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(54) **IMAGE SYSTEM**

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(51) **Int. Cl.**

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H04N 11/02	(2006.01)
H04N 11/04	(2006.01)
H04N 7/01	(2006.01)
G09G 5/00	(2006.01)

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

CPC ***H04N 7/0125*** (2013.01); ***G09G 5/005*** (2013.01); ***G09G 5/006*** (2013.01); *G09G 2370/12* (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

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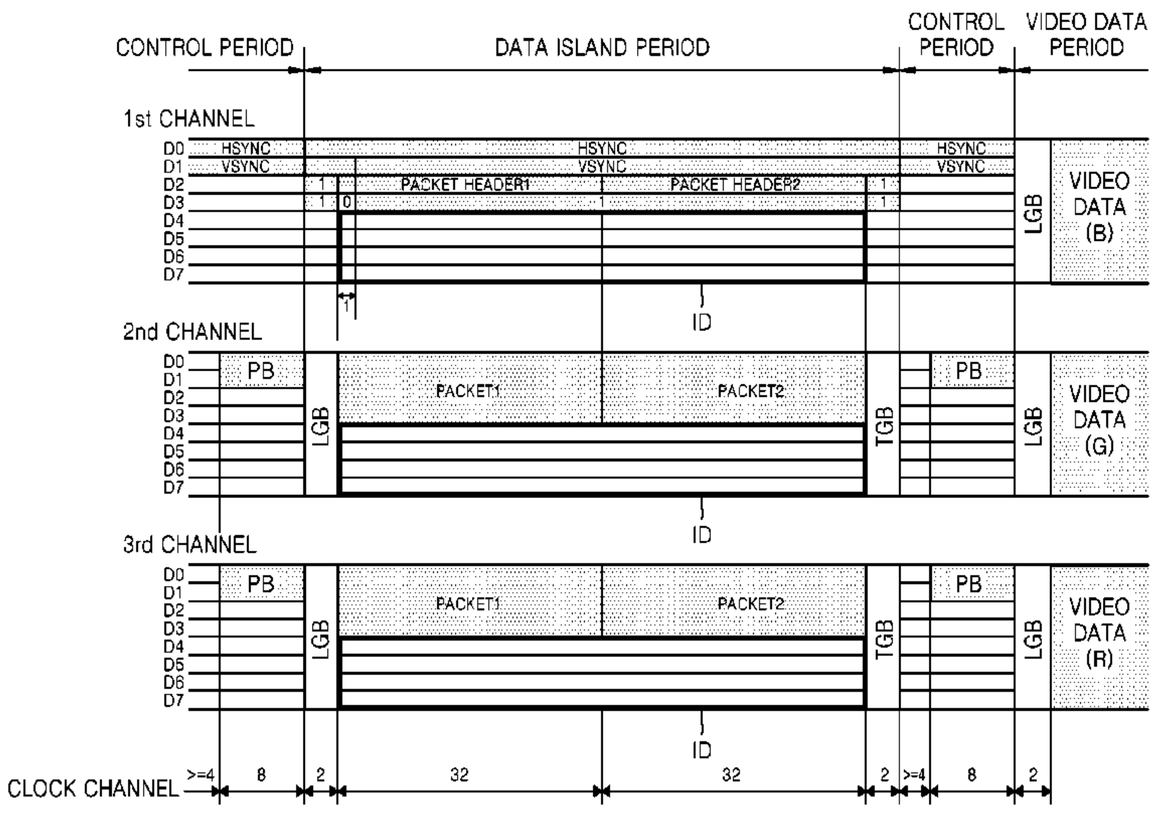
(57) **ABSTRACT**

An image system includes image signal generating apparatuses; display apparatuses; and intervention apparatuses. The intervention apparatuses are interconnected between the image signal generating apparatuses and the display apparatuses, convert the image signals from the image signal generating apparatuses to image signals of a first format, add identification information regarding the image signal generating apparatuses to the image signals of the first format, and output the image signals of the first format and the identification information, respectively.

7 Claims, 6 Drawing Sheets



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JP	2004-56282	A	2/2004
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Office Action in Japanese Application No. 2013-147108, dated Mar. 24, 2015.

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FIG. 1(RELATED ART)

