navigation information table, it is not increased further and stays as it is with the processing proceeding to S2806.

In S2812, the reception control unit 126 judges whether the user input reported by the signal reception unit 127 was an "enter" signal. When it is an "enter" signal, the processing advances to S2814, or if not, the user input processing is terminated.

In S2814, the reception control unit 126 refers to the object definition table in the navigation information table NVT and obtains the index number of the handler of the button object whose index number is equal to the value of the variable cur_focus. The reception control unit 126 then refers to the handler definition table and reads the instruction word from the handler which corresponds to this index number. When the instruction word is "goto_content", the processing advances to S2818, while when this is not the case, the processing advances to S2824 (S2816).

In S2818, the reception control unit 126 reads the index number of the argument of the goto_content instruction from the handler.

After this, the reception control unit 126 refers to the hyperlink table for the navigation information table and sets the values of the original_network_id, the transport_stream_id, the VE_service_id, the VE_event_id, the VE_id, the NE_service_id, the NE_event_id, and the NE_id of the content which corresponds to the index number read in S2818 at the respective values of the new_original_network_id, the new_transport_stream_id, the new_VE_service_id, the new_VE_event_id, the new_VE_id, the new_NE_service_id, the new_NE_event_id, and the new_NE_id. However, when the identifiers have not been set values in the hyperlink table, which is to say the identifiers are given as "-", the original values are left unchanged (S2820).

The reception control unit 126 set the value of the content change flag at "1" (S2822) and terminates the user input processing.

In S2824, the reception control unit 126 judges whether the script instruction word is "goto_entry", and if not, terminates the user input processing. When the script instruction word is "goto_entry", the reception control unit 126 refers to the PMT corresponding to the event identified by the cur_NE_service_id and the cur_NE_event_id in the

system information table storage unit 134, and sets the variable new_VE_id and the variable new_NE_id at the values of the "entry_VE_id" and the "entry_NE_id". The reception control unit 126 also sets the variables new_VE_service_id and new_VE_event_id at the values of the variables cur_NE_service_id and cur_event_id (S2826), before proceeding to step S2822.

As described above, the display can be switched between the display image 2301 shown in Fig. 75A and the display image 2303 shown in Fig. 75C in accordance with user operations.

2-3-12 Summary

As described above, the data reception apparatus 121 of the present invention can extract the presentation information and navigation information which are necessary for the reproduction of a specified content from the transport stream at the necessary time. By doing so, link destination contents can be extracted and reproduced in accordance with user operations, so that programs which allow user interaction can be achieved on a system which performs only one-directional communication.

It should be noted here that the reception unit 122, the TS decoder unit 123, the AV decoder unit 124, the reproduction unit 128, the display unit 129, the audio output unit 130, and the signal reception unit 127 in the data reception apparatus 121 may be provided using the same construction as a conventional digital TV broadcast receiver apparatus.

Accordingly, by merely adding the received data storage unit 125 and the reception control unit 126 described above to the reception unit, TS decoder unit and AV decoder unit of a conventional digital TV broadcast receiver apparatus, the interactive functions for programs of the present invention can be achieved.

By using such a conventional construction as it is, a reception apparatus is capable of receiving conventional digital satellite broadcasts in addition to achieving the interactive functions of the present invention.

2-3-13 Modifications

2-3-13-1

The present embodiment describes the case where all of the image data is for still images, although reproduction by the data reception apparatus 121 of the present embodiment is still possible when the image data is moving pictures.

2-3-13-2

The above explanation also describes the case when each content is the combination of image data and navigation information, although audio data may also be included. In such a case, the reception control unit 126 may be constructed so as to perform a switching process for audio data at the same time as the switching process for image data, and to output the audio data to an audio output unit 130. The switching process for audio data may be performed using the same method as the switching process for image data.

2-3-13-3

The above embodiment also describes an example where the script which is included in the handler definition table of the navigation information and which denotes the operation to be taken by the data reception apparatus 121 merely indicates switching of contents, although complex script which is made up of a plurality of instruction words is also possible.

As one example, when a program is for shopping information, the script may represent the calculation of the total cost of the products selected by the user. To do so, the reception control unit 126 of the data reception apparatus 121 is provided with the suitable functions for script execution. These functions may calculate the total cost, and output the result to the reproduction unit 128 which has the total cost displayed by the display unit 129.

For the example of shopping, script for the ordering of products may also be included. To achieve this, the script may contain an instruction for a modem (not illustrated) of the data reception apparatus 121, which is connected to a telephone line, to connect to the retailer's computer system and transmit data which is used to order the desired products. With this construction, the user is able to first view the product information, and then confirm the total cost of the products before placing the actual order.

Third Embodiment

The following embodiment describes a digital broadcasting apparatus which can achieve interactive programs that are composed of stream-based contents and page-based contents.

3-1 Digital Broadcasting Apparatus 8101

Fig. 81 is a block diagram showing the construction of the digital broadcasting apparatus 8101. Components of the digital broadcasting apparatus 8101 which have been given the same reference numerals as components in the digital broadcasting apparatus 5101 of Fig. 4 or in the digital broadcasting apparatus 101 of Fig. 52 are the same as the corresponding components and so will not be described. The following explanation will instead focus on the differences with the previous embodiments.

The major difference between the data transmission apparatus 8101 and the data transmission apparatus 101 shown in Fig. 52 lies in the additional provision of the data multiplexing unit 5103. This is described in more detail below.

The transmission data storage unit 102 stores data (presentation information and navigation information) for both page-based contents and stream-based contents. The construction information storage unit 109, meanwhile, stores a construction information table for stream-based contents and a construction information table for page-based contents.

The data multiplexing unit 5103 multiplexes the data for the stream-based contents stored in the transmission data storage unit 102. The data multiplexing unit 103, meanwhile, multiplexes the data (presentation information and navigation information) for the page-based contents stored in the transmission data storage unit 102.

The data multiplexing unit 5103 and the data multiplexing unit 103 are the same as those described in the first and second embodiments, respectively.

The transmission unit 106 multiplexes the multiplexed streams outputted from the two data multiplexing units 5103 and 103 into a transport stream.

3-1-1 Construction Information Tables

Figs. 82A and 82B show the construction information table 8201 for stream-based contents that is stored in the construction information storage unit 109 and the construction information table 8301 for page-based contents that is stored in the construction information storage unit 109.

In the construction information table 8201, the sets of image data with the filenames "Video100.m2v", "Videol04.m2v", and "Video106.m2v" given in the "Video data" column are stored in the presentation information storage unit 107. Graphic representations of "Video100.m2v", "Videol04.m2v" and "Video106.m2v" are given in Figs. 84A to 84C. As shown in these figures, image data "Video100.m2v" is a world travel guide which has the same contents 100S to 103S as shown in Figs. 1 to 3. Image data "Video104.m2v" is a Japan travel guide which has the same contents 104S, 105S, 105S', and 105" as shown in Figs. 1 to 3. "Video106.m2v", meanwhile, is a China travel guide whose content is not illustrated in Figs. 1 to 3. This is also the case for the "Audio data" column in the construction information table 8201.

The sets of navigation information which have the filenames "Navi100-0.nif" ... in the "Navigation information" column in the construction information table 8201 are stored in the navigation information storage unit 108. Figs. 85 and 86 show the correspondence between the sets of navigation information in the construction information table 8201 and each of the scenes in Figs. 1 to 3. Here, Fig. 85 and Fig. 86 are the left and right sides of the line A-A'.

The construction information for the contents with the content numbers 100 to 104 in construction information table 8201 represents the contents 100S to 104S in Figs. 85 and 86. In the present example, the content numbers correspond one-to-one with the contents.

As one example, the image data "Video100.m2v", the audio data "Audio100.m2a", and the navigation information "Navi100-0.nif, Navi100-1.nif, Navi100-2.nif, ..." are indicated in the row for content number 100.

As shown in Fig. 84A, video data "Video100.m2v" represents a world travel guide for various countries such as China, Japan, and Egypt. This video data is based on the content 100S in Fig. 1. The audio data "Audio100.m2a" is a filename for audio data stored by the presentation information storage unit 107. This audio data "Audio100.m2a" represents audio which is to be reproduced together with the video data "Video100.m2v" to introduce the various countries.

The navigation information "Navi100-0.nif" represents the main menu for the travel guide scenes for China which include scene 100S1 shown as part of the video data "Video100.m2v" in Fig. 85. Similarly, the navigation information "Navi100-1.nif" is for the travel guide scenes for Japan which include scene 100S2, and the navigation information "Navi100-2.nif" is for the travel guide scenes for Egypt.

The construction information for content number 100, composed of the information described above, expresses the data for content 100 which is the world travel guide shown in Figs. 1 to 3.

The construction information for content number 105 in the construction information 8201 represents contents 105S, 105S', and 105". These contents 105S, 105S', and 105" for content 105S are an example where one content number represents a plurality of contents (here, with a ratio of 1 to 3). This is to say, the navigation information "Navi105-1.nif" corresponds to all of the contents 105S, 105S', and 105" using scripts which change the display of button objects and text information. This switching of the display of button objects and text information is the same as

in the first embodiment.

The construction information table 8301 in Fig. 82B is the same as that shown in Fig. 56 of the second embodiment. The image data and audio data indicated by the construction information table 8301 is stored in the presentation information storage unit 107 while the navigation information is stored in the navigation information storage unit 108.

The interactive program represented by the construction information table 8301 includes page-based contents for weather forecasts for around the world, in addition to the page-based contents for weather forecasts for Japan given in the second embodiment. Here, content 100P shows the world weather forecast (with a main menu for selecting various countries). The entry information stored in the construction information storage unit 109 indicates the content number 100, which is to say the stream-based content 100S.

The page-based contents in Figs. 85 and 86 are included in the contents shown by the construction information table 8301, with the content 104P in particular corresponding to the content representing the weather forecast for Japan (with a main menu for selecting various regions) in content number 5 given in the second embodiment. However, it is somewhat different to the navigation information (shown in Fig. 54) for content number 5 in the second embodiment in that it additionally includes links to stream-based contents. Fig. 83 shows the navigation information for content number 5 in the present embodiment. As can be seen by comparing this figure with Fig. 54, this navigation information additionally includes a hyperlink to content number 100.

3-1-2 Navigation Information

A detailed explanation of the navigation information is given in the first and second embodiments, so that the following explanation will instead focus on the correspondence between contents and navigation information shown in Figs. 85 and 86.

Fig. 87 gives a specific example of the navigation information "Navi100-0.nif". This is used for the travel guide scenes for China, including scene 100S1 in Fig. 85. This navigation information "Navi100-0.nif" has three button objects in its object definition table. These three button objects correspond to the "Details", "Weather", and "China" buttons in scene 100S1 in Fig. 85. As shown in the hyperlink table, the "Details" button has the content number 101 (content 101S) as its link destination. The "Weather" button has the content number 10 (content 100P shown by the arrow in Fig. 85) as its link destination. The "China" button, meanwhile, has the content number 106 as its link destination. Here, while not shown in Fig. 85, this content number 106 represents the content for the China travel guide which includes the video data "Video106.m2v" described above.

Fig. 88 gives a specific example of the navigation information "Navi100-1.nif". This is the same as the navigation information "Navi100-0.nif", except that the button for "China" has been replaced with a button for "Japan". The link destination of this button is the content number 104 (content 104S in Fig. 85) instead of the content number 106. This is because the version of the navigation information is changed reflecting the change in the video content of content 100S from scenes giving a travel guide for China to scenes giving a travel guide for Japan.

In the same way, Fig. 89 gives a specific example of the navigation information "Navi100-2.nif", Fig. 90 gives a specific example of the navigation information "Navi101-1.nif", Fig. 91 gives a specific example of the navigation information "Navi101-2.nif", Fig. 92 gives a specific example of the navigation information "Navi102-1.nif", Fig. 93 gives a specific example of the navigation information "Navil03-1.nif", and Fig. 94 gives a specific example of the navigation information "Navi104-1.nif".

Fig. 95, meanwhile, gives a specific example of the navigation information "Navi105-1.nif". This navigation information "Navi105-1.nif" represents the navigation information for all of contents 105S, 105S', and 105". The switching between contents 105S, 105S', and 105" is achieved by scripts. This switching according to scripts is the same as in Fig. 48 of the first embodiment.

As one example, the script for the hyperlink index number 0 is activated by the "Transport" button in content 105S, with the "Transport", "Accommodation", and "Return" buttons and "Nara...." picture (object indexes 0-3) being deleted from the display, and the "Getting to Nara" picture and "Return" buttons (object indexes 4, 5) being displayed. By doing so, the display is changed from 105S to 105S'.

The script for handler index 3 is activated by the "Return" button in Content 105S, and deletes the picture "Getting to Nara" and the "Return" button (object indexes 4 and 5), in addition to heving the "Transport", "Accommodation", and "Return" buttons and the "Nara ..." picture (objects indexes 0-3) displayed. By doing so, the display is switched from content 105S' back to 105S.

3-1-3 Navigation Information Table

The navigation information described above is converted into navigation information tables by the navigation information table generating unit 5111 or by the navigation information table generating unit 113.

In addition to generating the navigation information tables described in the first and second embodiments, the

navigation information table generating units 5111, 113 set the respective identifiers in the "VE_comp_tag", the "AE_comp_tag" and "NE_id" columns of the hyperlink table when the content number for the link destination is a stream-based content, or the respective identifiers in the "VE_id", the "AE_id" and "NE_id" columns of the hyperlink table when the content number for the link destination is a page-based content.

Fig. 96 shows the navigation information table NVT (104.1) which is generated from the navigation information "Navi104-1.nif". This navigation information table NVT (104.1) is such that each content number in the hyperlink table in "Navi104-1.nif" has been converted into a variety of identifiers.

The column for hyperlink index number 2 in this figure has the stream-based content 105S as its link destination, and so is converted into the "VE_comp_tag", "AE_comp_tag" and "NE_id" corresponding to content number 105. This is also the case for the hyperlink table index number 2, which has been converted into the "VE_comp_tag", "AE_comp_tag" and "NE_id" corresponding to content number 100.

The column for hyperlink index number 1 in this figure has the page-based content 5 (content 104P) as its link destination, and so is converted into the "VE_id", "AE_id" and "NE_id" corresponding to content number 5. However, this content does not contain audio data, so that the items related to audio data have been omitted.

3-1-4 Multiplexing

The presentation information and navigation information described above are multiplexed by the data multiplexing unit 103 and the data multiplexing unit 5103.

The data multiplexing unit 5103 multiplexes stream-based contents according to the construction information table 8201 in the same way as in the first embodiment. The data multiplexing unit 103 multiplexes page-based contents according to the construction information table 8301, in the same way as in the second embodiment. These processes are performed in parallel.

The multiplexed stream representing the stream-based contents and the multiplexed stream representing the page-based contents are multiplexed into a multiplexed stream by the transmission unit 106 and are transmitted.

Fig. 97 is a graphic representation of the transport stream multiplexed by the transmission unit 106. In the same way as Figs. 29 and 70, the horizontal axis represents elapsed time while the vertical axis represents the content data and system information tables which are multiplexed at the same time.

In Fig. 97, element 9701 represents the part of the multiplexed data stream where data for the stream-based contents has been multiplexed by the data multiplexing unit 5103. Element 9702 represents the part of the multiplexed data stream where data for the stream-based contents has been multiplexed by the data multiplexing unit 103. Element 9703 represents the part of the multiplexed data stream for the system information tables generated by the system information table generating unit 105.

3-2 Reception Apparatus 9121

Fig. 98 is a block diagram showing the construction of the reception apparatus 9121.

The elements of the reception apparatus 9121 which are the same as the reception apparatus 121 of the second embodiment shown in Fig. 52 have been given the same reference numerals, so that the following explanation will instead focus on the differences.

The differences with the reception apparatus 121 in Fig. 52 are that the reception apparatus 9121 includes a TS decoder unit 9123 and a reception control unit 9126 in place of the TS decoder unit 123 and the reception control unit 126. Here, the filter condition storage unit 9131 in the TS decoder unit 9123 is also somewhat different.

3-2-1 TS Decoder Unit 9123

The TS decoder unit 9123 is equipped with the functions of both the TS decoder unit 5123 of the first embodiment and the TS decoder unit 123 of the second embodiment. As a result, the TS decoder unit 9123 can handle both stream-based contents and page-based contents, and the filter condition storage unit 9131 stores all of the filter conditions of the filter condition storage unit 5131 and the filter condition storage unit 131 in the first and second embodiments, with the setting of these filter conditions being possible in the same way as before.

Fig. 99 shows the filter condition table that is stored in the filter condition storage unit 9131. This filter condition table 9131 stores a variety of filter conditions. As shown in Fig. 99, these filter conditions are composed of a "PID", a "stream_id", a "table_id_extension", a "version_no", and an "output destination". Each of these items is the same as in the first and second embodiments, and so will not be explained further.

3-2-2 Reception Control Unit 9126

The reception control unit 9126 is equipped with the functions of both the reception control unit 5126 in the first embodiment and the reception control unit 126 in the second embodiment. As a result, the reception control unit 9126 is able to handle both stream-based contents and page-based contents.

Figs. 100 and 101 are flowcharts showing the control conten fo the reception control unit 9126. In Fig. 100, S2402, S2404, S2406, and S2408 represent the processes with the same reference numerals in Fig. 76. In Fig. 101, S2410, S2412, S2414, S2416, and S2418 represent the processes with the same reference numerals in Fig. 76. Also, in Fig. 101, S8110, S8112, and S8114 represent the processes with the same reference numerals in Fig. 36. However, the "cur_VE_comp_tag", "cur_AE_comp_tag", "new_VE_comp_tag", and "new_AE_comp tag" are also handled in S2406 and S2408.

In Fig. 100, the reception control unit 9126 judges whether the various identifiers indicated in S2408 specify a stream-based content or a page-based content. More specifically, the reception control unit 9126 judges that a stream-based content is specified when "new_VE_comp_tag" is included, and that a page_based content is specified when "new_VE_id" is included.

Here, when the reception control unit 9126 judges that a stream-based content is specified, it performs the processing in S8110 onwards in Fig. 101, while when the reception control unit 9126 judges that a page-based content is specified, it performs the processing in S2410 onwards in Fig. 101. The details of this processing are the same as the corresponding processes in the first and second embodiment.

3-2-3 Other Modifications

In this third embodiment, the distinction between page-based contents and stream-based contents is made according to whether a "VE_comp_tag" or a "VE_id" is specified, but this need not be the case, with it being possible to provide other identifiers for making this distinction.

The construction information storage unit 109 is described as storing separate construction information tables for stream-based contents and page-based contents, although both types of contents may be provided in the same table. As one example, flags may be provided to indicate stream-based contents or page-based contents with these flags being multiplexed with the corresponding contents by the data multiplexing units 103, 5103.

In the first and third embodiments, the multiplexing of the video data included in stream-based contents is commenced at the same time as the start of multiplexing, although the video data may be multiplexed with only a partial overlap of reproduction times.

In the first and third embodiments, the video data in the stream-based contents are described with the premise of full-screen display on the display screen of the reception apparatus 5121, although video data of a smaller size may be used. As one example, the video data may be one quarter of the size of the video data, so that the total number of contents can still be increased when there is an upper limit for the bit rate which may be assigned to the interactive program. When doing so, the image data may be still be combined with objects described in the navigation information to give the reproduced image. It is also possible for contents to be composed of a simultaneous display of between two and four quarter-screen sets of video data.

The still images in the page-based contents of the second and third embodiments may also be image data which is smaller than the display screen. It is also possible for one content to include a plurality of sets of image data. As one example, one content may include between two and four quarter screen still images.

The still images may be used as background images with quarter-size sets of video data being reproduced on top of these.

In the first to third embodiments, the scripts in the handler definition table of the navigation information may describe operations of the reception apparatus aside from the switching of the display of buttons and graphics. As one example, the scripts may describe sounds (beeps or clicks) to be sounded when a button is selected or activated, or when an error occurs. For the example of contents in an interactive program which includes shopping information, script may receive numerical inputs (prices) from the operator and calculate a total cost.

The operation of the reception control unit shown in the flowcharts in the first to third embodiments may be achieved by software. This is to say, a program which includes these functions may be executed by a CPU to achieve the necessary control. The remaining construction elements are achieved by hardware, so that almost the same hardware as a conventional digital satellite broadcast tuner may be used. Accordingly, the reception apparatus described above can be realized by equipping a conventional digital satellite broadcast tuner with a program which realizes the functions of the reception control unit. As one example, the program may be provided to a conventional digital satellite broadcast tuner using a recording medium, such as a ROM card, on which the program is recorded. By doing so, the present invention may be achieved by making slight modifications to a conventional digital satellite broadcast tuner.

Although the present invention has been fully described by way of examples with reference to accompanying

drawings, it is to be noted that various changes and modifications will be apparent to those skilled in the art. Therefore, unless such changes and modifications depart from the scope of the present invention, they should be construed as being included therein.

Claims

1. A broadcasting apparatus for broadcasting an interactive program composed of a plurality of contents that are linked to one another, the broadcasting apparatus comprising:

   content storing means for storing the plurality of contents, each content including a set of video data and a set of control information that indicates another content that is a link destination for a present content; and
   transmitting means for multiplexing a set of video data and a plurality of sets of the same control information included in a same content as the set of video data, and for transmitting the multiplexed sets of video data and control information.

2. The broadcasting apparatus of Claim 1, wherein the content storing means includes:

   first storing means for storing the sets of video data included in the plurality of contents;
   second storing means for storing the sets of control information included in the plurality of contents; and
   construction table storing means for storing a construction table showing correspondence between the sets of video data stored in the first storing means and the sets of control information stored in the second storing means.

3. The broadcasting apparatus of Claim 2, wherein the transmitting means includes:

   multiplexing means for reading the plurality of sets of video data stored in the first storing means and the plurality of sets of control information stored in the second storing means as respective digital data streams, and multiplexing the digital data streams to generate a multiplexed stream;
   multiplexing control means for referring to the construction table and controlling the multiplexing means to multiplex the plurality of sets of video data and to repeatedly multiplex a set of control information corresponding to a set of video data; and
   broadcasting means for placing the multiplexed stream generated by the multiplexing means onto a digital broadcast wave and broadcasting the digital broadcast wave.

4. The broadcasting apparatus of Claim 3, wherein the content storing means further includes:

   third storing means for storing sets of audio data that correspond to the sets of video data,
   wherein the construction table storing means stores correspondence between a set of video data, a set of audio data, and a set of control information included in each of the plurality of contents,
   and wherein the multiplexing means also multiplexes the sets of audio data stored in the third storing means into the multiplexed stream.

5. The broadcasting apparatus of Claim 3,

   wherein each content includes a plurality of sets of control information, each set of control information including a set of link information showing contents that are link destinations and a set of time information indicating a valid period for the present control information within the reproduction period of the set of video data corresponding to the present set of control information,
   and wherein the multiplexing control means controls the multiplexing means to repeatedly multiplex each set of control information with the corresponding set of video data during the valid period of the set of control information.

6. The broadcasting apparatus of Claim 5,

   wherein the multiplexing control means controls the multiplexing means to repeatedly multiplex each set of control information with the corresponding video data starting from a predetermined time before the valid period of the set of control information, the predetermined time being sufficiently long to enable a reception

apparatus to process a set of control information.

7. The broadcasting apparatus of Claim 5, wherein the multiplexing control means appends a version number, reflecting the valid period of each set of control information, to each set of control information in a given content.

8. The broadcasting apparatus of Claim 3,

wherein each content includes a plurality of sets of control information,
wherein the construction table storing means includes a valid period table indicating a valid period for a set of control information within the reproduction period of the corresponding set of video data, for each of the plurality of sets of control information included in a given content,
wherein the multiplexing control means controls the multiplexing means to repeatedly multiplex a given set of control information with the corresponding set of video data during the valid period of the given set of control information, based on the valid period table, and
wherein the multiplexing control means appends a version number, reflecting the valid period of each set of control information, to each set of control information in a given content.

9. The broadcasting apparatus of Claim 3, wherein at least one set of control information includes a set of additional information representing one of text and a graphic image that is to be displayed superimposed onto the corresponding video data.

10. The broadcasting apparatus of Claim 3, wherein each set of control information stored by the second storing means includes a set of link information showing contents that are link destinations and supplementary images representing menu items for each link destination.

11. The broadcasting apparatus of Claim 10,

wherein at least one set of control information includes:
a plurality of sets of additional information representing one of text and a graphic image that is to be displayed superimposed onto the corresponding video data; and
a set of script information that validates one of the sets of additional information within a reception apparatus, in accordance with a user operation.

12. The broadcasting apparatus of Claim 10,

wherein at least one set of control information includes:
at least two groups of a set of link information and supplementary images;
a set of initial information showing a group of a set of link information and supplementary images that is valid at a start of reproduction by a reception apparatus for a content including the present set of control information; and
a set of script information that changes a valid setting in the reception apparatus in accordance with a user operation.

13. The broadcasting apparatus of Claim 12, wherein each group of a set of link information and supplementary image further includes a set of additional information representing one of text and a graphic image that is to be displayed superimposed onto the corresponding video data.

14. A broadcasting apparatus for broadcasting an interactive program composed of a plurality of contents that are linked to one another, the broadcasting apparatus comprising:

first storing means for storing a plurality of sets of video data that each have an identifier, each set of video data being an element of a content that composes an interactive program;
second storing means for storing a plurality of sets of control information that each have an identifier, each set of control information being another element of a content that composes an interactive program and each set of control information including a set of link information that shows an identifier of a set of control information for a content that is a link destination;
construction table storing means for storing a construction table showing correspondence between the sets of video data stored in the first storing means and the sets of control information stored in the second storing

means;
multiplexing means for reading the plurality of sets of video data stored in the first storing means and the plurality of sets of control information stored in the second storing means as respective digital data streams, and for multiplexing the digital data streams to generate a multiplexed stream;
multiplexing control means for referring to the construction table and controlling the multiplexing means to multiplex the plurality of sets of video data and to repeatedly multiplex a set of control information corresponding to an arbitrary set of video data; and
broadcasting means for placing the multiplexed stream generated by the multiplexing means onto a digital broadcast wave and broadcasting the digital broadcast wave.

15. The broadcasting apparatus of Claim 14, wherein the multiplexing control means includes:

first determining means for determining a multiplexing start position in the multiplexed stream for each set of video data in each content given in the construction table; and
second determining means for determining a plurality of multiplexing start positions in the multiplexed stream for each set of control information included in each content given in the construction table, wherein the multiplexing start positions for a given set of control information are determined so that the given set of control information is multiplexed a plurality of times;
wherein the multiplexing means reads the sets of video data from the first storing means and the sets of control information from the second storing means in accordance with the multiplexing start positions determined by the first determining means and the second determining means.

16. The broadcasting apparatus of Claim 15,

wherein each set of control information stored in the second storing means includes a set of link information showing contents that are link destinations and a set of time information showing a valid period of the set of control information to which the time information belongs, and
wherein the second determining means determines the plurality of multiplexing start positions for each set of control information so that each set of control information is repeatedly multiplexed during the valid period of the set of control information.

17. The broadcasting apparatus of Claim 16, wherein the multiplexing control means further includes:

version appending means for appending a different version number to each of the plurality of sets of control information included in a same content, the version numbers being assigned in accordance with the valid period given in the set of time information included in each set of control information,
wherein the multiplexing means multiplexes the sets of control information with the appended version numbers in accordance with the multiplexing start positions determined by the second determining means.

18. The broadcasting apparatus of Claim 16, wherein the second determining means determines the multiplexing start positions so that each set of control information is multiplexed with the corresponding video data starting from a predetermined time before the valid period of the set of control information, the predetermined time being sufficiently long to enable a reception apparatus to process a set of control information.

19. The broadcasting apparatus of Claim 15, wherein the multiplexing control means further includes:

system information storing means for storing system information for specifying a multiplexed stream on a digital broadcast wave, wherein the system information includes a stream ID for each set of video data and a stream ID for each set of control information;
identification information appending means for converting an identifier of a set of video data and an identifier of a set of control information respectively into first identification information and second identification information, based on the system information, for appending the first identification information to the set of video data, and for appending the second identification information to the set of control information; and
link destination information converting means for converting the link information in each set of control information into the first identification information and second identification information for the set of video data and set of control information of each content that is a link destination,
wherein the multiplexing means generates the multiplexed stream using the system information, the first identification information, and the second identification information.

20. The broadcasting apparatus of Claim 19, wherein the first identification information is expressed as a unique stream ID for each set of video data and the second identification information is expressed as a combination of a stream ID that is common to all sets of control information in a content and a unique parameter for each set of control information in the content.

21. The broadcasting apparatus of Claim 20,

wherein each content includes a plurality of sets of control information, each set of control information including a set of link information showing contents that are link destinations and a set of time information indicating a valid period for the present control information within the reproduction period of the set of video data corresponding to the present set of control information,
and wherein the multiplexing control means controls the multiplexing means to repeatedly multiplex each set of control information with the corresponding set of video data during the valid period of the set of control information.

22. The broadcasting apparatus of Claim 20,

wherein each content includes a plurality of sets of control information,
wherein the construction table storing means includes a valid period table indicating a valid period for a set of control information within the reproduction period of the corresponding set of video data, for each of the plurality of sets of control information included in a given content,
wherein the multiplexing control means controls the multiplexing means to repeatedly multiplex a given set of control information with the corresponding set of video data during the valid period of the given set of control information, based on the valid period table, and
wherein the multiplexing control means appends a version number, reflecting the valid period of each set of control information, to each set of control information in a given content.

23. The broadcasting apparatus of Claim 21,

wherein the multiplexing control means controls the multiplexing means to repeatedly multiplex each set of control information with the corresponding video data starting from a predetermined time before the valid period of the set of control information, the predetermined time being sufficiently long to enable a reception apparatus to process a set of control information.

24. The broadcasting apparatus of Claim 21,

wherein the multiplexing control means appends a version number, reflecting the valid period of each set of control information, to each set of control information in a given content.

25. The broadcasting apparatus of Claim 19, wherein each set of control information stored by the second storing means includes a set of link information showing contents that are link destinations and supplementary images representing menu items for each link destination.

26. The broadcasting apparatus of Claim 15, wherein the multiplexing control means further includes:

a bandwidth assigning table that shows a bandwidth for each content, the bandwidth being for the digital data stream of the sets of control information in a content that are repeatedly transmitted and being a bandwidth that is part of a total bandwidth of the multiplexed stream,
wherein the second determining means determines the multiplexing start positions of sets of control information in accordance with the bandwidths given in the bandwidth assigning table, and
wherein the multiplexing means multiplexes the digital data streams in accordance with the bandwidth assigning table.

27. The digital broadcasting apparatus of Claim 14, further comprising:

third storing means for storing a plurality of sets of audio data that each have an identifier, each set of audio data being an element of a content that composes an interactive program,
wherein the construction table shows a correspondence between a set of video data, a set of audio data and

sets of control information in each content, and
wherein the multiplexing means additionally multiplexes the audio data into the multiplexed stream.

28. A broadcasting apparatus for broadcasting an interactive program composed of a plurality of contents that are linked to one another, the broadcasting apparatus comprising:

image storing means storing a plurality of sets of video data and a plurality of sets of still image data;
control information storing means for storing sets of type 1 control information and sets of type 2 control information, the sets of type 1 control information being elements of contents including video images, the sets of type 2 control information being elements of contents including still images, and the sets of type 1 control information and sets of type 2 control information including sets of link information that indicate contents which are link destinations for a present content;
construction table storing means storing a first construction table showing correspondence between sets of video data and sets of type 1 control information and a second construction table showing correspondence between sets of still image data and sets of type 2 control information;
first multiplexing means for generating a first multiplexed stream by multiplexing a set of video data in the first construction table and repeatedly multiplexing a set of type 1 control information corresponding to the set of video data;
second multiplexing means for generating a second multiplexed stream by repeatedly multiplexing a plurality of sets of still image data in the second construction table with a set of type 2 control information; and
broadcasting means for placing the multiplexed stream generated by the multiplexing means onto a digital broadcast wave and broadcasting the digital broadcast wave.

29. A reception apparatus for receiving a broadcast wave including an interactive program composed of a plurality of contents that are linked to one another, wherein the broadcast wave includes a multiplexed stream into which different sets of video data have been multiplexed with a plurality of sets of control information showing a link to another content, the sets of control information being repeatedly multiplexed,

the reception apparatus comprising:
extracting means for extracting a set of video data and a set of control information in a same content as the set of video data;
storing means for storing the extracted set of control information;
reproducing means for reproducing the extracted set of video data and outputting an image signal;
operation means for receiving a user operation that indicates a content switching; and
control means for controlling the extracting means to extract another content indicated by the set of control information stored in the storing means, in accordance with the user operation.

30. The reception apparatus of Claim 29,

wherein the sets of control information each include valid period information showing a valid period for the set of control information,
wherein each content has to a plurality of sets of control information which have different valid periods, and
wherein the reproducing means reproduces supplementary images in the set of control information stored in the storing means during the valid period of the set of control information.

31. The reception apparatus of Claim 29,

wherein each content corresponds to a plurality of sets of control information which have different valid periods,
wherein each set of control information has a version number which reflects the valid period, and
wherein the control means controls the extracting means to extract a set of control information which has a next version number, when one set of control information has been extracted by the extracting means.

32. The reception apparatus of Claim 29,

wherein first identification information is appended to each set of video data and second identification information is appended to each set of control information, and wherein the sets of control information include first identification information and second identification information which express a content of a link destination,
wherein the extracting means includes:

first judging means for judging the first identification information appended to sets of video data in the broadcast wave;
second judging means for judging the second identification information appended to sets of control information in the broadcast wave;
obtaining means for obtaining a set of video data and when the first judging means judges that the first identification information coincides with specified identification information indicated by the control means and obtaining a set of control information when the second judging means judges that the second identification information coincides with specified identification information,
wherein the reproducing means reproduces the set of video data obtained by the obtaining means, and the storing means stores the set of control information obtained by the obtaining means.

33. The reception apparatus of Claim 32,

wherein a set of entry information giving first identification information and second identification information for the content to be reproduced first is multiplexed into the multiplexed stream,
wherein the control means sends an indication to the extracting means to extract the set of entry information when the operation means has received a selection operation for a multiplexed stream from a user,
wherein the extracting means further includes:
entry information extracting means for receiving the indication from the control means and extracting the set of entry information from the multiplexed stream; and
entry information storing means for storing the set of entry information extracted by the entry information extracting means,
wherein the control means gives the obtaining means an indication of the first identification information and second identification information included in the entry information as the specified identification information.

34. The reception apparatus of Claim 32,

wherein the link information includes an identifier of a set of video data and an identifier of a set of control information which show a content of a link destination,
wherein the first identification information and second identification information are IDs (identifiers) of digital data streams which represent a set of video data and a set of control information in the multiplexed stream,
wherein a correspondence table, showing correspondence between the identifiers for sets of video data and the first identification information and correspondence between the identifiers for sets of control information and the second identification information, is multiplexed into the multiplexed stream and repeatedly transmitted, and
wherein the extracting means extracts the correspondence table and the control means refers to the correspondence table, converts an identifier of the set of video data included in the link information into first identification information and an identifier of the set of control information into second identification information and informs the extracting means of the converted first and second identification information.

35. The reception apparatus of Claim 32,

wherein at least one set of control information includes link information showing a content of a link destination and supplementary images that include a menu item image for each link destination,
wherein the reproducing means includes:
video data reproducing means for reproducing the set of video data obtained by the obtaining means; and
image reproducing means for reproducing supplementary images stored by the storing means superimposed onto the video data,
wherein the operation means receives a user selection of a menu item image, and
wherein the control means determines the first identification information and the second identification information of a link destination content in accordance with the link information and the menu item image selected by the user.

36. The reception apparatus of Claim 35,

wherein at least one set of control information includes additional information which expresses one of a text image and a graphics image, and wherein the reproducing means additionally reproduces one of the text image and graphics image stored in the storing means superimposed onto the video data.

