US009398339B2

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Lee et al.

(10) **Patent No.: US 9,398,339 B2**
(45) **Date of Patent: Jul. 19, 2016**

(54) **IMAGE DISPLAY APPARATUS AND METHOD FOR OPERATING THE SAME**

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(73) Assignee: **LG Electronics Inc.**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 444 days.

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(22) Filed: **Dec. 16, 2010**

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Related U.S. Application Data

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(30) **Foreign Application Priority Data**

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Sep. 2, 2010 (KR) 10-2010-0086152
Sep. 2, 2010 (KR) 10-2010-0086153

(51) **Int. Cl.**
H04N 21/431 (2011.01)
H04N 21/81 (2011.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H04N 21/4755*** (2013.01); ***H04N 21/4312*** (2013.01); ***H04N 21/4316*** (2013.01); ***H04N 21/47*** (2013.01); ***H04N 21/4782*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H04N 21/8173; H04N 5/44591; H04N 21/47; H04N 21/4316; H04N 21/4312; H04N 21/44591; G06F 3/04886
USPC 725/34–47, 50–52, 56, 61
See application file for complete search history.

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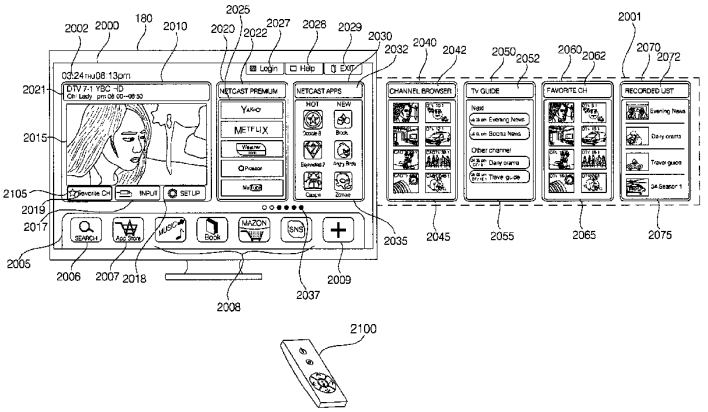
Assistant Examiner — Jason Thomas
(74) *Attorney, Agent, or Firm* — KED & Associates LLP

(57) **ABSTRACT**

An image display apparatus for receiving and processing a broadcast signal and a method for operating the same are disclosed. The method includes displaying a home screen including a plurality of card objects, displaying a broadcast image and a favorite channel object representing favorite channels in a broadcast card object representing a broadcast image among the plurality of card objects, and displaying a favorite channel list including favorite channel items on the display, upon selection of the favorite channel object.

16 Claims, 69 Drawing Sheets



(51) **Int. Cl.**

H04N 21/47	(2011.01)
H04N 21/475	(2011.01)
H04N 21/478	(2011.01)
H04N 21/4782	(2011.01)
H04N 21/4786	(2011.01)
H04N 21/482	(2011.01)

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

CPC ***H04N 21/4786*** (2013.01); ***H04N 21/47815*** (2013.01); ***H04N 21/482*** (2013.01); ***H04N 21/4826*** (2013.01); ***H04N 21/8173*** (2013.01)

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2007/0157248	A1	7/2007	Ellis	725/47
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2010/0192179	A1	7/2010	Ellis et al.	725/40
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2010/0257559	A1 *	10/2010	Friedlander et al.	725/40
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Chinese Office Action for Application 201080068905.2 dated Dec. 16, 2015 (full English Translation and full Chinese text).

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FIG. 1

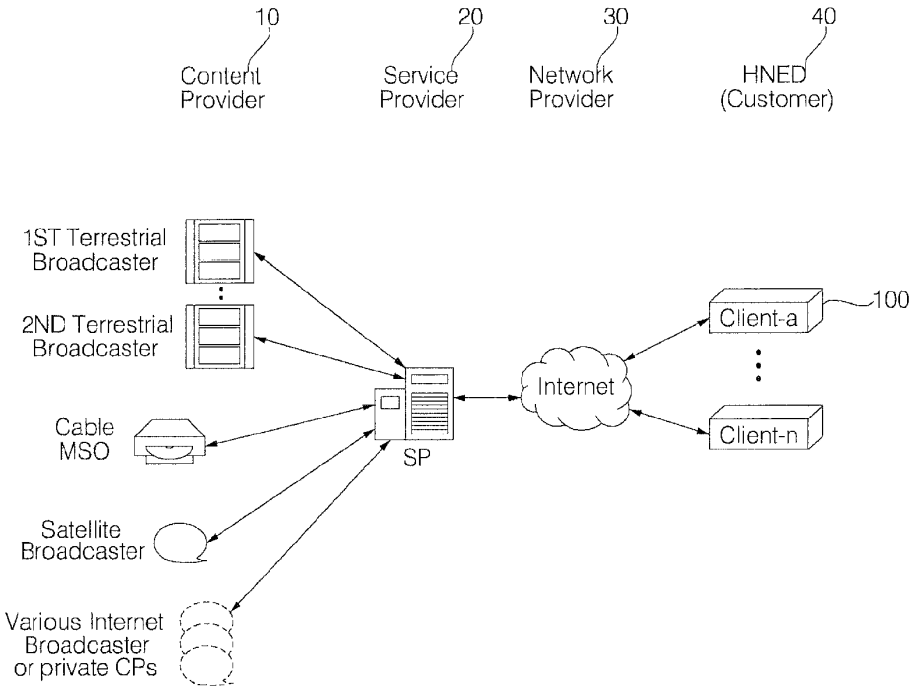

10
Content Provider
20
Service Provider
30
Network Provider
40
HNED (Customer)
1ST Terrestrial Broadcaster
2ND Terrestrial Broadcaster
Cable MSO
Satellite Broadcaster
Various Internet Broadcaster or private CPs
SP
Internet
Client-a
Client-n
100

FIG. 2

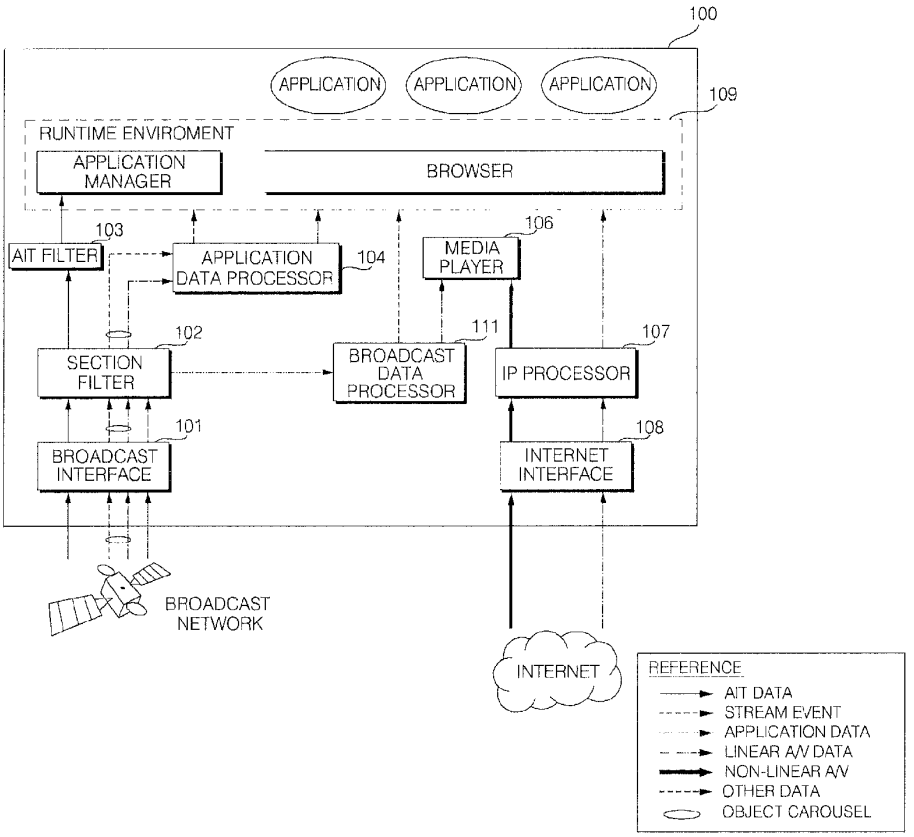

100
APPLICATION
APPLICATION
APPLICATION
109
RUNTIME ENVIROMENT
APPLICATION MANAGER
BROWSER
103
AIT FILTER
APPLICATION DATA PROCESSOR
104
106
MEDIA PLAYER
102
SECTION FILTER
111
BROADCAST DATA PROCESSOR
107
IP PROCESSOR
101
BROADCAST INTERFACE
108
INTERNET INTERFACE
BROADCAST NETWORK
INTERNET
REFERENCE
AIT DATA
STREAM EVENT
APPLICATION DATA
LINEAR A/V DATA
NON-LINEAR A/V
OTHER DATA
OBJECT CAROUSEL