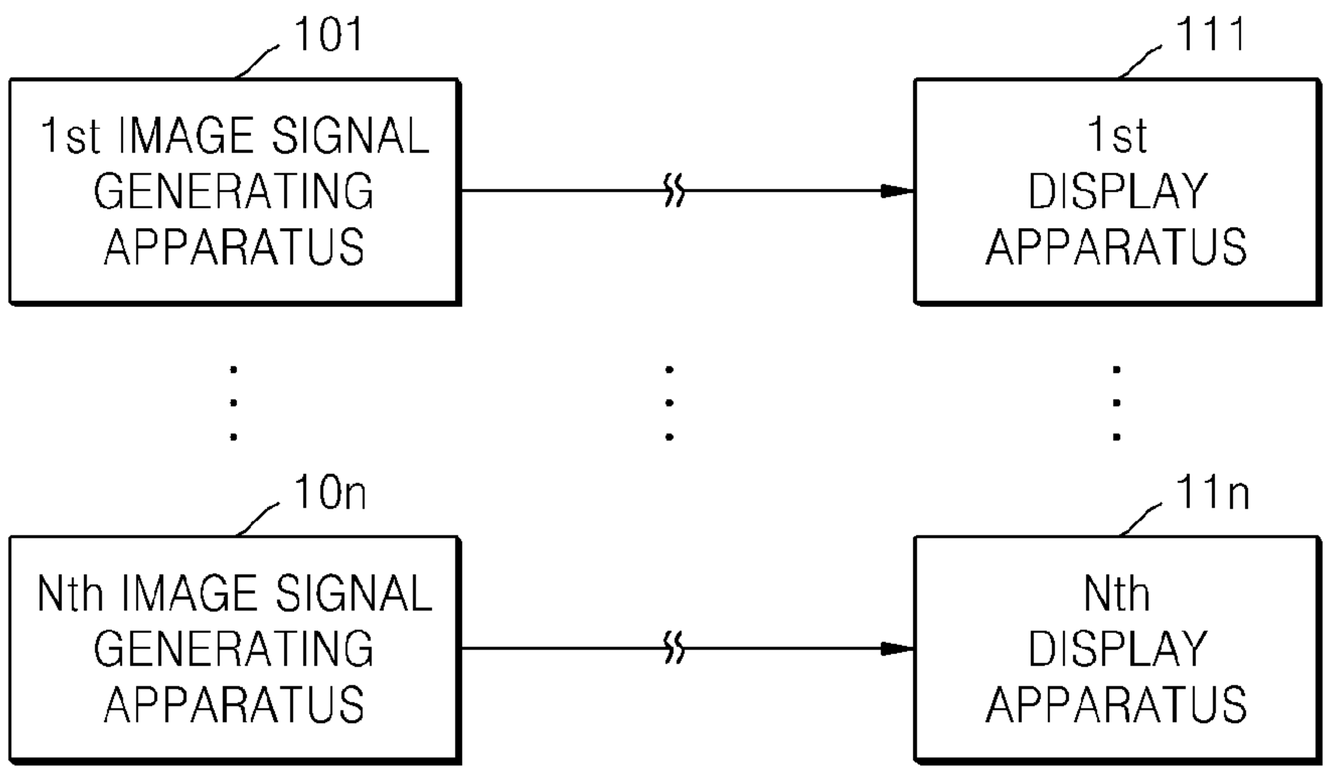

FIG. 2

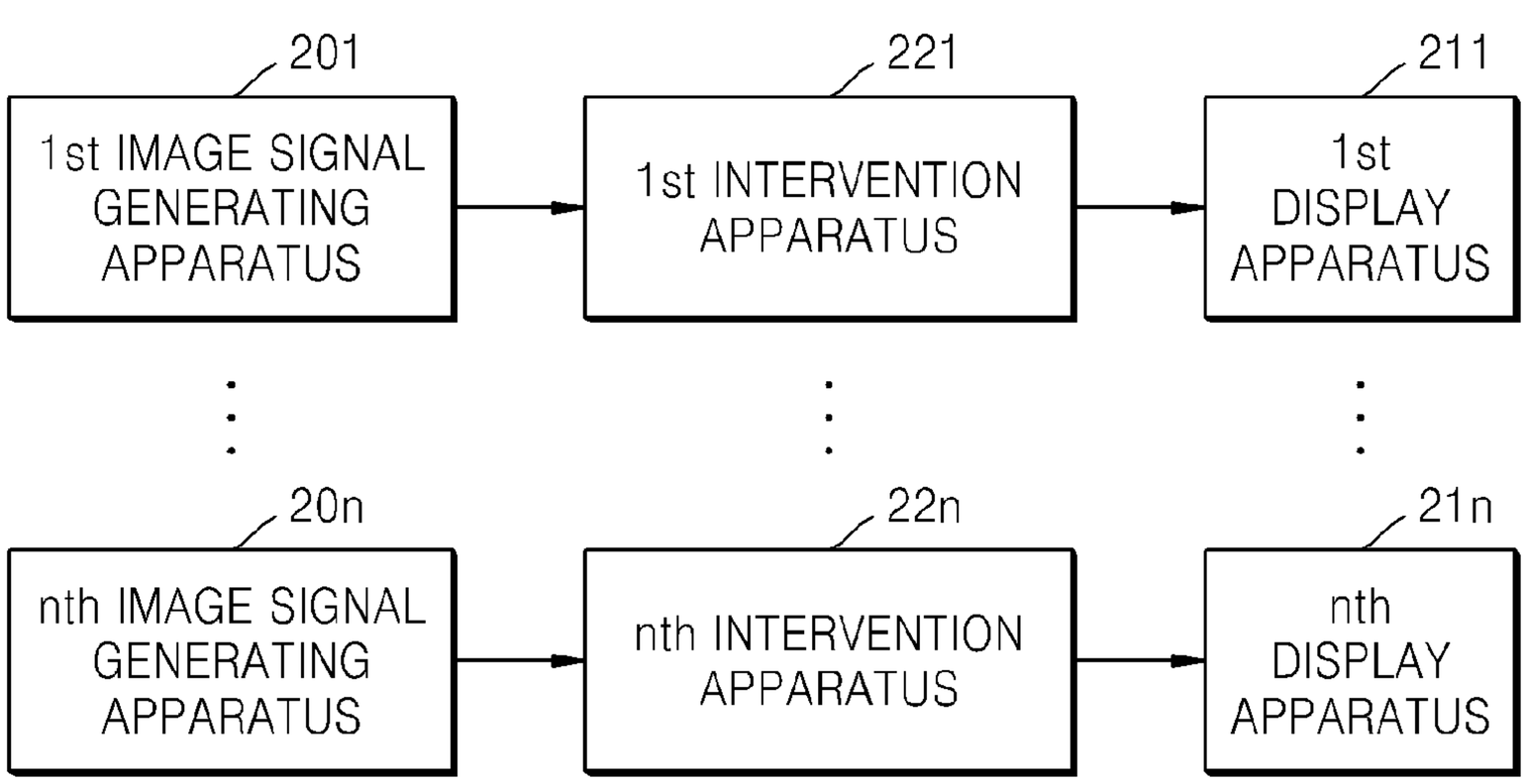

FIG. 3

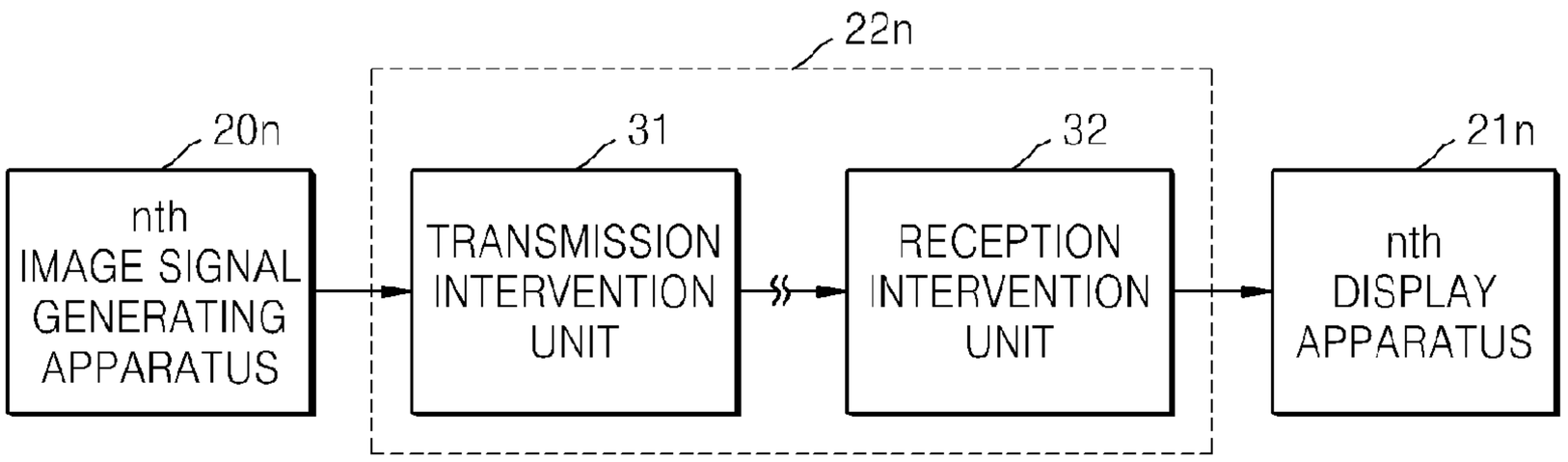
22n
20n
nth IMAGE SIGNAL GENERATING APPARATUS
31
TRANSMISSION INTERVENTION UNIT
32
RECEPTION INTERVENTION UNIT
21n
nth DISPLAY APPARATUS