37. The reception apparatus of Claim 36,

wherein one content has a plurality of sets of control information which each have a different valid period,
wherein each set of control information in a same content has a version number which reflects a valid period of the set of control information, and
wherein when the extracting means has extracted a set of control information, the control means controls the extracting means to extract a set of control information that has a next version number.

38. The reception apparatus of Claim 36,

wherein each set of control information includes valid period information showing a valid period of the set of control information,
wherein each content has a plurality of sets of control information which have different valid periods,
and wherein the reproducing means reproduces supplementary images stored in the storing means only during a valid period of the set of control information stored in the storing means.

39. The reception apparatus of Claim 38,

wherein each of the plurality of sets of control information for a same content has a version number that reflects the valid period, and wherein the control means controls the extracting means to extract a set of control information which has a next version number, when one set of control information has been extracted by the extracting means.

40. The reception apparatus of Claim 36,

wherein at least one set of control information includes a plurality of sets of additional information which each express one of a text image and a graphics image to be displayed superimposed onto the video data, and a set of script information that validates one of the sets of additional information within a reception apparatus, in accordance with a user operation,
wherein the control means determines a valid set of additional information by interpreting and executing the script information stored in the storing means, and
wherein the reproducing means reproduces one of the text image and the graphics image included in the valid set of additional information based on a result of interpreting and executing by the control means.

41. The reception apparatus of Claim 36,

wherein at least one set of control information includes: at least two groups that each include a set of link information and a supplementary image; a set of initial information showing a valid group at a start of reproduction by the reception apparatus of a content to which the set of control information belongs; and a set of script information which changes a setting of a valid group in the reception apparatus in accordance with a user operation,
wherein the control means determines a valid group by interpreting and executing the initial information and script information stored in the storing means,
wherein the reproducing means reproduces the supplementary images in the valid group in accordance with an interpreting and executing result of the control means.

42. The reception apparatus of Claim 29,

wherein the multiplexed stream includes sets of audio data corresponding to the sets of video data,
wherein the extracting means extracts a set of audio data corresponding to a set of video data from the broadcast wave,
and wherein the reproducing means additionally reproduces the extracted set of audio data.

43. A reception apparatus for receiving a broadcast wave including an interactive program composed of a plurality of contents that are linked to one another,

wherein the broadcast wave includes a multiplexed stream into which different sets of video data have been multiplexed with a plurality of sets of control information showing a link to another content, the sets of control

information being repeatedly multiplexed,
wherein first identification information is appended to each set of video data and second identification information is appended to each set of control information,
wherein the sets of control information include first identification information and second identification information which express a content of a link destination,
the reception apparatus comprising:
extracting means for extracting a set of video data and a set of control information in a same content as the set of video data;
storing means for storing the extracted set of control information;
reproducing means for reproducing the extracted set of video data and outputting an image signal;
operation means for receiving a user operation that indicates a content switching; and
control means for controlling the extracting means to extract another content indicated by the set of control information stored in the storing means, in accordance with the user operation,
the extracting means including:
first judging means for judging the first identification information appended to sets of video data in the broadcast wave;
second judging means for judging the second identification information appended to sets of control information in the broadcast wave; and
obtaining means for obtaining a set of video data and when the first judging means judges that the first identification information coincides with specified identification information indicated by the control means and obtaining a set of control information when the second judging means judges that the second identification information coincides with specified identification information,
wherein the reproducing means reproduces the set of video data obtained by the obtaining means, and the storing means stores the set of control information obtained by the obtaining means.

44. The reception apparatus of Claim 43,

wherein the link information includes an identifier of a set of video data and an identifier of a set of control information which show a content of a link destination,
wherein the second identification information is an identifier for a set of control information,
wherein a correspondence table, showing correspondence between the identifiers for sets of video data and the first identification information and correspondence between the identifiers for sets of control information and the second identification information, is multiplexed into the multiplexed stream and transmitted,
wherein the extracting means extracts the correspondence table, and
wherein the control means refers to the extracted correspondence table, converts the identifier of the set of video data included in the link information into first identification information, and informs the extracting means.

45. The reception apparatus of Claim 44, wherein the first identification information includes a packet identifier in accordance with MPEG2 (Moving Pictures Experts Group 2) standard.

46. The reception apparatus of Claim 44, wherein the first identification information is a combination of a packet identifier in accordance with MPEG2 (Moving Pictures Experts Group 2) standard and another parameter.

47. A reception apparatus in a broadcasting system for achieving interactiveness using a broadcast wave,

wherein the broadcast wave includes a first multiplexed stream which represents a plurality of stream-based contents that each include a set of video data and a set of type 1 control information, and a second multiplexed stream which represents a plurality of page-based contents that each include a set of still image data and a set of type 2 control information,
the first multiplexed stream having the sets of type 1 control information that show a link to another content repeatedly multiplexed with the corresponding sets of video data,
the second multiplexed stream having a plurality of sets of still image data and a plurality of sets of type 2 control information repeatedly multiplexed,
the reception apparatus comprising:
extracting means for extracting one of a set of video data and a set of still image data, and one of a set of type 1 control information and a set of type 2 control information in a same content from the broadcast wave;
storing means for storing an extracted set of one of type 1 control information and type 2 control information;
judging means for judging whether a content extracted by the extracting means is one of a stream-based

content and a page-based content;
reproducing means for reproducing, when the judging means judges that the judging means is a stream-based content, the extracted set of video data and outputting an image signal, and for reproducing, when the judging means judges that the judging means is a page-based content, the extracted set of still image data and outputting an image signal;
operation means for receiving a user operation that indicates a content switching; and
control means for controlling the extracting means to extract another content indicated by the set of control information stored in the storing means, in accordance with the user operation.

48. A broadcasting system which includes a broadcasting apparatus and a reception apparatus and which achieves interactiveness using a brbadcast wave,

the broadcasting apparatus comprising:
content storing means for storing the plurality of contents, each content including a set of video data and a set of control information that indicates another content that is a link destination for a present content; and
transmitting means for multiplexing a set of video data and a plurality of sets of the same control information included in a same content as the set of video data, and for transmitting the multiplexed sets of video data and control information,
and the reception apparatus comprising:
extracting means for extracting a set of video data and a set of control information in a same content as the set of video data;
storing means for storing the extracted set of control information;
reproducing means for reproducing the extracted set of video data and outputting an image signal;
operation means for receiving a user operation that indicates a content switching; and
control means for controlling the extracting means to extract another content indicated by the set of control information stored in the storing means, in accordance with the user operation.

49. A recording medium used by a reception apparatus that includes a receiving unit for receiving a broadcast wave including an interactive program composed of a plurality of contents that are linked to one another, an extracting unit for extracting one digital data stream from the broadcast wave, and a reproducing unit for reproducing a set of video data and outputting an image signal, the recording medium storing a program that includes the following steps:

an extracting step for extracting a set of video data and a set of control information in a same content as the set of video data from the broadcast wave;
a storing step for storing the extracted set of control information into a memory in the reception apparatus;
a reproducing step for reproducing the extracted set of video data and outputting an image signal;
a judging step for judging whether a user operation indicating a switching of content has been made; and
a control step for controlling the extracting unit to extract another content indicated by the set of control information stored in the memory, when the judging step judges that a user operation indicating a switching of content has been made.

Fig. 1

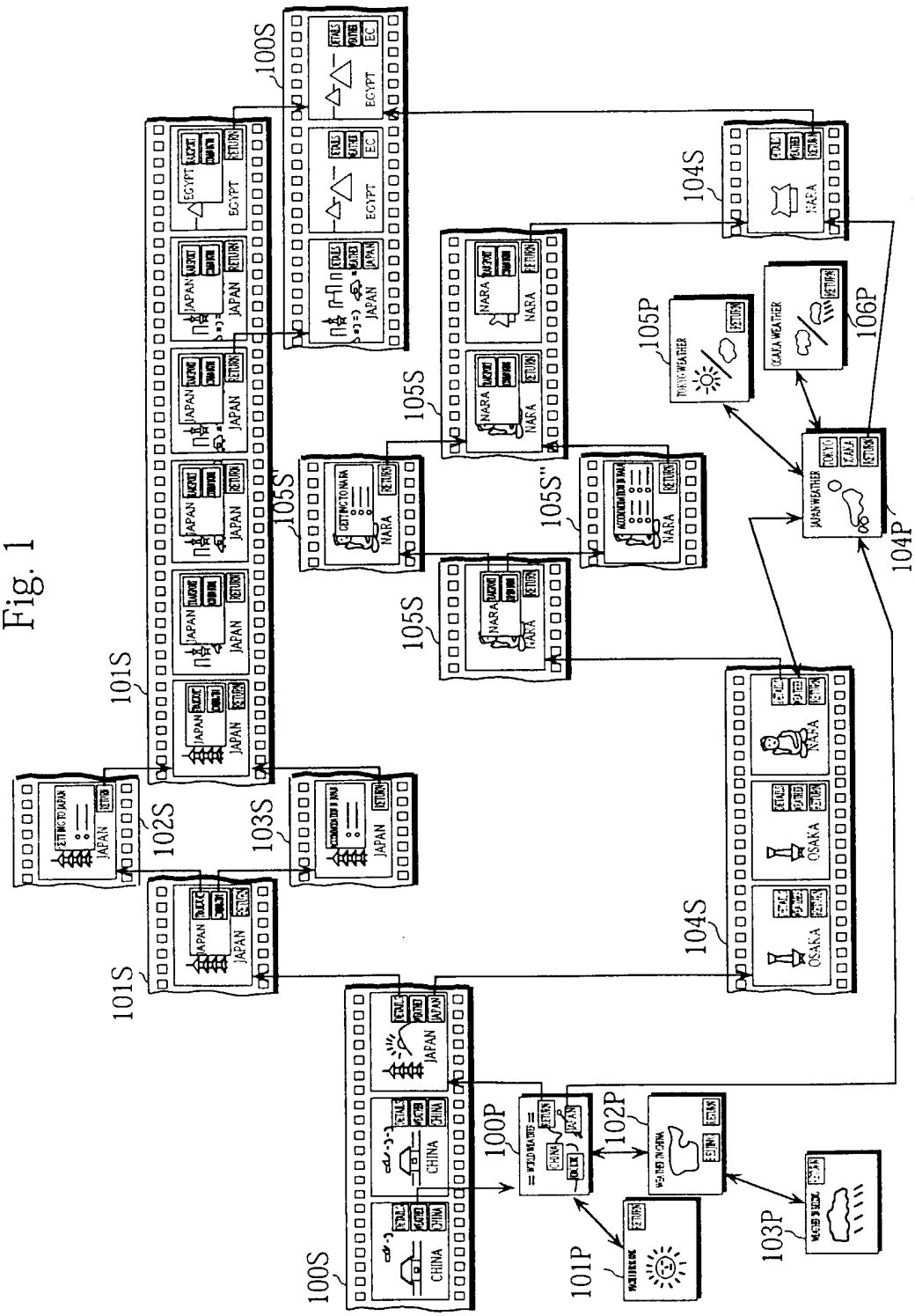


Fig. 2

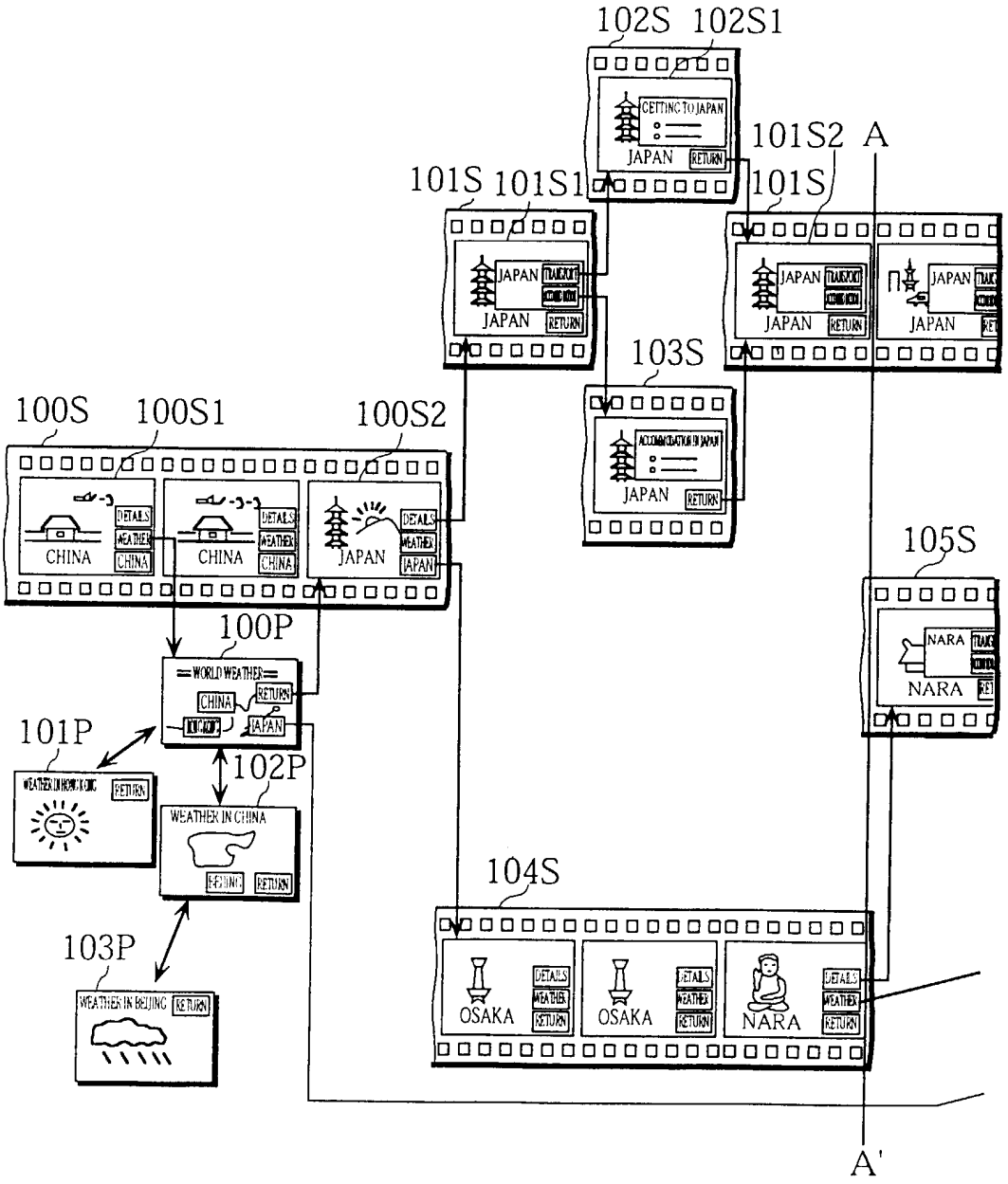


Fig. 3

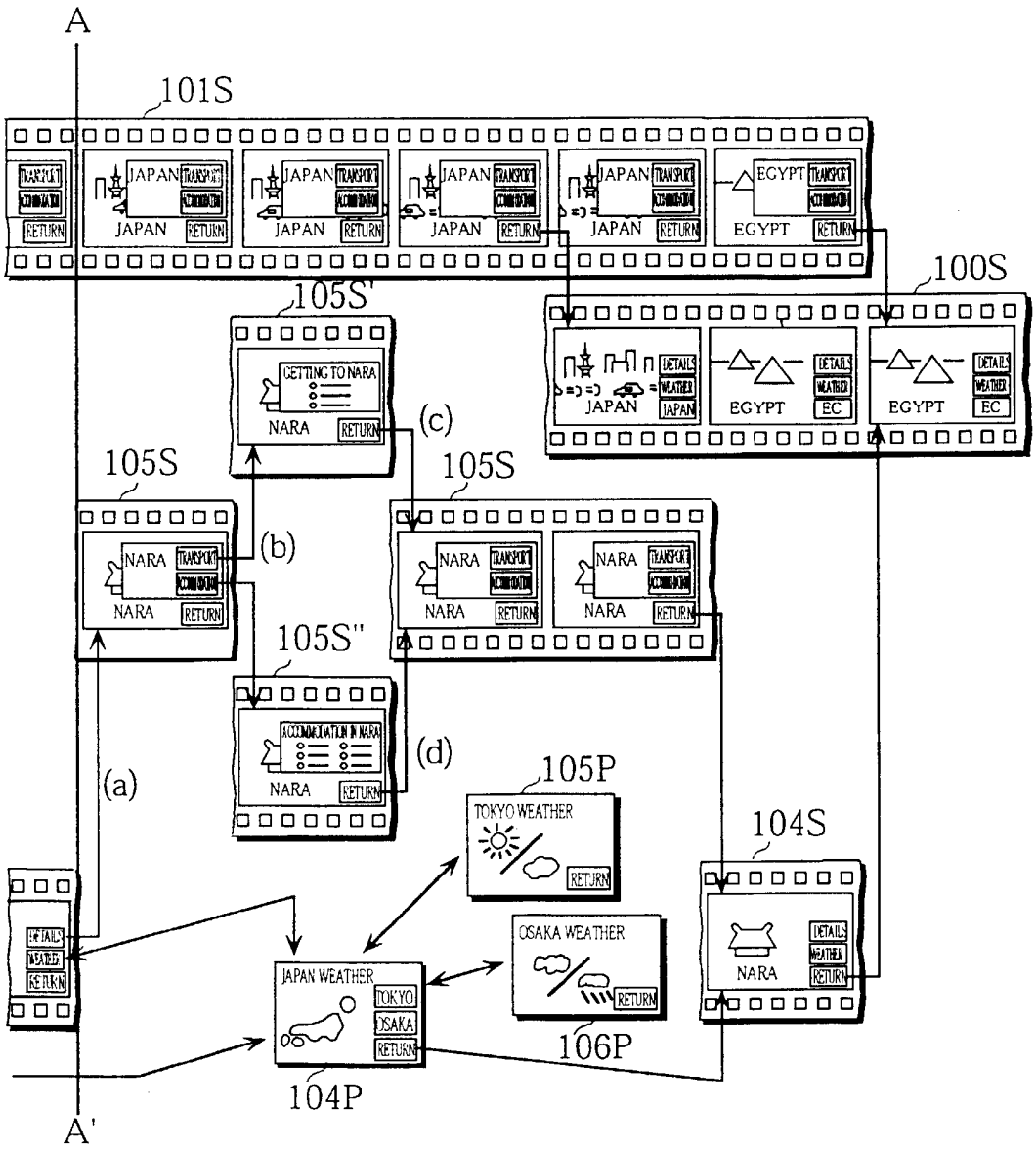


Fig. 4

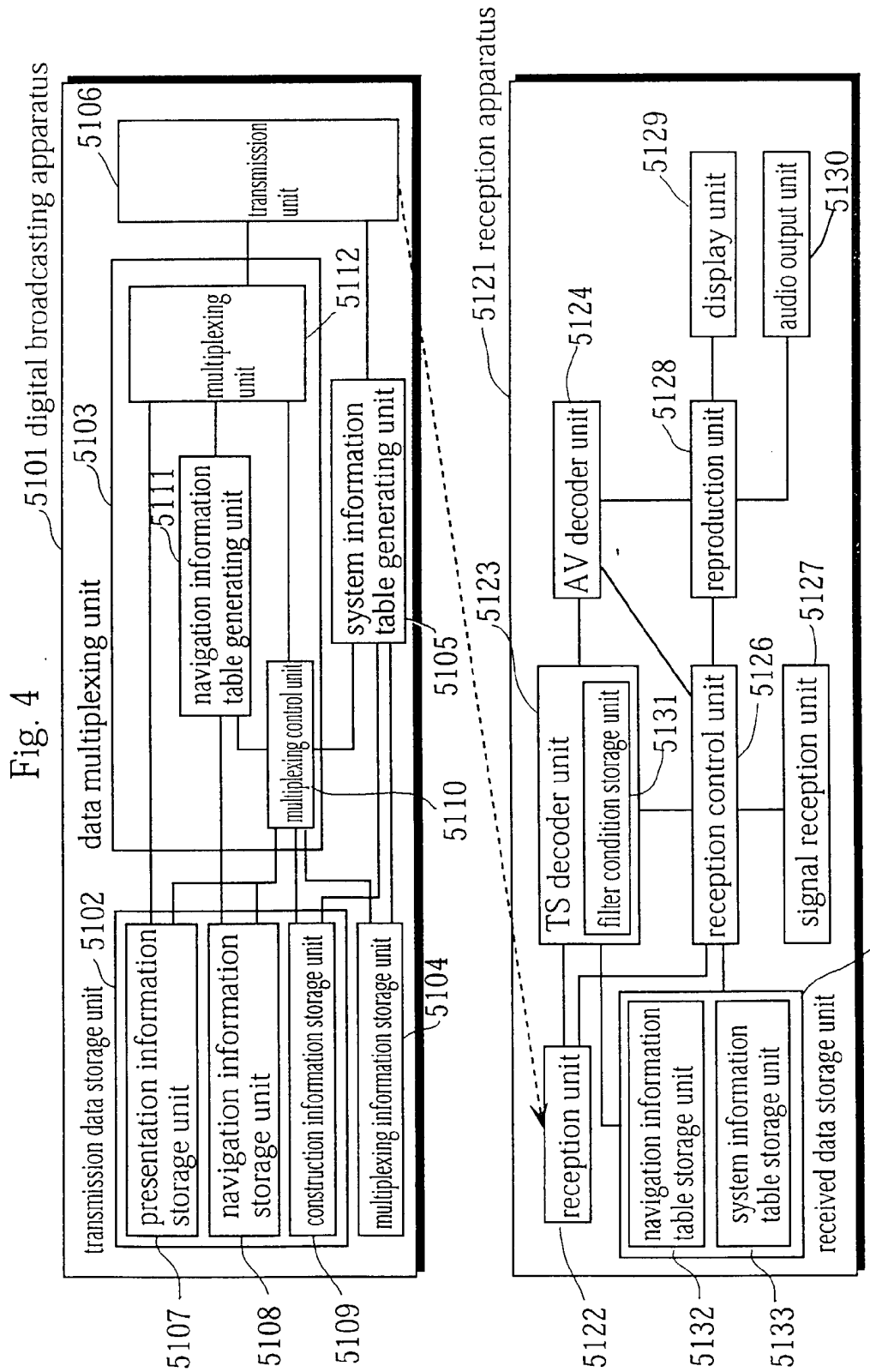


Fig. 5

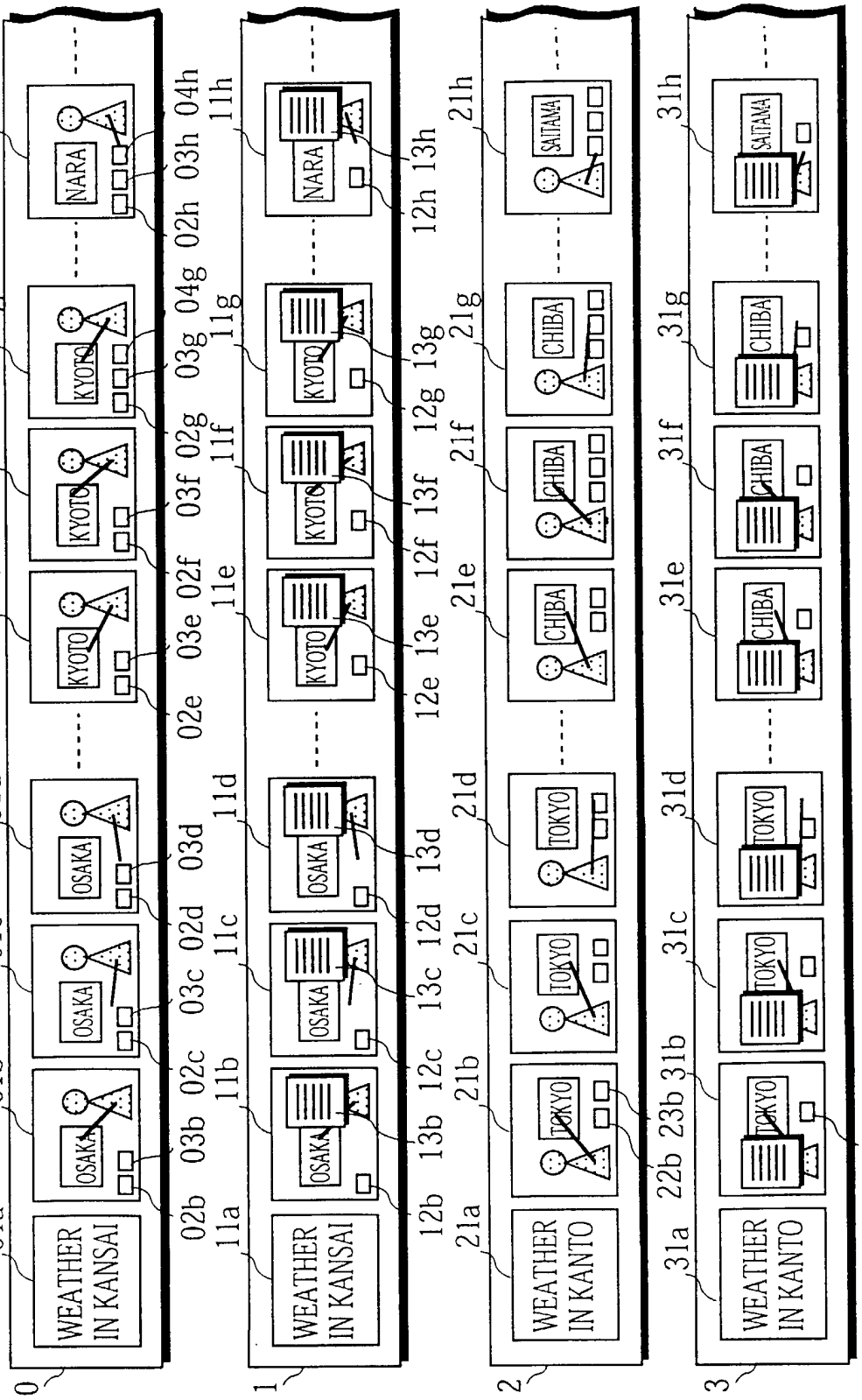


Fig. 6A

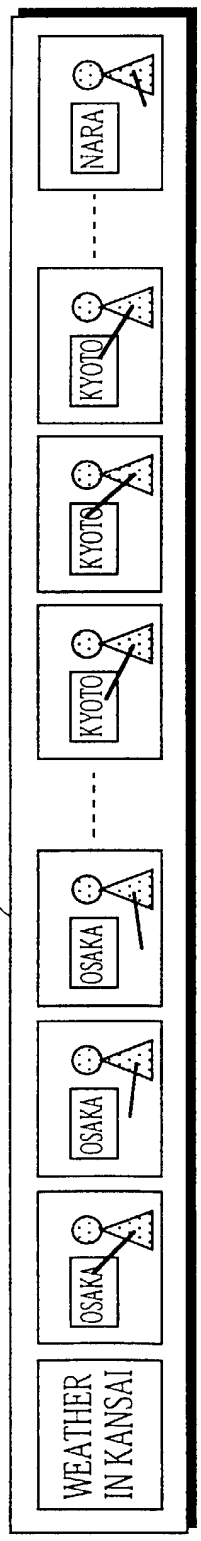


Fig. 6B

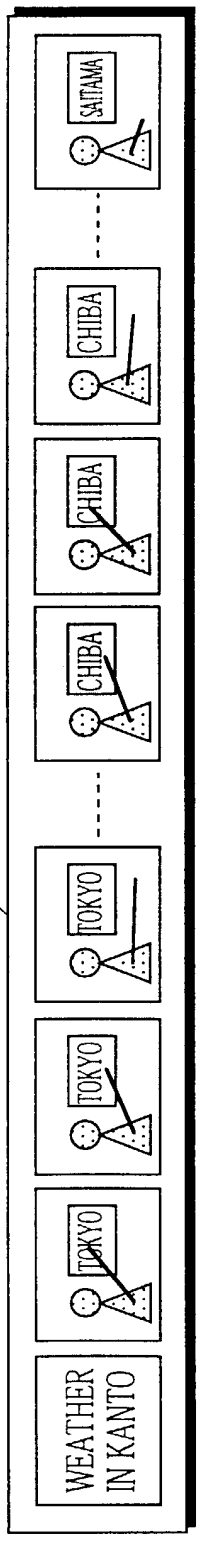


Fig. 6C

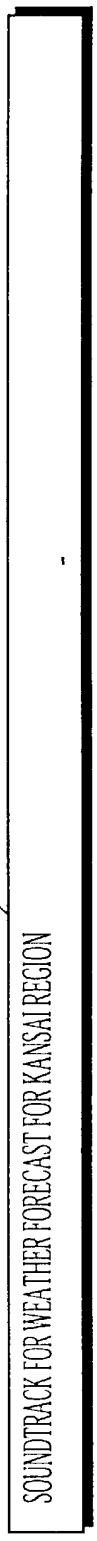


Fig. 6D

Fig. 7

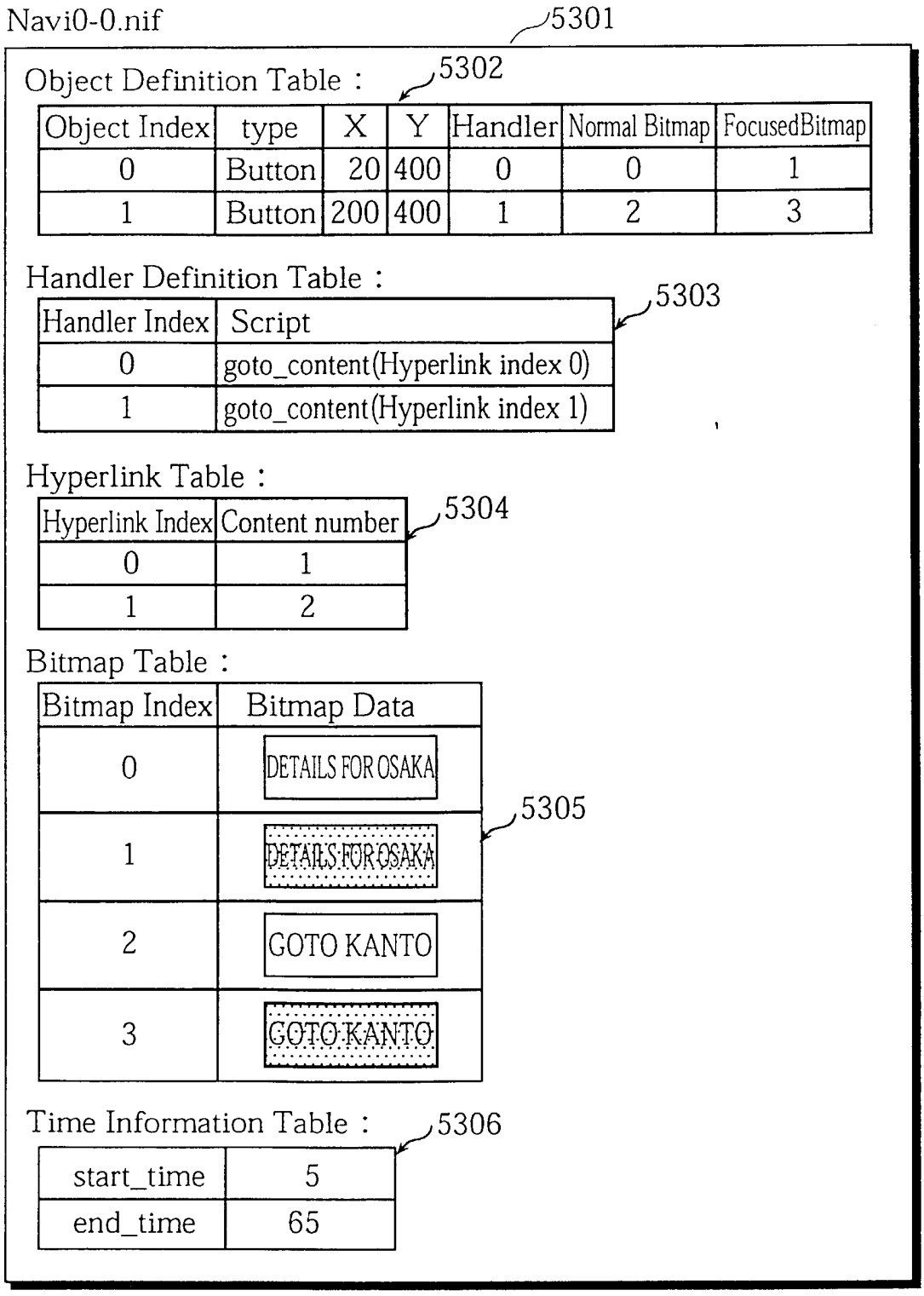


Fig. 8

Navi1-0.nif

5401

Object Definition Table :

5402

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	20	400	0	0	1
1	Picture	300	20	—	2	—

Handler Definition Table :

5403

Handler Index	Script
0	goto_entry

Bitmap Table :

5404

Bitmap Index	Bitmap Data
0	MENU
1	MENU
2	WEATHER IN OSAKA MAX.TEMPERATURE 10℃ MIN.TEMPERATURE 3℃ HUMIDITY 60% PROBABILITY OF RAIN TODAY 10% TOMORROW 20% DAY AFTER TOMORROW 30%

Time Information Table :

5405

start_time	5
end_time	65

Fig. 9

Navi0-1.nif 5501

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	20	400	0	0	1
1	Button	200	400	1	2	3

Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)
1	goto_content(Hyperlink index 1)

Hyperlink Table :

Hyperlink Index	Content number
0	1
1	2

Bitmap Table :

Bitmap Index	Bitmap Data
0	DETAILS FOR KYOTO
1	DETAILS FOR KYOTO
2	GOTO KANTO
3	GOTO KANTO

Time Information Table :

start_time	70
end_time	130

Fig. 10

Navi1-1.nif 5601

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	20	400	0	0	1
1	Picture	300	20	—	2	—

Handler Definition Table :

Handler Index	Script
0	goto_entry

Bitmap Table :

Bitmap Index	Bitmap Data
0	MENU
1	MENU
2	WEATHER IN KYOTO MAX.TEMPERATURE 8℃ MIN.TEMPERATURE 0℃ HUMIDITY 80% PROBABILITY OF RAIN TODAY 20% TOMORROW 15% DAY AFTER TOMORROW 0%

Time Information Table :

start_time	70
end_time	130

Fig. 11

Navi2-0.nif 5701

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	20	400	0	0	1
1	Button	200	400	1	2	3

Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)
1	goto_entry

Hyperlink Table :

Hyperlink Index	Content number
0	3

Bitmap Table :

Bitmap Index	Bitmap Data
0	DETAILS FOR TOKYO
1	DETAILS FOR TOKYO
2	GO TO KANSAI
3	GO TO KANSAI

Time Information Table :

start_time	5
end_time	65

Fig. 12

CONSTRUCTION INFORMATION TABLE 5801

CONTENT NUMBER	VIDEO DATA	AUDIO DATA	NAVIGATION INFORMATION
0	Video0.m2v	Audio0.m2a	(Navi0-0.nif,Navi0-1.nif,Navi0-2.nif,Navi0-3.nif,Navi0-4.nif)
1	Video0.m2v	Audio0.m2a	(Navi1-0.nif,Navi1-1.nif,Navi1-2.nif,Navi1-3.nif,Navi1-4.nif)
2	Video1.m2v	Audio1.m2a	(Navi2-0.nif,Navi2-1.nif,Navi2-2.nif,Navi2-3.nif,Navi2-4.nif)
3	Video1.m2v	Audio1.m2a	(Navi3-0.nif,Navi3-1.nif,Navi3-2.nif,Navi3-3.nif,Navi3-4.nif)