FIG. 3

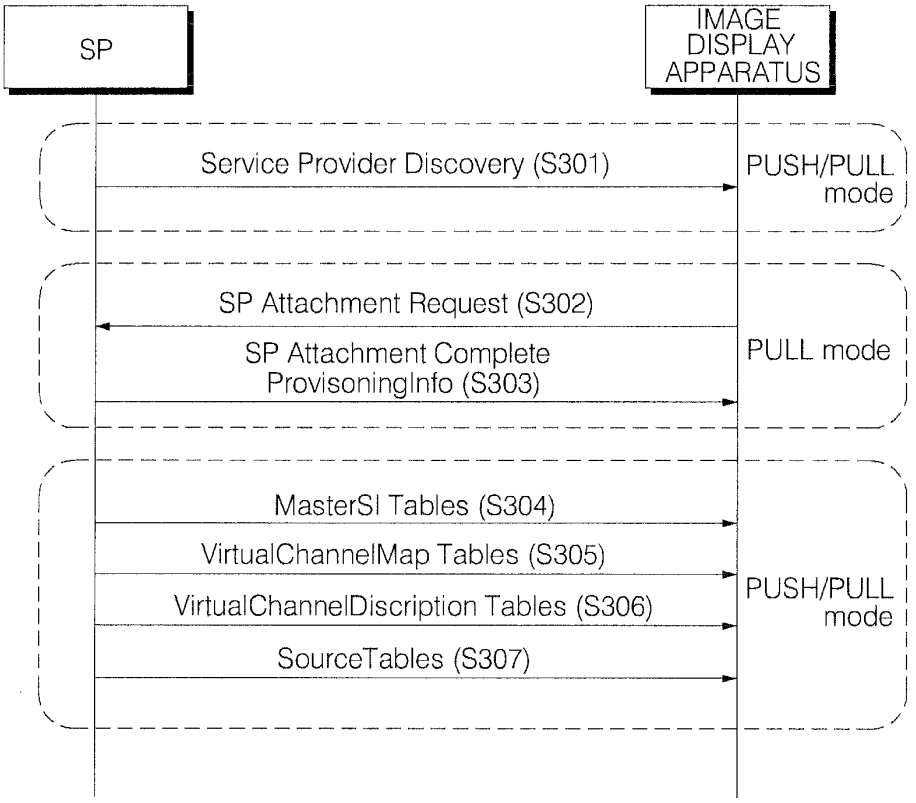

SP
IMAGE DISPLAY APPARATUS
Service Provider Discovery (S301)
PUSH/PULL mode
SP Attachment Request (S302)
SP Attachment Complete ProvisoningInfo (S303)
PULL mode
MasterSI Tables (S304)
VirtualChannelMap Tables (S305)
VirtualChannelDiscription Tables (S306)
SourceTables (S307)
PUSH/PULL mode

FIG. 4

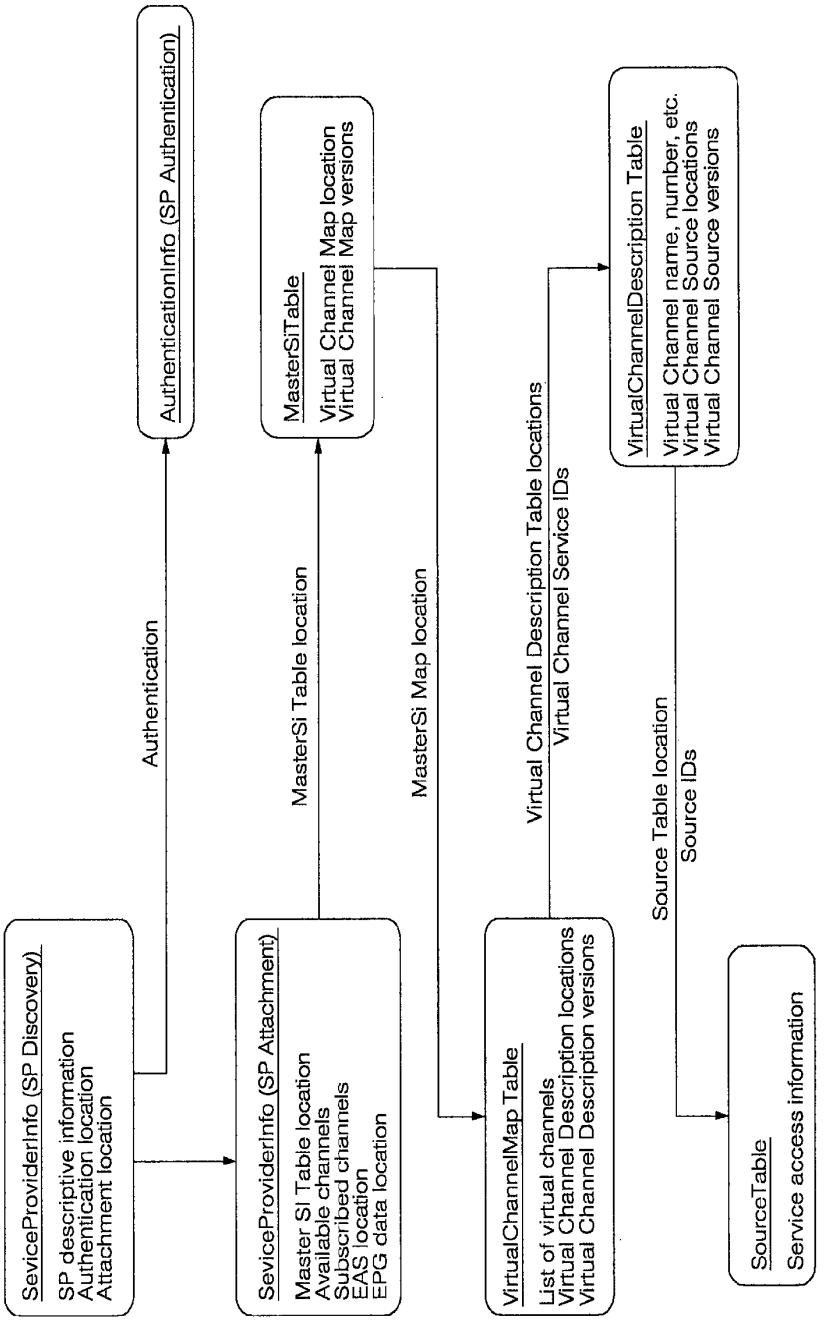

SeviceProviderInfo (SP Discovery)
SP descriptive information
Authentication location
Attachment location
Authentication
AuthenticationInfo (SP Authentication)
SeviceProviderInfo (SP Attachment)
Master SI Table location
Available channels
Subscribed channels
EAS location
EPG data location
MasterSi Table location
MasterSiTable
Virtual Channel Map location
Virtual Channel Map versions
MasterSi Map location
VirtualChannelMap Table
List of virtual channels
Virtual Channel Description locations
Virtual Channel Description versions
Virtual Channel Description Table locations
Virtual Channel Service IDs
VirtualChannelDescription Table
Virtual Channel name, number, etc.
Virtual Channel Source locations
Virtual Channel Source versions
Source Table location
Source IDs
SourceTable
Service access information