FIG. 4

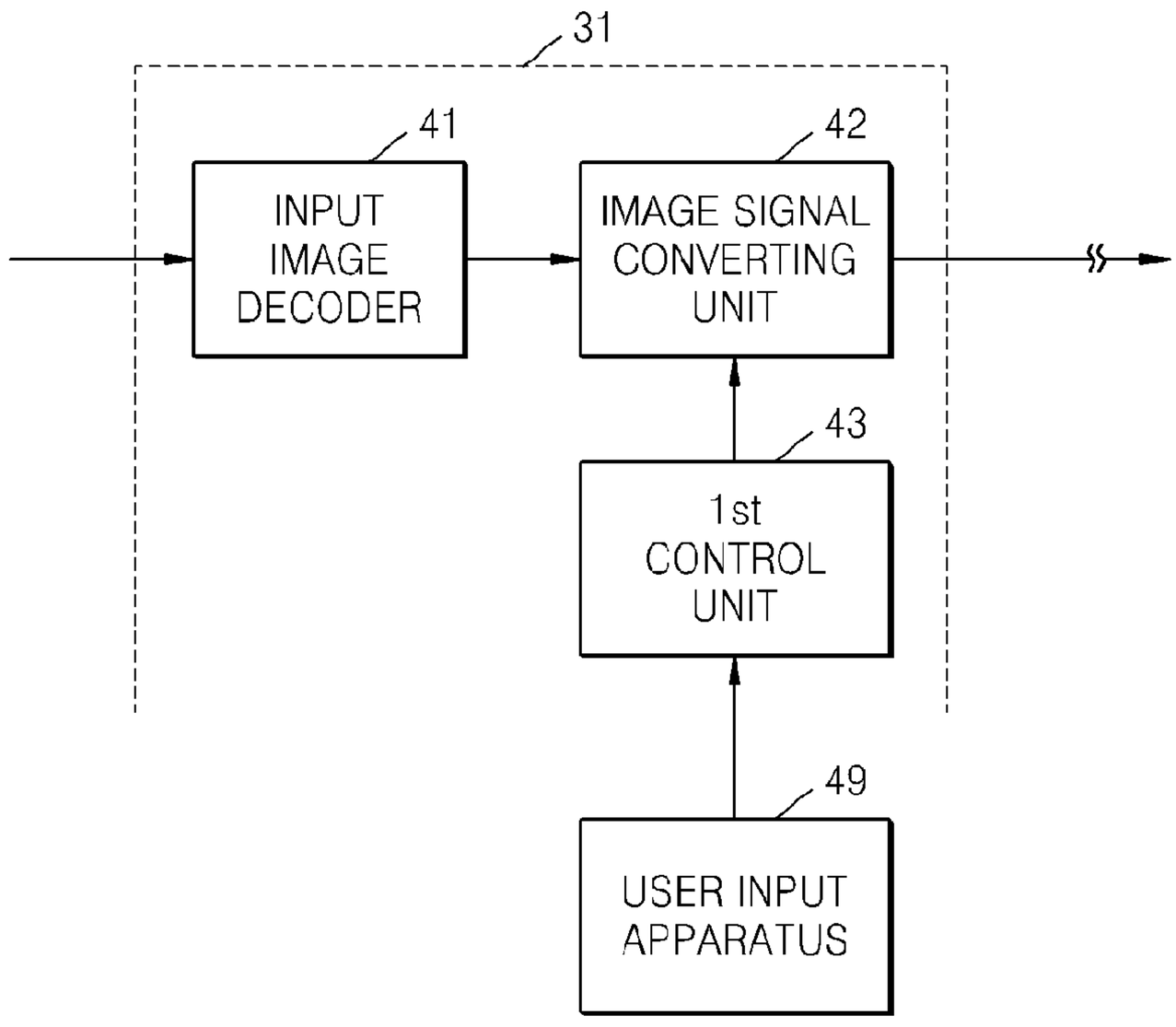
31
41
INPUT IMAGE DECODER
42
IMAGE SIGNAL CONVERTING UNIT
43
1st CONTROL UNIT
49
USER INPUT APPARATUS

FIG. 5

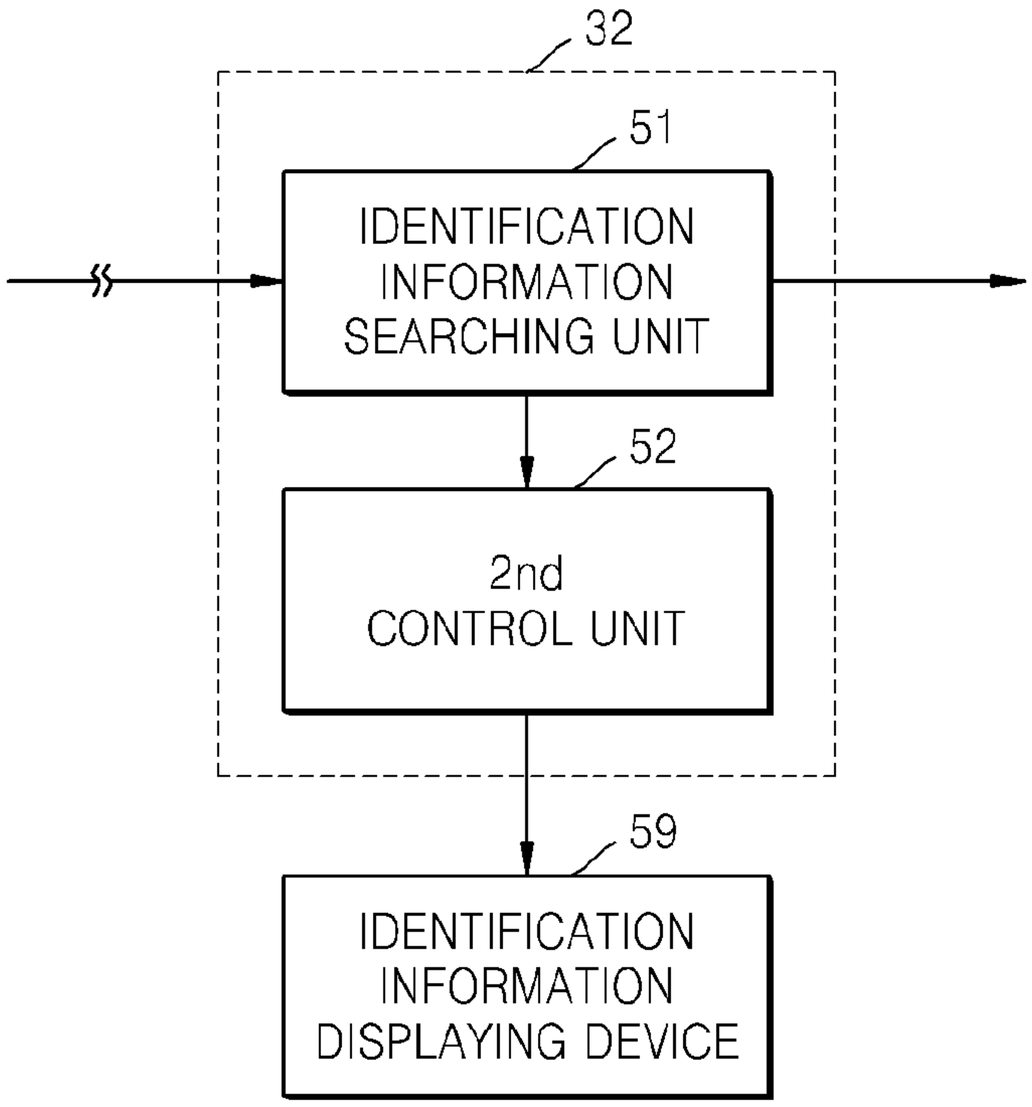
32
51
IDENTIFICATION INFORMATION SEARCHING UNIT
52
2nd CONTROL UNIT
59
IDENTIFICATION INFORMATION DISPLAYING DEVICE