Fig. 13

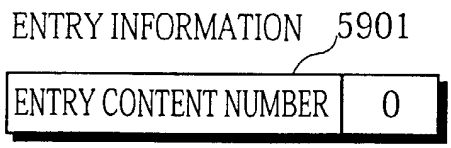


Fig. 14

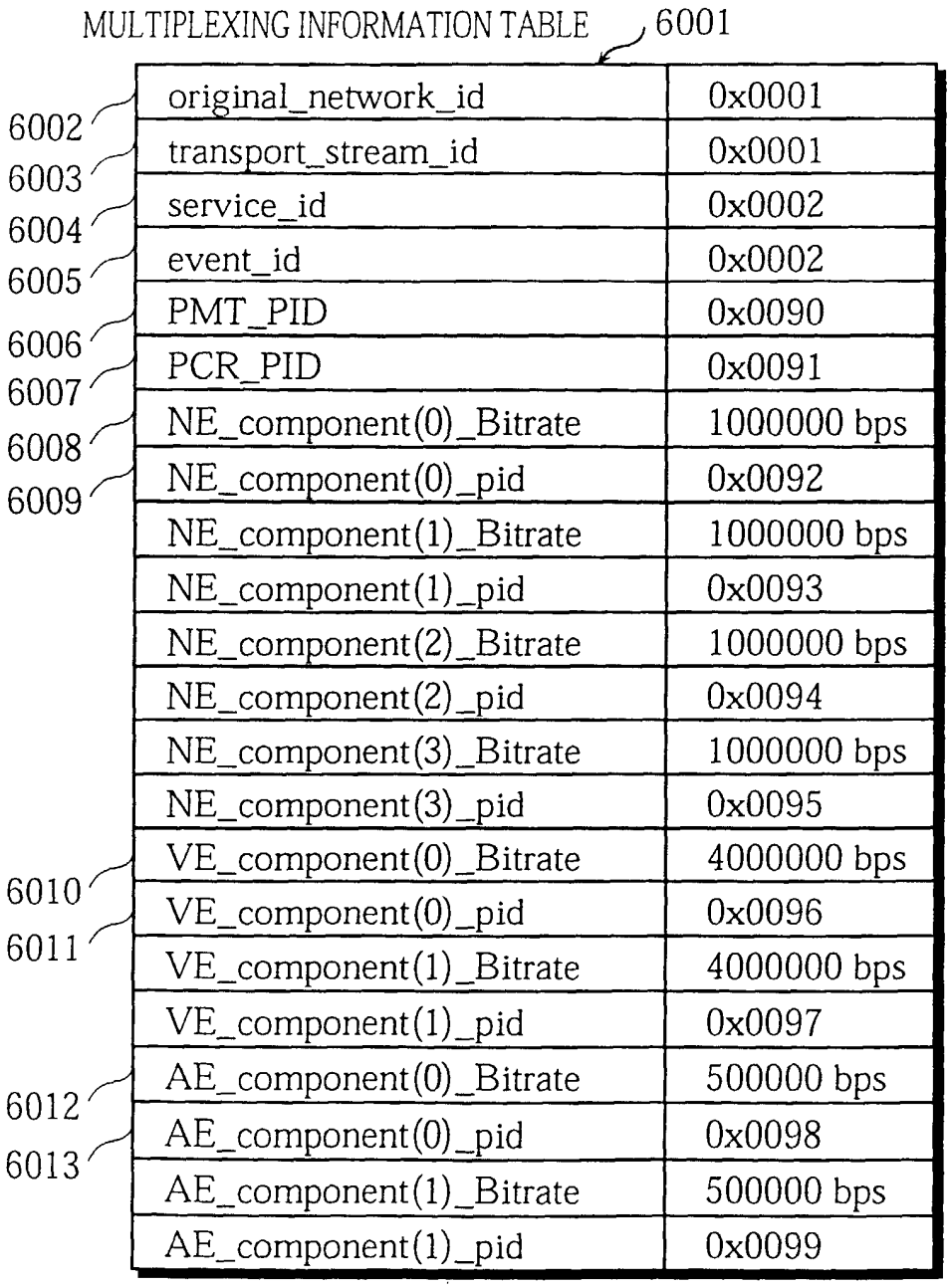
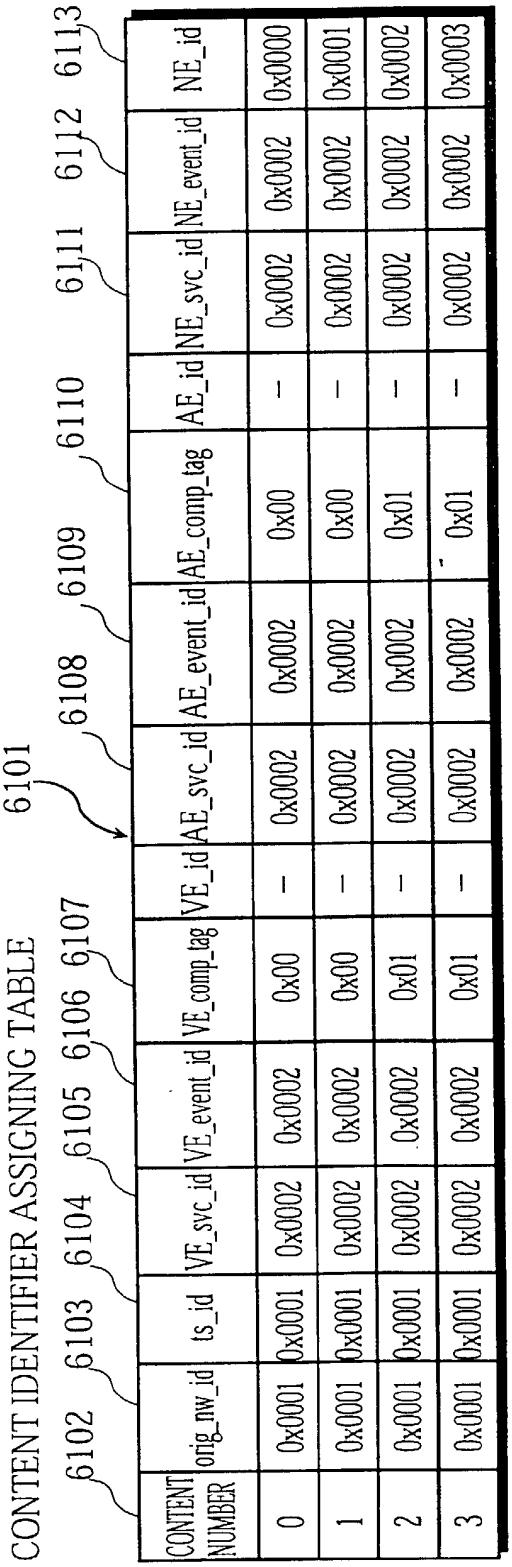


Fig. 15



CONTENT IDENTIFIER ASSIGNING TABLE

6101

CONTENT NUMBER (6102)	orig_nw_id (6103)	ts_id (6104)	VE_svc_id (6105)	VE_event_id (6106)	VE_comp_tag (6107)	VE_id	AE_svc_id (6108)	AE_event_id (6109)	AE_comp_tag (6110)	AE_id	NE_svc_id (6111)	NE_event_id (6112)	NE_id (6113)
0	0x0001	0x0001	0x0002	0x0002	0x00	—	0x0002	0x0002	0x00	—	0x0002	0x0002	0x0000
1	0x0001	0x0001	0x0002	0x0002	0x00	—	0x0002	0x0002	0x00	—	0x0002	0x0002	0x0001
2	0x0001	0x0001	0x0002	0x0002	0x01	—	0x0002	0x0002	0x01	—	0x0002	0x0002	0x0002
3	0x0001	0x0001	0x0002	0x0002	0x01	—	0x0002	0x0002	0x01	—	0x0002	0x0002	0x0003

Fig. 16

VERSION NUMBER ASSIGNING TABLE

6201

NAVIGATION INFORMATION	VERSION NUMBER
Navi0-0.nif	0x00
Navi0-1.nif	0x01
Navi0-2.nif	0x02
:	:
:	:
Navi1-0.nif	0x00
Navi1-1.nif	0x01
:	:
:	:
Navi2-0.nif	0x00
Navi2-1.nif	0x01
:	:
:	:

Fig. 17

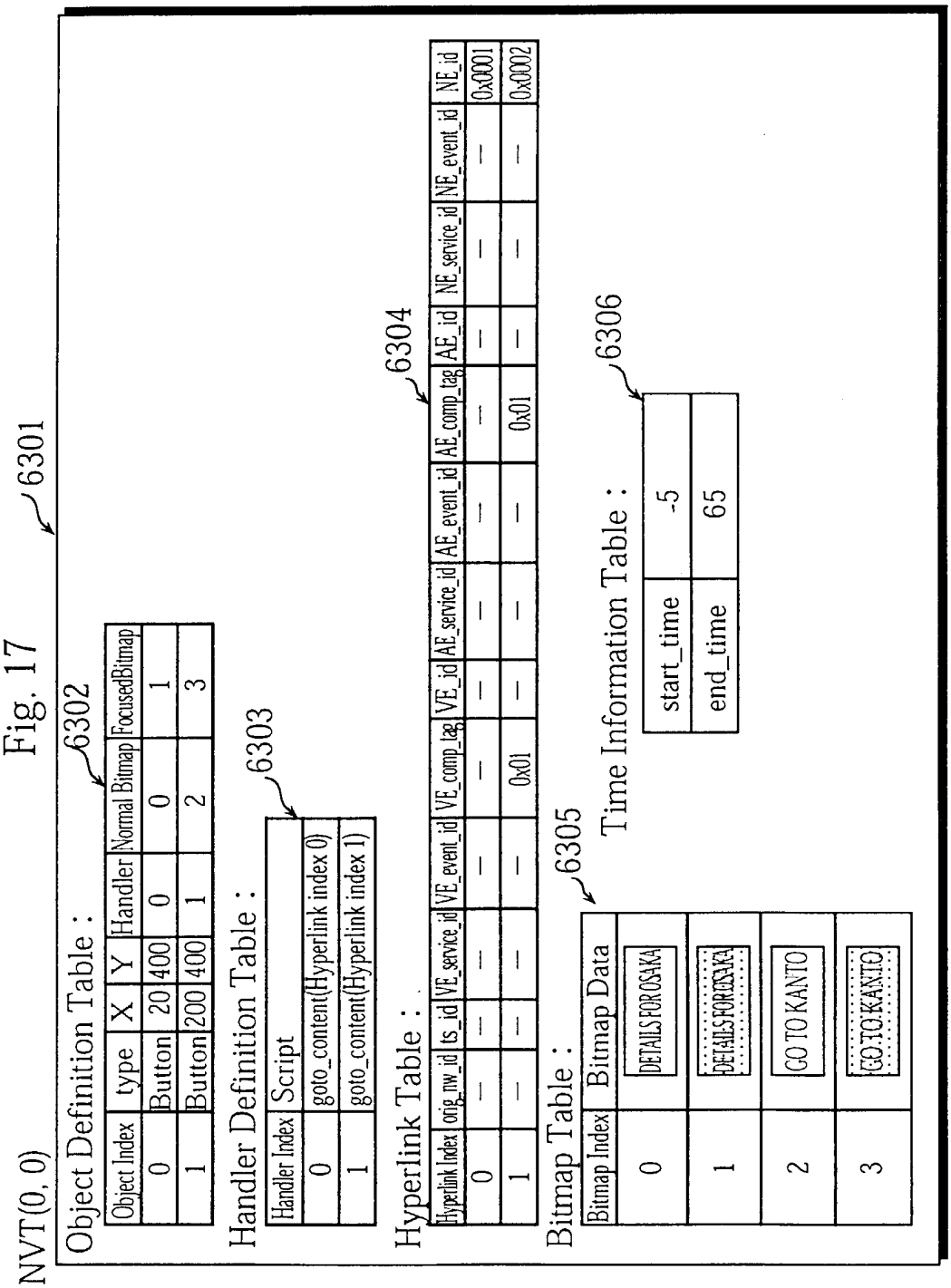


Fig. 18

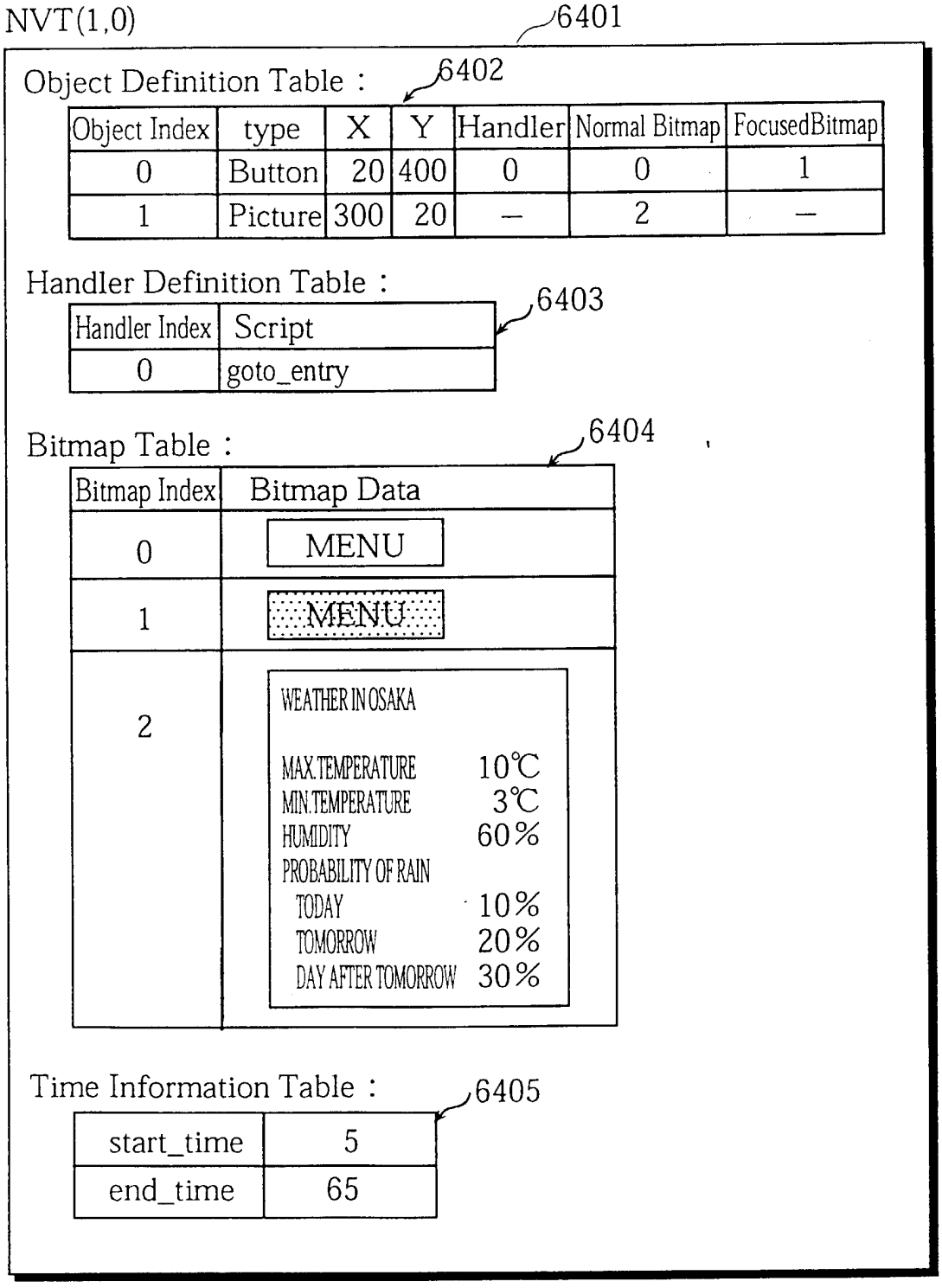


Fig. 19

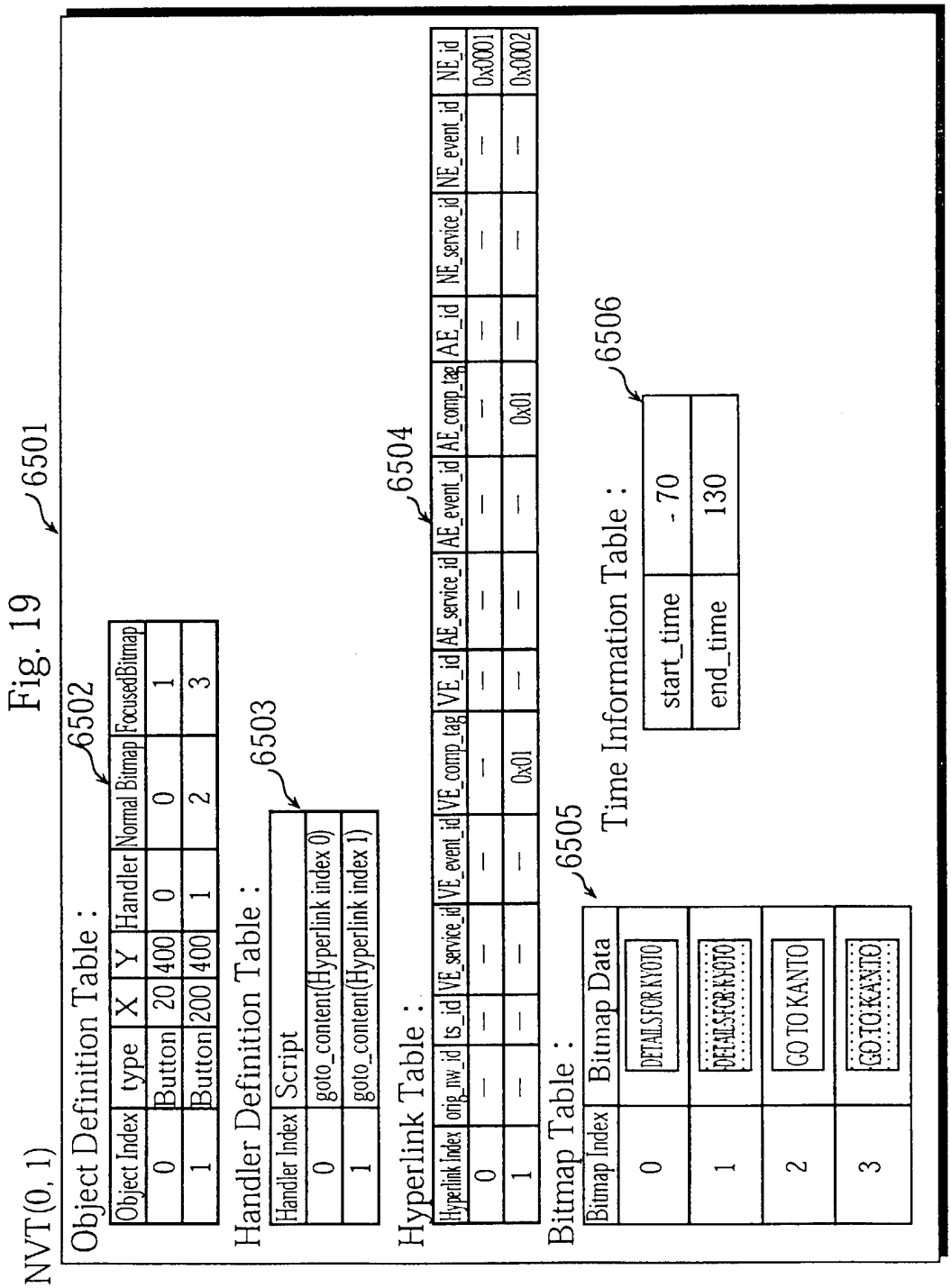


Fig. 20

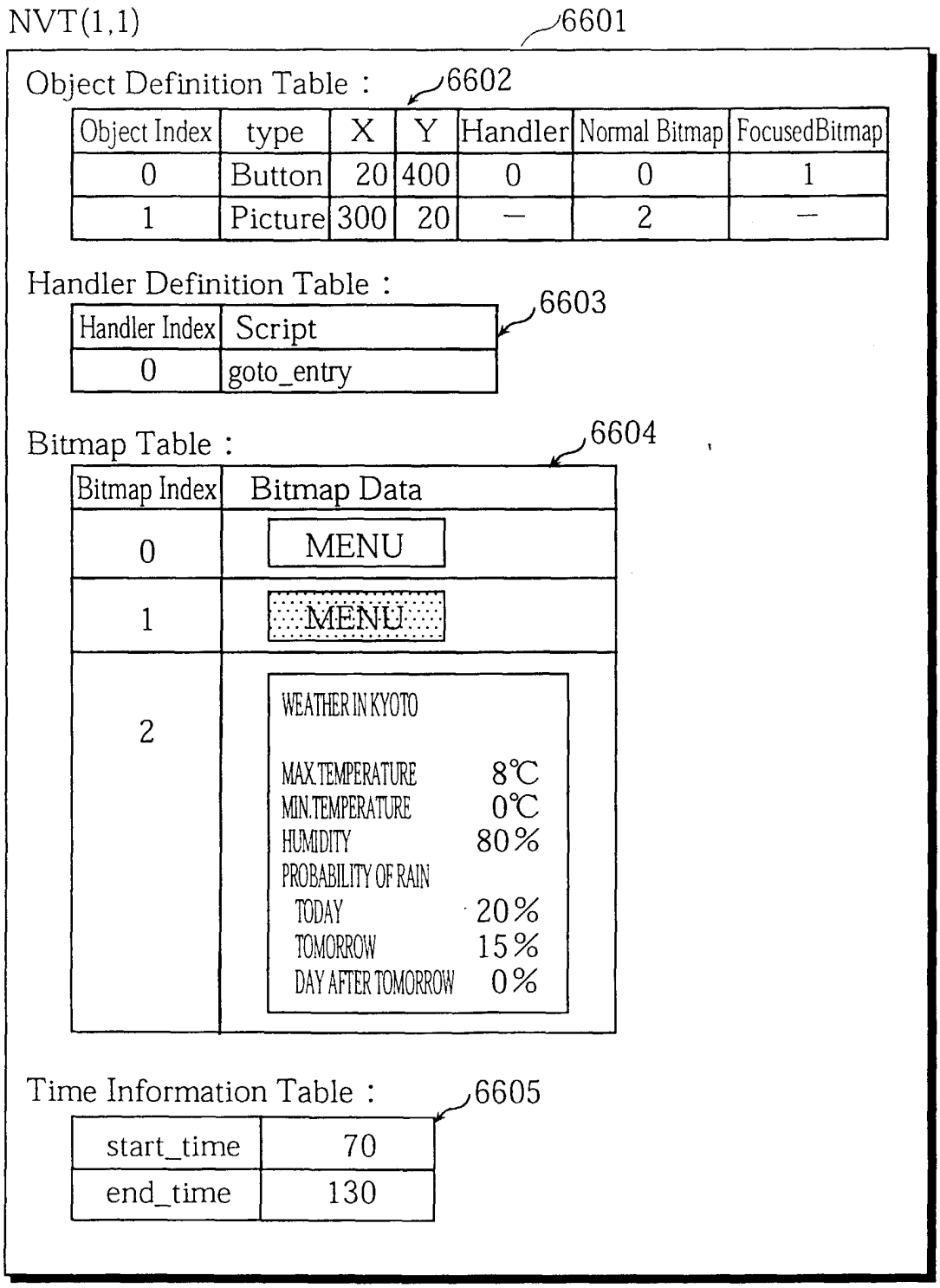


Fig. 21

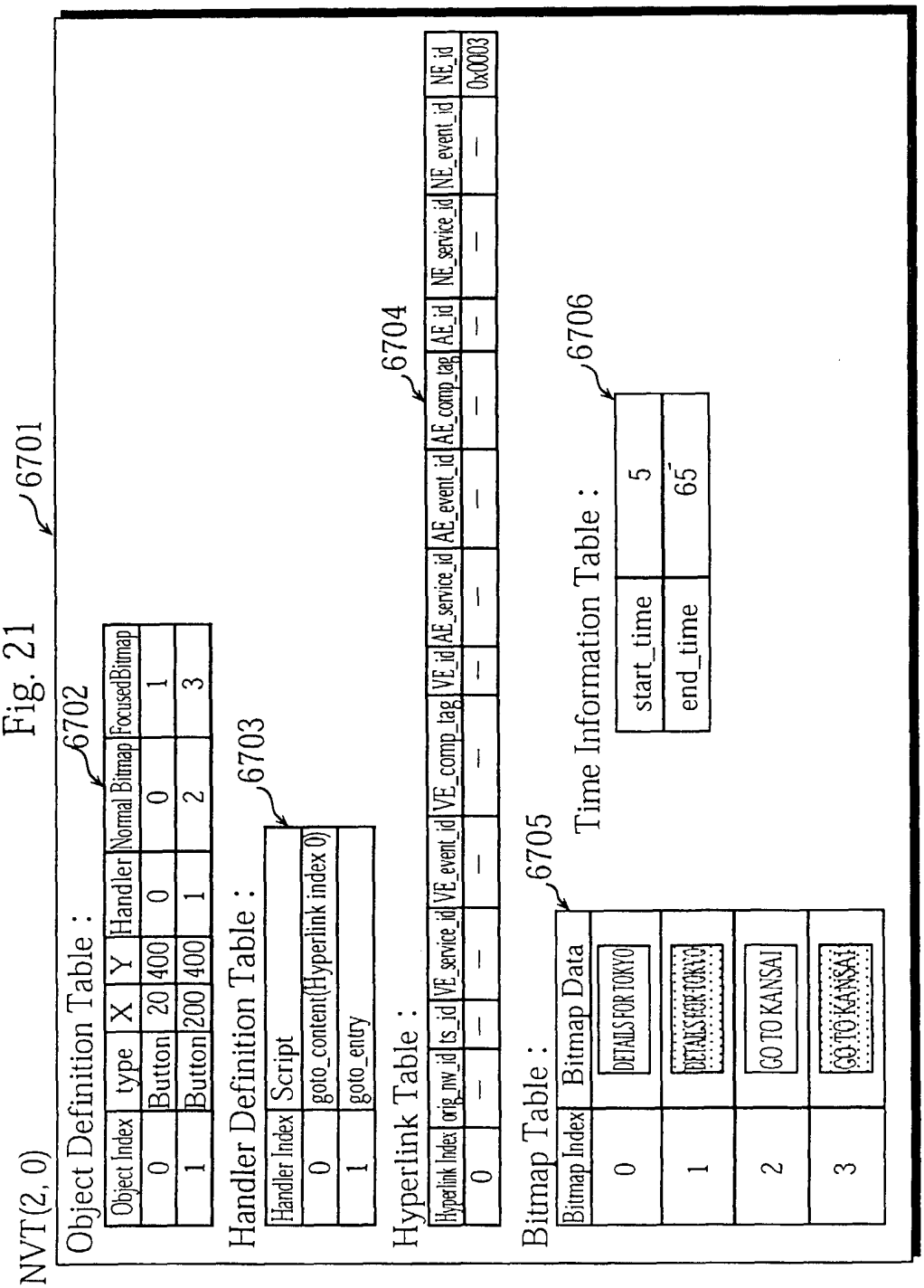


Fig. 22A

Network Information Table 6801

table_id=0x40
:
network_id=0x0001
:

original_network_id	transport_stream_id	descriptor
: :	: :	: :
0x0001	0x0001	TRANSFER PREFACE
: :	: :	: :

Fig. 22C

Event Information Table 6803

table_id=0x4e
:
service_id=0x0002
:

event_id	descriptor
: :	: :
0x0002	EVENT NAME AND OTHER INFORMATION
: :	: :

Fig. 22B

Service Description Table 6802

table_id=0x42
:
transport_stream_id=0x0001
:

service_id	descriptor
: :	: :
0x0002	SERVICE NAME AND OTHER INFORMATION
: :	: :

Fig. 23

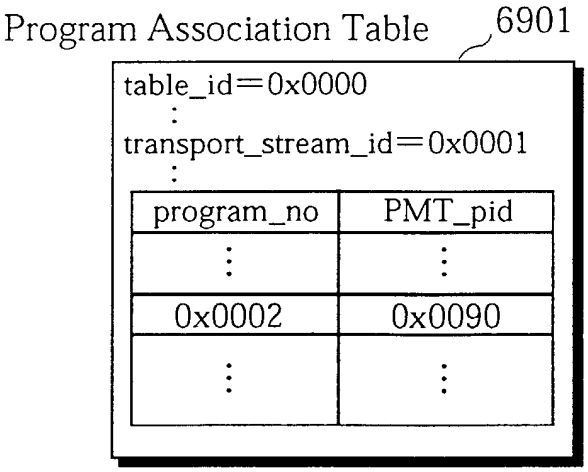
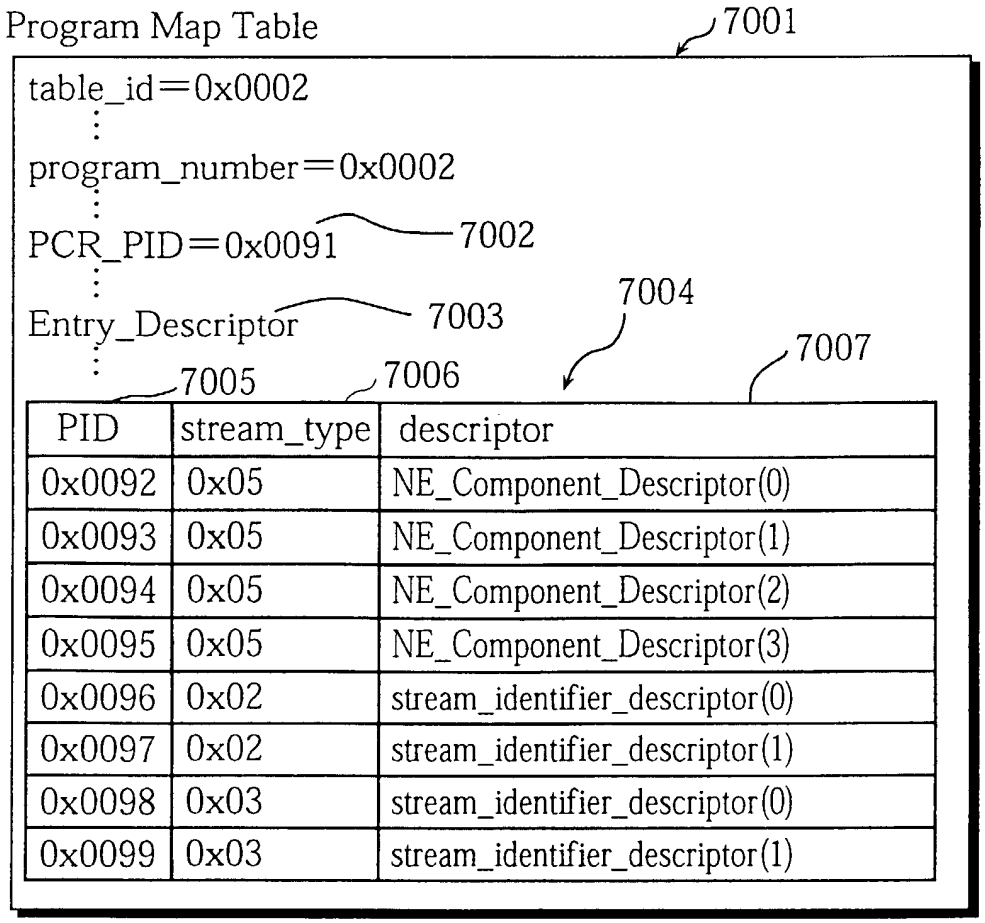


Fig. 24



PID	stream_type	descriptor
0x0092	0x05	NE_Component_Descriptor(0)
0x0093	0x05	NE_Component_Descriptor(1)
0x0094	0x05	NE_Component_Descriptor(2)
0x0095	0x05	NE_Component_Descriptor(3)
0x0096	0x02	stream_identifier_descriptor(0)
0x0097	0x02	stream_identifier_descriptor(1)
0x0098	0x03	stream_identifier_descriptor(0)
0x0099	0x03	stream_identifier_descriptor(1)