FIG. 5

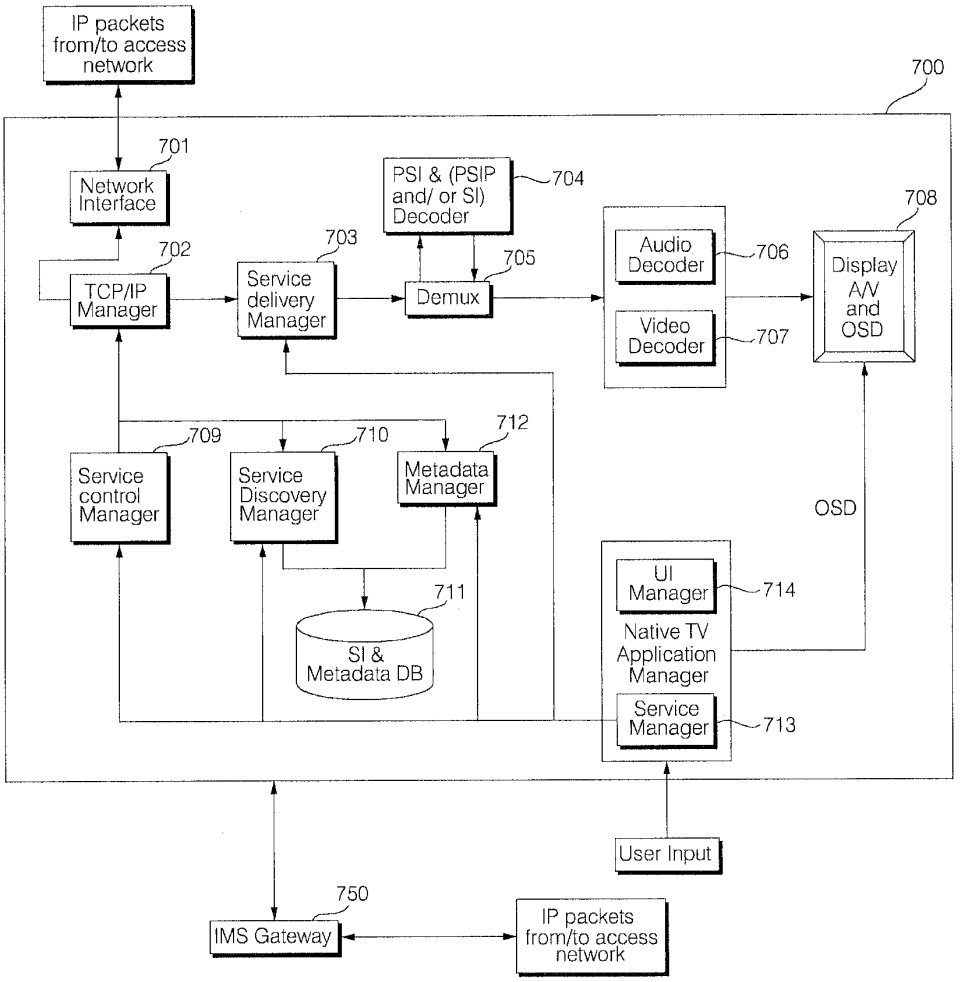

IP packets from/to access network
700
701
Network Interface
PSI & (PSIP and/ or SI) Decoder
704
708
702
703
705
Audio Decoder
706
Display A/V and OSD
TCP/IP Manager
Service delivery Manager
Demux
Video Decoder
707
709
710
712
Service control Manager
Service Discovery Manager
Metadata Manager
OSD
711
UI Manager
714
SI & Metadata DB
Native TV Application Manager
Service Manager
713
User Input
750
IMS Gateway
IP packets from/to access network

FIG. 6

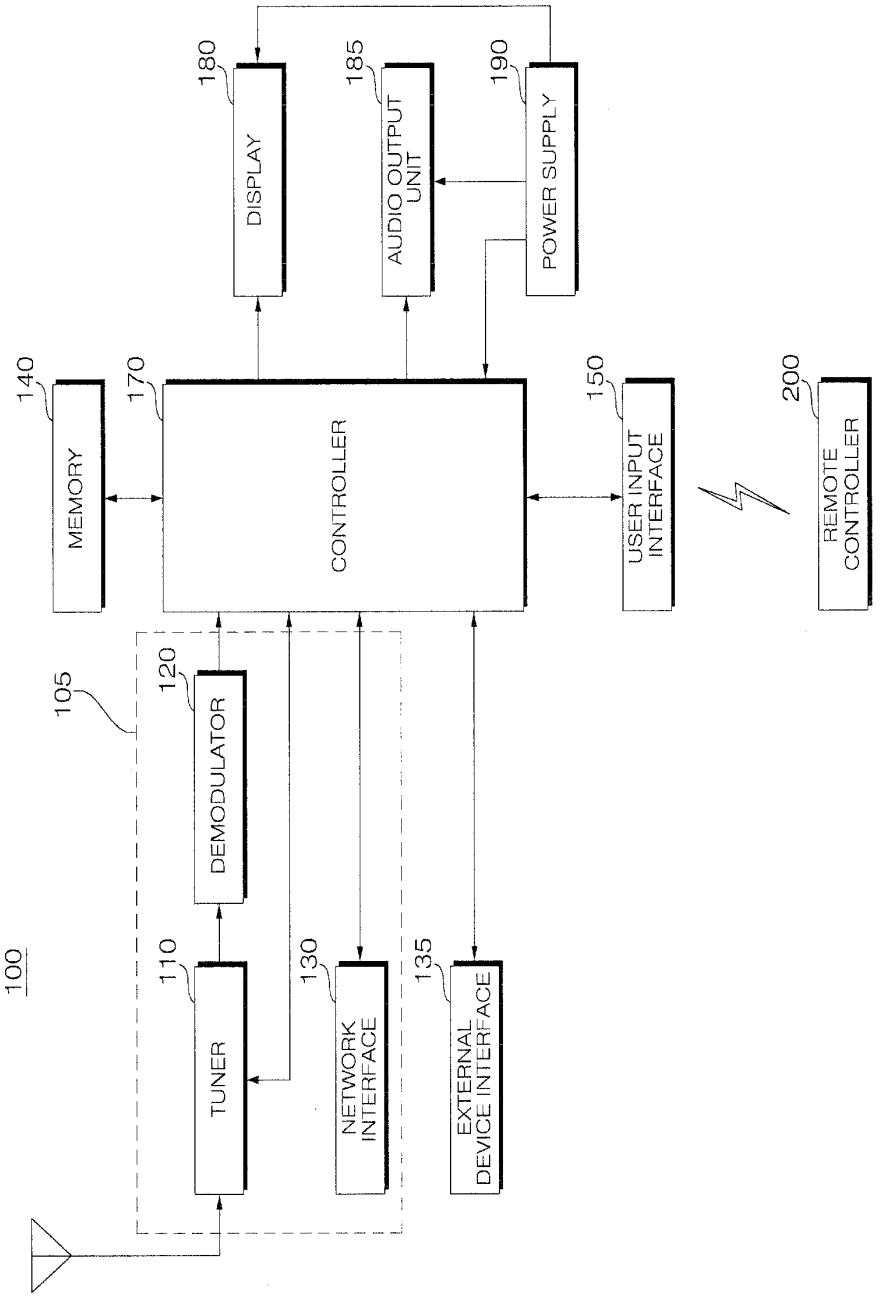

100
105
110
TUNER
120
DEMODULATOR
130
NETWORK INTERFACE
135
EXTERNAL DEVICE INTERFACE
140
MEMORY
170
CONTROLLER
150
USER INPUT INTERFACE
200
REMOTE CONTROLLER
180
DISPLAY
185
AUDIO OUTPUT UNIT
190
POWER SUPPLY

FIG. 7

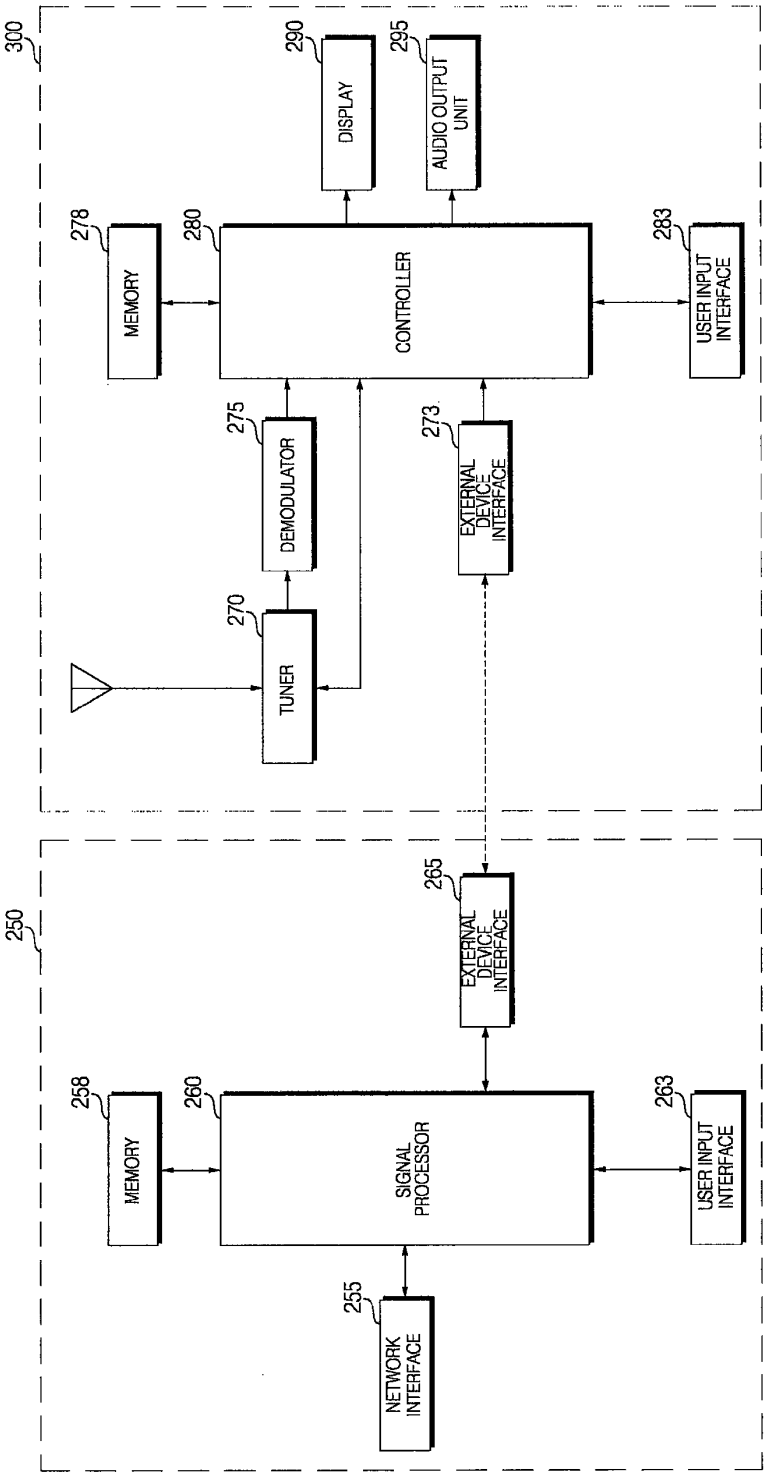

300
290
DISPLAY
295
AUDIO OUTPUT UNIT
278
MEMORY
280
CONTROLLER
283
USER INPUT INTERFACE
275
DEMODULATOR
273
EXTERNAL DEVICE INTERFACE
270
TUNER
250
265
EXTERNAL DEVICE INTERFACE
258
MEMORY
260
SIGNAL PROCESSOR
263
USER INPUT INTERFACE
255
NETWORK INTERFACE