FIG. 6

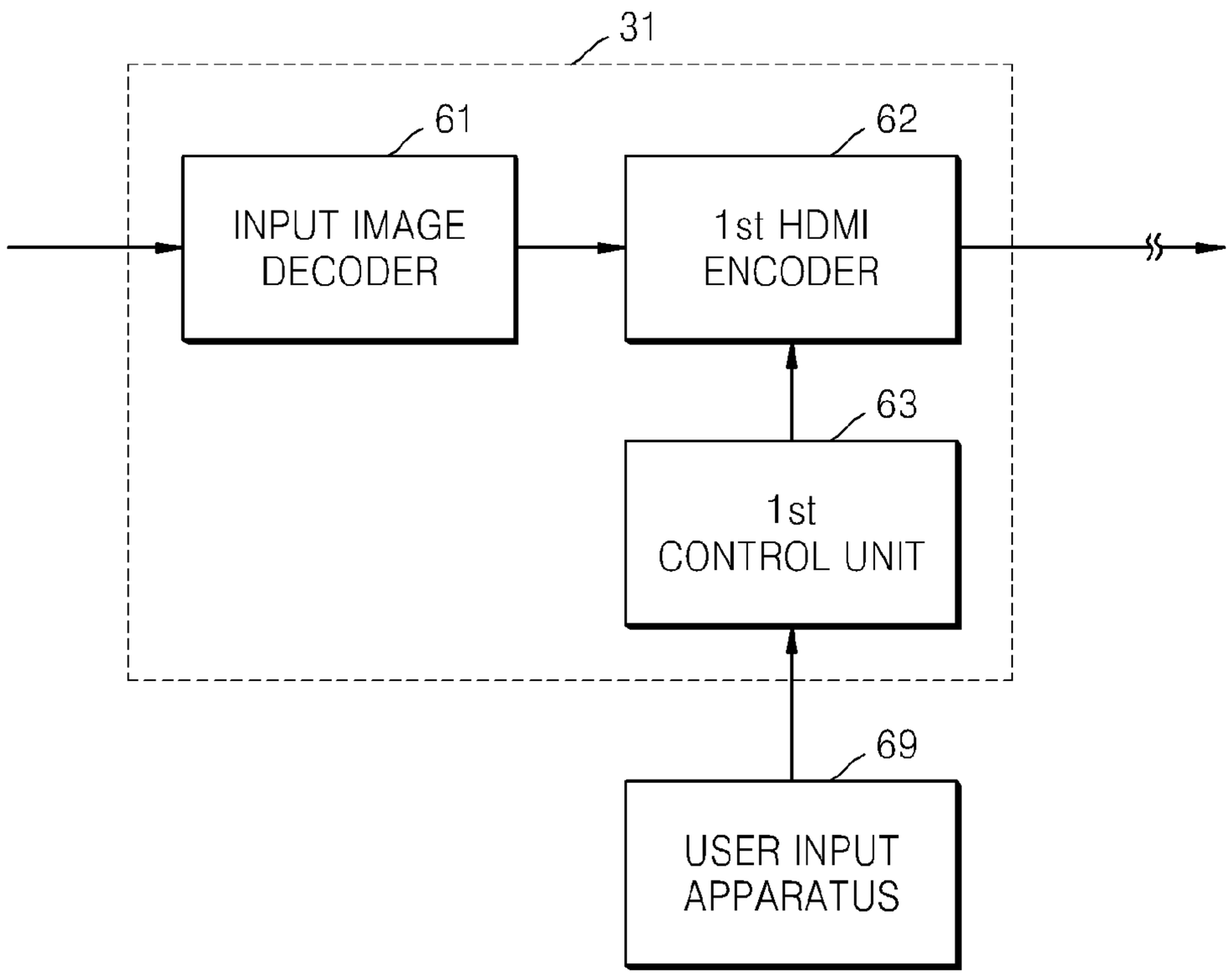
31
61
INPUT IMAGE DECODER
62
1st HDMI ENCODER
63
1st CONTROL UNIT
69
USER INPUT APPARATUS

FIG. 7

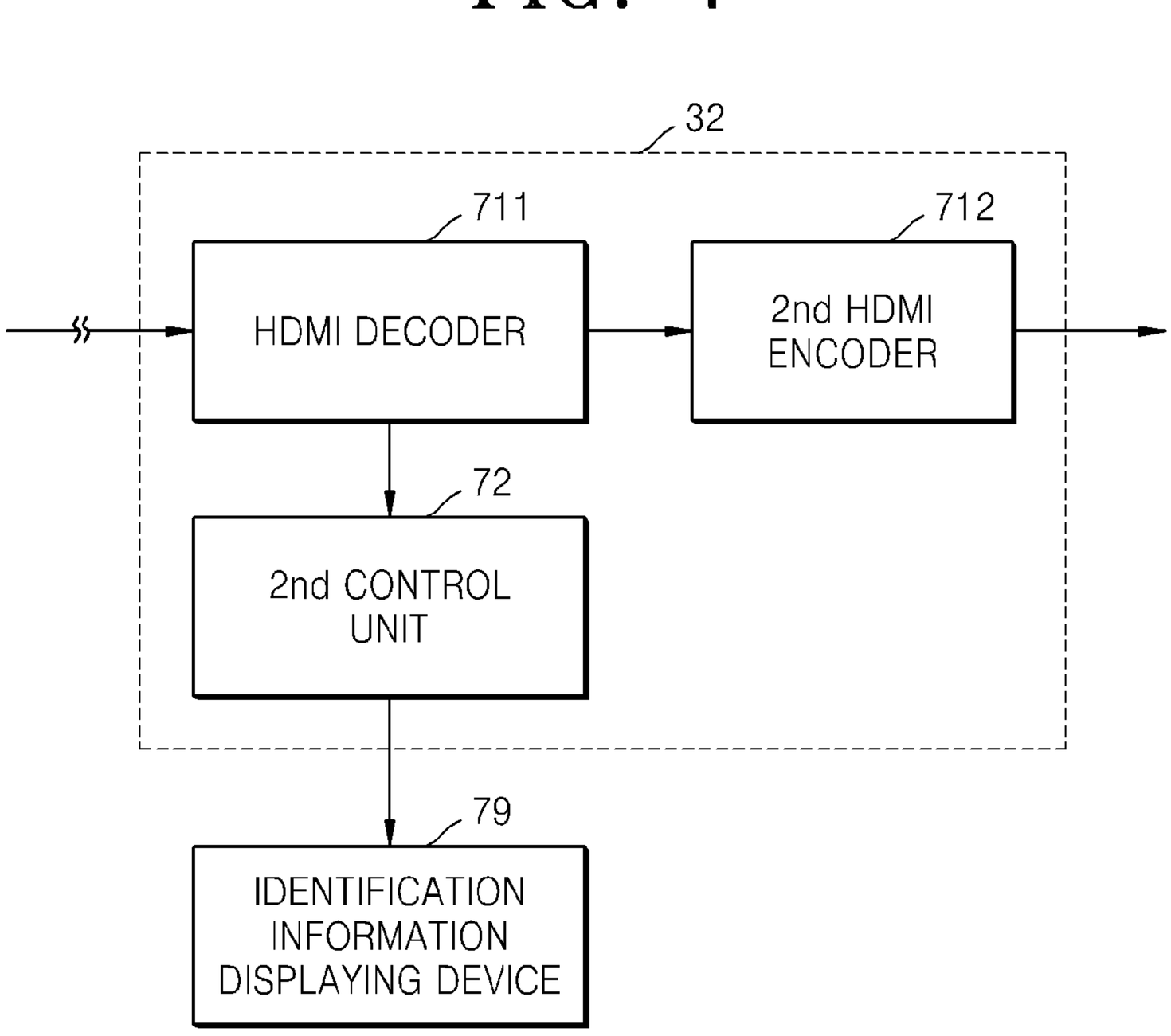
32
711
712
HDMI DECODER
2nd HDMI ENCODER
72
2nd CONTROL UNIT
79
IDENTIFICATION INFORMATION DISPLAYING DEVICE