Fig. 25

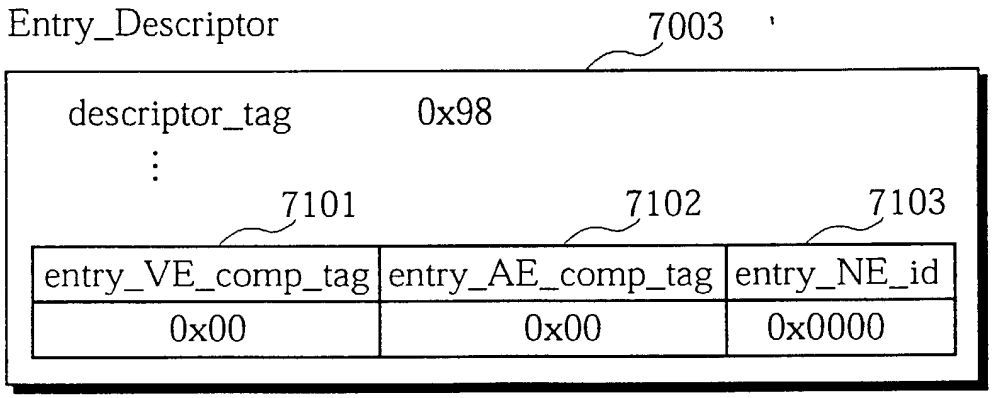


Fig. 26A

NE_Component_Descriptor(0) 7201

descriptor_tag	0x99
:	
min_NE_id	0x0000
max_NE_id	0x0000

Fig. 26B

NE_Component_Descriptor(1) 7202

descriptor_tag	0x99
:	
min_NE_id	0x0001
max_NE_id	0x0001

Fig. 26C

NE_Component_Descriptor(2) 7203

descriptor_tag	0x99
:	
min_NE_id	0x0002
max_NE_id	0x0002

Fig. 26D

NE_Component_Descriptor(3) 7204

descriptor_tag	0x99
:	
min_NE_id	0x0003
max_NE_id	0x0003

Fig. 27A

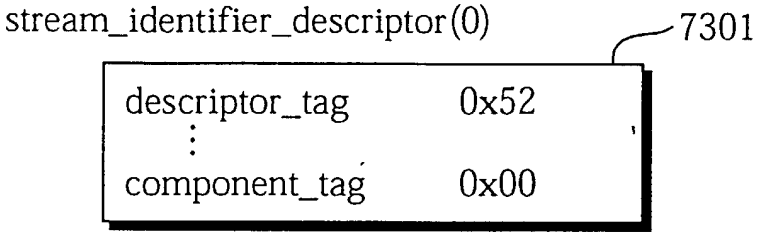


Fig. 27B

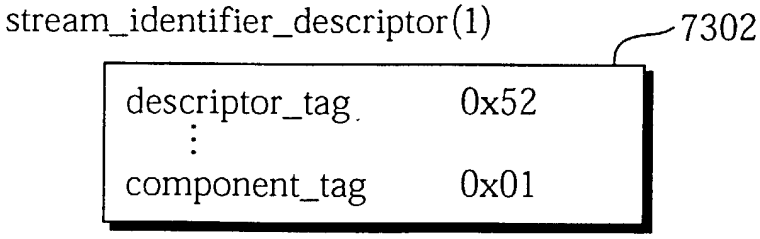


Fig. 28

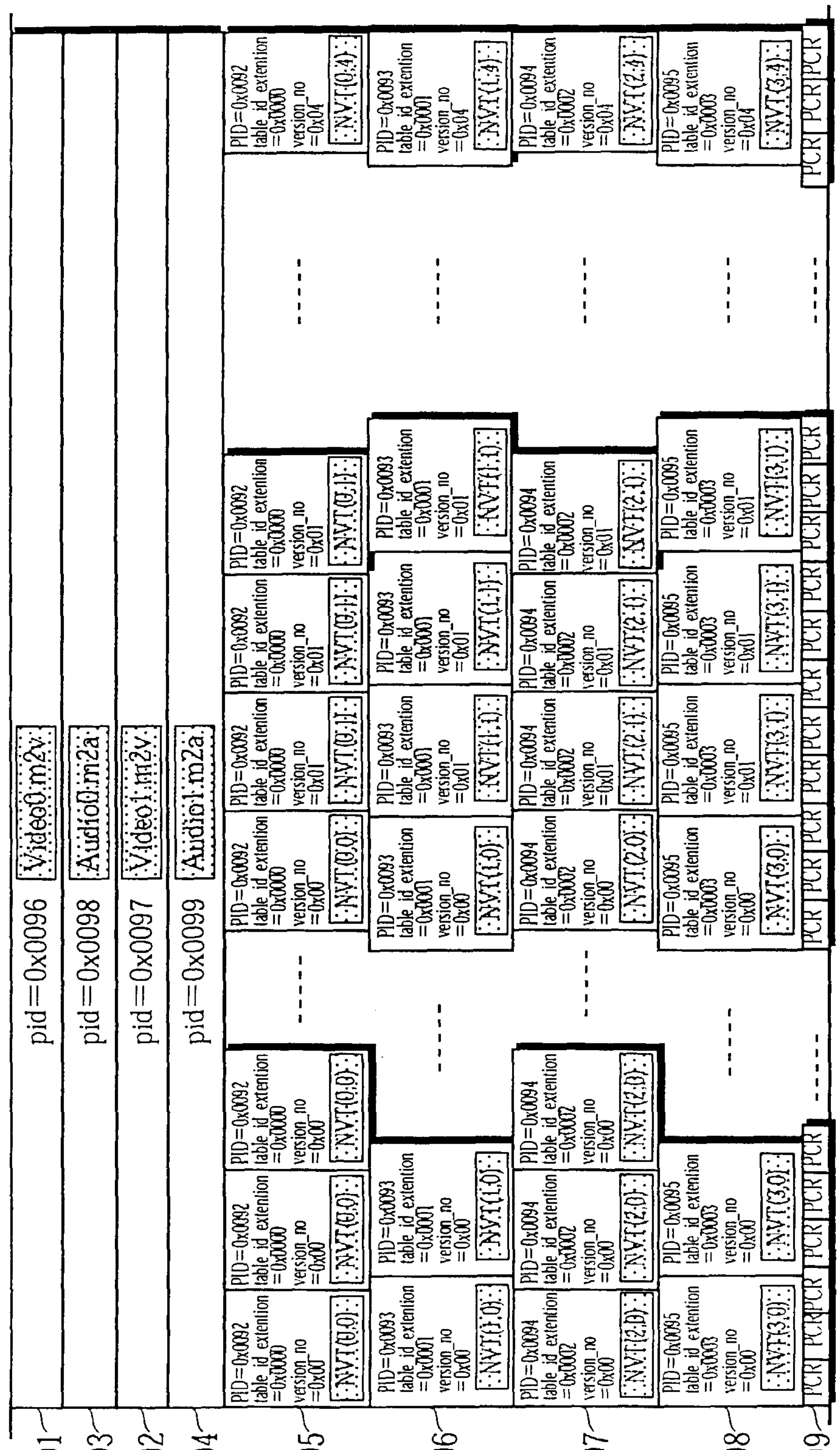


Fig. 29

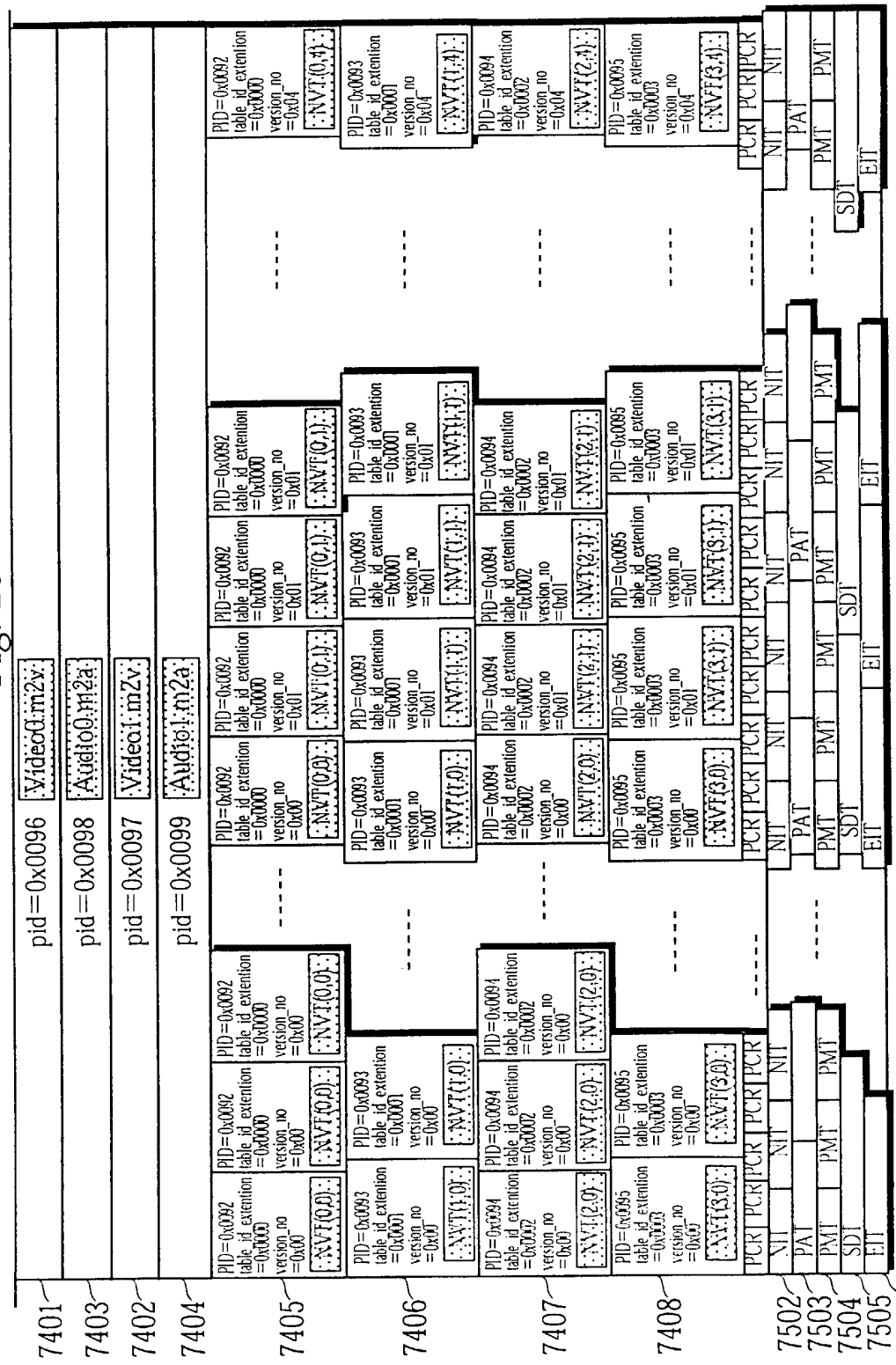


Fig. 30

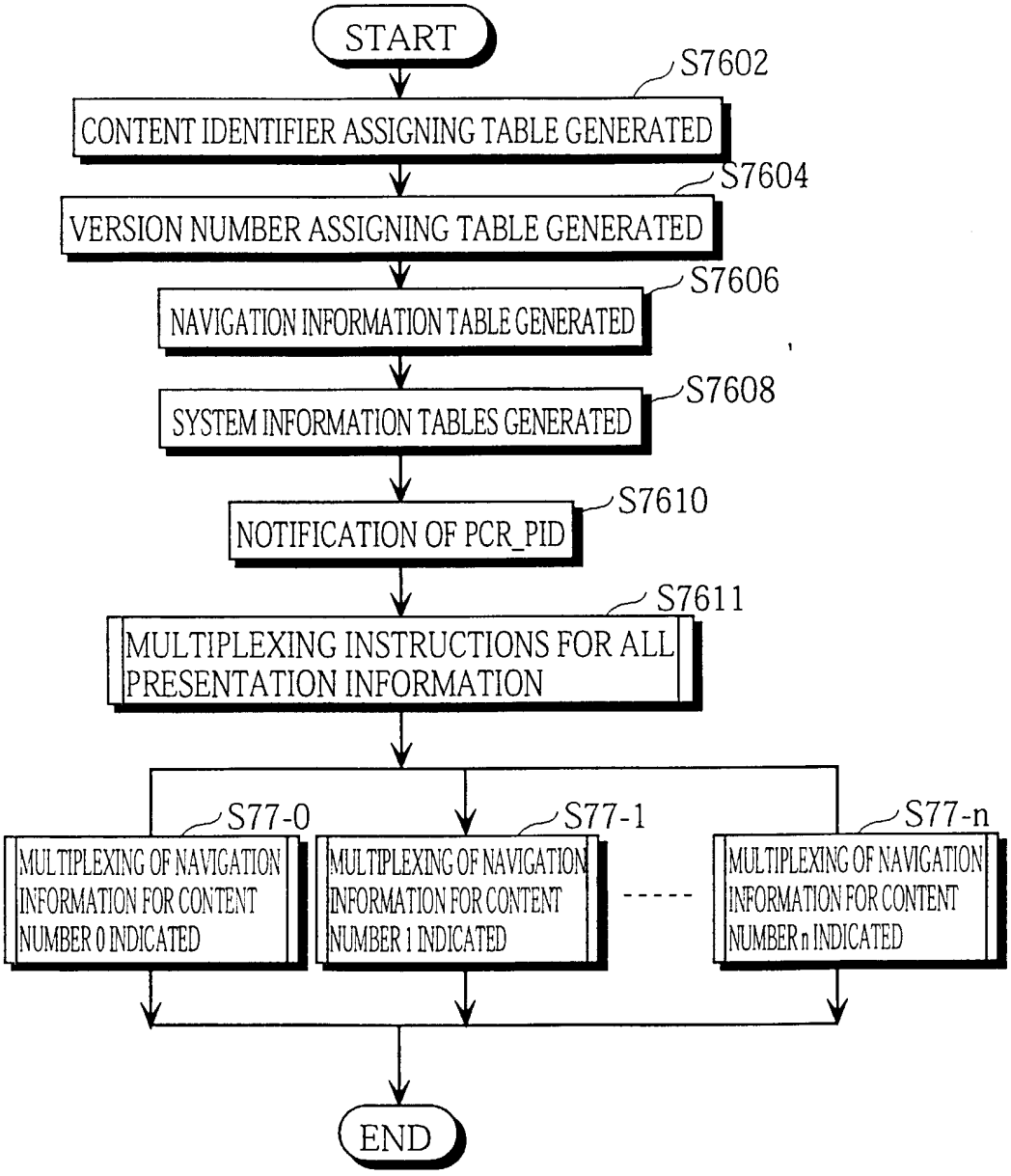


Fig. 31

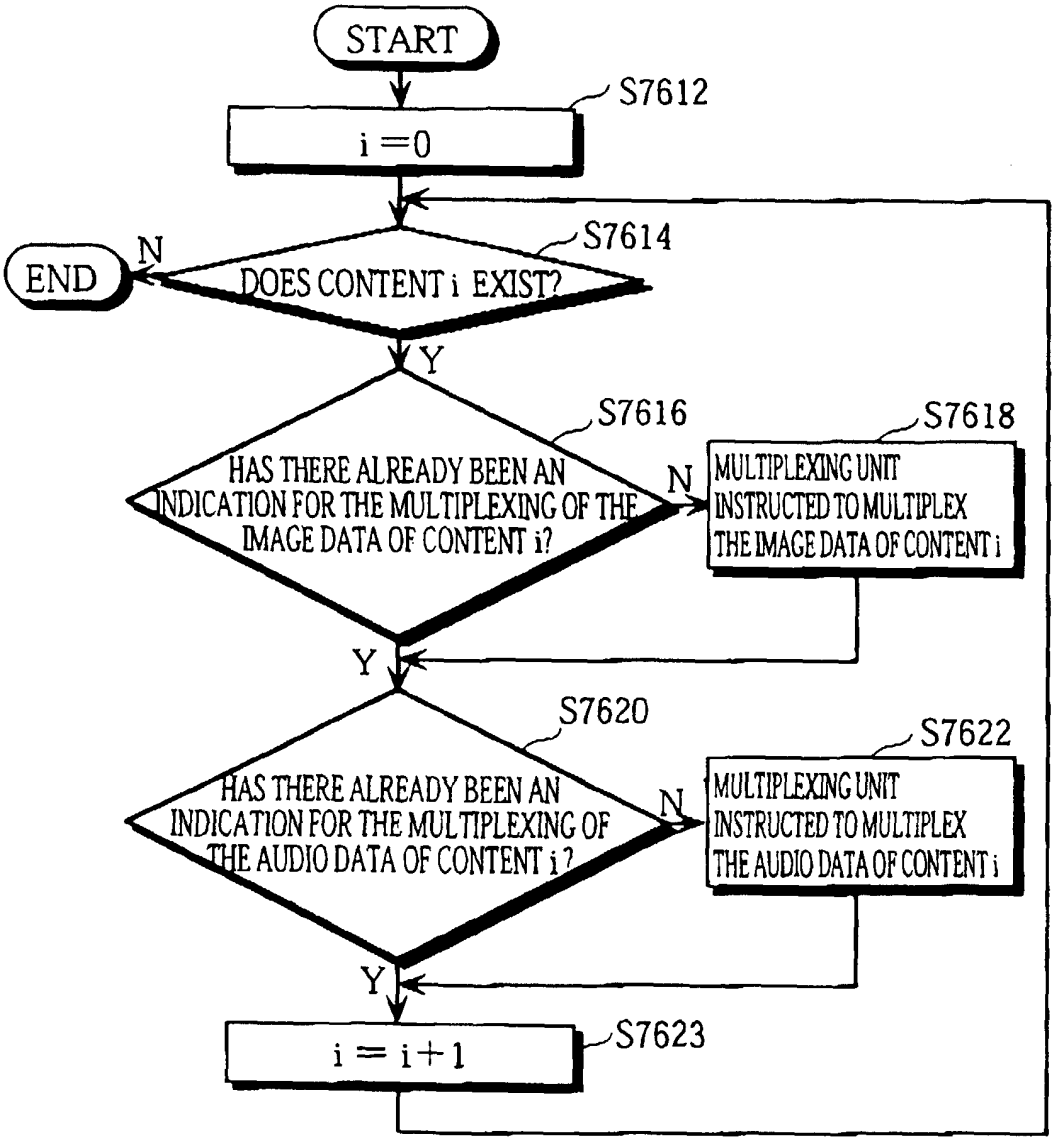


Fig. 32

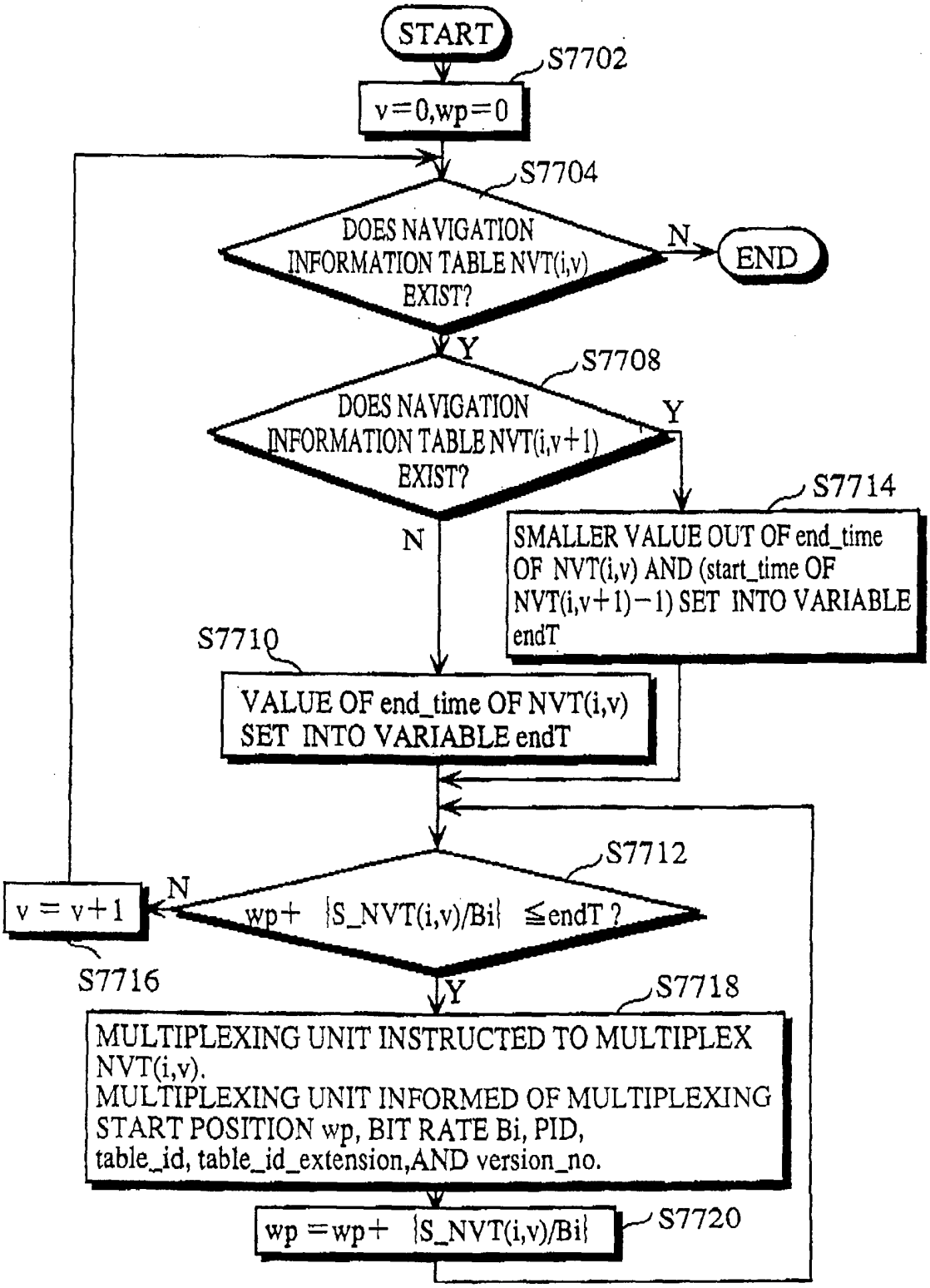
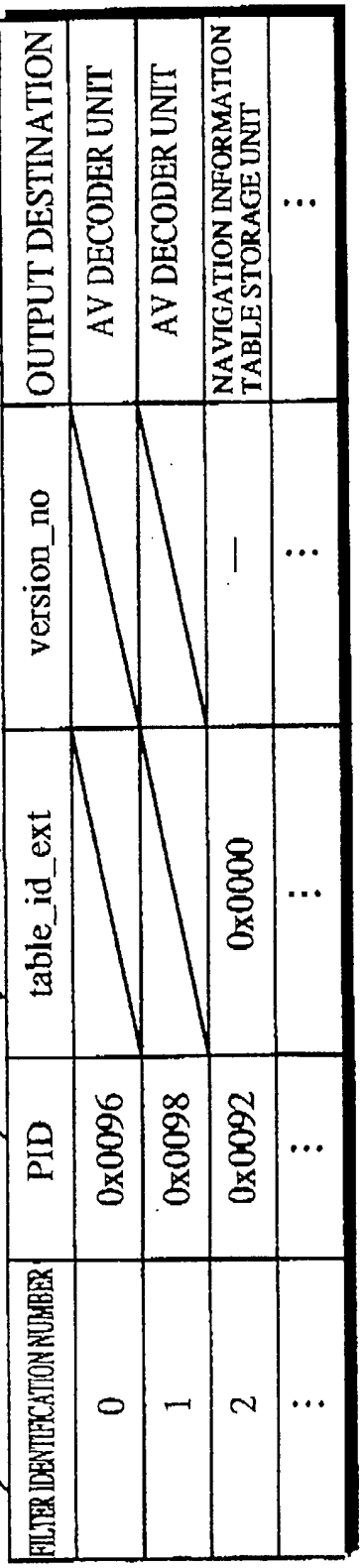
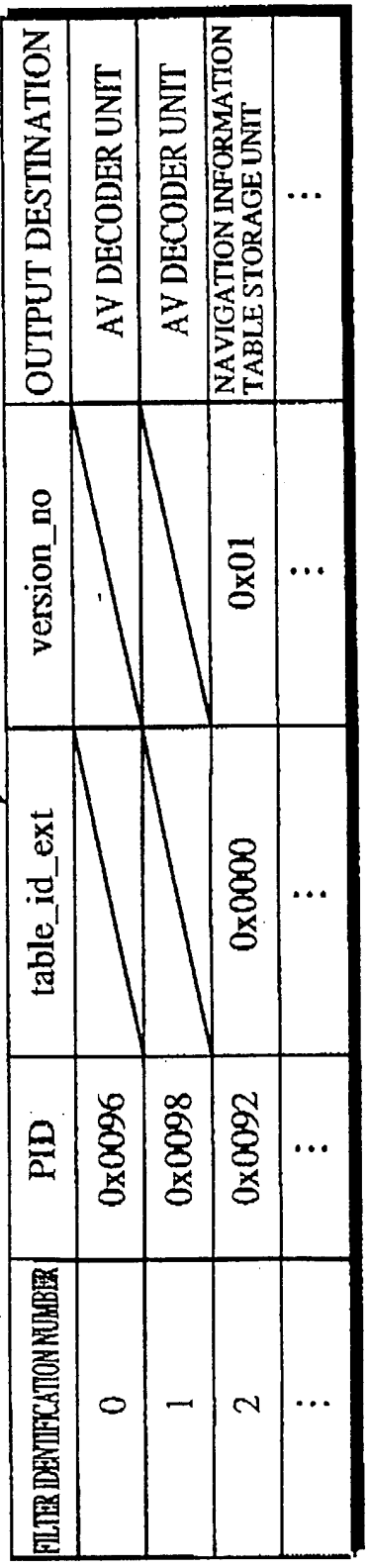


Fig. 33A



7802 FILTER IDENTIFICATION NUMBER	7803 PID	7801 7804 table_id_ext	7805 version_no	7806 OUTPUT DESTINATION
0	0x0096			AV DECODER UNIT
1	0x0098			AV DECODER UNIT
2	0x0092	0x0000	—	NAVIGATION INFORMATION TABLE STORAGE UNIT
⋮	⋮	⋮	⋮	⋮

Fig. 33B



FILTER IDENTIFICATION NUMBER	PID	7807 table_id_ext	version_no	OUTPUT DESTINATION
0	0x0096			AV DECODER UNIT
1	0x0098			AV DECODER UNIT
2	0x0092	0x0000	0x01	NAVIGATION INFORMATION TABLE STORAGE UNIT
⋮	⋮	⋮	⋮	⋮