FIG. 8

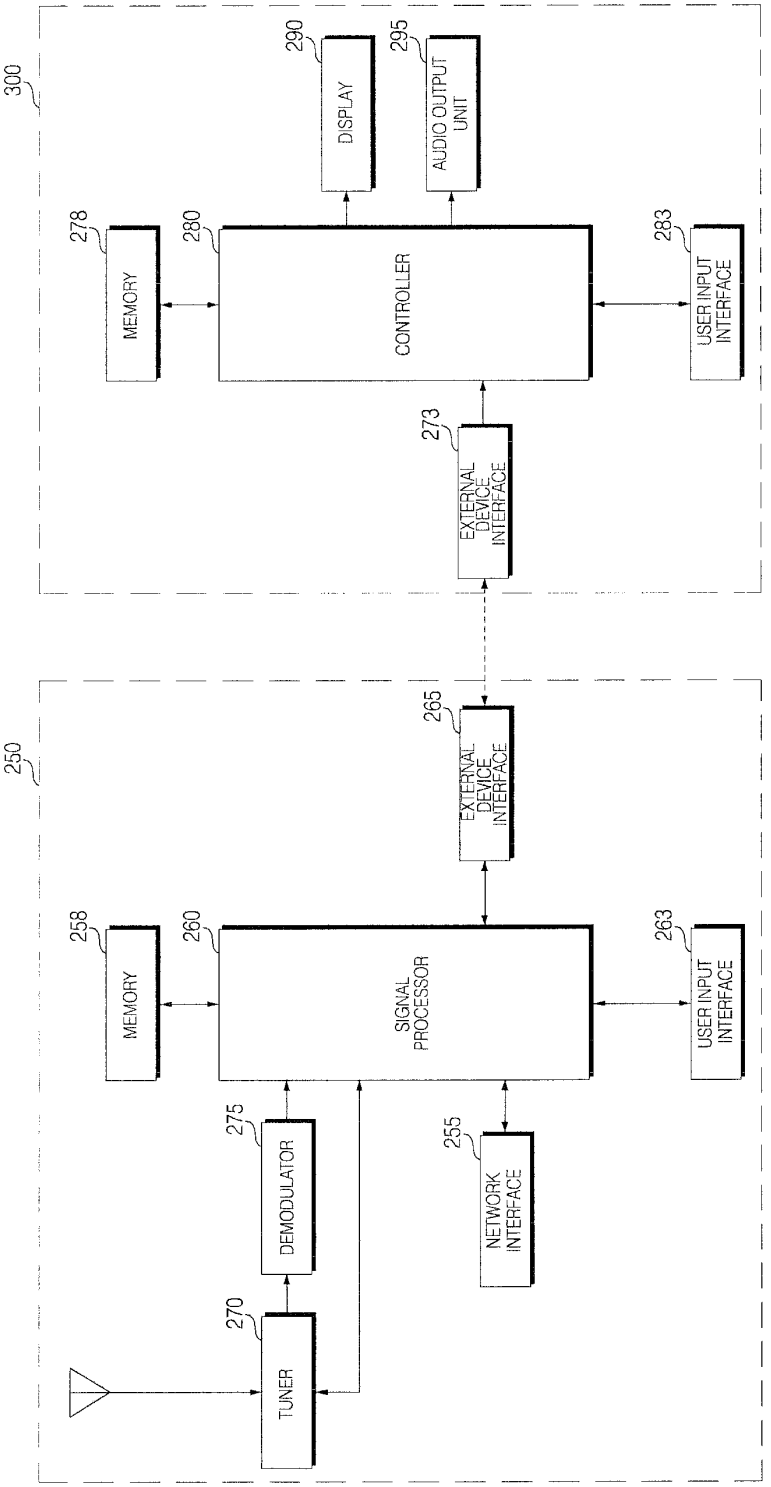

300
290
DISPLAY
295
AUDIO OUTPUT UNIT
278
MEMORY
280
CONTROLLER
283
USER INPUT INTERFACE
273
EXTERNAL DEVICE INTERFACE
250
265
EXTERNAL DEVICE INTERFACE
258
MEMORY
260
SIGNAL PROCESSOR
263
USER INPUT INTERFACE
275
DEMODULATOR
255
NETWORK INTERFACE
270
TUNER