FIG. 8

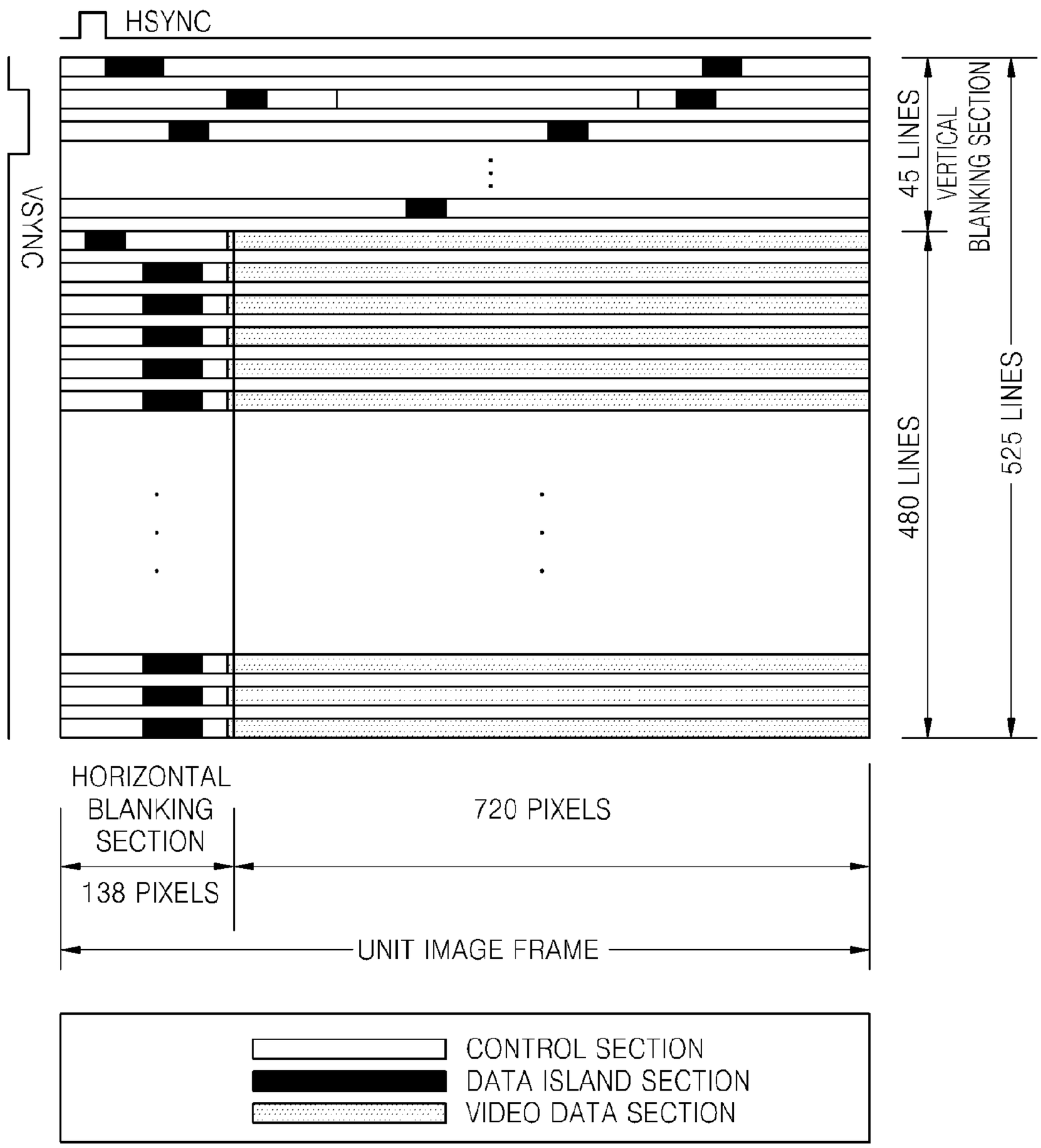
HSYNC
VSYNC
45 LINES
VERTICAL BLANKING SECTION
480 LINES
525 LINES
HORIZONTAL BLANKING SECTION
138 PIXELS
720 PIXELS
UNIT IMAGE FRAME
CONTROL SECTION
DATA ISLAND SECTION
VIDEO DATA SECTION

FIG. 9

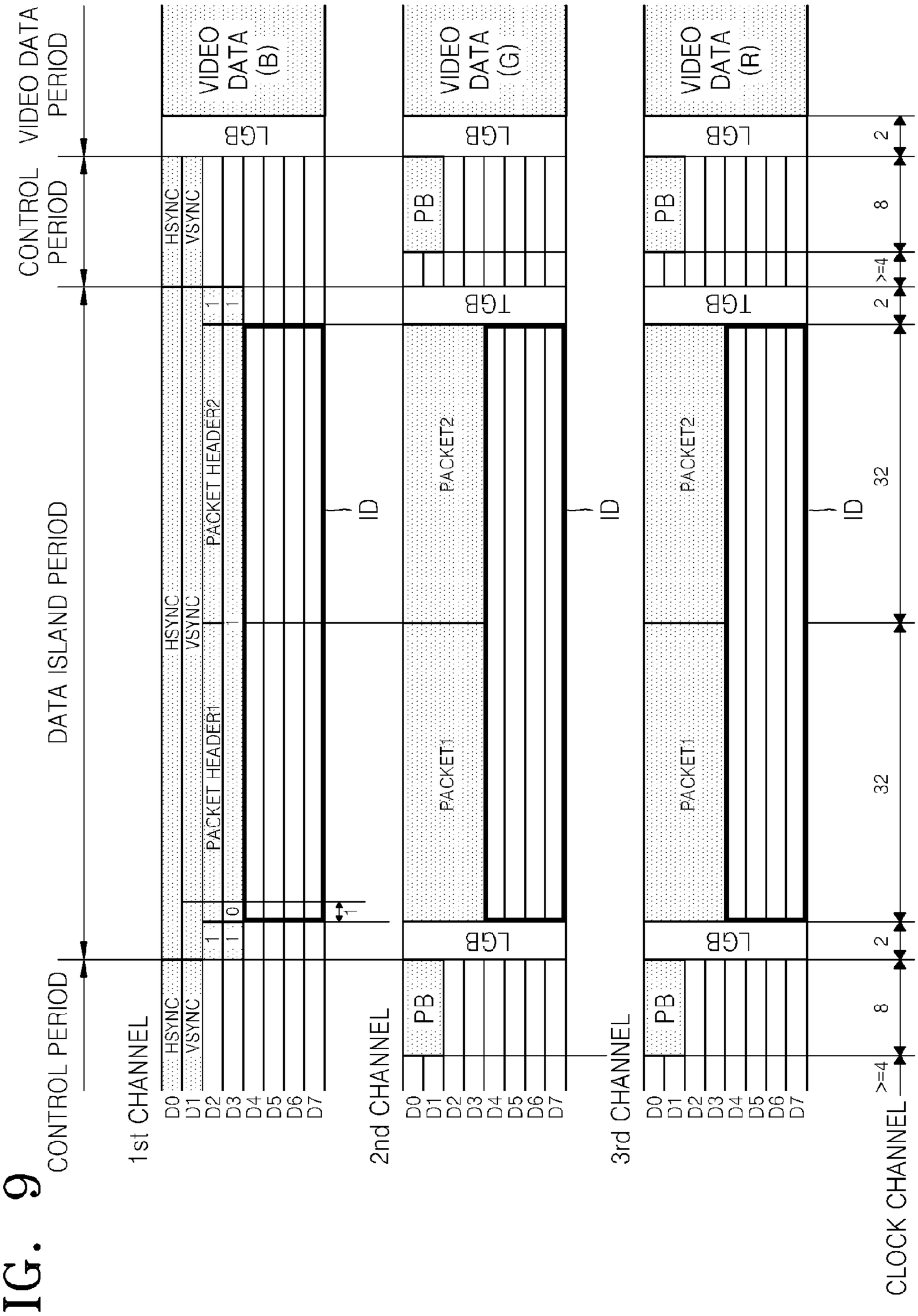
VIDEO DATA PERIOD
CONTROL PERIOD
DATA ISLAND PERIOD
VIDEO DATA (B)
VIDEO DATA (G)
VIDEO DATA (R)
LGB
PB
TGB
HSYNC
VSYNC
PACKET HEADER1
PACKET HEADER2
PACKET1
PACKET2
ID
1
2
8
>=4
32
1st CHANNEL
2nd CHANNEL
3rd CHANNEL
CLOCK CHANNEL
D0
D1
D2
D3
D4
D5
D6
D7