Fig. 34A

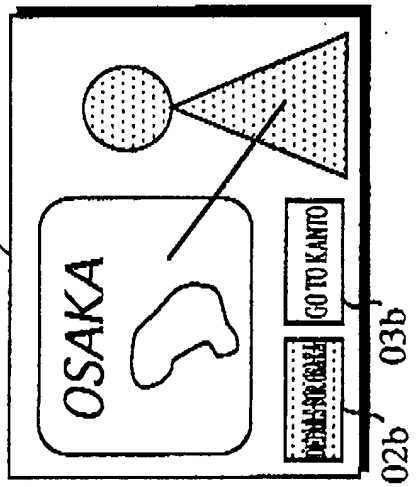


Fig. 34B

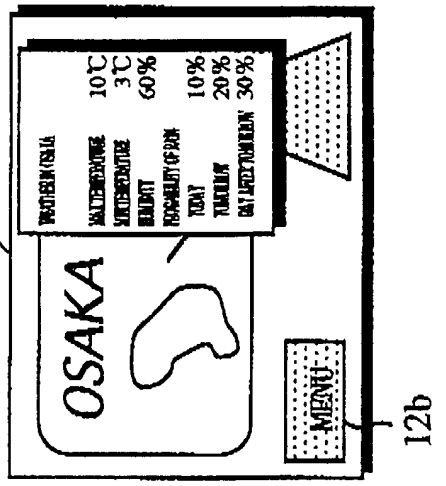


Fig. 34C

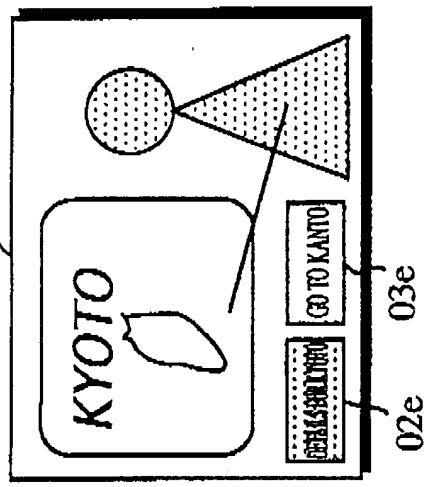


Fig. 34D

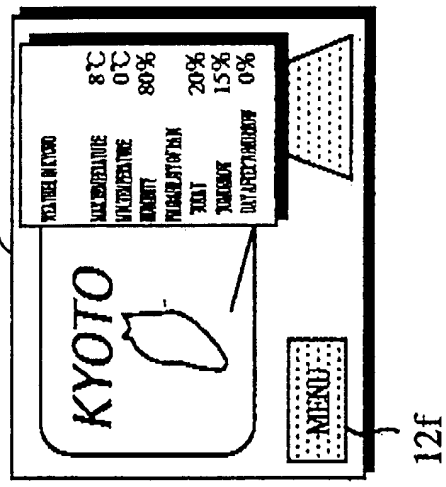


Fig. 35B

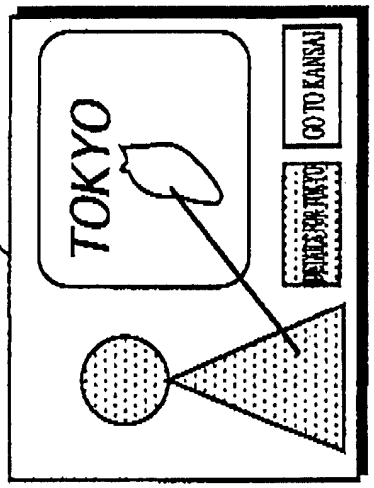


Fig. 35A

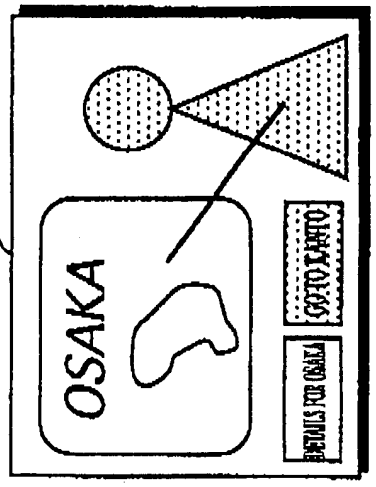


Fig. 36

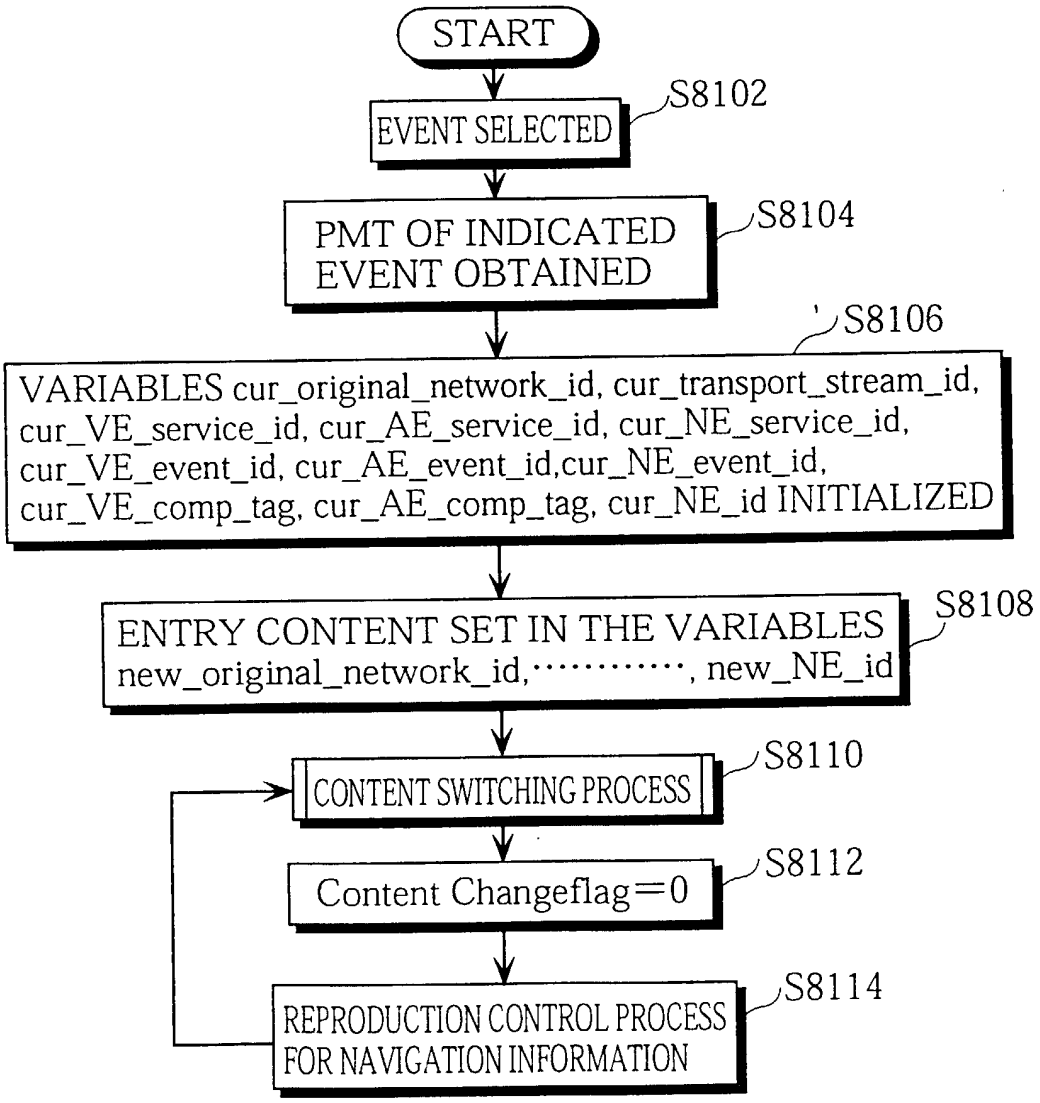


Fig. 37

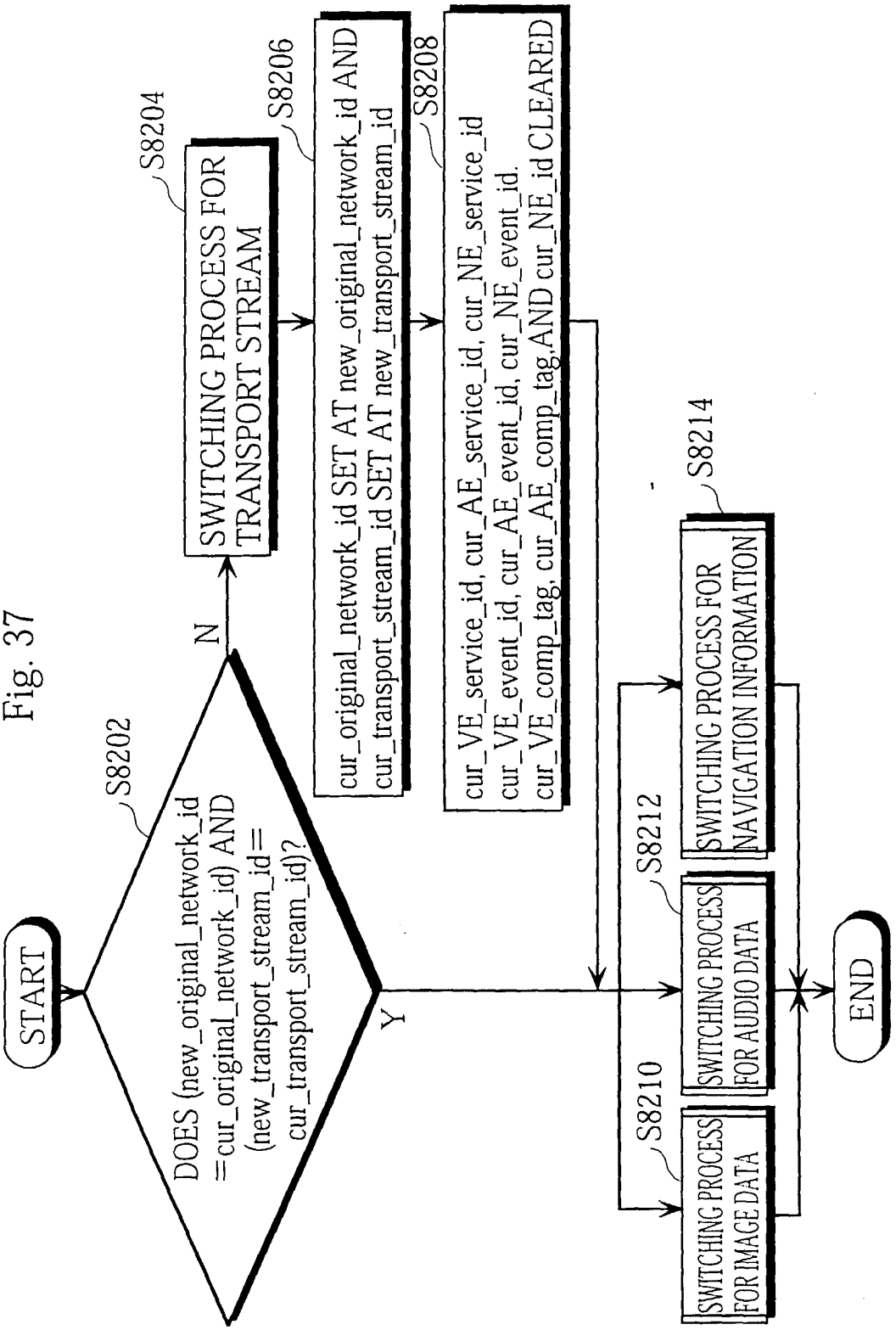


Fig. 38

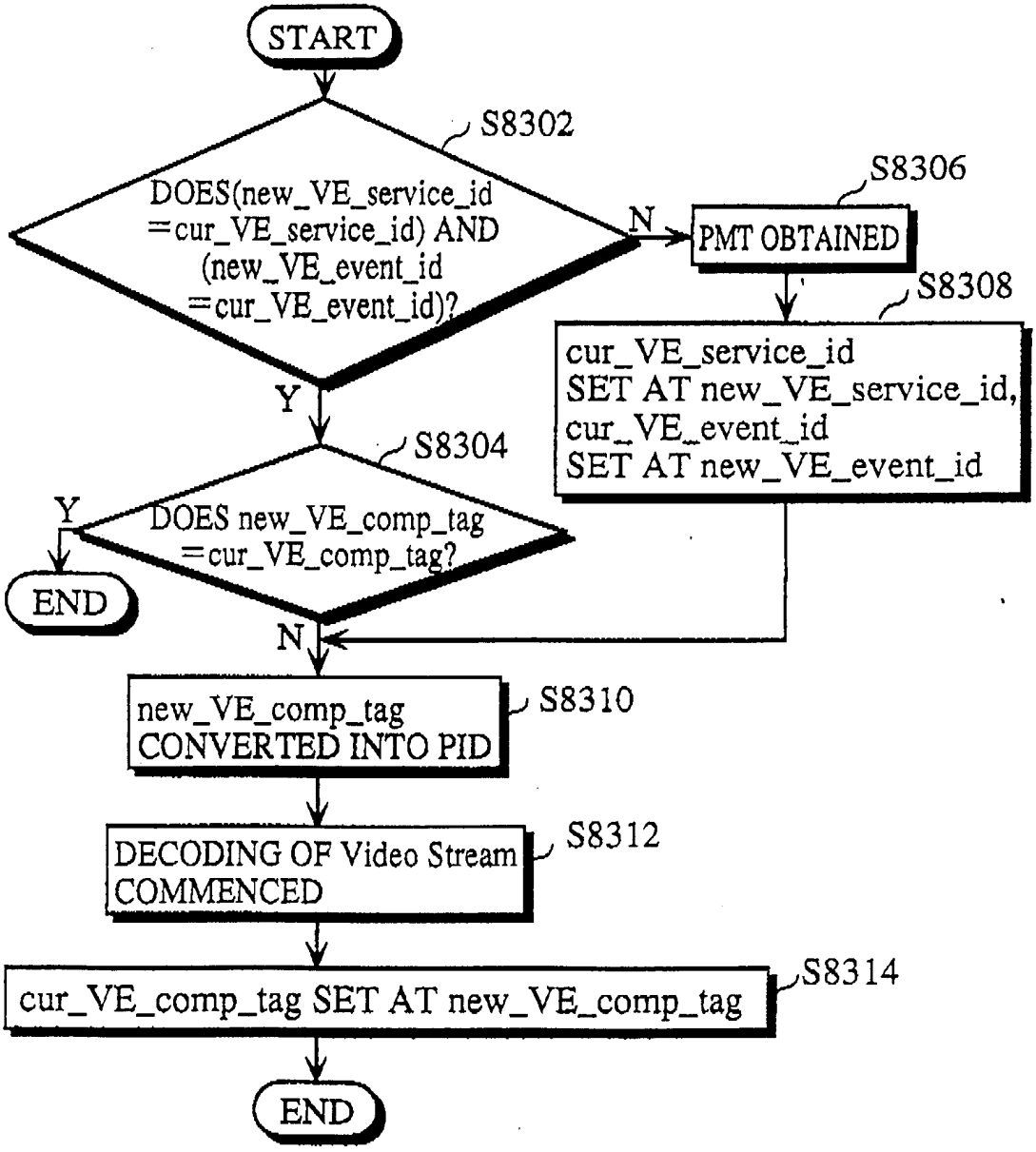


Fig. 39

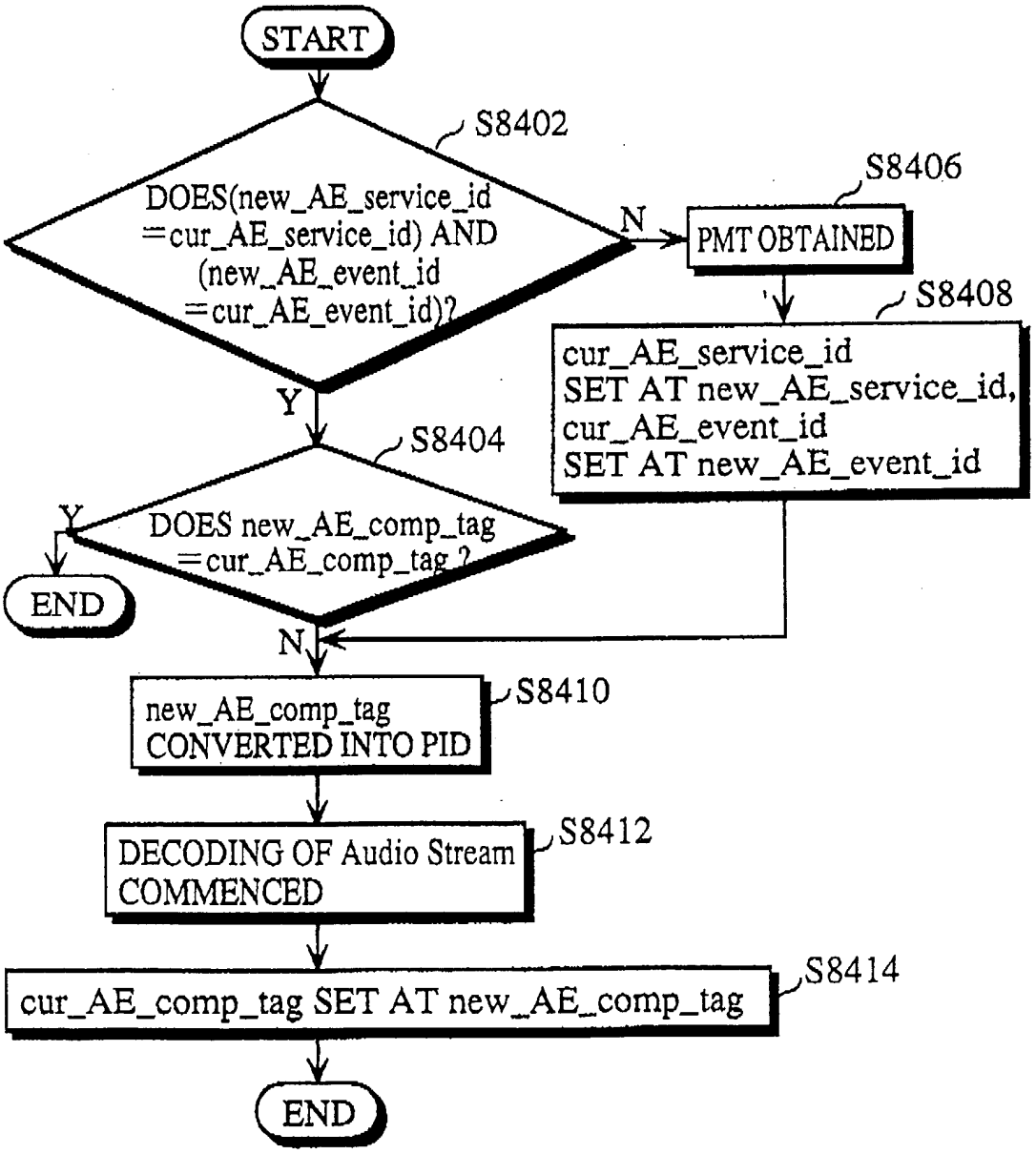


Fig. 40

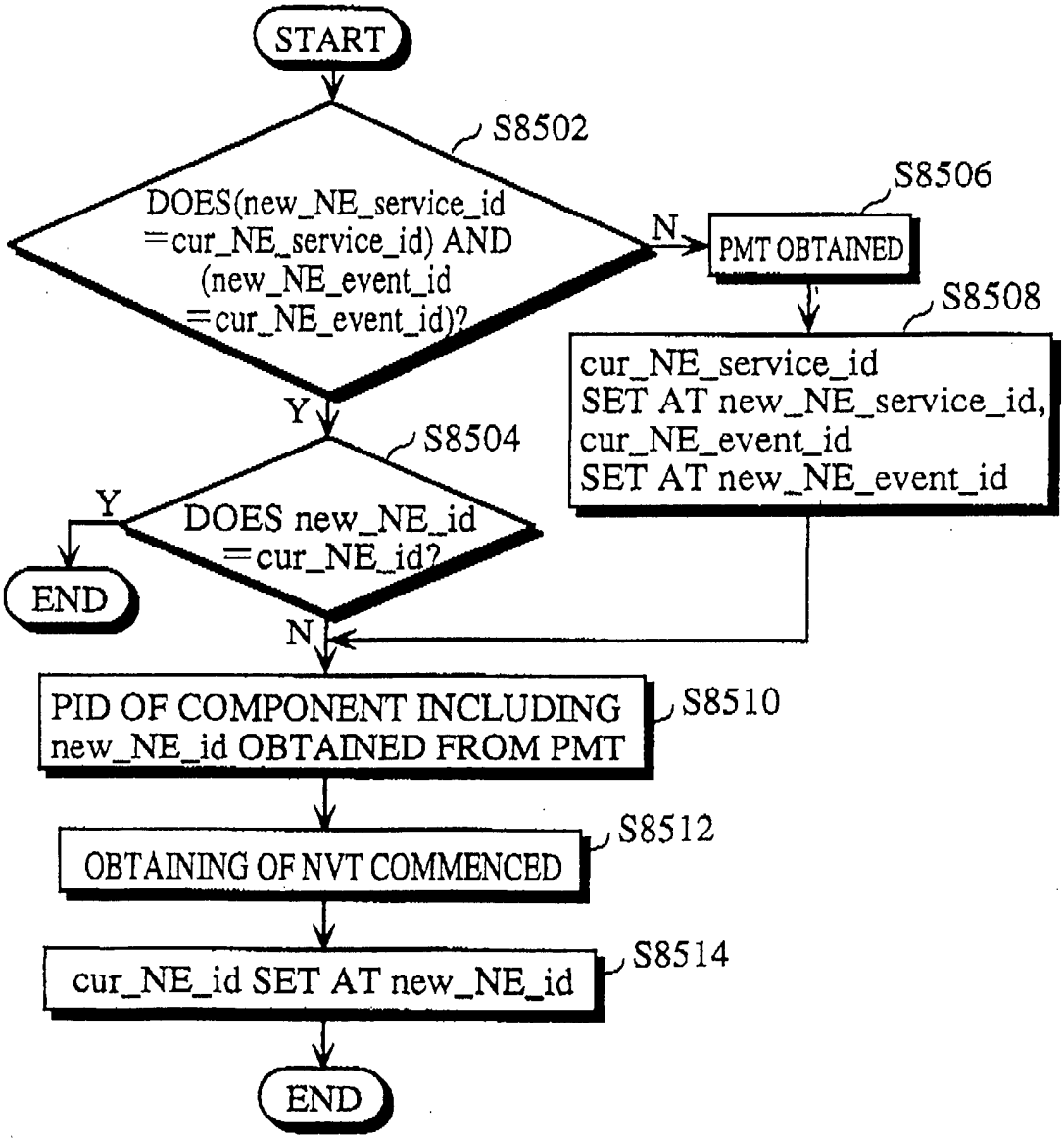


Fig. 41

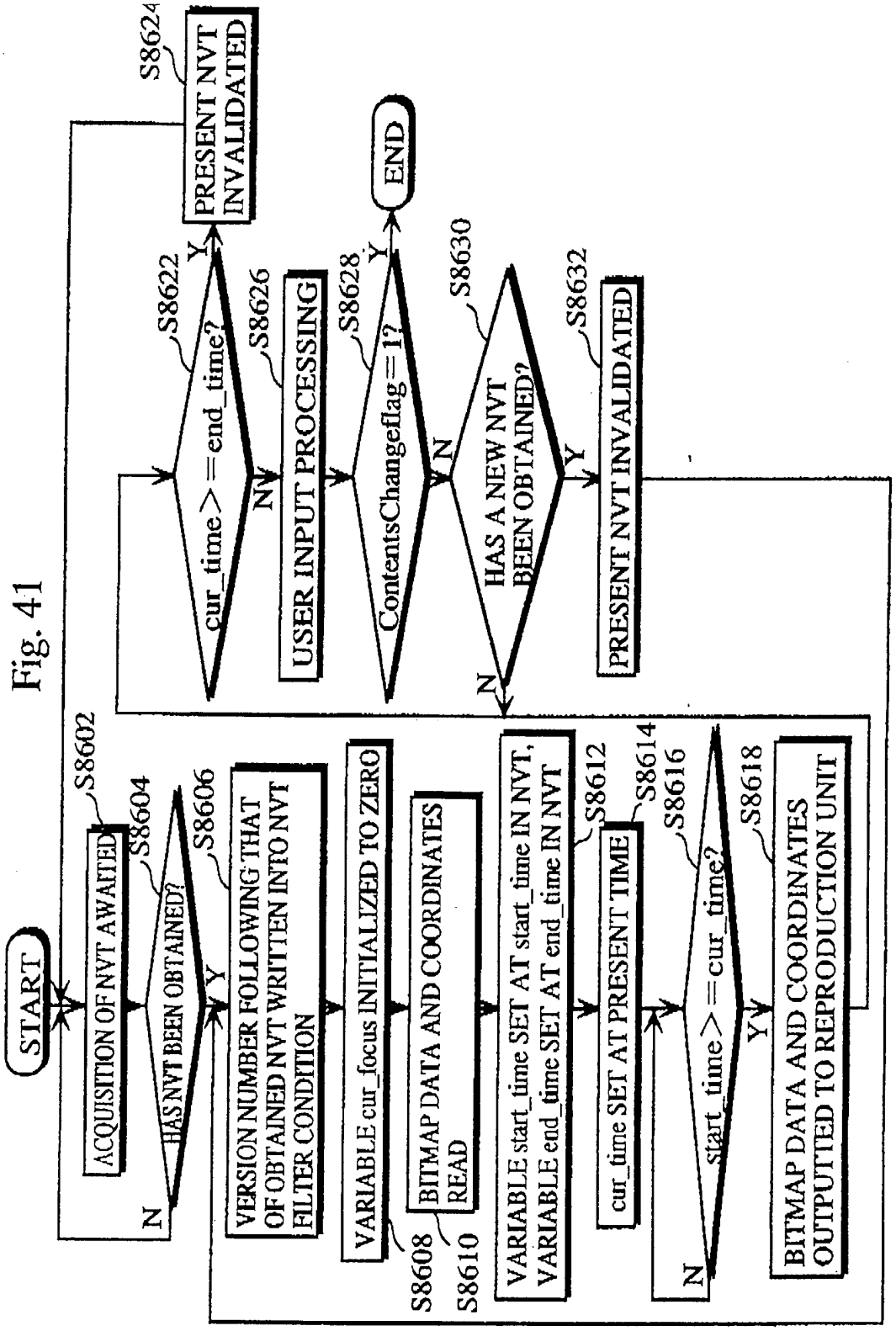


Fig. 42

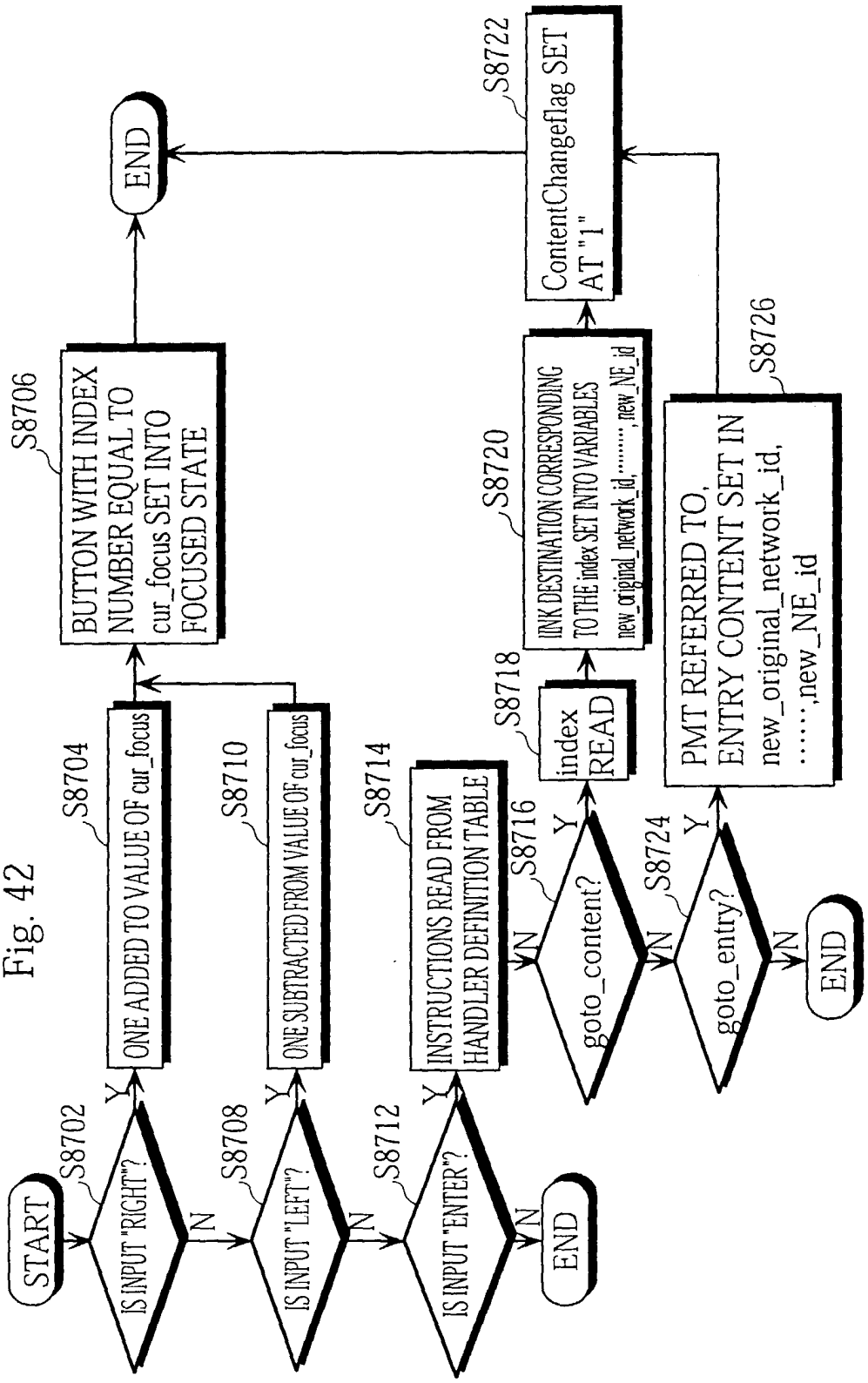


Fig. 43

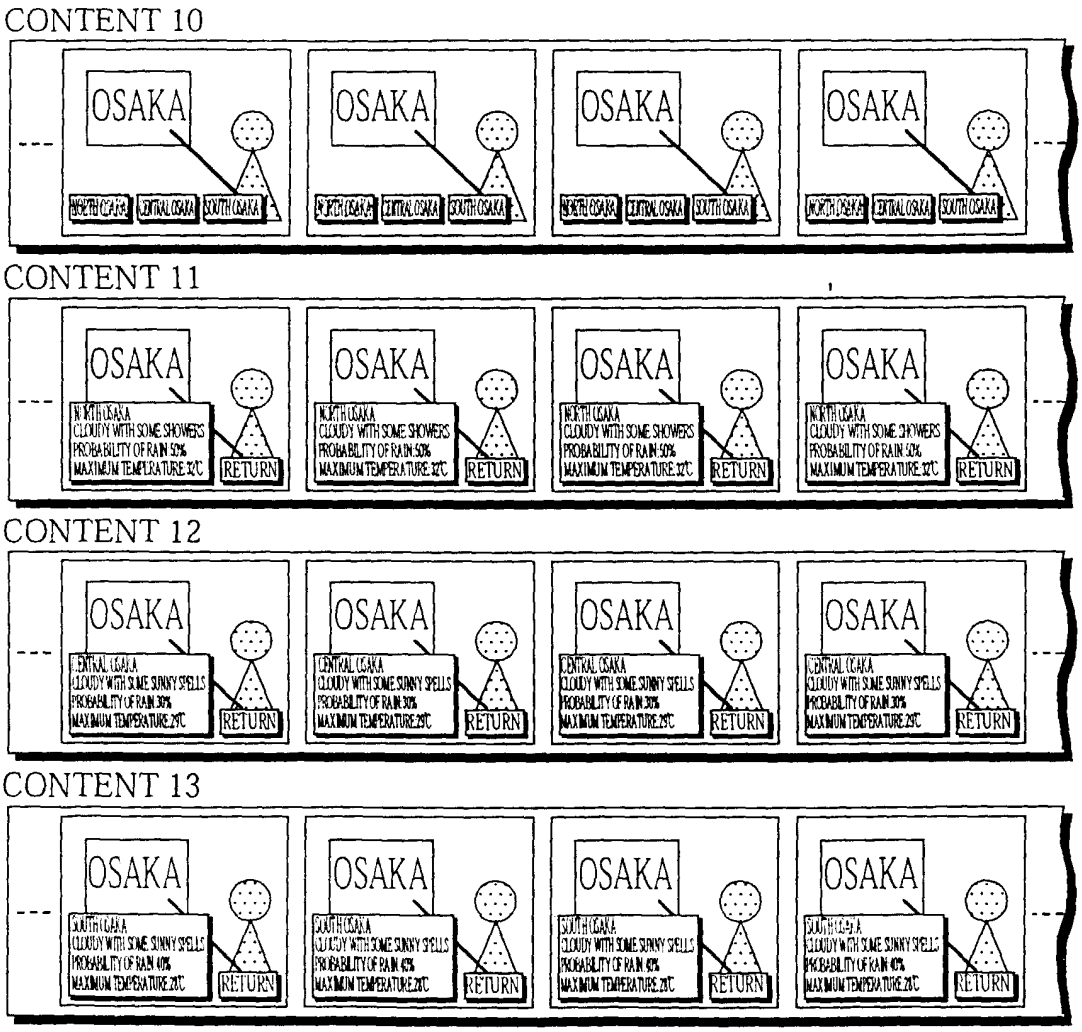


Fig. 44

Navi10-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	50	300	0	0	1
1	Button	200	300	1	2	3
2	Button	350	300	2	4	5

Handler Definition Table :

Handler Index	Bytecode
0	goto_content(Hyperlink Index 0)
1	goto_content(Hyperlink Index 1)
2	goto_content(Hyperlink Index 2)

Hyperlink Table :

Hyperlink Index	Content number
0	11
1	12
2	13

Bitmap Table :

Bitmap Index	Bitmap Data
0	NORTH OSAKA
1	NORTH OSAKA
2	CENTRAL OSAKA
3	CENTRAL OSAKA
4	SOUTH OSAKA
5	SOUTH OSAKA

Time Information Table :

start_time	5
end_time	65

Fig. 45

Navi11-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	400	300	0	0	1
1	Picture	50	150	—	2	—

Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)

Hyperlink Table :

Hyperlink Index	Content number
0	10

Bitmap Table :

Bitmap Index	Bitmap Data
0	RETURN
1	RETURN
2	NORTH OSAKA CLOUDY WITH SOME SHOWERS PROBABILITY OF RAIN:50% MAXIMUM TEMPERATURE:32℃

Time Information Table :

start_time	5
end_time	65

Fig. 46

Navi12-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	400	300	0	0	1
1	Picture	50	150	—	2	—

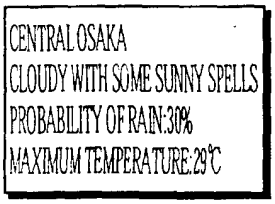
Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)

Hyperlink Table :

Hyperlink Index	Content number
0	0

Bitmap Table :

Bitmap Index	Bitmap Data
0	
1	
2	

Time Information Table :

start_time	5
end_time	65

Fig. 47

Navi13-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	400	300	0	0	1
1	Picture	50	150	—	2	—

Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)

Hyperlink Table :

Hyperlink Index	Content number
0	0

Bitmap Table :

Bitmap Index	Bitmap Data
0	RETURN
1	RETURN
2	SOUTH OSAKA CLOUDY WITH SOME SUNNY SPELLS PROBABILITY OF RAIN:40% MAXIMUM TEMPERATURE:28℃

Time Information Table :

start_time	5
end_time	65

Fig. 48

Navi10-13-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	Focused Bitmap	visibility
0	Button	50	300	0	0	1	1
1	Button	200	300	1	2	3	1
2	Button	350	300	2	4	5	1
3	Button	400	300	3	6	7	0
4	Picture	50	150	—	8	—	0
5	Picture	50	150	—	9	—	0
6	Picture	50	150	—	10	—	0

Handler Definition Table :

Handler Index	Script

0	for(i=0, i<3, i++){
	hide_object(object index i)
	}
	show_object(object index 3)
	show_object(object index 4)

1	for(i=0, i<3, i++){
	hide_object(object index i)
	}
	show_object(object index 3)
	show_object(object index 5)

2	for(i=0, i<3, i++){
	hide_object(object index i)
	}
	show_object(object index 3)
	show_object(object index 6)

3	for(i=3, i<7, i++){
	hide_object(object index i)
	}
	for(i=0, i<3, i++){
	hide_object(object index i)
	}

Bitmap Table :

Bitmap Index	Bitmap Data
0	NORTH OSAKA
1	NORTH OSAKA
2	CENTRAL OSAKA
3	CENTRAL OSAKA
4	SOUTH OSAKA
5	SOUTH OSAKA
6	RETURN
7	RETURN
8	NORTH OSAKA CLOUDY WITH SOME SHOWERS PROBABILITY OF RAIN:50% MAXIMUM TEMPERATURE:32℃
9	CENTRAL OSAKA CLOUDY WITH SOME SUNNY SPELLS PROBABILITY OF RAIN:30% MAXIMUM TEMPERATURE:29℃
10	SOUTH OSAKA CLOUDY WITH SOME SUNNY SPELLS PROBABILITY OF RAIN:40% MAXIMUM TEMPERATURE:28℃

Time Information Table :