FIG. 9

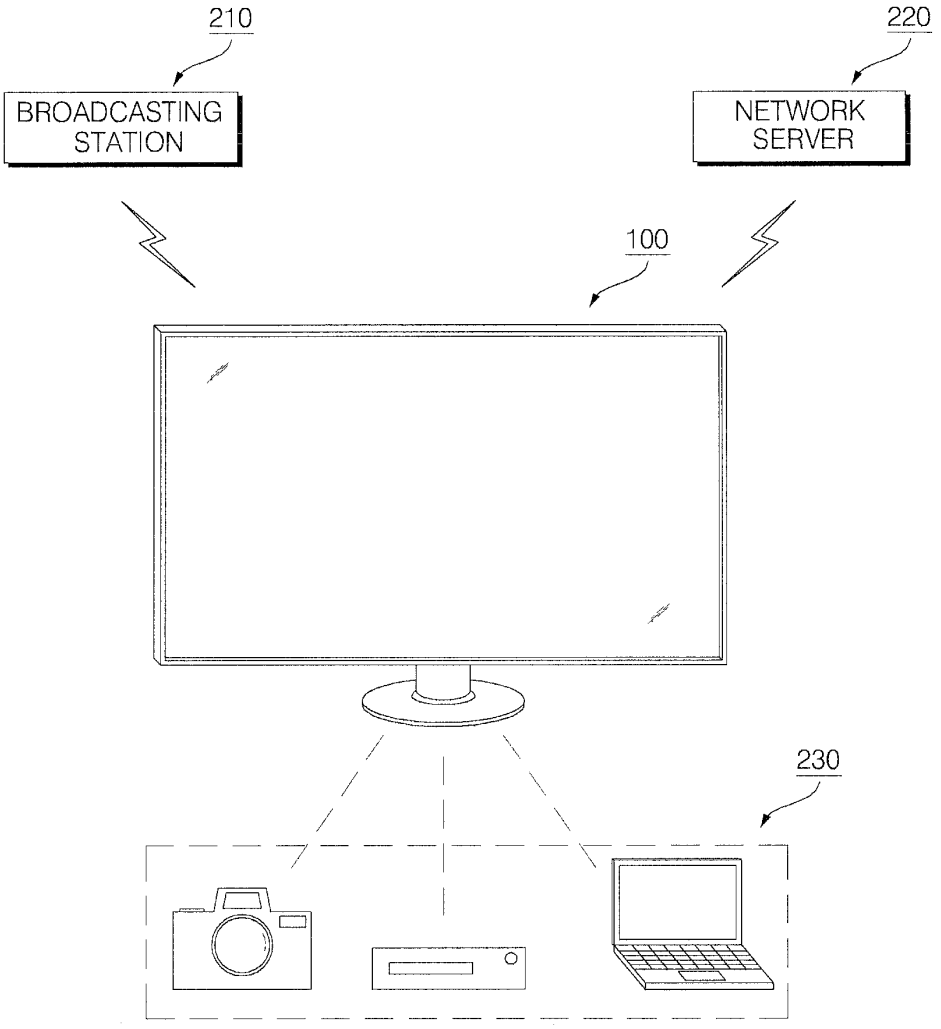


FIG. 10

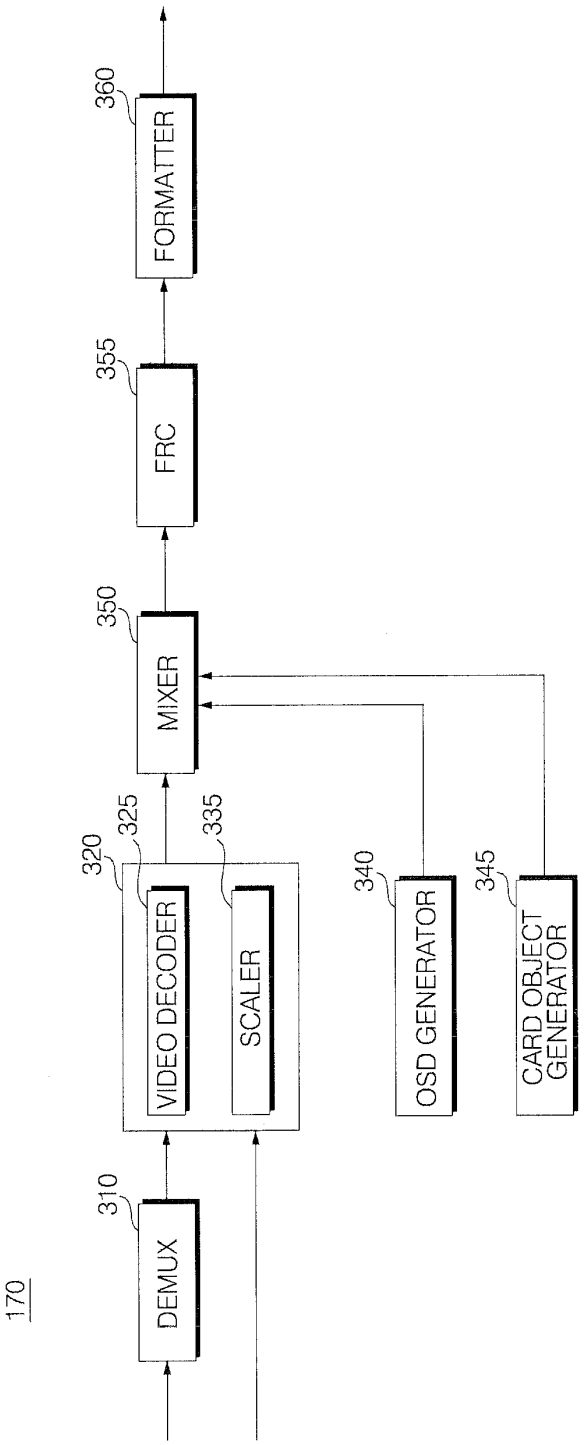

170
310
DEMUX
320
325
VIDEO DECODER
335
SCALER
350
MIXER
340
OSD GENERATOR
345
CARD OBJECT GENERATOR
355
FRC
360
FORMATTER

FIG. 11

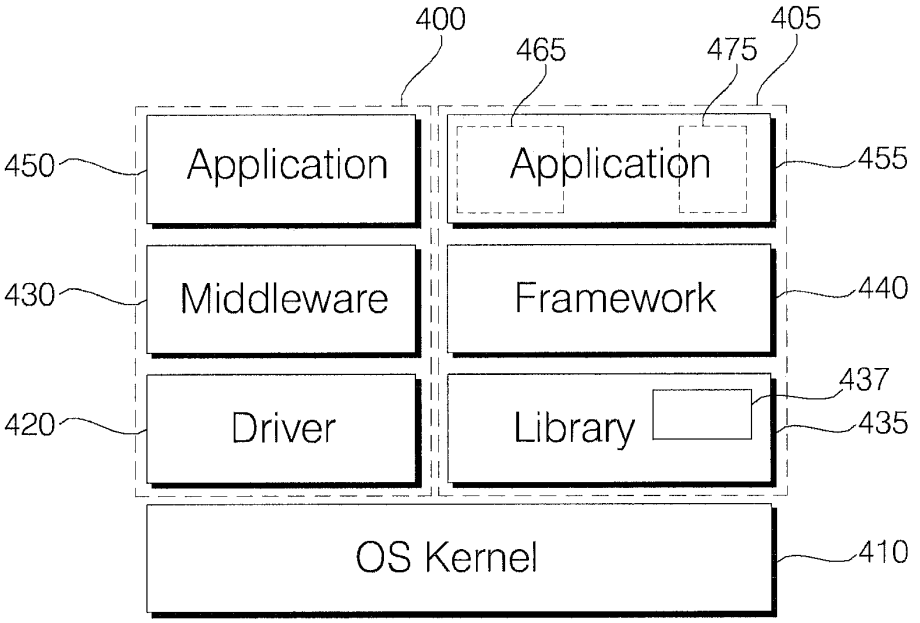

400
465
475
405
450
Application
Application
455
430
Middleware
Framework
440
437
420
Driver
Library
435
OS Kernel
410