IMAGE SYSTEM

CROSS-REFERENCE TO RELATED PATENT APPLICATION

This application claims the benefit of Korean Patent Application No. 10-2012-77317, filed on Jul. 16, 2012, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an image system, and more particularly, to an image system including image signal generating apparatuses and display apparatuses.

2. Description of the Related Art

FIG. **1** shows a common image system.

Referring to FIG. **1**, the common image system includes image signal generating apparatuses **101** through **10***n* and display apparatuses **111** through **11***n* which correspond to the image signal generating apparatuses **101** through **10***n*, respectively.

For example, an image system for a hospital include a plurality of image signal generating apparatuses **101** through **10***n* that are respectively combined with medical equipments and a plurality of display apparatuses **111** through **11***n* which correspond to the plurality of image signal generating apparatuses **101** through **10***n*, respectively.

In the image system as stated above, since formats of image signals generated by the image signal generating apparatuses **101** through **10***n* are different from one another, types of the display apparatuses **111** through **11***n* are different from one another. Furthermore, if the display apparatuses **111** through **11***n* are the same type of display apparatuses **111** through **11***n*, it is necessary for each of the display apparatuses **111** through **11***n* to be able to display various types of image signals.

Therefore, a convention image system inefficiently utilizes display apparatuses, and it is difficult to jointly control the display apparatuses.

To resolve the problem, if formats of image signals generated by a plurality of image signal generating apparatuses are converted to a same format, it is difficult to determine a particular image signal generating apparatus to which a particular display apparatus is to be connected or is connected.

SUMMARY OF THE INVENTION

The present invention provides an image system which enables efficient utilization of display apparatuses, easy joint control of the display apparatuses, and easy determination of a particular image signal generating apparatus to which a particular display apparatus is to be connected or is connected.

According to an aspect of the present invention, there is provided an image system including image signal generating apparatuses, which generate image signals of different formats; display apparatuses, which receive and display the image signals from the image signal generating apparatuses, respectively; and intervention apparatuses, which are interconnected between the image signal generating apparatuses and the display apparatuses, convert the image signals from the image signal generating apparatuses to image signals of a first format, add identification information regarding the image signal generating apparatuses to the image signals of the first format, and output the image signals of the first format and the identification information, respectively.

Each of the intervention unit includes a transmission intervention unit and a reception intervention unit that are connected to each other. The transmission intervention unit is connected to the corresponding one from among the image signal generating apparatuses. The reception intervention unit is connected to the corresponding one from among the display apparatuses.

The transmission intervention unit converts image signals from the corresponding image signal generating apparatus to image signals of the first format, adds identification information regarding the corresponding image signal generating apparatus to the image signals of the first format according to a user input, and transmits the image signals of the first format to the reception intervention unit.

The reception intervention unit finds the identification information in the image signals of the first format from the transmission intervention unit, outputs the identification information, and inputs the image signals of the first format to the display apparatus.

The transmission intervention unit includes an input image decoder, which decodes image signals from a corresponding image signal generating apparatus; a image signal converting unit, which converts the decoded image signals from the input image decoder to image signals of the first format, adds identification information regarding the corresponding image signal generating apparatus to the image signals of the first format, and transmits the image signals of the first format to the reception intervention unit; and a first control unit, which communicates with a user interface device and provides the identification information regarding the corresponding image signal generating apparatus to the image signal converting unit according to an input signal from the user interface device.

The reception intervention unit includes an identification information searching unit, which finds identification information included in the image signals of the first format from the image signal converting unit of the transmission intervention unit, outputs the identification information, and provides the image signals of the first format to the display apparatus; and a second control unit, which communicates with a identification information displaying device and provides the identification information from the identification information searching unit to the identification information displaying device.

Image signals of the first format are image signals of high-definition multimedia interface (HDMI) format that are encoded in transition minimized differential signalling (TMDS) method

The transmission intervention unit includes an input image decoder, which decodes image signals from the corresponding image signal generating apparatus; a first HDMI encoder, which converts the decoded image signals from the input image decoder to image signals of the HDMI format, adds identification information regarding the corresponding image signal generating apparatus to the image signals of the HDMI format by using the TMDS method, and transmits the image signals of the HDMI format to the reception intervention unit; and a first control unit, which communicates with a user input apparatus and provides the identification information regarding the corresponding image signal generating apparatus to the first HDMI encoder according to an input signal from the user input apparatus.

The reception intervention unit includes a HDMI decoder, which decodes the image signals of the HDMI format from the first HDMI encoder, finds identification information included in the image signals of the HDMI format, outputs the identification information, and outputs the decoded image

signals of the HDMI format; a second HDMI encoder, which encodes the decoded image signals of the HDMI format from the HDMI decoder by using the TMDS method and provides the encoded image signals to the display apparatus; and a second control unit, which communicates with a identification information displaying device and provides the identification information from the HDMI decoder to the identification information displaying device.

The identification information regarding the corresponding image signal generating apparatus is added to at least one of info-frame regions providing information regarding various data and unrecognized packet regions in the decoded HDMI format.

The information regarding various data include information regarding audio video interleave (AVI) data, information regarding source produce descriptor (SPD) data, information regarding audio data, and information regarding moving picture experts group (MPEG) data.

A unit image frame of HDMI format encoded by using the TMDS method includes control sections, data island sections, and video data sections. Here, the identification information regarding the corresponding image signal generating apparatus is added to the data island sections.

Furthermore, an image signal of the HDMI format encoded by using the TMDS method is transmitted via 3 data channels and 1 clock channel, where a unit frame of the image signal is transmitted in the order of control period, data island period, control period, and video data period. Here, the identification information regarding the corresponding image signal generating apparatus is added to data island period.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features and advantages of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

FIG. **1** is a block diagram showing a common image system;

FIG. **2** is a block diagram showing an image system according to an embodiment of the present invention;

FIG. **3** is a block diagram showing the configuration of an arbitrary intervention apparatus of FIG. **2**;

FIG. **4** is a block diagram showing a first example configuration of a transmission intervention unit of FIG. **3**;

FIG. **5** is a block diagram showing a first example configuration of a reception intervention unit of FIG. **3**;

FIG. **6** is a block diagram showing a second example configuration of the transmission intervention unit of FIG. **3**;

FIG. **7** is a block diagram showing a second example configuration of the reception intervention unit of FIG. **3**;

FIG. **8** shows a unit image frame of HDMI format encoded by using the transition minimized differential signalling (TMDS) method; and

FIG. **9** shows the structure of an image signal of HDMI format encoded by using the TMDS method.