start_time	5
end_time	65

Fig. 49

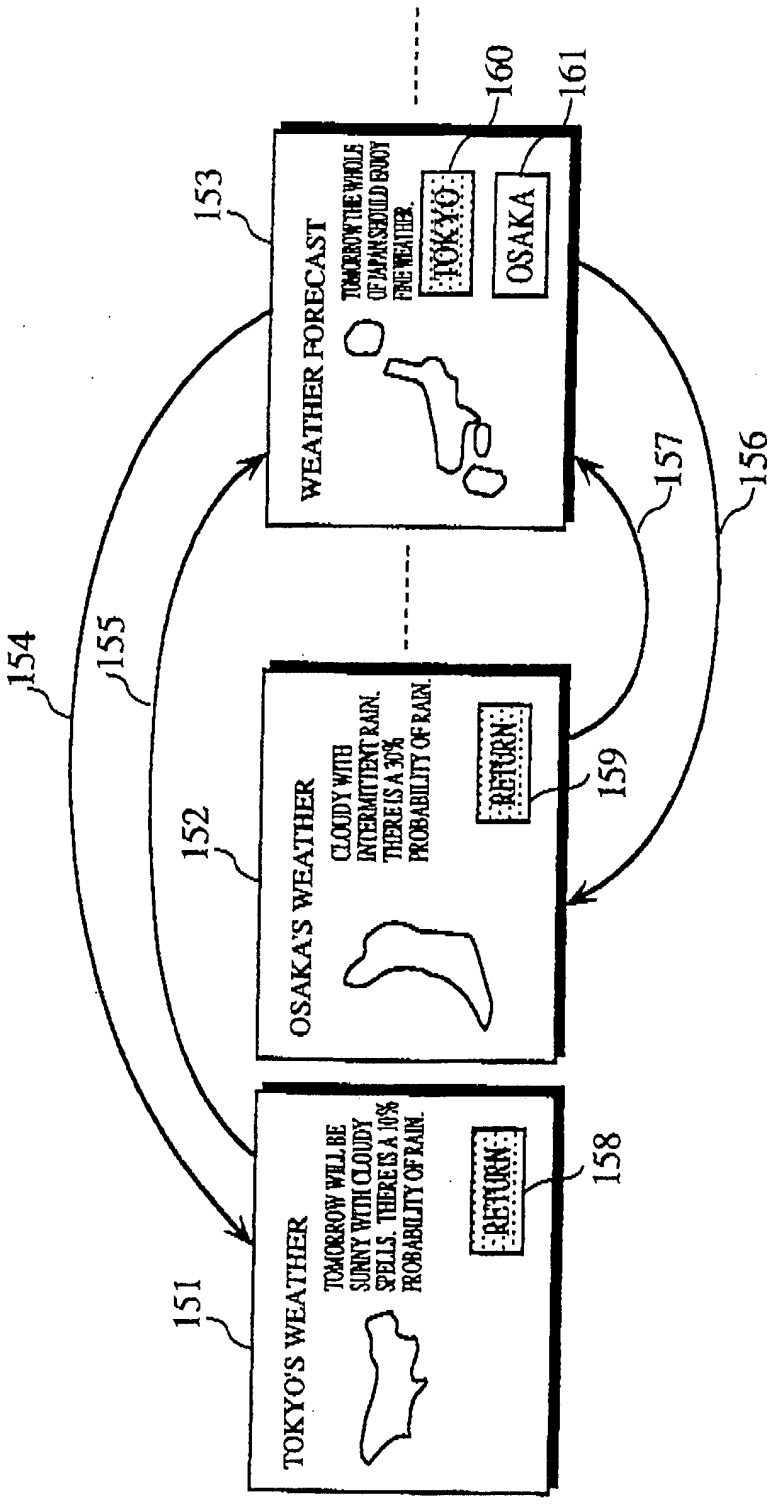


Fig. 50

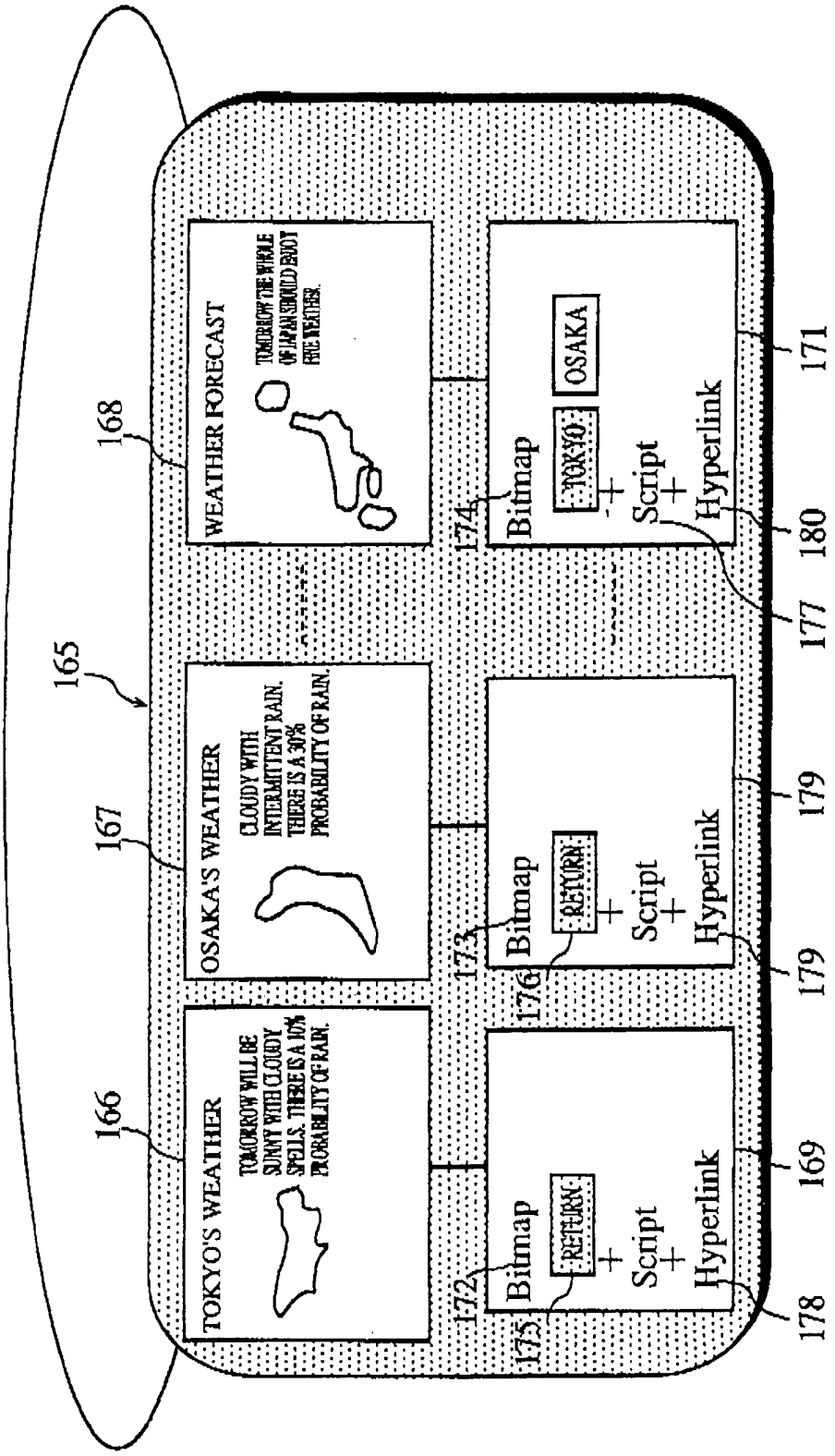


Fig. 51

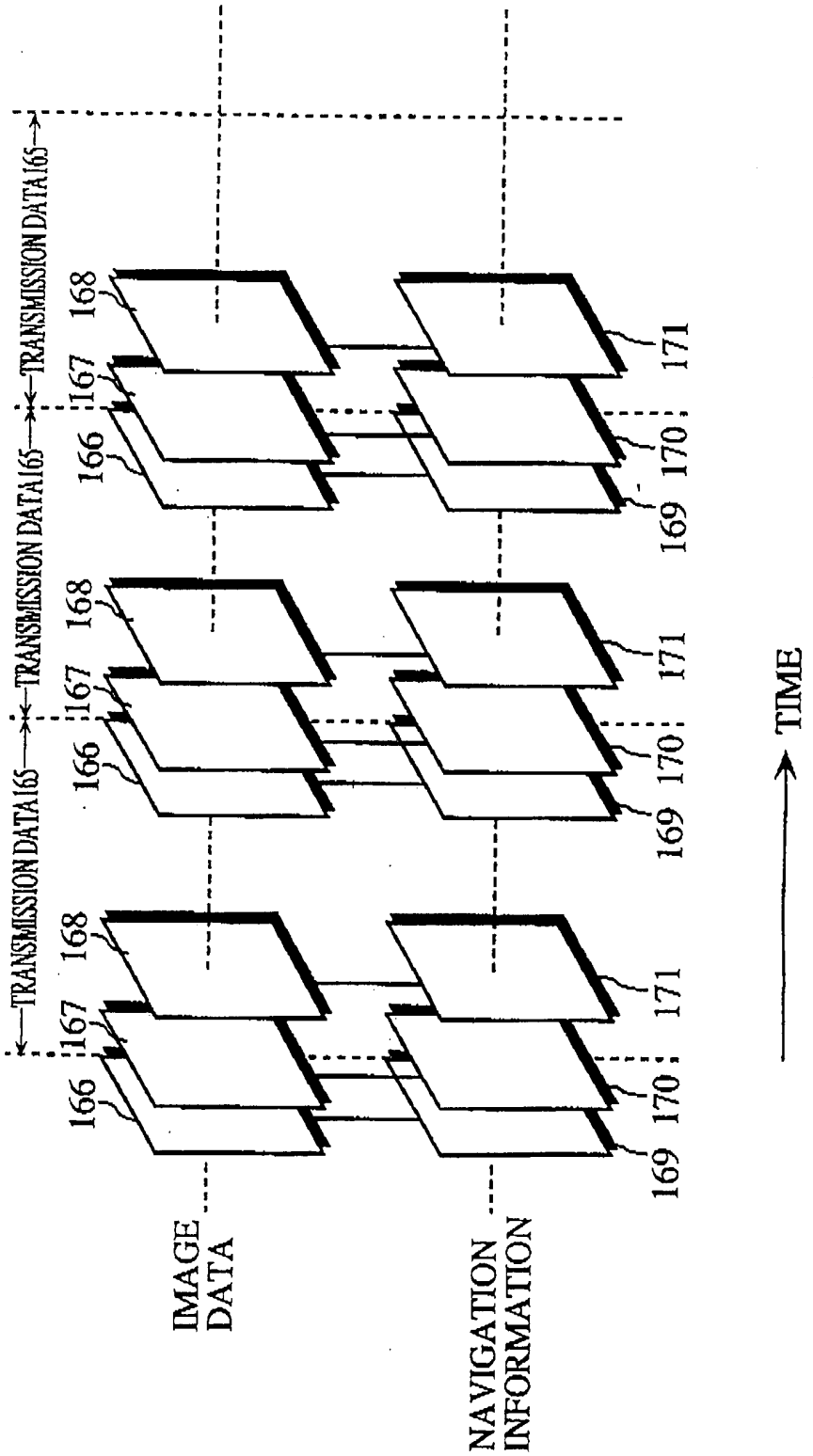


Fig. 52

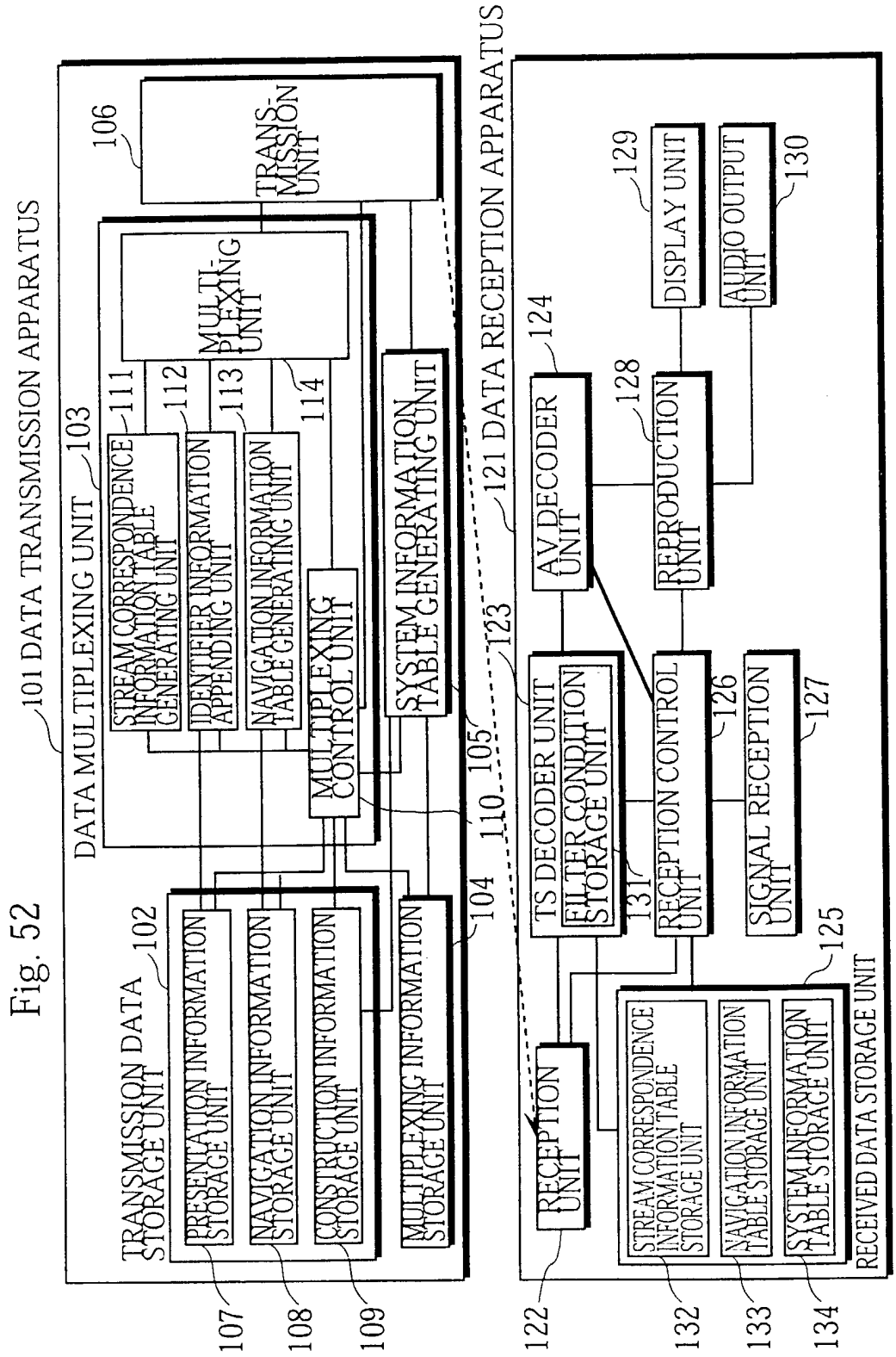


Fig. 53A

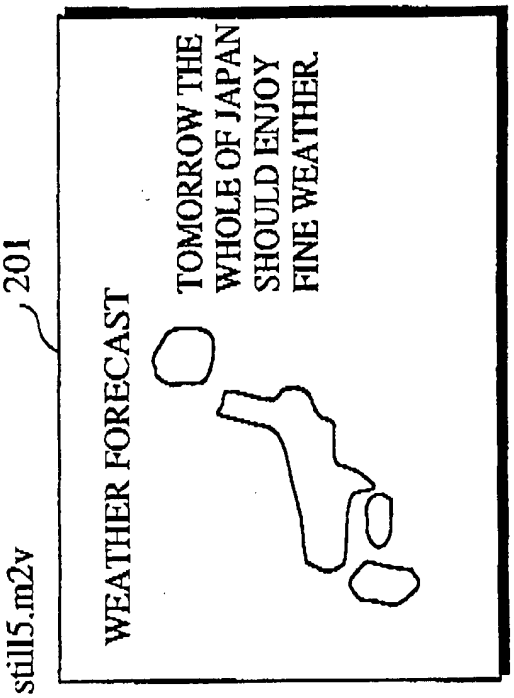


Fig. 53B

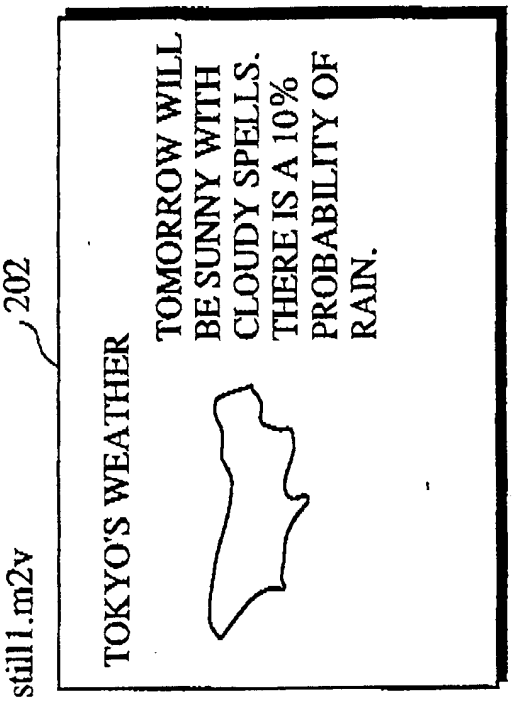


Fig. 54

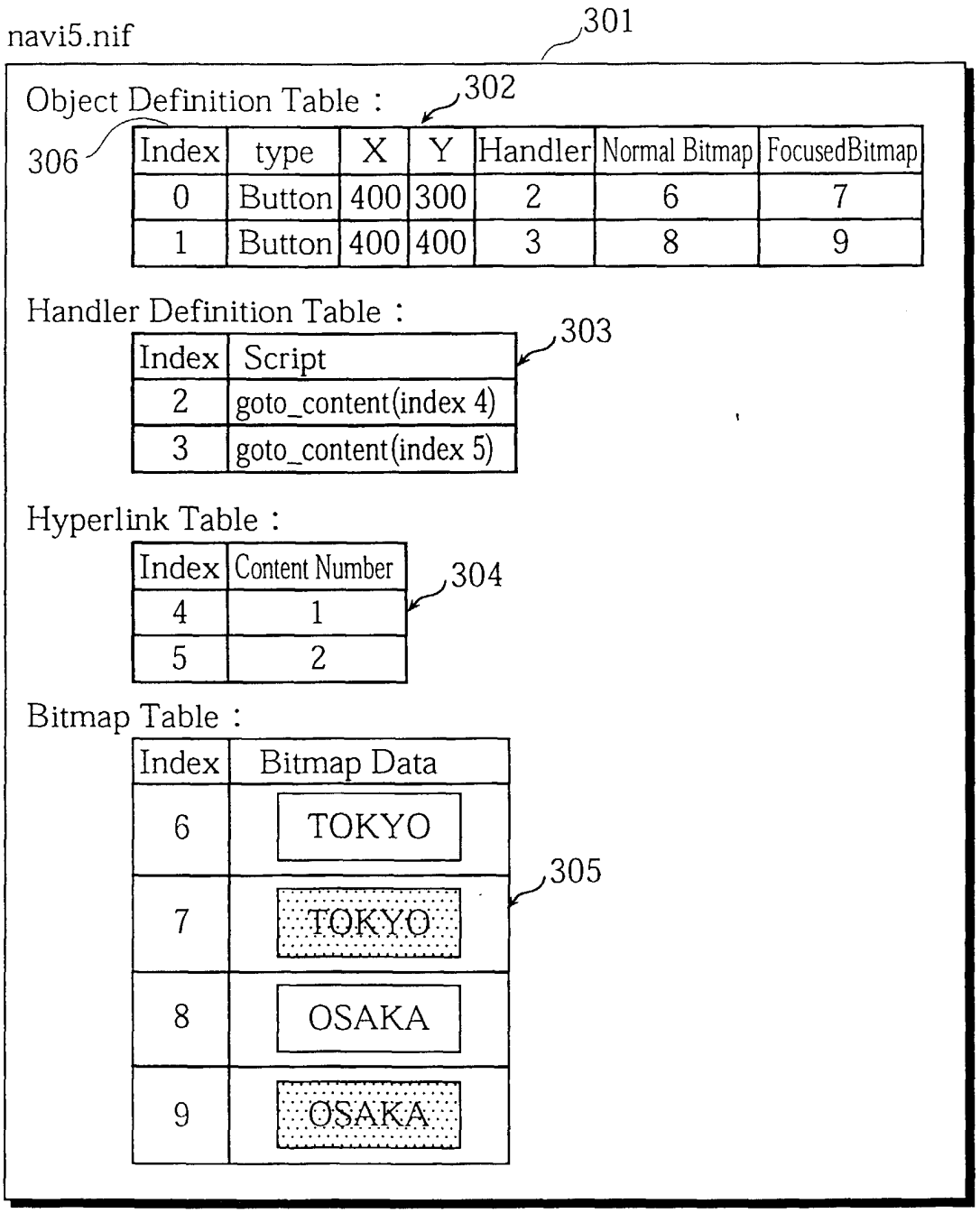


Fig. 55

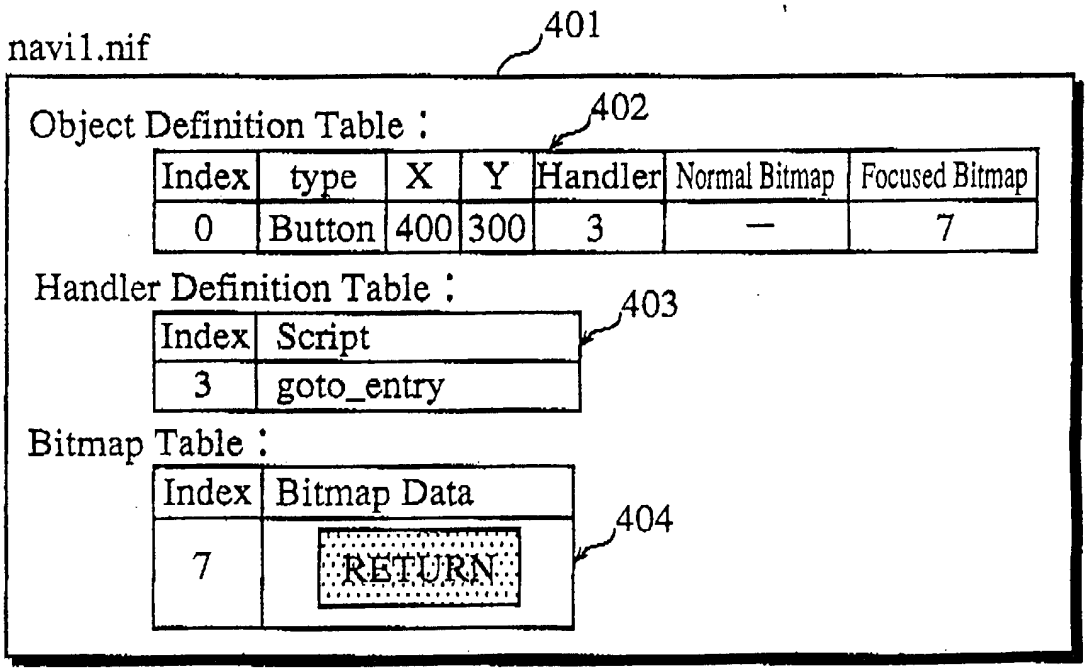


Fig. 56

501 CONSTRUCTION INFORMATION TABLE

CONTENT NUMBER	IMAGE DATA	NAVIGATION INFORMATION
0	still0.m2v	navi0.nif
1	still1.m2v	navi1.nif
2	still2.m2v	navi2.nif
:	:	:
5	still5.m2v	navi5.nif
:	:	:

ENTRY INFORMATION 502

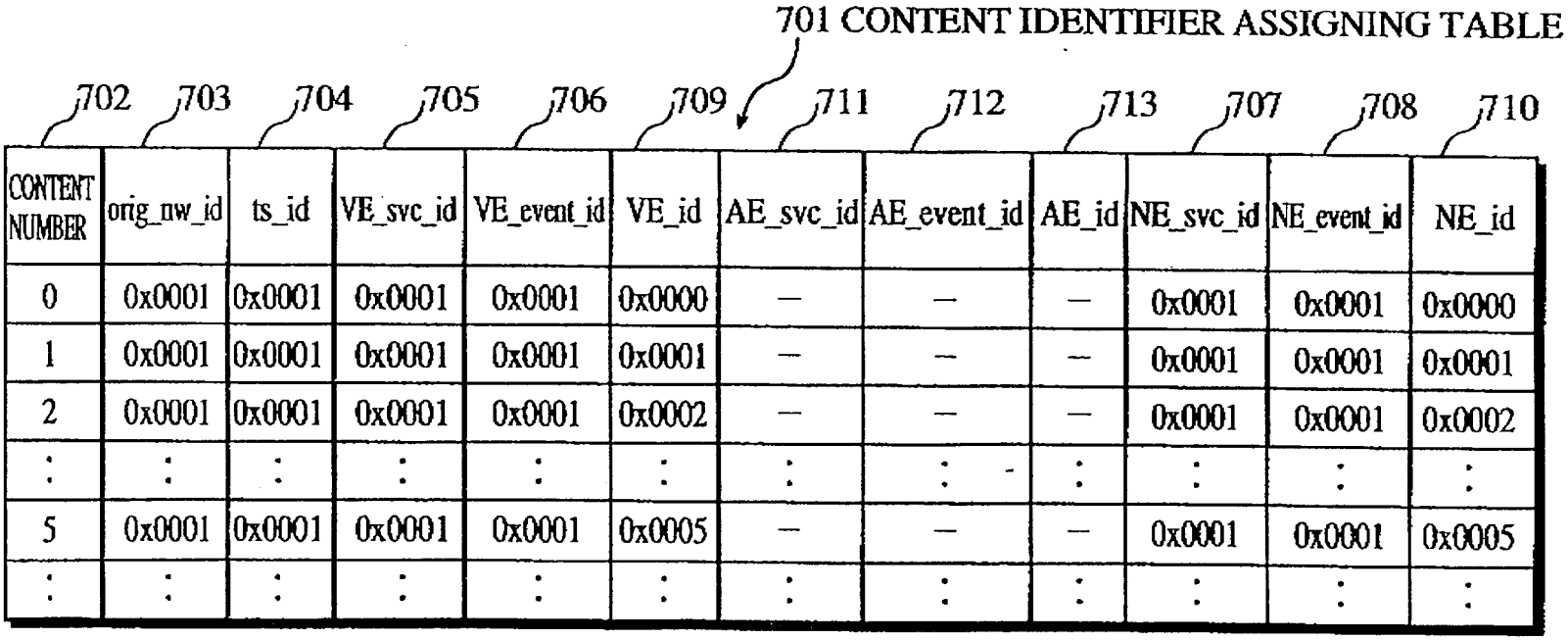
ENTRY CONTENT NUMBER	5

Fig. 57

601 MULTIPLEXING INFORMATION TABLE

Bitrate	6000000bps
original_network_id	0x0001
transport_stream_id	0x0001
service_id	0x0001
event_id	0x0001
PMT_PID	0x0080
PCR_PID	0x0081
NE_component_pid	0x0082
VE_information_component_pid	0x0083
VE_component_pid	0x0084

Fig. 58



CONTENT NUMBER	orig_nw_id	ts_id	VE_svc_id	VE_event_id	VE_id	AE_svc_id	AE_event_id	AE_id	NE_svc_id	NE_event_id	NE_id
0	0x0001	0x0001	0x0001	0x0001	0x0000	—	—	—	0x0001	0x0001	0x0000
1	0x0001	0x0001	0x0001	0x0001	0x0001	—	—	—	0x0001	0x0001	0x0001
2	0x0001	0x0001	0x0001	0x0001	0x0002	—	—	—	0x0001	0x0001	0x0002
:	:	:	:	:	:	:	:	:	:	:	:
5	0x0001	0x0001	0x0001	0x0001	0x0005	—	—	—	0x0001	0x0001	0x0005
:	:	:	:	:	:	:	:	:	:	:	:

EP 0 827 336 A2

Fig. 59

801 DISPLAY IMAGE INFORMATION IDENTIFIER ASSIGNING TABLE

709 VE_id	802 component_tag	803 PID	804 stream_id	805 IMAGE DATA FILE
0x0000	0x00	0x0084	0xe0	still0.m2v
0x0001	0x00	0x0084	0xe1	still1.m2v
0x0002	0x00	0x0084	0xe2	still2.m2v
⋮	⋮	⋮	⋮	⋮
0x0005	0x00	0x0084	0xe5	still5.m2v
⋮	⋮	⋮	⋮	⋮
0x000f	0x00	0x0084	0xef	still15.m2v
0x0010	0x00	0x0084	0xe0	still16.m2v
⋮	⋮	⋮	⋮	⋮

Fig. 60

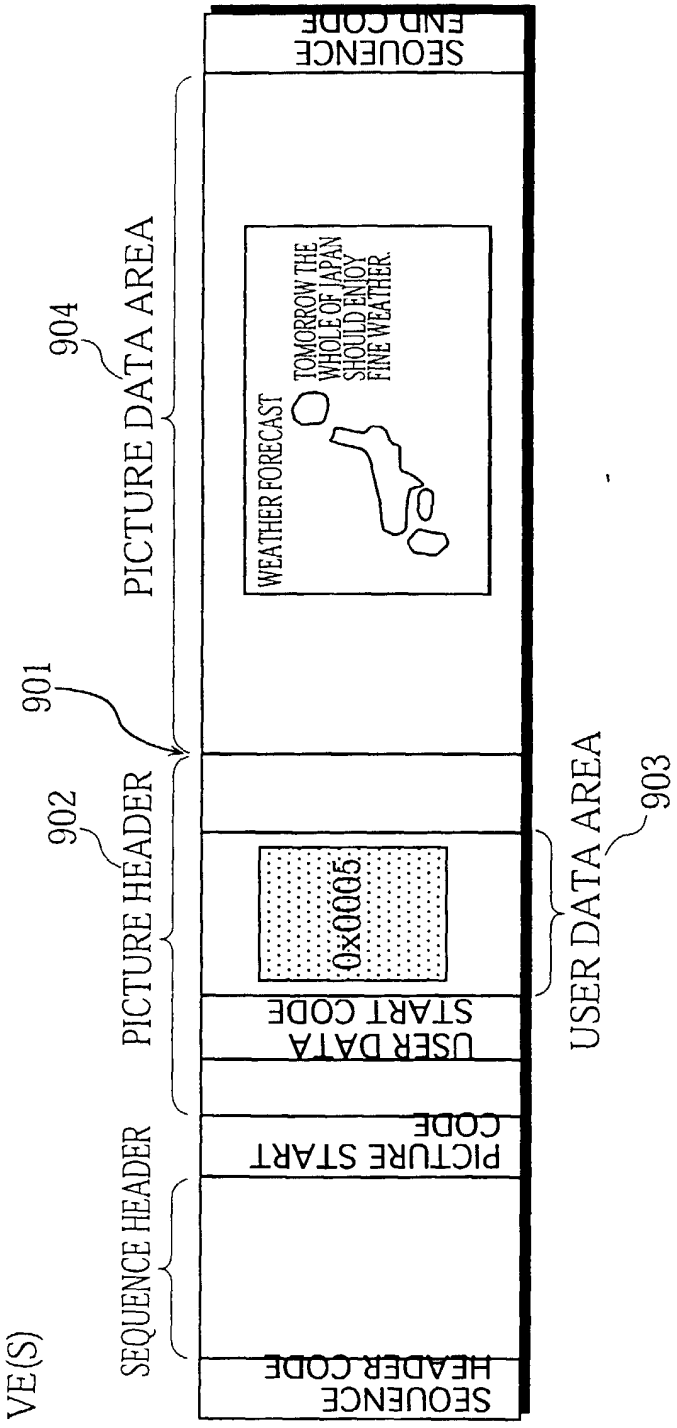


Fig. 61

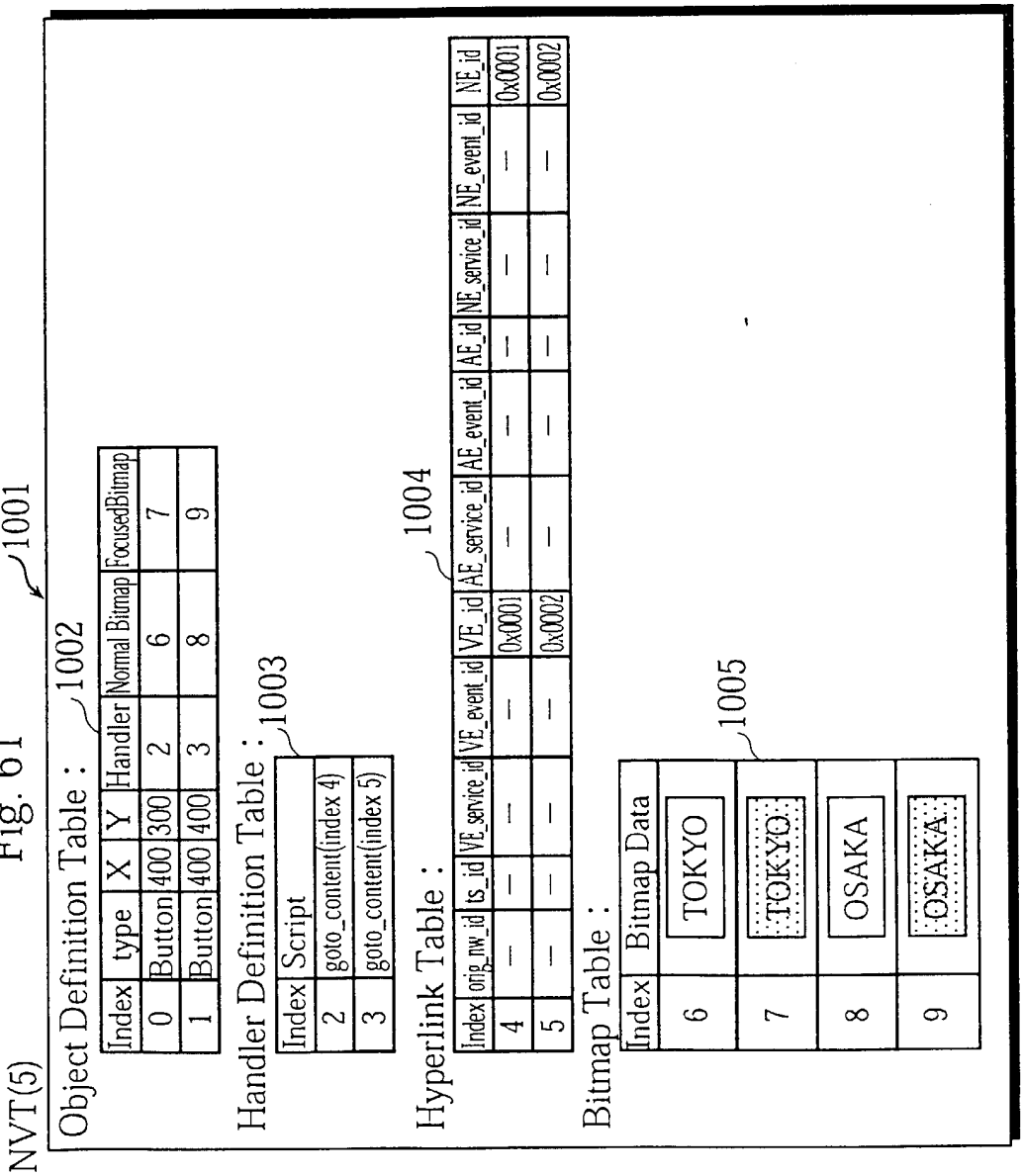


Fig. 62

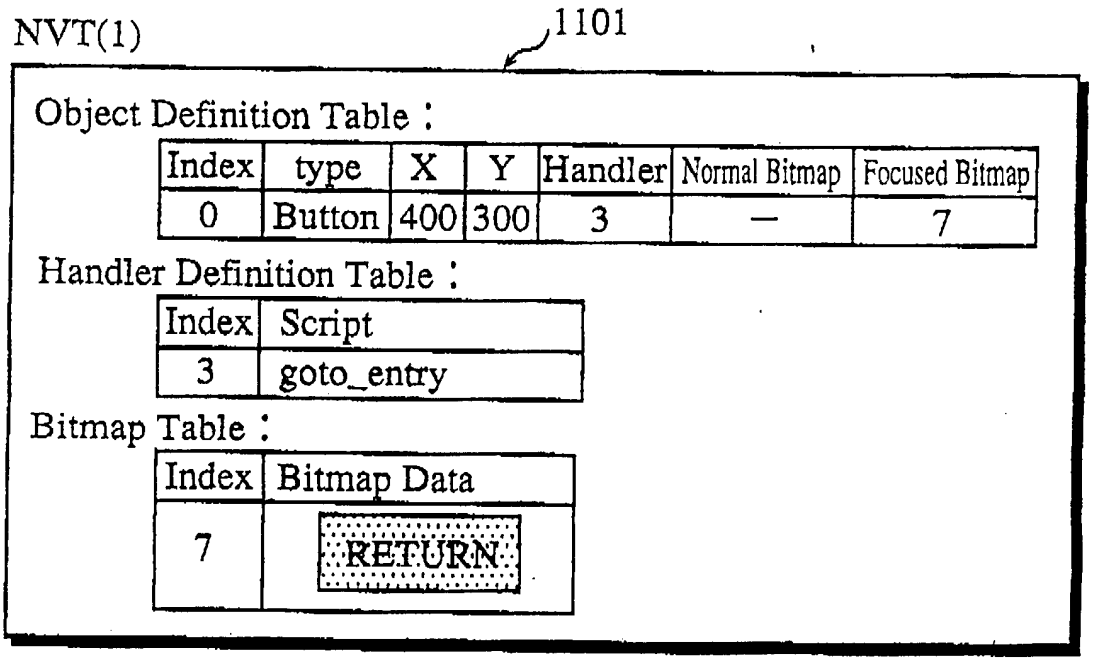


Fig. 63A

VET(5) 1201

first_pts	112500
last_pts	112500
stream_id	0xe5
component_tag	0x00

Fig. 63B

VET(1) 1202

first_pts	45000
last_pts	45000
stream_id	0xe1
component_tag	0x00

Fig. 63C

VET(15) 1203

first_pts	360000
last_pts	360000
stream_id	0xef
component_tag	0x00

Fig. 64

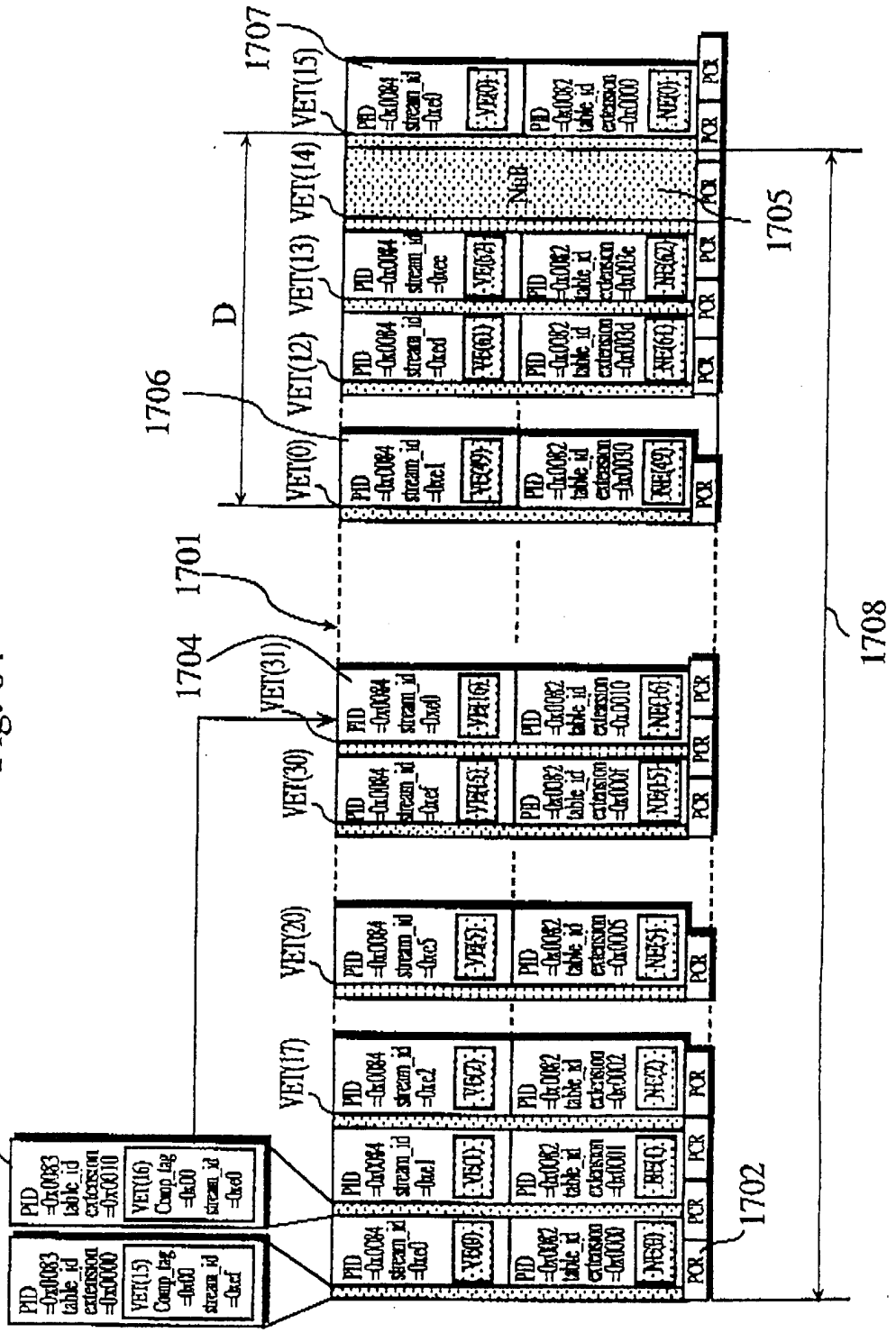
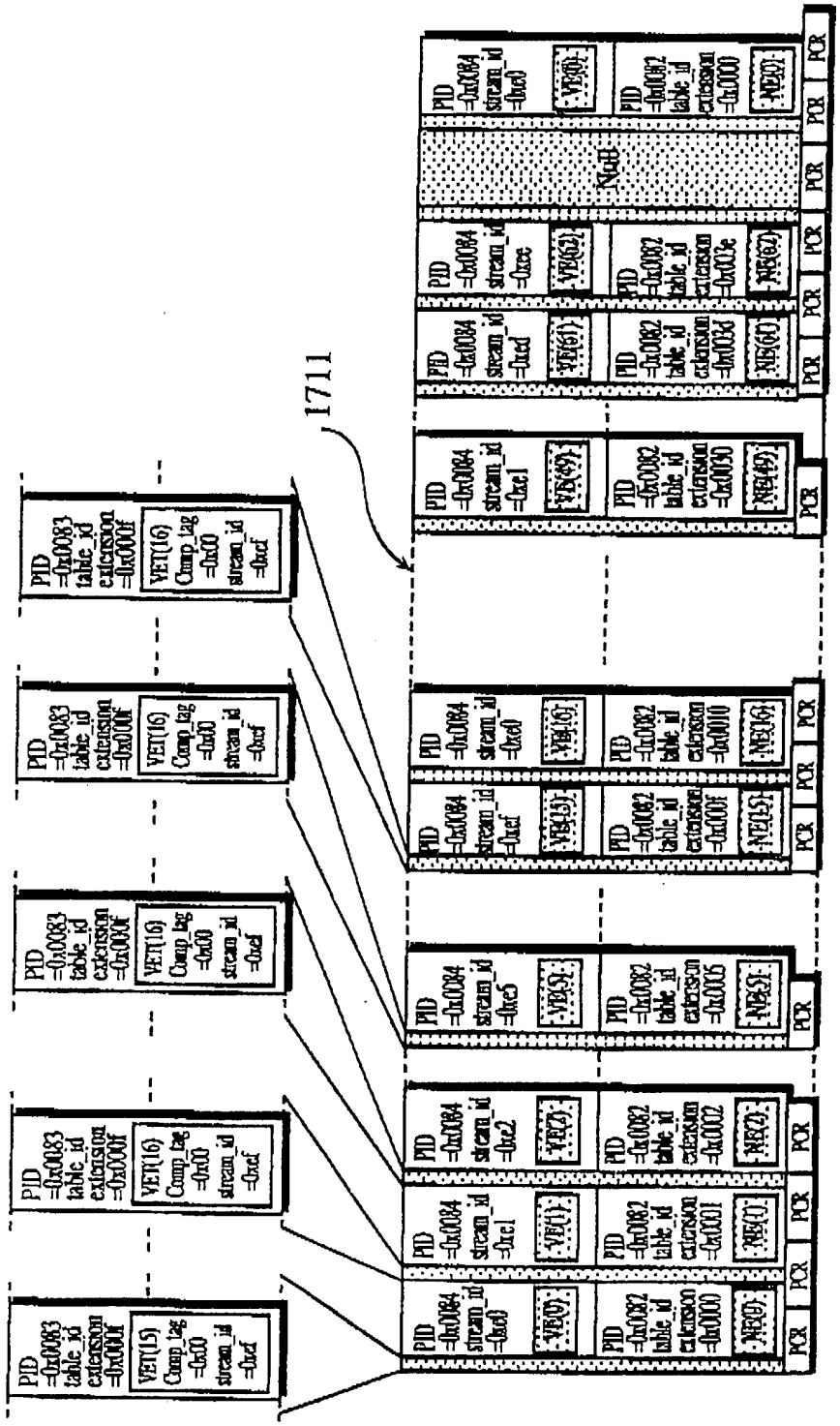


Fig. 65



Network Information Table 1301

table_id=0x40
:
network_id=0x0001
:

original_network_id	transport_stream_id	descriptor
:	:	:
0x0001	0x0001	TRANSFER PREFACE
:	:	:

Fig. 66A

Event Information Table 1303

table_id=0x4c
:
service_id=0x0001
:

event_id	descriptor
:	:
0x0001	EVENT NAME AND OTHER INFORMATION
:	:

Fig. 66C

Service Description Table 1302

table_id=0x42
:
transport_stream_id=0x0001
:

service_id	descriptor
:	:
0x0001	SERVICE NAME AND OTHER INFORMATION
:	:

Fig. 66B

Fig. 67

Program Association Table 1401

table_id=0x00
:
transport_stream_id=0x0001
:

program_no	PMT_pid
⋮	⋮
0x0001	0x0080
⋮	⋮

Fig. 68

Program Map Table 1501

table_id=0x02
:
program_number=0x0001
:
PCR_PID=0x0081
:
Entry_Descriptor
:

1502

PID	stream_type	descriptor
0x0082	0x05	NE_Component_Descriptor
0x0083	0x05	VE_Information_Component_Descriptor
0x0084	0x02	stream_identifier_descriptor

Fig. 69A

Entry_Descriptor

descriptor_tag	0x98
.....	

entry_VE_id	entry_AE_id	entry_NE_id
0x0005	—	0x0005

Fig. 69B

NE_Component_Descriptor

descriptor_tag	0x99
. .	