FIG. 12

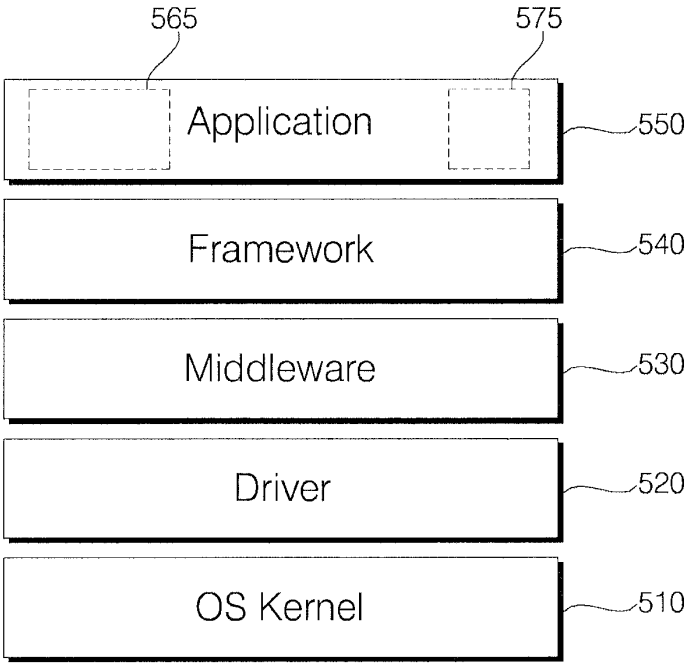

565
575
Application
550
Framework
540
Middleware
530
Driver
520
OS Kernel
510

FIG. 13

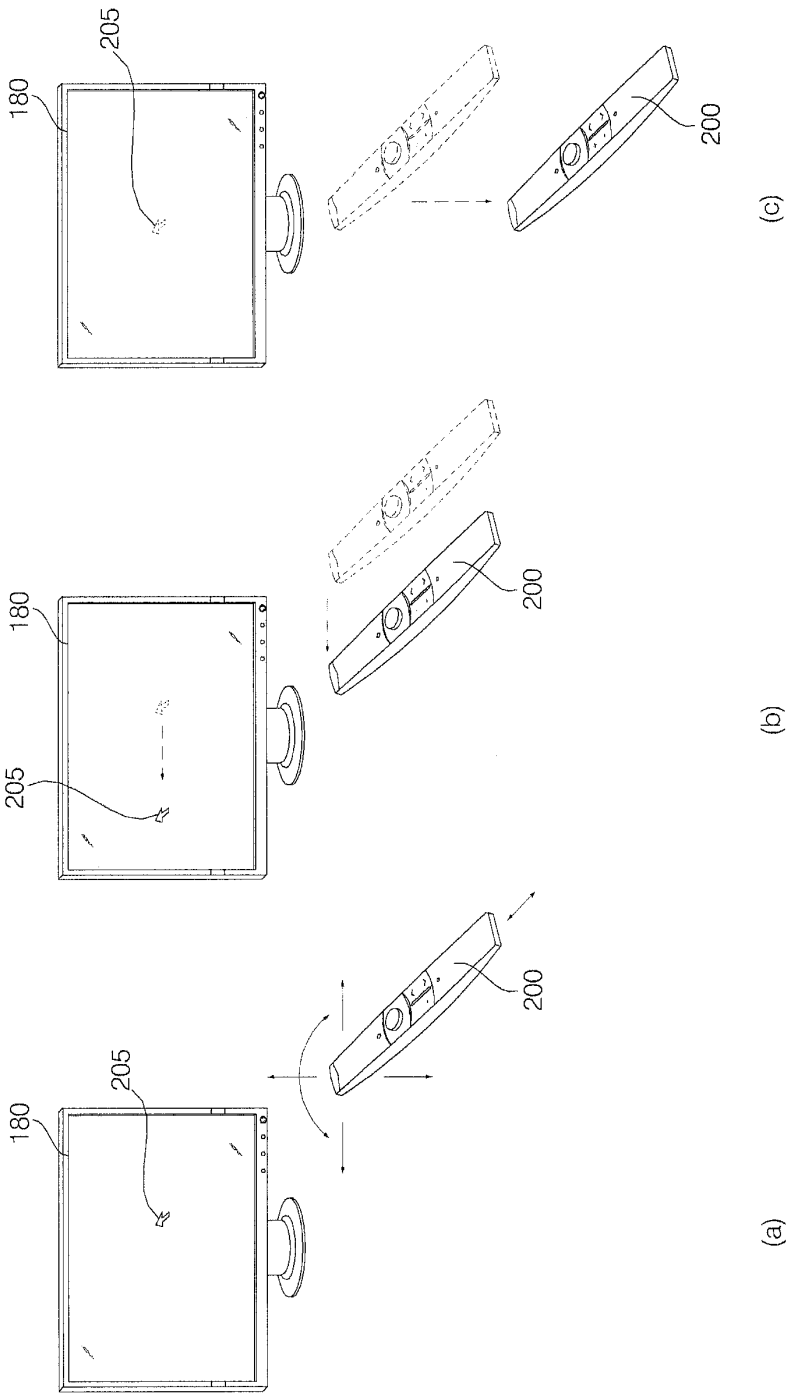


FIG. 14

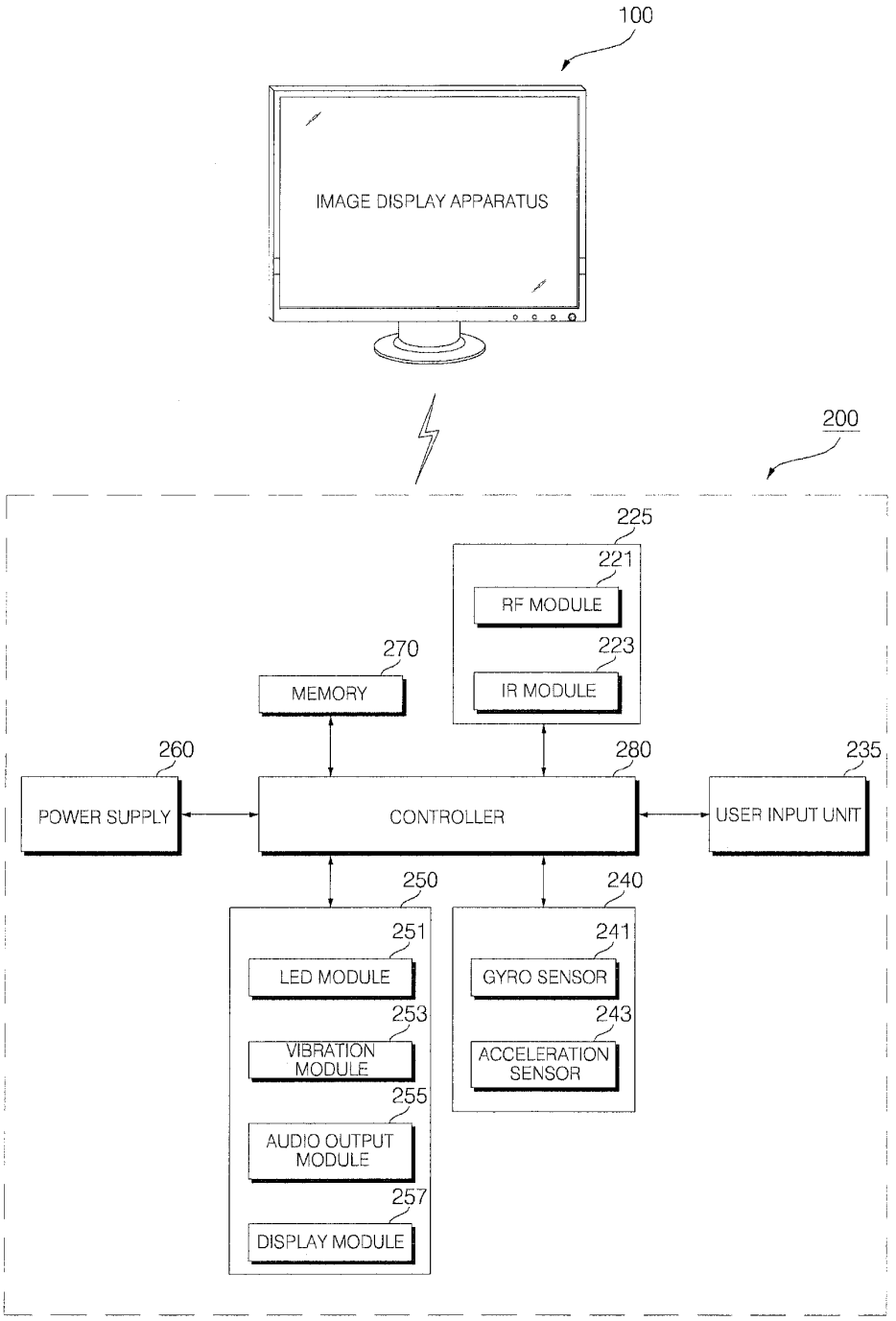

100
IMAGE DISPLAY APPARATUS
200
225
221
RF MODULE
223
IR MODULE
270
MEMORY
260
POWER SUPPLY
280
CONTROLLER
235
USER INPUT UNIT
250
251
LED MODULE
253
VIBRATION MODULE
255
AUDIO OUTPUT MODULE
257
DISPLAY MODULE
240
241
GYRO SENSOR
243
ACCELERATION SENSOR

FIG. 15

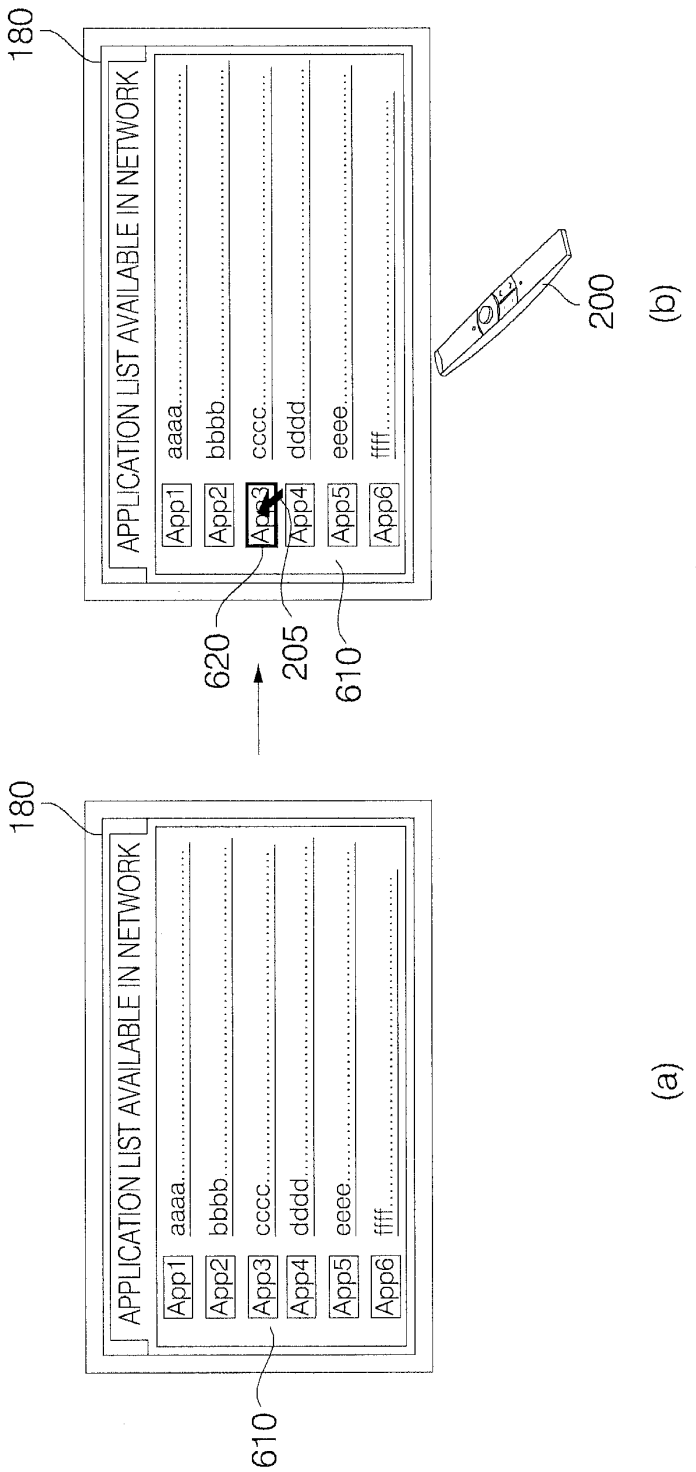

180
APPLICATION LIST AVAILABLE IN NETWORK
App1 aaaa
App2 bbbb
App3 cccc
App4 dddd
App5 eeee
App6 ffff
610
(a)
180
APPLICATION LIST AVAILABLE IN NETWORK
App1 aaaa
App2 bbbb
App3 cccc
App4 dddd
App5 eeee
App6 ffff
620
205
610
200
(b)