DETAILED DESCRIPTION OF THE INVENTION

The attached drawings for illustrating exemplary embodiments of the present invention are referred to in order to gain a sufficient understanding of the present invention, the merits thereof, and the objectives accomplished by the implementation of the present invention. Hereinafter, the present invention will be described in detail by explaining exemplary embodiments of the invention with reference to the attached drawings. Like reference numerals in the drawings denote like elements. Expressions such as "at least one of," when preceding a list of elements, modify the entire list of elements and do not modify the individual elements of the list.

FIG. **2** shows an image system according to an embodiment of the present invention, the image system according to an embodiment of the present invention includes image signal generating apparatuses **201** through **20***n*, display apparatuses **211** through **21***n*, and intervention apparatuses **221** through **22***n*.

The image signal generating apparatuses **201** through **20***n* generate image signals of different formats.

The display apparatuses **211** through **21***n* receive and display the image signals generated by the image signal generating apparatuses **201** through **20***n*, respectively.

The intervention apparatuses **221** through **22***n* are interconnected between the image signal generating apparatuses **201** through **20***n* and the display apparatuses **211** through **21***n*, respectively.

The intervention apparatuses **221** through **22***n* convert the image signals from the image signal generating apparatuses **201** through **20***n* to image signals of a first format, respectively.

Therefore, the display apparatuses **211** through **21***n* receive and display image signals of the first format only and may be a same type of display apparatuses **211** through **21***n*. In other words, the display apparatuses **211** through **21***n* may be utilized efficiently, and it becomes easy to jointly control the display apparatuses **211** through **21***n*.

Furthermore, the intervention apparatuses **221** through **22***n* add identification information regarding the image signal generating apparatuses **201** through **20***n* according to a user input to image signals of the first format and output the image signals of the first format and the identification information, respectively.

Therefore, the problem in a case where the display apparatuses **211** through **21***n* receive and display image signals of the first format only, that is, the problem that it is difficult for a user to determine a particular image signal generating apparatus to which a particular display apparatus is to be connected or is connected may be resolved.

FIG. **3** shows the configuration of the arbitrary intervention apparatus **22***n* of FIG. **2**. In FIG. **3**, the like reference numeral denotes the like components.

Referring to FIGS. **2** and **3**, the intervention apparatus **20***n* includes a transmission intervention unit **31** and a reception intervention unit **32** that are connected to each other. The transmission intervention unit **31** is connected to the corresponding one **20***n* of the image signal generating apparatuses **201** through **20***n*. The reception intervention unit **32** is connected to the corresponding one **21***n* of the display apparatuses **211** through **21***n*.

The transmission intervention unit **31** converts image signals from the corresponding image signal generating apparatus **20***n* to image signals of the first format, adds identification information regarding the corresponding image signal generating apparatus **20***n* according to a user input to the image signals of the first format, and transmits the image signals of the first format to the reception intervention unit **32**.

The reception intervention unit **32** finds the identification information in the image signals of the first format from the transmission intervention unit **31**, outputs the identification information, and inputs the image signals of the first format to the display apparatus **21***n*.

FIG. **4** shows a first example configuration of the transmission intervention unit **31**.

Referring to FIGS. **3** and **4**, the transmission intervention unit **31** includes an input image decoder **41**, an image signal converting unit **42**, and a first control unit **43**.

The input image decoder **41** decodes image signals from the corresponding corresponding image signal generating apparatus **20***n*.

The image signal converting unit **42** converts the decoded image signals from the input image decoder **41** to image signals of the first format, adds identification information regarding the corresponding image signal generating apparatus **20***n* to the image signals of the first format, and transmits the image signals of the first format to the reception intervention unit **32**.

The first control unit **43** communicates with a user input apparatus **49** and provides the identification information regarding the corresponding image signal generating apparatus **20***n* to the image signal converting unit **42** according to an input signal from the user input apparatus **49**.

The user input apparatus **49** may be a laptop computer, for example. The first control unit **43** and the user input apparatus **49** may communicate with each other via a universal serial bus (USB) or universal asynchronous receiver/transmitter (UART).

FIG. **5** shows a first example configuration of the reception intervention unit **32** of FIG. **3**.

Referring to FIGS. **3** and **5**, the reception intervention unit **32** includes an identification information searching unit **51** and a second control unit **52**.

The identification information searching unit **51** finds identification information included in the image signals of the first format from the image signal converting unit **42** of the transmission intervention unit **31**, outputs the identification information, and provides the image signals of the first format to the display apparatus **21***n*.

The second control unit **52** communicates with a identification information displaying device **59** and provides the identification information from the identification information searching unit **51** to the identification information displaying device **59**.

The identification information displaying device **59** may be a small liquid crystal display (LCD) device, for example. The second control unit **52** and the identification information displaying device **59** may communicate with each other via a USB or UART.

FIG. **6** shows a second example configuration of the transmission intervention unit **31** of FIG. **3**. Hereinafter, image signals of the first format are image signals of high-definition multimedia interface (HDMI) format that are encoded in transition minimized differential signalling (TMDS) method.

Referring to FIGS. **3** and **6**, the transmission intervention unit **31** of the second example includes an input image decoder **61**, a first HDMI encoder **62**, and a first control unit **63**.

The input image decoder **61** decodes image signals from the corresponding image signal generating apparatus **20***n*.

The first HDMI encoder **62** converts the decoded image signals from the input image decoder **61** to image signals of the HDMI format, adds identification information regarding the corresponding image signal generating apparatus **20***n* to the image signals of the HDMI format by using the TMDS method, and transmits the image signals of the HDMI format to the reception intervention unit **32**.

The first control unit **63** communicates with a user input apparatus **69** and provides the identification information regarding the corresponding image signal generating apparatus **20***n* to the first HDMI encoder **62** according to an input signal from the user input apparatus **69**.

As described above, the user input apparatus **69** may be a laptop computer, for example. The first control unit **63** and the user input apparatus **69** may communicate with each other via a USB or UART.

FIG. **7** shows a second example configuration of the reception intervention unit **32** of FIG. **3**.

Referring to FIGS. **3**, **6**, and **7**, the reception intervention unit **32** includes a HDMI decoder **711**, a second HDMI encoder **712**, and a second control unit **72**.

The HDMI decoder **711** decodes the image signals of the HDMI format from the first HDMI encoder **62**, finds identification information included in the image signals of the HDMI format, outputs the identification information, and outputs the decoded image signals of the HDMI format.

The second HDMI encoder **712** encodes the decoded image signals of the HDMI format from the HDMI decoder **711** by using the TMDS method and provides the encoded image signals to the display apparatus **21***n*.

The second control unit **72** communicates with a identification information displaying device **79** and provides the identification information from the HDMI decoder **711** to the identification information displaying device **79**.

As described above, the identification information displaying device **79** may be a small liquid crystal display (LCD) device, for example. The second control unit **72** and the identification information displaying device **79** may communicate with each other via a USB or UART.