Fig. 69C

VE_Information_Component_Descriptor

descriptor_tag	0x9a
. .	

Fig. 69D

stream_identifier_descriptor

descriptor_tag	0x52
. .	
component_tag	0x00

Fig. 70

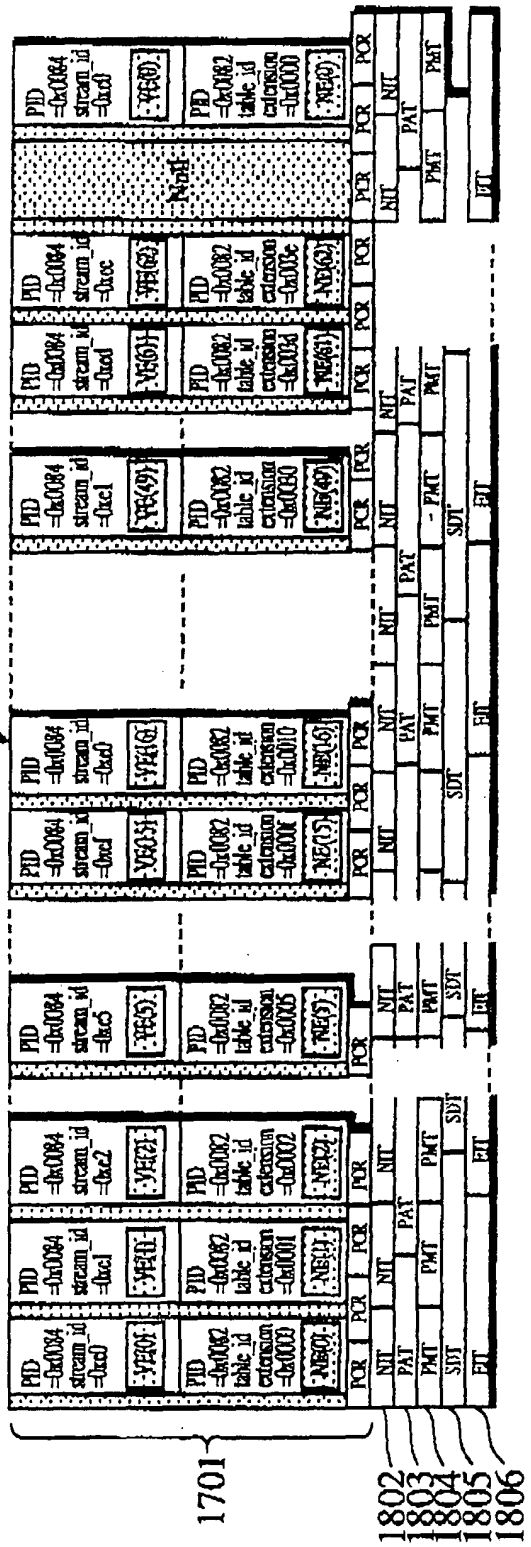


Fig. 71

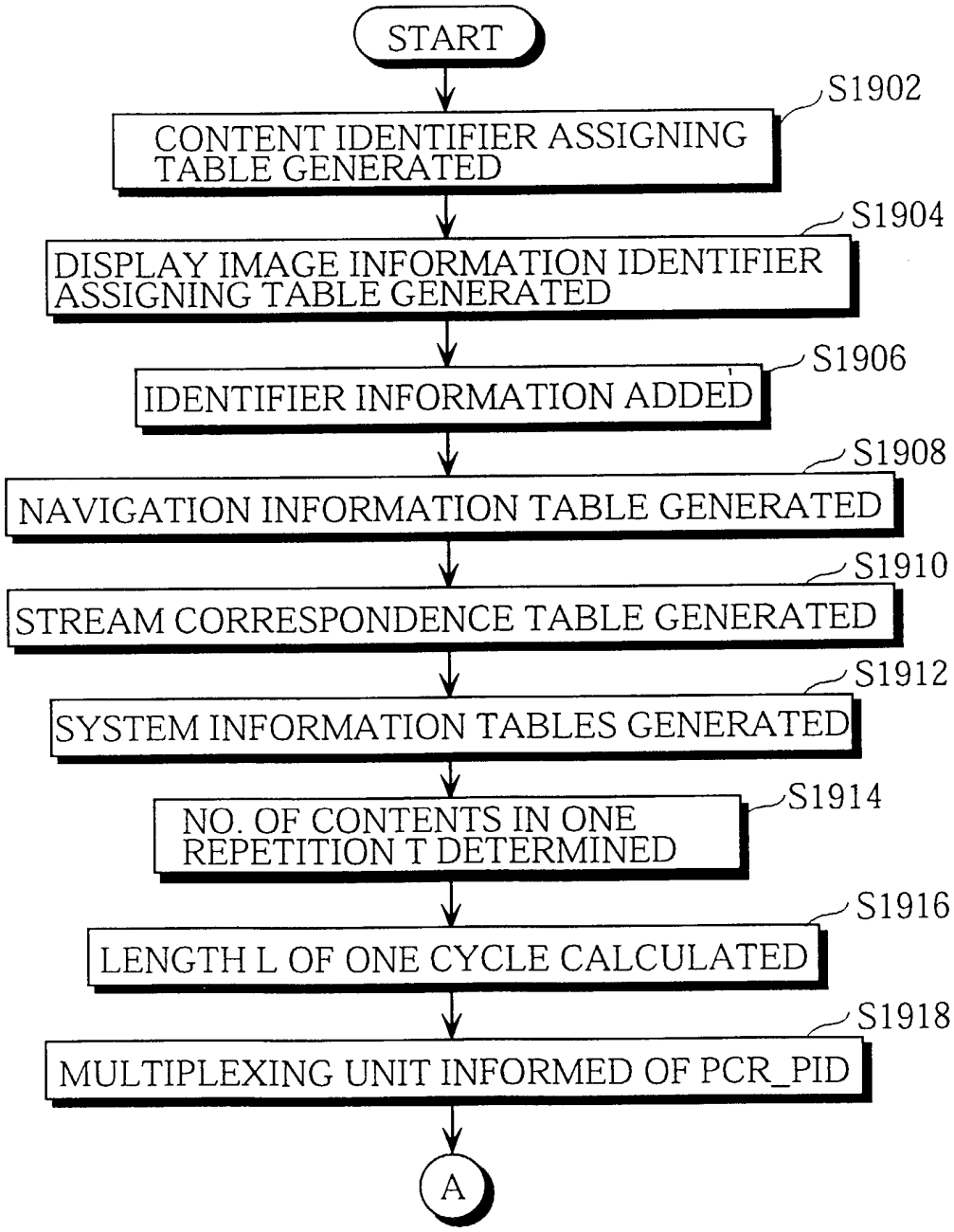


Fig. 72

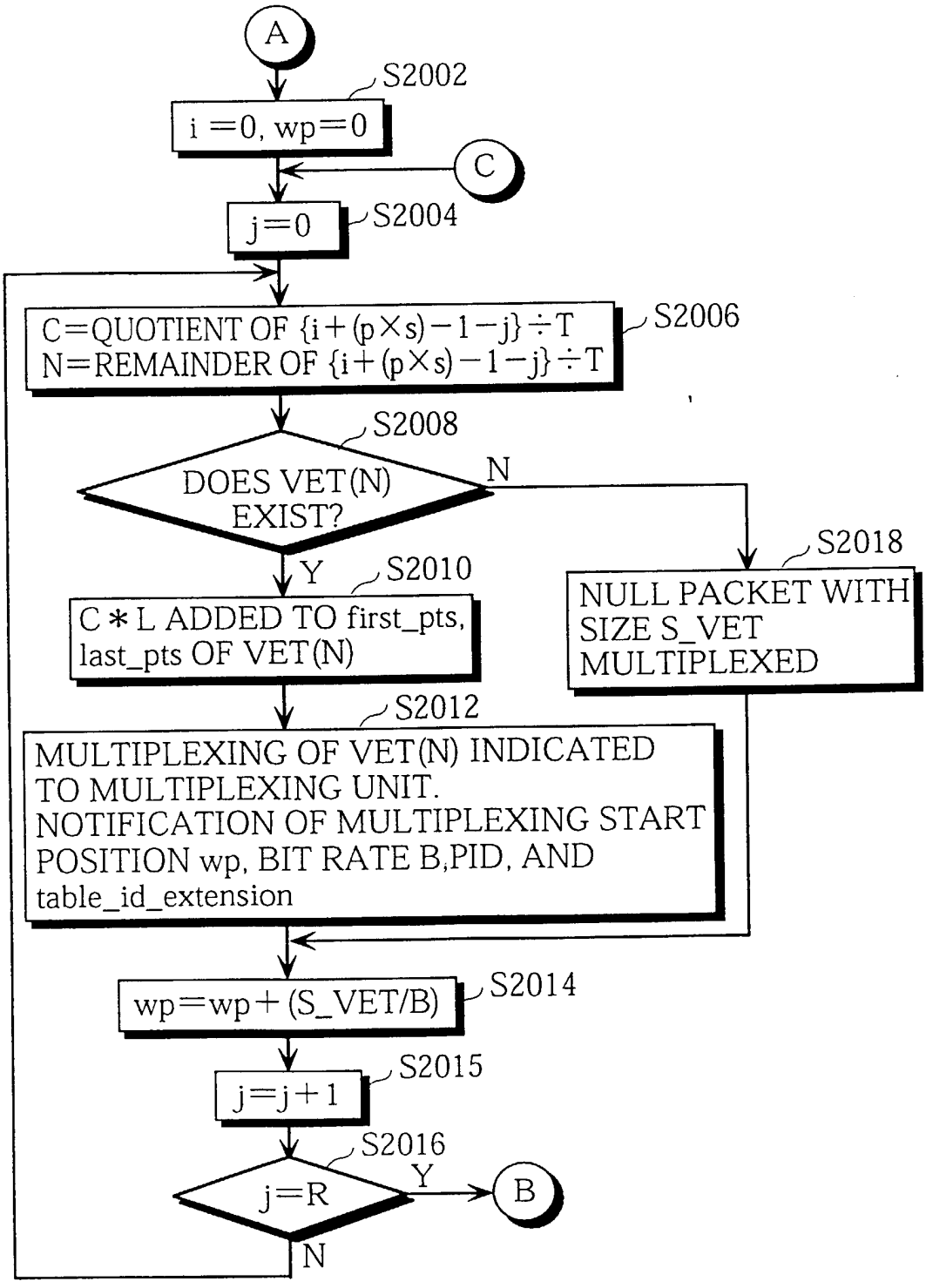


Fig. 73

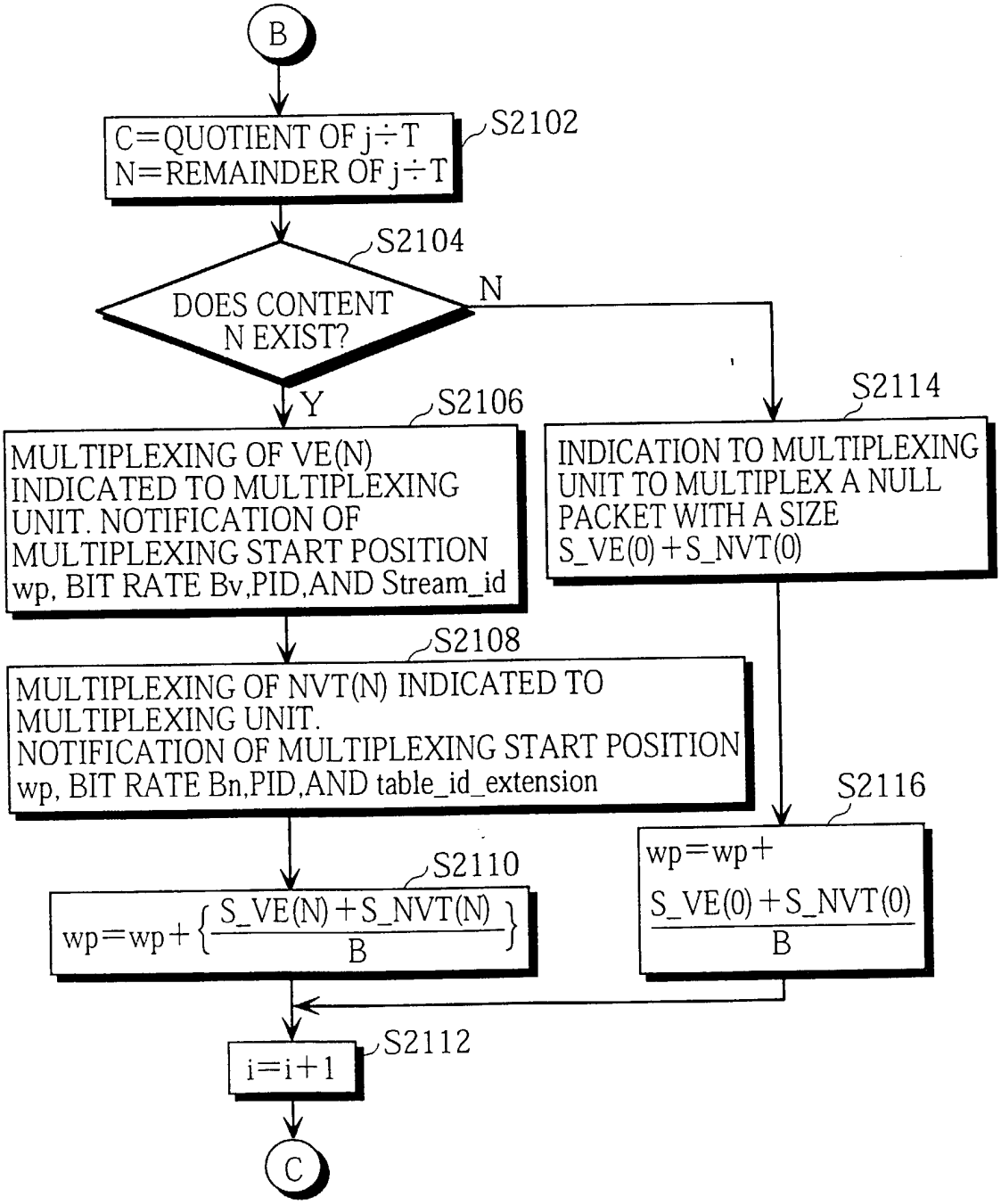


Fig. 74A

2202 FILTER IDENTIFICATION NUMBER	2203 START/STOP	2204 PID	2205 stream_id	2206 table_id_extension	2201 2207 OUTPUTTED DESTINATION
0	STOP	—	—		AV DECODER UNIT
1	STOP	—	—		AV DECODER UNIT
2	START	0x0083		0x0005	STREAM CORRESPONDENCE INFORMATION TABLE STORAGE UNIT
3	START	0x0082		0x0005	NAVIGATION INFORMATION TABLE STORAGE UNIT

Fig. 74B

2208

FILTER IDENTIFICATION NUMBER	START/STOP	PID	stream_id	table_id_extension	OUTPUTTED DESTINATION
0	START	0x0084	0xe5		AV DECODER UNIT
1	STOP	—	—	-	AV DECODER UNIT
2	STOP	—	—	—	STREAM CORRESPONDENCE INFORMATION TABLE STORAGE UNIT
3	START	0x0082		0x0005	NAVIGATION INFORMATION TABLE STORAGE UNIT