FIG. 16

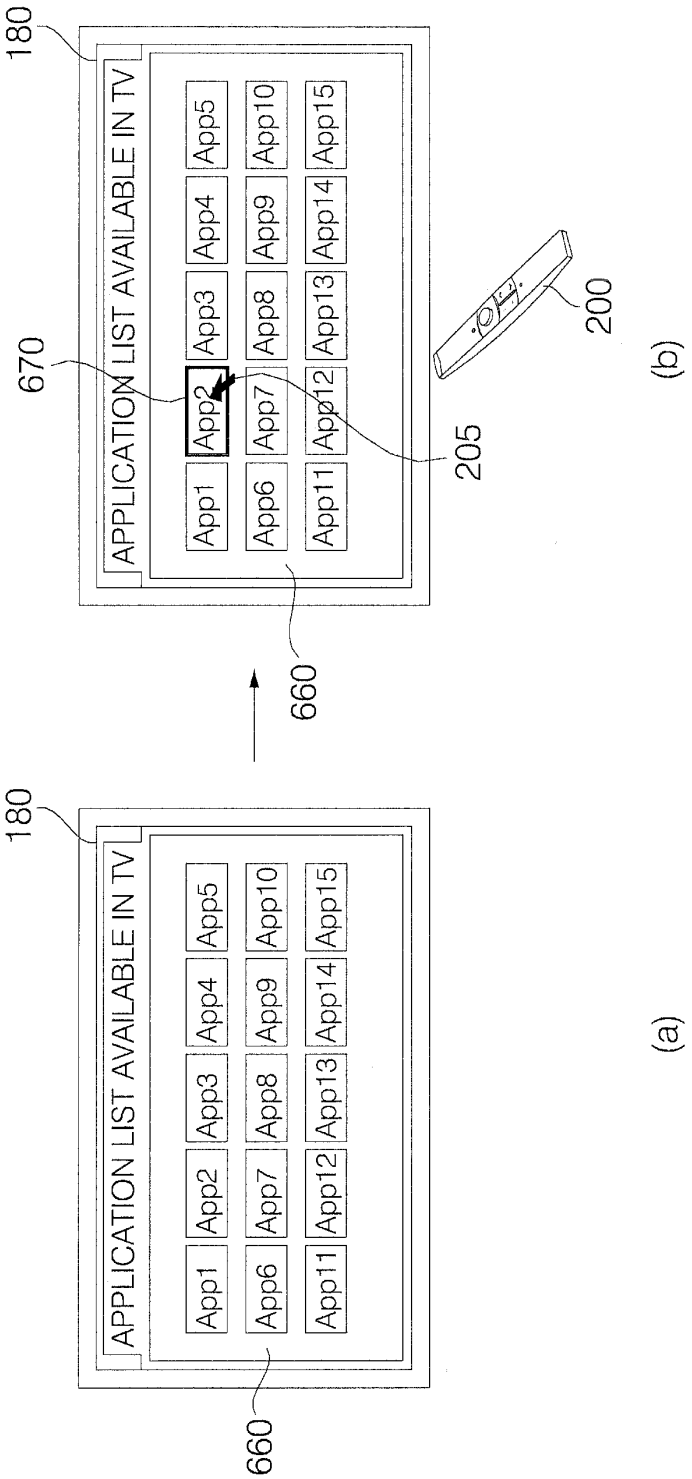

180
APPLICATION LIST AVAILABLE IN TV
App1
App2
App3
App4
App5
App6
App7
App8
App9
App10
App11
App12
App13
App14
App15
660
(a)
180
APPLICATION LIST AVAILABLE IN TV
App1
App2
App3
App4
App5
App6
App7
App8
App9
App10
App11
App12
App13
App14
App15
670
660
205
200
(b)

FIG. 17

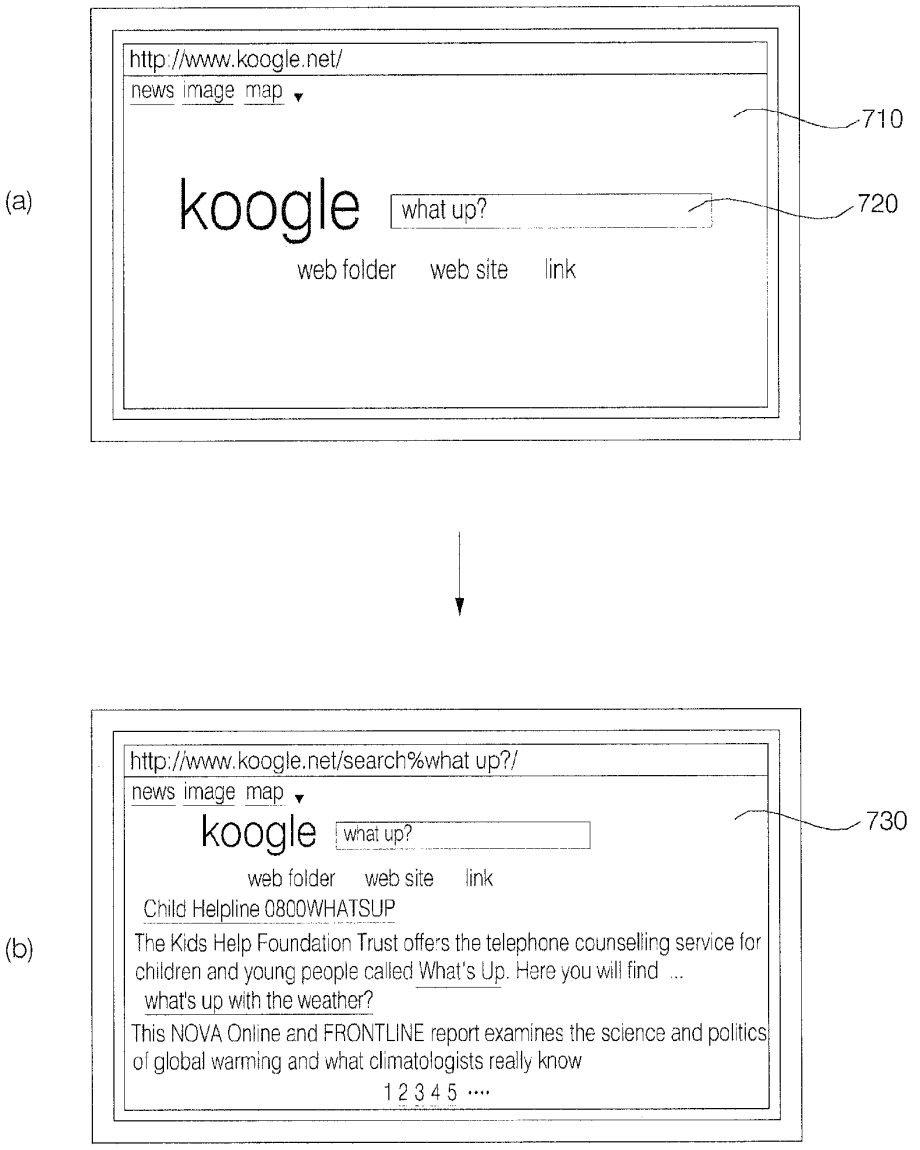

(a)
http://www.koogle.net/
news image map
koogle
what up?
web folder web site link
710
720
(b)
http://www.koogle.net/search%what up?/
news image map
koogle
what up?
web folder web site link
Child Helpline 0800WHATSUP
The Kids Help Foundation Trust offers the telephone counselling service for children and young people called What's Up. Here you will find ...
what's up with the weather?
This NOVA Online and FRONTLINE report examines the science and politics of global warming and what climatologists really know
1 2 3 4 5 ....
730

FIG. 18

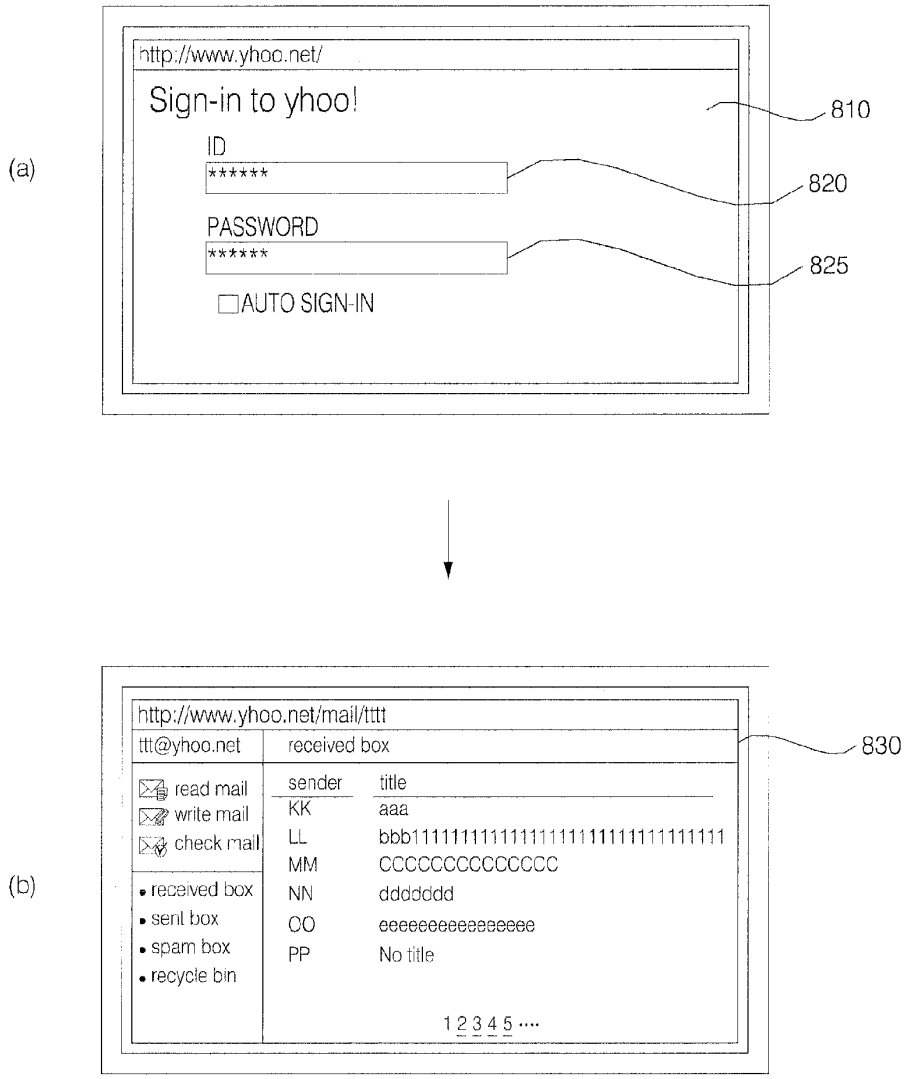

(a)
http://www.yhoo.net/
Sign-in to yhoo!
ID
******
PASSWORD
******
AUTO SIGN-IN
810
820
825
(b)
http://www.yhoo.net/mail/tttt
ttt@yhoo.net
received box
read mail
write mail
check mail
received box
sent box
spam box
recycle bin
sender
title
KK
aaa
LL
bbb1111111111111111111111111111111
MM
CCCCCCCCCCCCC
NN
ddddddd
OO
eeeeeeeeeeeeeee
PP
No title
1 2 3 4 5 ····
830