Meanwhile, the identification information regarding the corresponding image signal generating apparatus **20***n* is added to at least one of info-frame regions providing information regarding various data and unrecognized packet regions in the decoded HDMI format.

As known in the art, the information regarding various data include information regarding audio video interleave (AVI) data, information regarding source produce descriptor (SPD) data, information regarding audio data, and information regarding moving picture experts group (MPEG) data.

FIG. **8** shows a unit image frame of HDMI format encoded by using the TMDS method. In FIG. **8**, the reference numeral VSYNC denotes a vertical synchronization signal, whereas the reference numeral HSYNC denotes a horizontal synchronization signal.

Referring to FIG. **8**, a unit image frame of HDMI format encoded by using the TMDS method includes control sections, data island sections, and video data sections. Here, the identification information regarding the corresponding image signal generating apparatus **20***n* is added to the data island sections.

FIG. **9** shows the structure of an image signal of HDMI format encoded by using the TMDS method. In FIG. **9**, the reference numeral PB denotes a premise part PB, the reference numeral LGB denotes a leading guard section, the reference numeral ID denotes an identification information recording region, and the reference numeral TGB denotes a tailing guard section.

Furthermore, video data R, video data G, and video data G denote red (R)-green (G)-blue (B) video data.

Referring to FIG. **9**, an image signal of the HDMI format encoded by using the TMDS method is transmitted via 3 data channels and 1 clock channel, where a unit frame of the image signal is transmitted in the order of control period, data island period, control period, and video data period. Here, the identification information regarding the corresponding image signal generating apparatus **20***n* is added to data island period.

As described above, in an image system according to an embodiment of the present invention, image signals from image signal generating apparatuses are converted to image signals of a first format.

Therefore, display apparatuses may receive and display image signals of the first format only, and thus the display apparatuses may be display apparatuses of a same type.

In other words, the display apparatuses may be utilized efficiently, and it becomes easy to jointly control the display apparatuses.

Furthermore, intervention apparatuses add identification information regarding the image signal generating apparatuses to image signals of the first format according to a user input and outputs the image signals of the first format and the identification information.

Therefore, the problem in a case where the display apparatuses receive and display image signals of the first format only, that is, the problem that it is difficult for a user to determine a particular image signal generating apparatus to which a particular display apparatus is to be connected or is connected may be resolved.

While this invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. An image system comprising:

image signal generating apparatuses, which generate image signals of different formats;

display apparatuses, which receive and display the image signals from the image signal generating apparatuses, respectively; and

intervention apparatuses, which are interconnected between the image signal generating apparatuses and the display apparatuses, convert the image signals from the image signal generating apparatuses to image signals of a first format, add identification information regarding the image signal generating apparatuses to the image signals of the first format, and output the image signals of the first format and the identification information, respectively,

wherein each of the intervention apparatuses includes a transmission intervention unit and a reception intervention unit that are connected to each other, the transmission intervention unit is connected to the corresponding one from among the image signal generating apparatuses, and the reception intervention unit is connected to the corresponding one from among the display apparatuses,

wherein the transmission intervention unit converts image signals from the corresponding image signal generating apparatus to image signals of the first format, adds identification information regarding the corresponding image signal generating apparatus to the image signals of the first format according to a user input, and transmits the image signals of the first format to the reception intervention unit, and the reception intervention unit finds the identification information in the image signals of the first format from the transmission intervention unit, outputs the identification information, and inputs the image signals of the first format to the display apparatus, and the transmission intervention unit includes an input image decoder, which decodes image signals from a corresponding image signal generating apparatus, an image signal converting unit, which converts the decoded image signals from the input image decoder to image signals of the first format, adds identification information regarding the corresponding image signal generating apparatus to the image signals of the first format, and transmits the image signals of the first format to the reception intervention unit, and a first control unit, which communicates with a user interface device and provides the identification information regarding the corresponding image signal generating apparatus to the image signal converting unit according to an input signal from the user interface device, and

wherein the reception intervention unit includes an identification information searching unit, which finds identification information included in the image signals of the first format from the image signal converting unit of the transmission intervention unit, outputs the identification information, and provides the image signals of the first format to the display apparatus, and a second control unit, which communicates with an identification information displaying device and provides the identification information from the identification information searching unit to the identification information displaying device.

2. An image system comprising:

image signal generating apparatuses, which generate image signals of different formats;

display apparatuses, which receive and display the image signals from the image signal generating apparatuses, respectively; and

intervention apparatuses, which are interconnected between the image signal generating apparatuses and the display apparatuses, convert the image signals from the image signal generating apparatuses to image signals of a first format, add identification information regarding the image signal generating apparatuses to the image signals of the first format, and output the image signals of the first format and the identification information, respectively,

wherein each of the intervention apparatuses includes a transmission intervention unit and a reception intervention unit that are connected to each other, the transmission intervention unit is connected to the corresponding one from among the image signal generating apparatuses, and the reception intervention unit is connected to the corresponding one from among the display apparatuses,

wherein the transmission intervention unit converts image signals from the corresponding image signal generating apparatus to image signals of the first format, adds identification information regarding the corresponding image signal generating apparatus to the image signals of the first format according to a user input, and transmits the image signals of the first format to the reception intervention unit, and the reception intervention unit finds the identification information in the image signals of the first format from the transmission intervention unit, outputs the identification information, and inputs the image signals of the first format to the display apparatus,

wherein image signals of the first format are image signals of high-definition multimedia interface (HDMI) format that are encoded in transition minimized differential signaling (TMDS) method, and

wherein the transmission intervention unit includes an input image decoder, which decodes image signals from the corresponding image signal generating apparatus, a first HDMI encoder, which converts the decoded image

signals from the input image decoder to image signals of the HDMI format, adds identification information regarding the corresponding image signal generating apparatus to the image signals of the HDMI format by using the TMDS method, and transmits the image signals of the HDMI format to the reception intervention unit, and a first control unit, which communicates with a user input apparatus and provides the identification information regarding the corresponding image signal generating apparatus to the first HDMI encoder according to an input signal from the user input apparatus.

3. The image system of claim **2**, wherein the reception intervention unit comprises:

a HDMI decoder, which decodes the image signals of the HDMI format from the first HDMI encoder, finds identification information included in the image signals of the HDMI format, outputs the identification information, and outputs the decoded image signals of the HDMI format;

a second HDMI encoder, which encodes the decoded image signals of the HDMI format from the HDMI decoder by using the TMDS method and provides the encoded image signals to the display apparatus; and

a second control unit, which communicates with a identification information displaying device and provides the identification information from the HDMI decoder to the identification information displaying device.

4. The image system of claim **3**, wherein the identification information regarding the corresponding image signal generating apparatus is added to at least one of info-frame regions providing information regarding various data and unrecognized packet regions in the decoded HDMI format.

5. The image system of claim **4**, wherein the information regarding various data include information regarding audio video interleave (AVI) data, information regarding source produce descriptor (SPD) data, information regarding audio data, and information regarding moving picture experts group (MPEG) data.

6. The image system of claim **5**, wherein a unit image frame of HDMI format encoded by using the TMDS method includes control sections, data island sections, and video data sections, and

the identification information regarding the corresponding image signal generating apparatus is added to the data island sections.

7. The image system of claim **6**, wherein an image signal of the HDMI format encoded by using the TMDS method is transmitted via 3 data channels and 1 clock channel, where a unit frame of the image signal is transmitted in the order of control period, data island period, control period, and video data period, and

the identification information regarding the corresponding image signal generating apparatus is added to data island period.

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