Fig. 75A

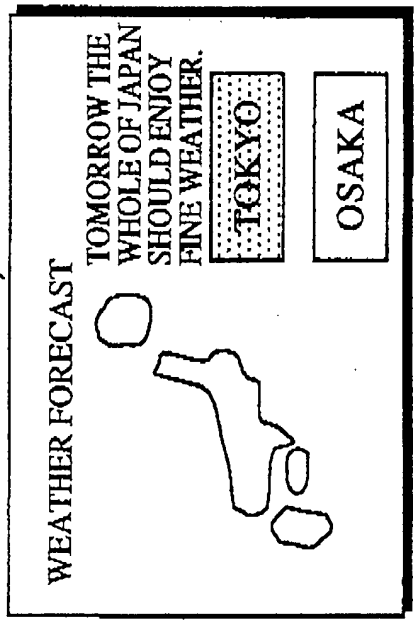


Fig. 75B

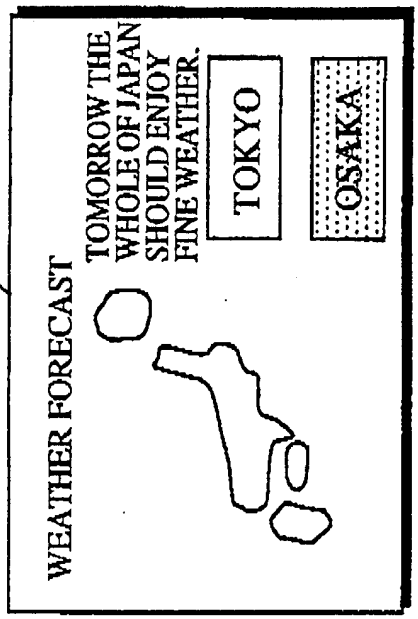


Fig. 75C

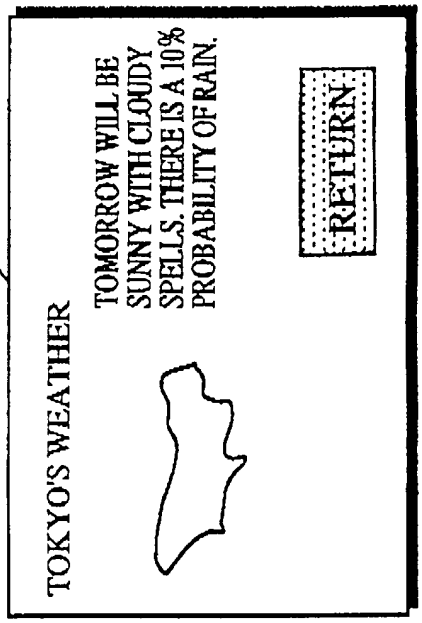


Fig. 76

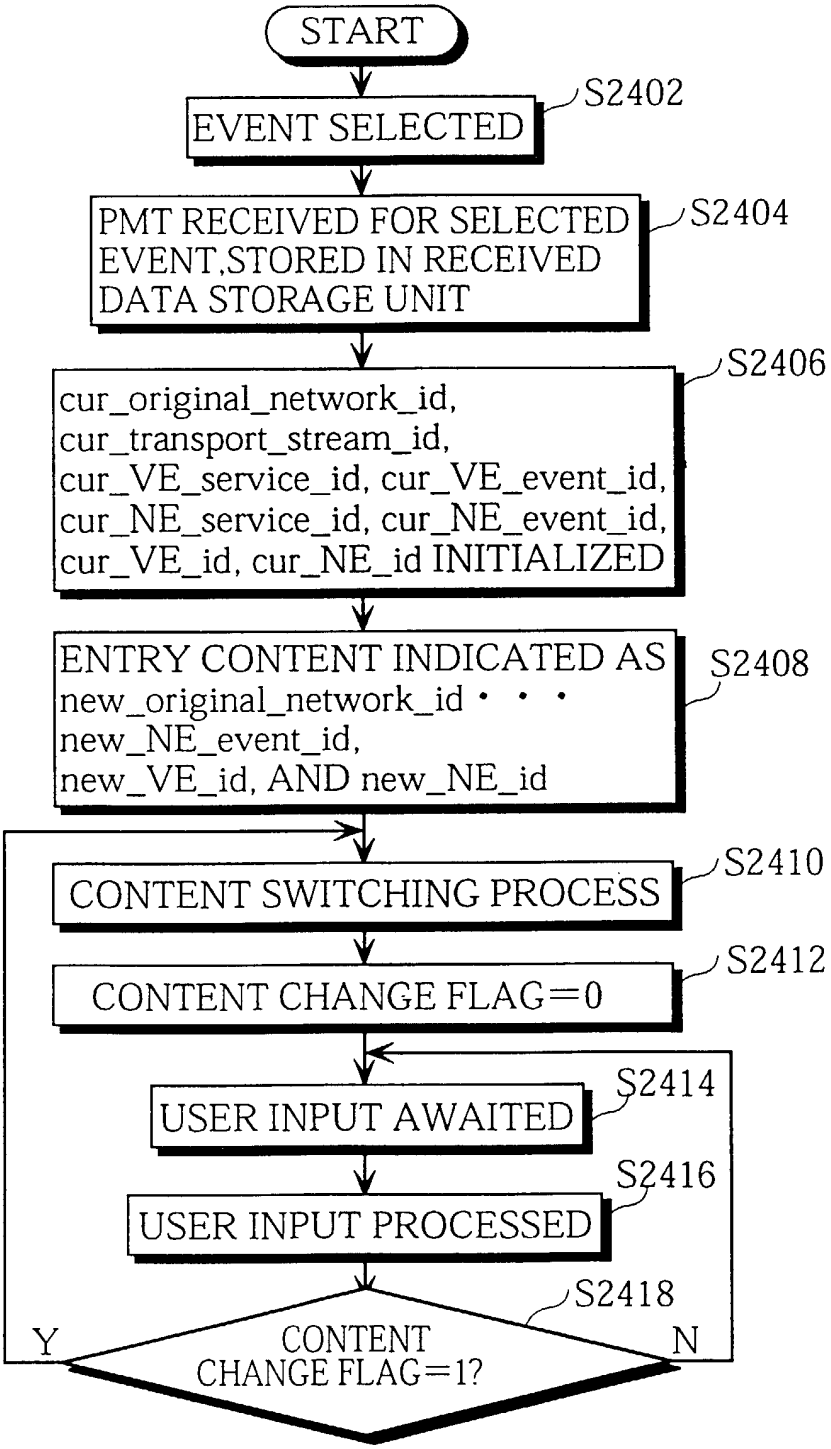


Fig. 77

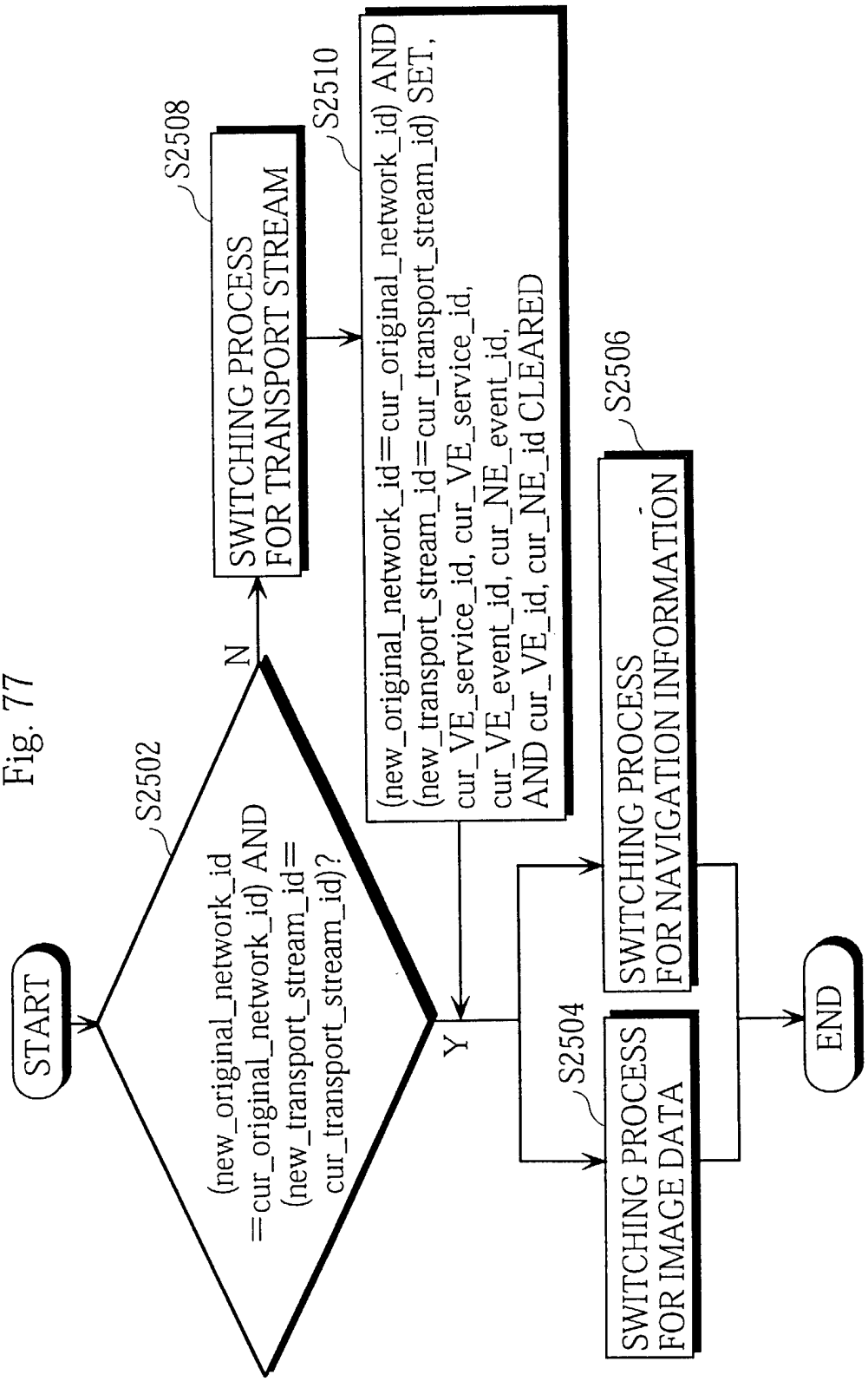


Fig. 78

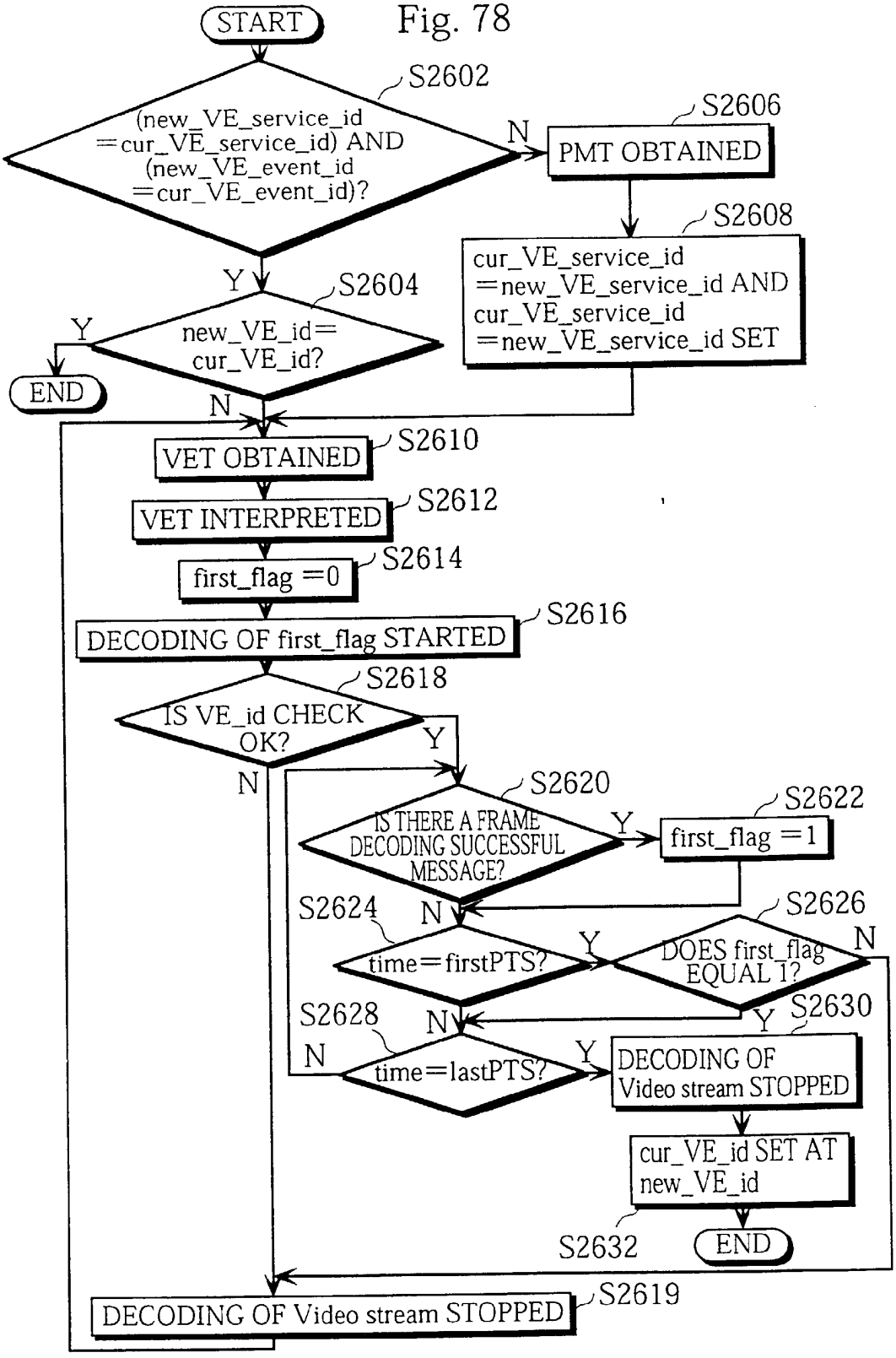


Fig. 79

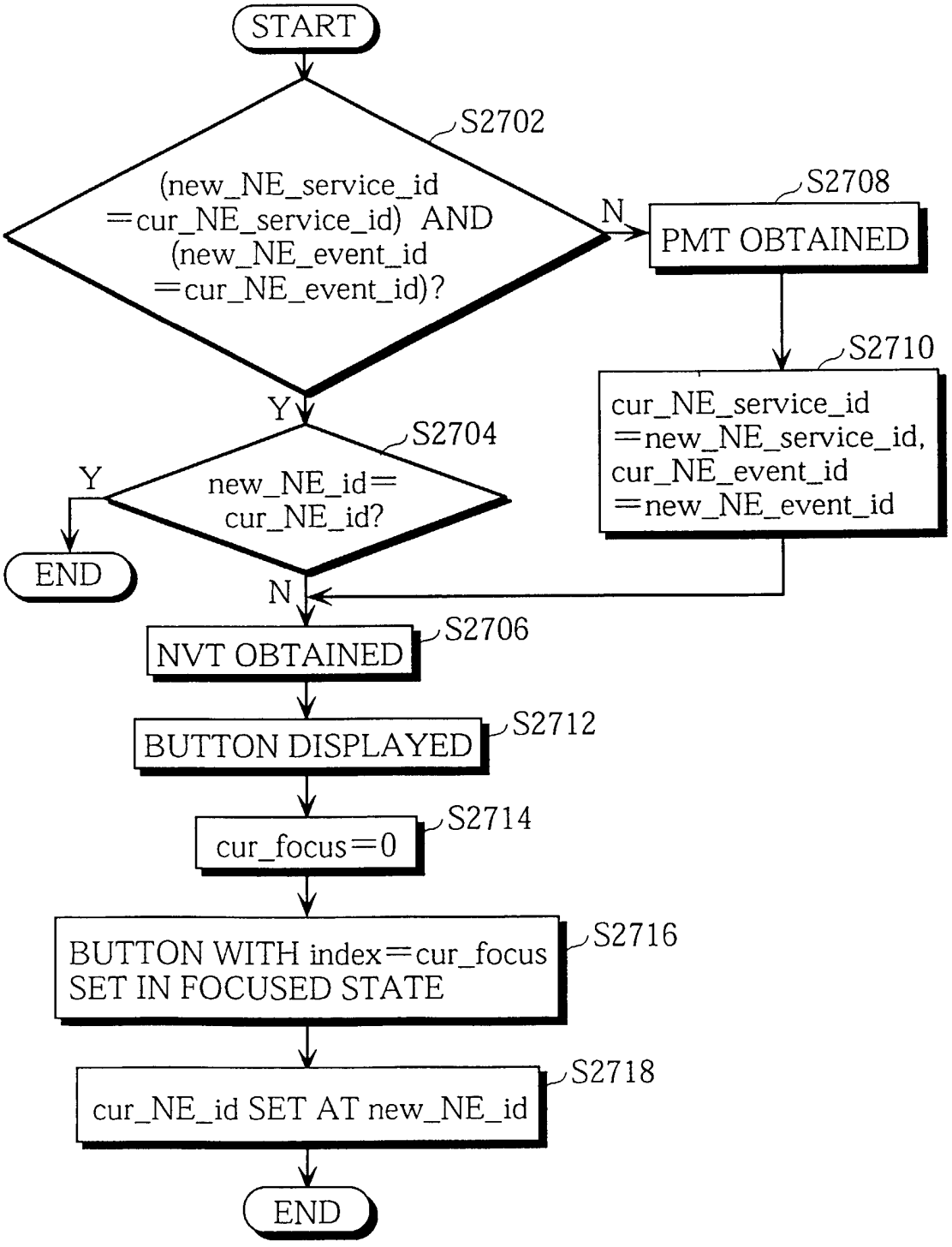


Fig. 80

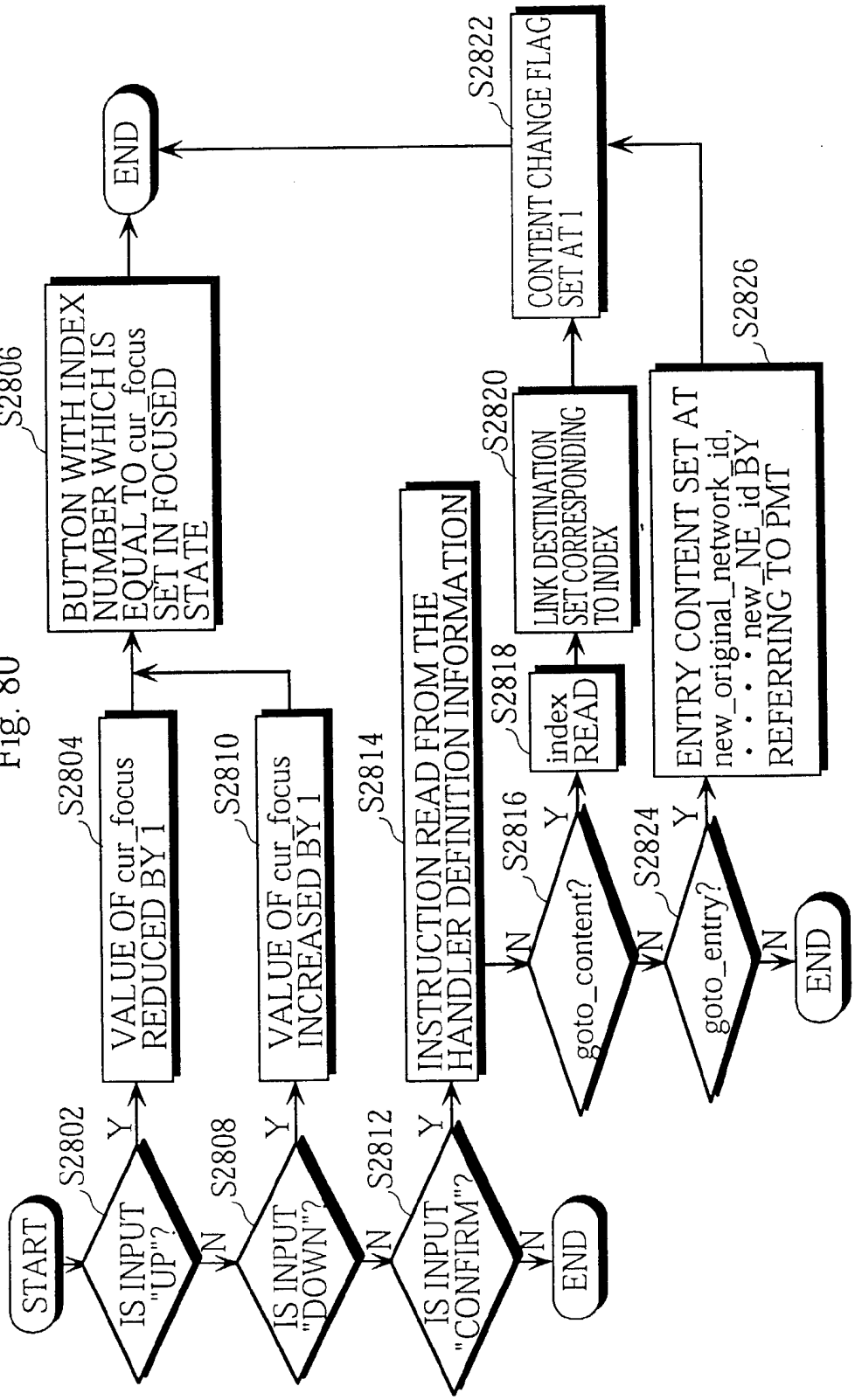


Fig. 81

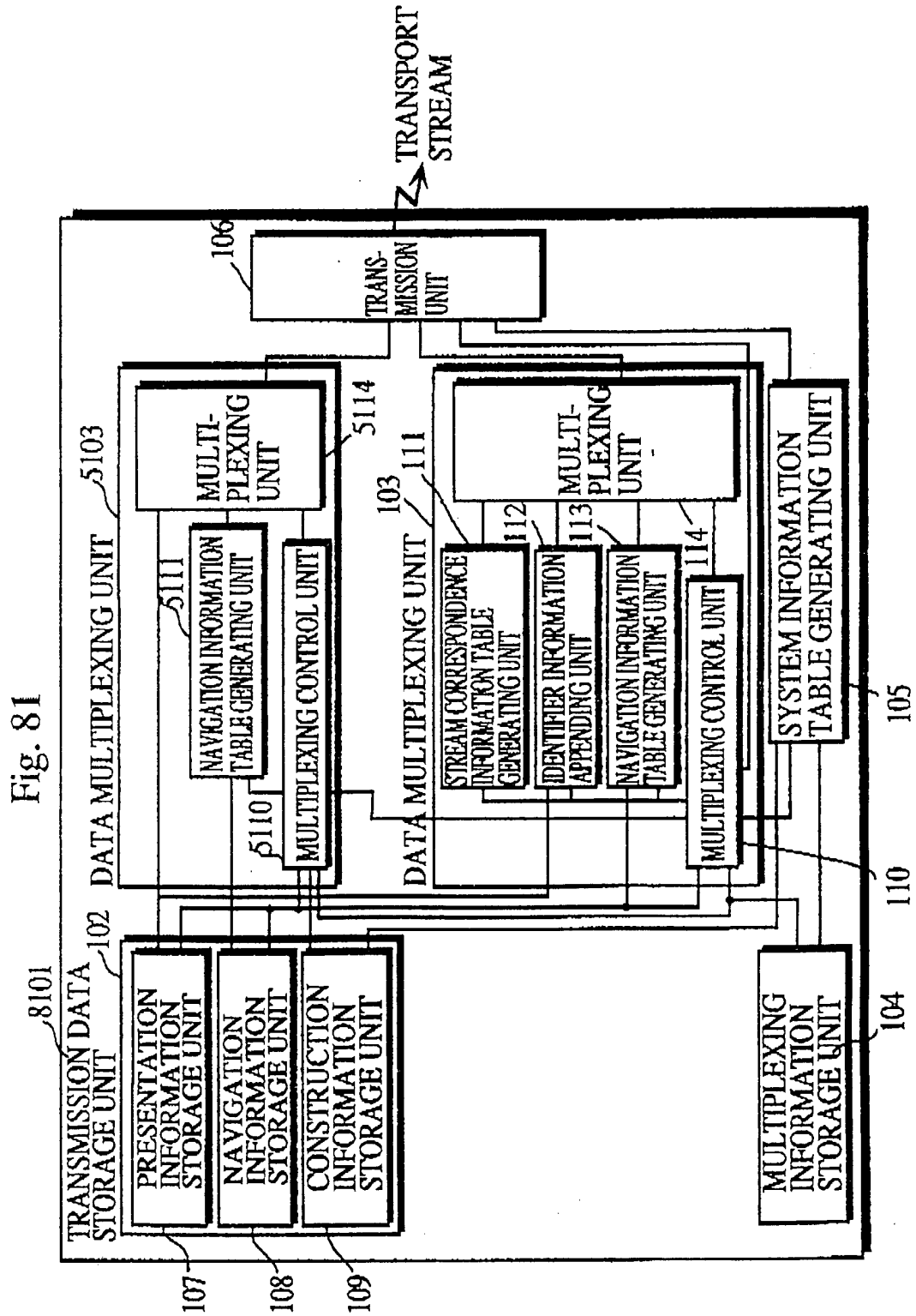


Fig. 82A

8201

CONTENT NUMBER	IMAGE DATA	AUDIO DATA	NAVIGATION INFORMATION
100	Video100.m2v	Audio100.m2v	Navi100-0.nif, Navi100-1.nif, Navi100-2.nif,···
101	Video100.m2v	Audio100.m2v	Navi101-0.nif, Navi101-1.nif, Navi101-2.nif,···
102	Video100.m2v	Audio100.m2v	Navi102-0.nif, Navi102-1.nif, Navi102-2.nif,···
103	Video100.m2v	Audio100.m2v	Navi103-0.nif, Navi103-1.nif, Navi103-2.nif,···
104	Video104.m2v	Audio104.m2v	Navi104-0.nif, Navi104-1.nif, Navi104-2.nif,···
105	Video104.m2v	Audio104.m2v	Navi105-0.nif, Navi105-1.nif, Navi105-2.nif,···
106	Video106.m2v	Audio106.m2v	Navi106-0.nif, Navi106-1.nif, Navi106-2.nif,···
···	···	···	···

Fig. 82B

8301

CONTENT NUMBER	IMAGE DATA	AUDIO DATA	NAVIGATION INFORMATION
0	still0.m2v	—	navi0.nif
1	still1.m2v	—	navi1.nif
2	still2.m2v	—	navi2.nif
3	still3.m2v	—	navi3.nif
4	still4.m2v	—	navi4.nif
5	still5.m2v	—	navi5.nif
6	still6.m2v	—	navi6.nif
···	···	···	···

Fig. 83

Navi5.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	400	200	3	9	10
1	Button	400	300	4	11	12
2	Button	450	400	5	13	14

Handler Definition Table :

Handler Index	Bytecode
3	goto_content(Hyperlink index 6)
4	goto_content(Hyperlink index 7)
5	goto_content(Hyperlink index 8)

Hyperlink Table :

Hyperlink Index	Content number
6	1
7	2
8	100

Bitmap Table :

Bitmap Index	Bitmap Data
9	TOKYO
10	TOKYO
11	OSAKA
12	OSAKA
13	RETURN
14	RETURN

Fig. 84A

(WORLD TRAVEL GUIDE) Video 100.m2v

Fig. 84B

(JAPAN TRAVEL GUIDE) Video 104.m2v

Fig. 84C

(CHINA TRAVEL GUIDE) Video 106.m2v

Fig. 85

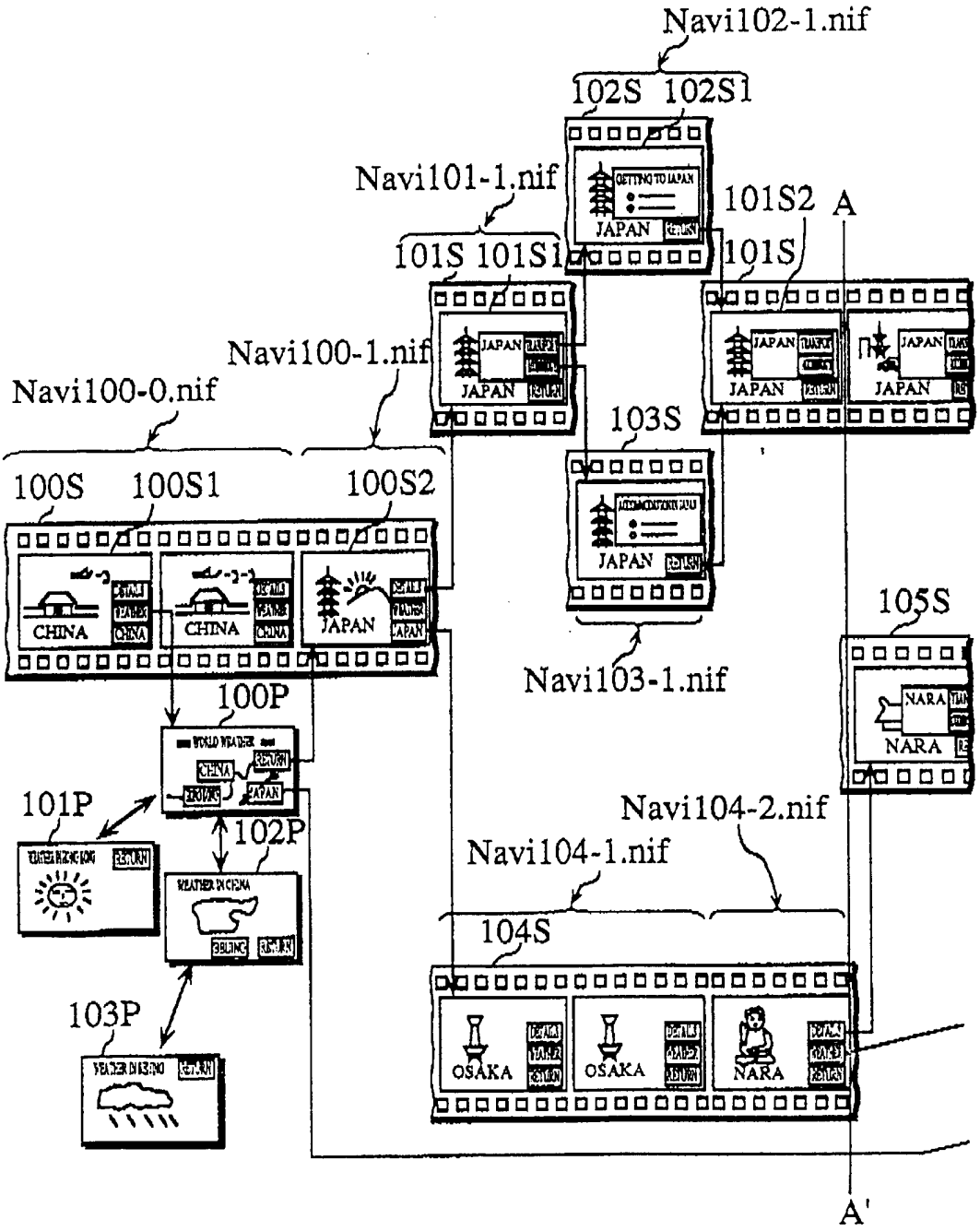


Fig. 86

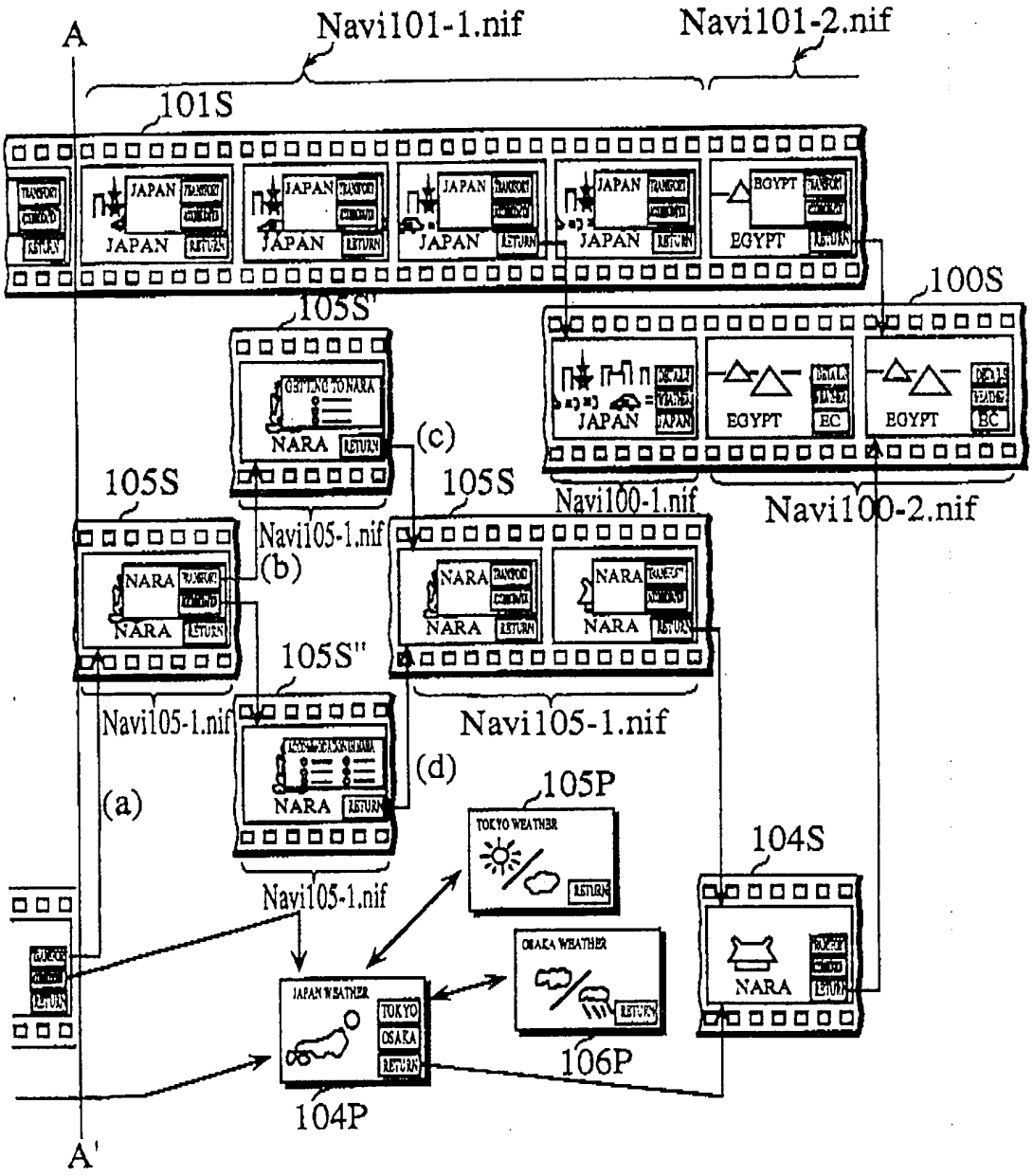


Fig. 87

Navi100-0.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	500	150	0	0	1
1	Button	500	250	1	2	3
2	Button	500	350	2	4	5

Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)
1	goto_content(Hyperlink index 1)
2	goto_content(Hyperlink index 2)

Hyperlink Table :

Hyperlink Index	Content Number
0	101
1	10
2	106

Bitmap Table :

Bitmap Index	Bitmap Data
0	Details
1	Details
2	Weather
3	Weather
4	China
5	China

Time Information Table :

start_time	1
end_time	300

Fig. 88

Navi100-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	500	150	0	0	1
1	Button	500	250	1	2	3
2	Button	500	350	2	4	5

Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)
1	goto_content(Hyperlink index 1)
2	goto_content(Hyperlink index 2)

Hyperlink Table :

Hyperlink Index	Content Number
0	101
1	10
2	104

Time Information Table :

start_time	301
end_time	600

Bitmap Table :

Bitmap Index	Bitmap Data
0	Details
1	Details
2	Weather
3	Weather
4	Japan
5	Japan

Fig. 89

Navi100-2.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	500	150	0	0	1
1	Button	500	250	1	2	3
2	Button	500	350	2	4	5

Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)
1	goto_content(Hyperlink index 1)
2	goto_content(Hyperlink index 2)

Hyperlink Table :

Hyperlink Index	Content Number
0	101
1	10
2	120

Bitmap Table :

Bitmap Index	Bitmap Data
0	Details
1	Details
2	Weather
3	Weather
4	Egypt
5	Egypt

Time Information Table :

start_time	601
end_time	900

Fig. 90

Navi101-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	500	120	0	0	1
1	Button	500	220	1	2	3
2	Button	500	350	2	4	5
3	Picture	200	100		6	

Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)
1	goto_content(Hyperlink index 1)
2	goto_content(Hyperlink index 2)

Hyperlink Table :

Hyperlink Index	Content Number
0	102
1	103
2	100

Time Information Table :

start_time	301
end_time	600

Bitmap Table :

Bitmap Index	Bitmap Data
0	TRANSPORT
1	TRANSPORT
2	ACCOMMODATION
3	ACCOMMODATION
4	RETURN
5	RETURN
6	JAPAN....

Fig. 91

Navi101-2.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	500	120	0	0	1
1	Button	500	220	1	2	3
2	Button	500	350	2	4	5
3	Picture	200	100		6	

Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)
1	goto_content(Hyperlink index 1)
2	goto_content(Hyperlink index 2)

Hyperlink Table :

Hyperlink Index	Content Number
0	102
1	103
2	100

Time Information Table :

start_time	601
end_time	900

Bitmap Table :

Bitmap Index	Bitmap Data
0	TRANSPORT
1	TRANSPORT
2	ACCOMMODATION
3	ACCOMMODATION
4	RETURN
5	RETURN
6	EGYPT....

Fig. 92

Navi102-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	500	350	0	0	1
1	Picture	200	100	—	2	—

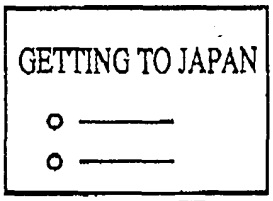
Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)

Hyperlink Table :

Hyperlink Index	Content Number
0	101

Bitmap Table :

Bitmap Index	Bitmap Data
0	
1	
2	

Time Information Table :

start_time	301
end_time	600

Fig. 93

Navi103-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	500	350	0	0	1
1	Picture	200	100	—	2	—

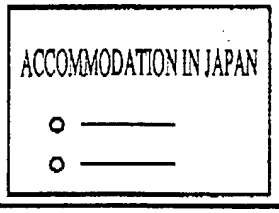
Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)

Hyperlink Table :

Hyperlink Index	Content Number
0	101

Bitmap Table :

Bitmap Index	Bitmap Data
0	
1	
2	

Time Information Table :

start_time	301
end_time	600

Fig. 94

Navi104-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	500	150	0	0	1
1	Button	500	250	1	2	3
2	Button	500	350	2	4	5

Handler Definition Table :

Handler Index	Script
0	goto_content(Hyperlink index 0)
1	goto_content(Hyperlink index 1)
2	goto_content(Hyperlink index 2)

Hyperlink Table :

Hyperlink Index	Content Number
0	105
1	5
2	100

Bitmap Table :

Bitmap Index	Bitmap Data
0	DETAILS
1	DETAILS
2	WEATHER
3	WEATHER
4	RETURN
5	RETURN

Time Information Table :

start_time	401
end_time	900

Fig. 95

Navi105-1.nif

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	Focused Bitmap	visibility
0	Button	500	120	0	0	1	1
1	Button	500	220	1	2	3	1
2	Button	500	350	2	4	5	1
3	Picture	100	200	—	6	—	1
4	Picture	100	200	—	7	—	0
5	Button	500	350	3	4	5	0
6	Picture	100	200	—	8	—	0
7	Button	500	350	4	4	5	0

Handler Definition Table :

Handler Index	Script

0	for(i=0, i<4, i++){
	hide_object(object index i)
	}
	show_object(object index 4)
	show_object(object index 5)

1	for(i=0, i<4, i++){
	hide_object(object index i)
	}
	show_object(object index 6)
	show_object(object index 7)

2	goto_content(hyperlink index 0)

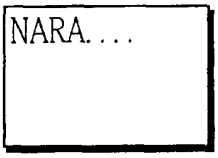
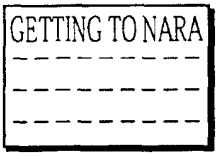
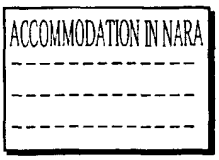
3	hide_object(object index 4)
	hide_object(object index 5)
	for(i=0, i<4, i++){
	show object(object index i)
	}

4	hide_object(object index 6)
	hide_object(object index 7)
	for(i=0, i<4, i++){
	show object(object index i)
	}

Hyperlink Table :

Hyperlink Index	Content Number
0	104

Bitmap Table :

Bitmap Index	Bitmap Data
0	
1	
2	
3	
4	
5	
6	
7	
8	

Time Information Table :

start_time	401
end_time	900

Fig. 96

NVT(104.1)

Object Definition Table :

Object Index	type	X	Y	Handler	Normal Bitmap	FocusedBitmap
0	Button	500	150	0	0	1
1	Button	500	250	1	2	3
2	Button	500	350	2	4	5

Handler Definition Table :

Handler Index	Bytecode
0	goto_content(Hyperlink index 0)
1	goto_content(Hyperlink index 1)
2	goto_content(Hyperlink index 2)

Hyperlink Table :

Hyperlink Index	orig_nw_id	ts_id	VE_service_id	VE_event_id	VE_comp_tag	VE_id	AE_service_id	AE_event_id	AE_comp_tag	AE_id	NE_service_id	NE_event_id	NE_id
0	—	—	—	—	0xf5	—	—	—	0xf5	—	—	—	0x0069
1	—	—	—	—	—	0x0005	—	—	—	—	—	—	0x0005
2	—	—	—	—	0xf0	—	—	—	0xf0	—	—	—	0x0064

Bitmap Table :

Bitmap Index	Bitmap Data
0	DETAILS
1	DETAILS
2	WEATHER
3	WEATHER
4	RETURN
5	RETURN

Time Information Table :

start_time	401
end_time	900

Fig. 97

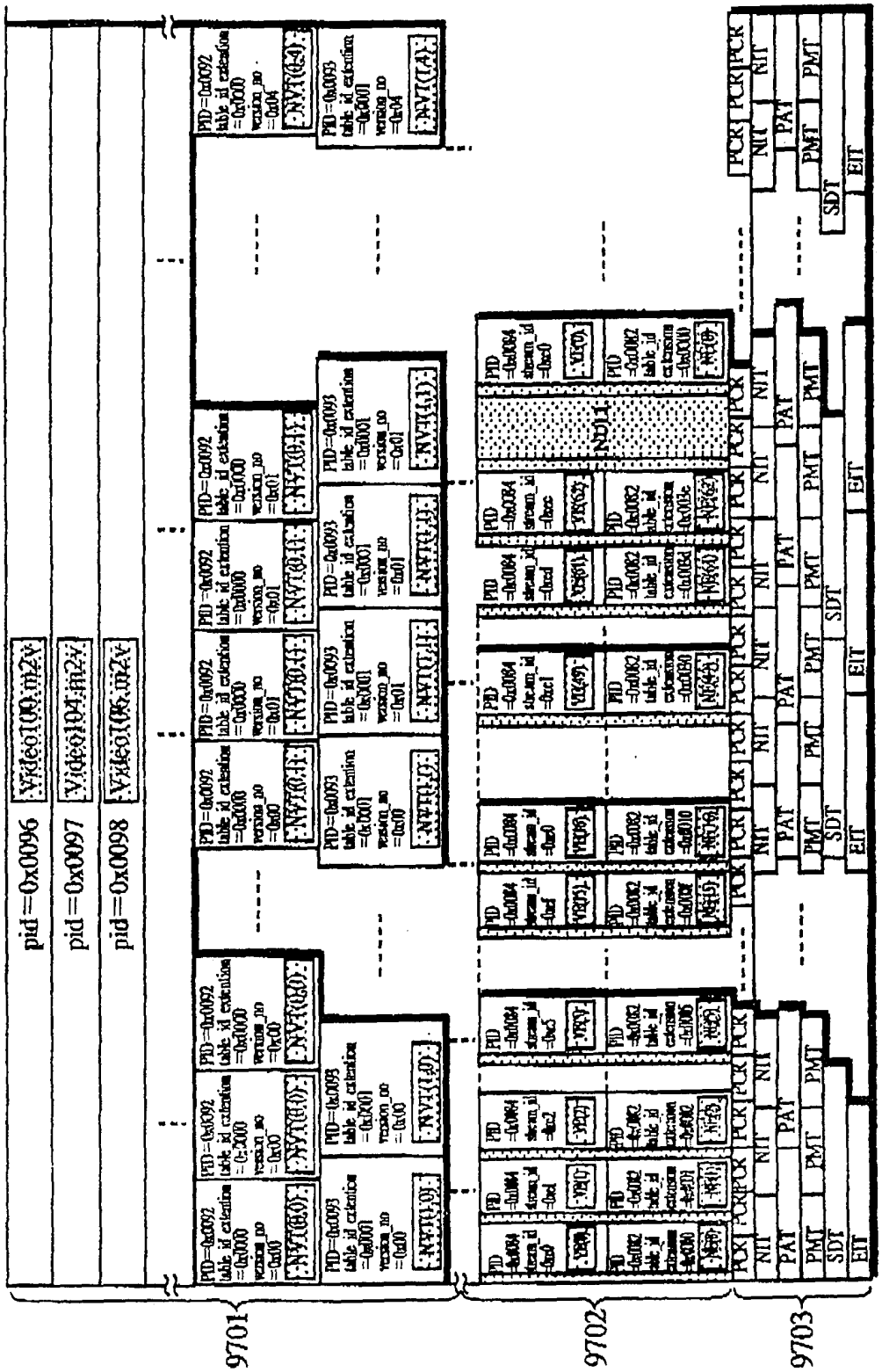


Fig. 98

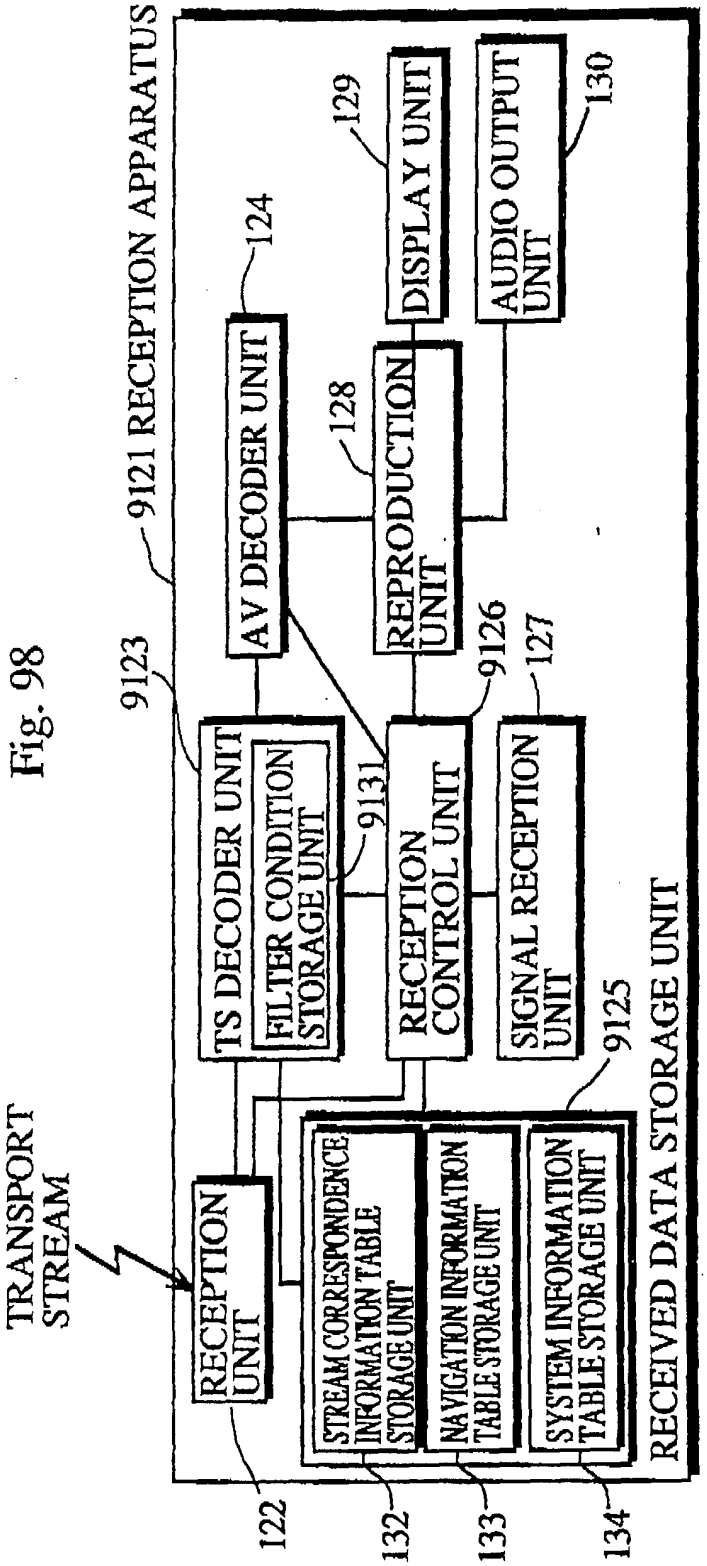


Fig. 99

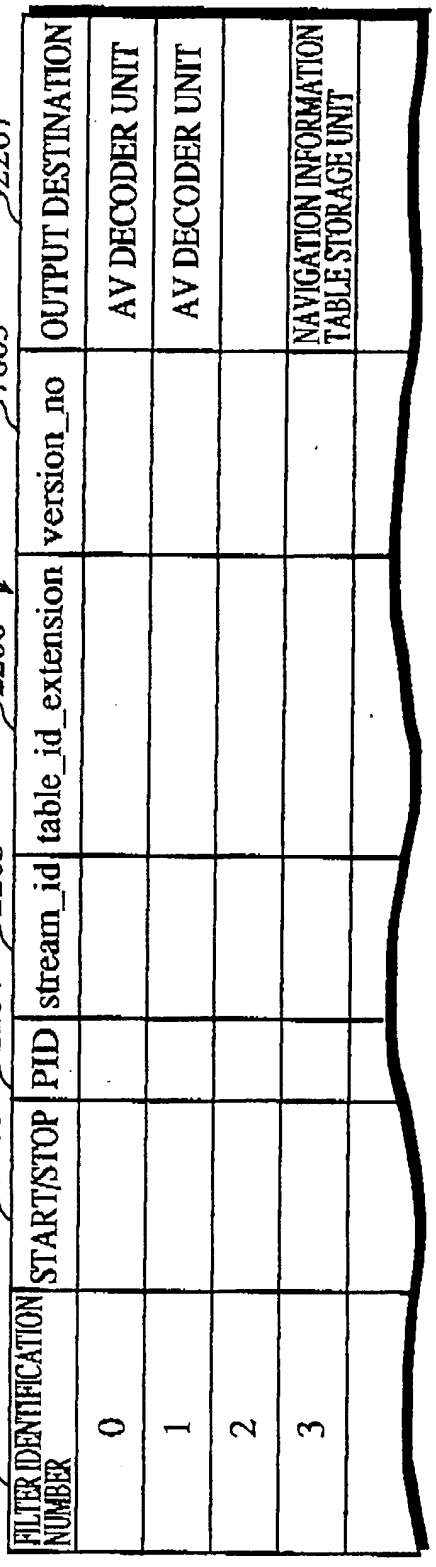


Fig. 100

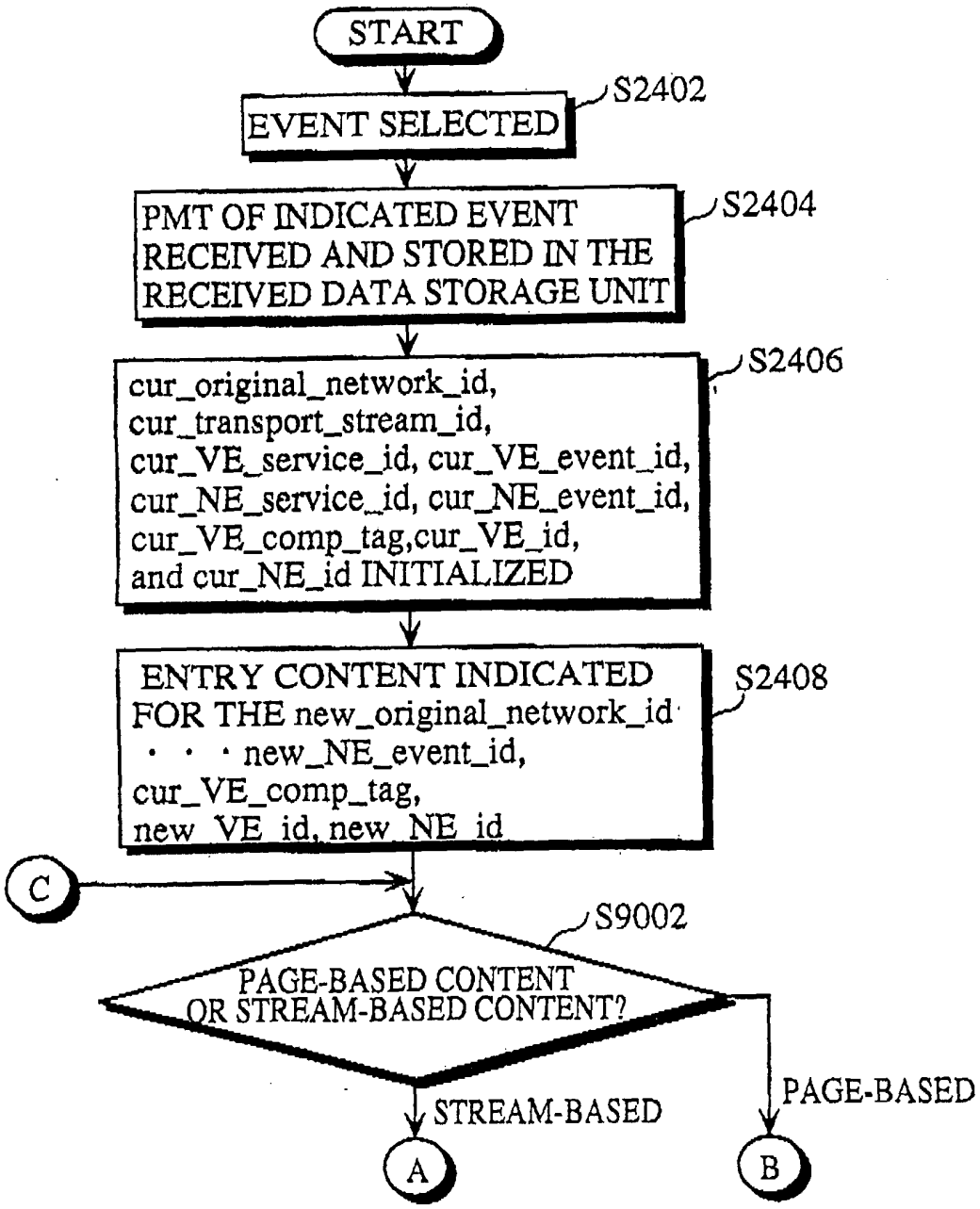


Fig. 101