FIG. 19

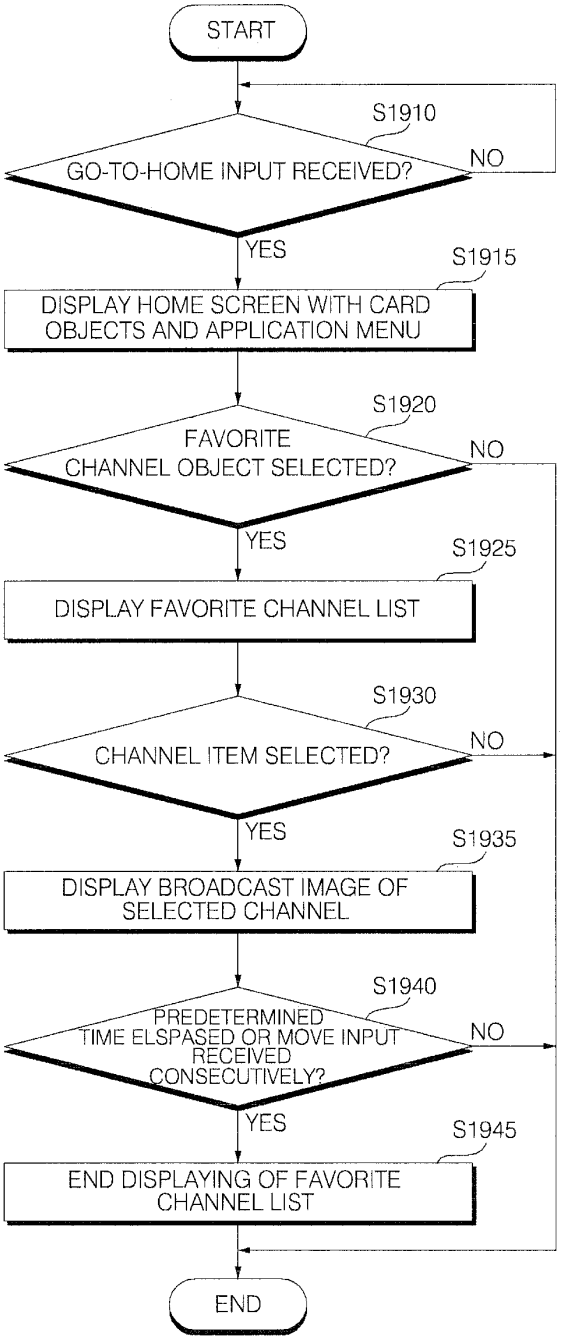

START
S1910
GO-TO-HOME INPUT RECEIVED?
NO
YES
S1915
DISPLAY HOME SCREEN WITH CARD OBJECTS AND APPLICATION MENU
S1920
FAVORITE CHANNEL OBJECT SELECTED?
NO
YES
S1925
DISPLAY FAVORITE CHANNEL LIST
S1930
CHANNEL ITEM SELECTED?
NO
YES
S1935
DISPLAY BROADCAST IMAGE OF SELECTED CHANNEL
S1940
PREDETERMINED TIME ELSPASED OR MOVE INPUT RECEIVED CONSECUTIVELY?
NO
YES
S1945
END DISPLAYING OF FAVORITE CHANNEL LIST
END

FIG. 20

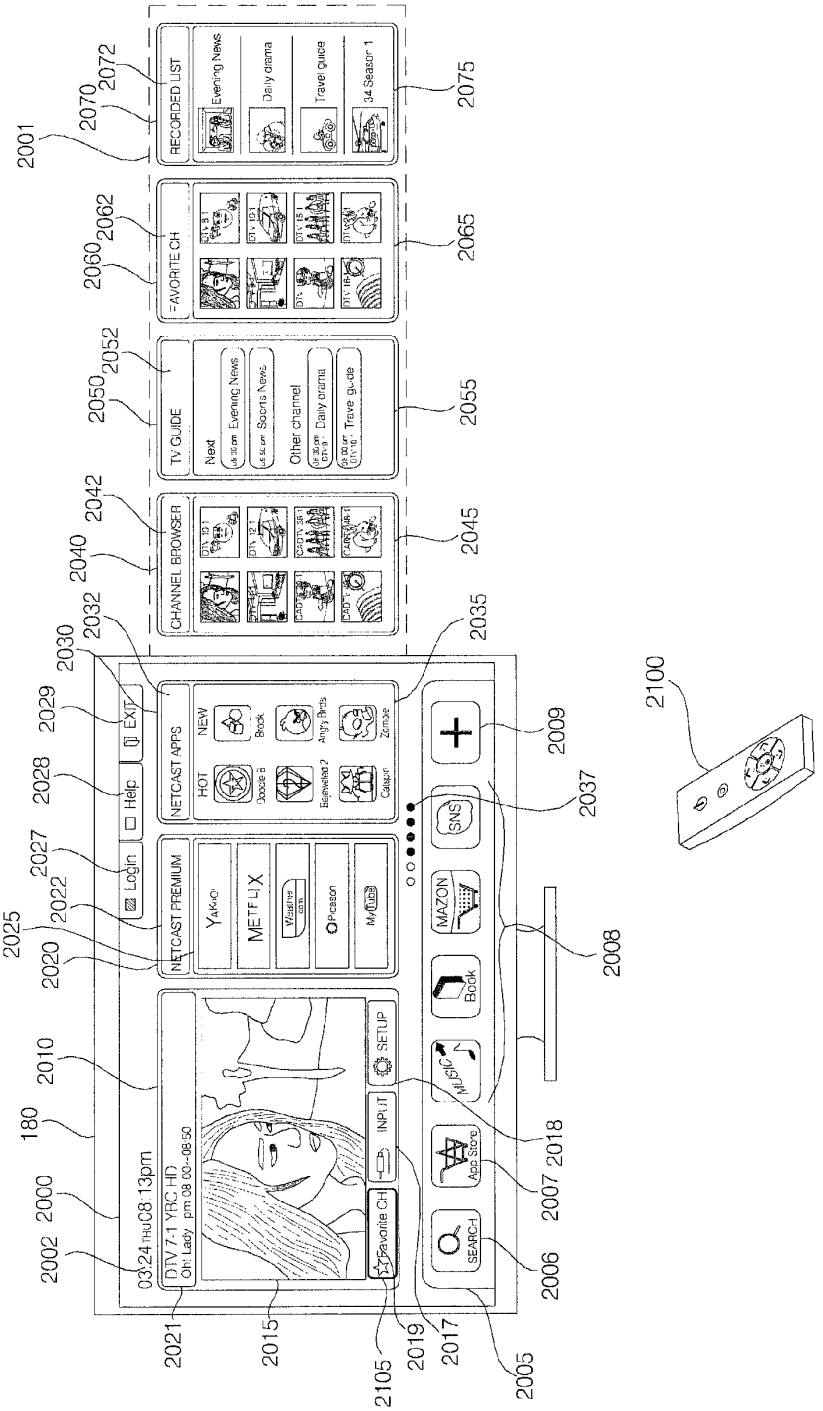

RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
FAVORITE CH
TV GUIDE
Next
Evening News
Sports News
Other channel
Daily drama
Travel guide
CHANNEL BROWSER
NETCAST APPS
HOT
NEW
Book
Angry Birds
Zombie
Doodle B
Beatwelled 2
Catspin
NETCAST PREMIUM
YAKHO!
METFLIX
Weather.com
Picasson
MyTube
Login
Help
EXIT
03:24 THU 08:13pm
DTV 7-1 YRC HD
Oh! Lady pm 08:00~08:50
Favorite CH
INPUT
SETUP
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2001
2070
2072
2075
2060
2062
2065
2050
2052
2055
2040
2042
2045
2030
2032
2035
2029
2028
2027
2022
2025
2020
2010
180
2000
2002
2021
2015
2105
2019
2017
2005
2006
2007
2018
2008
2037
2009
2100

FIG. 21A

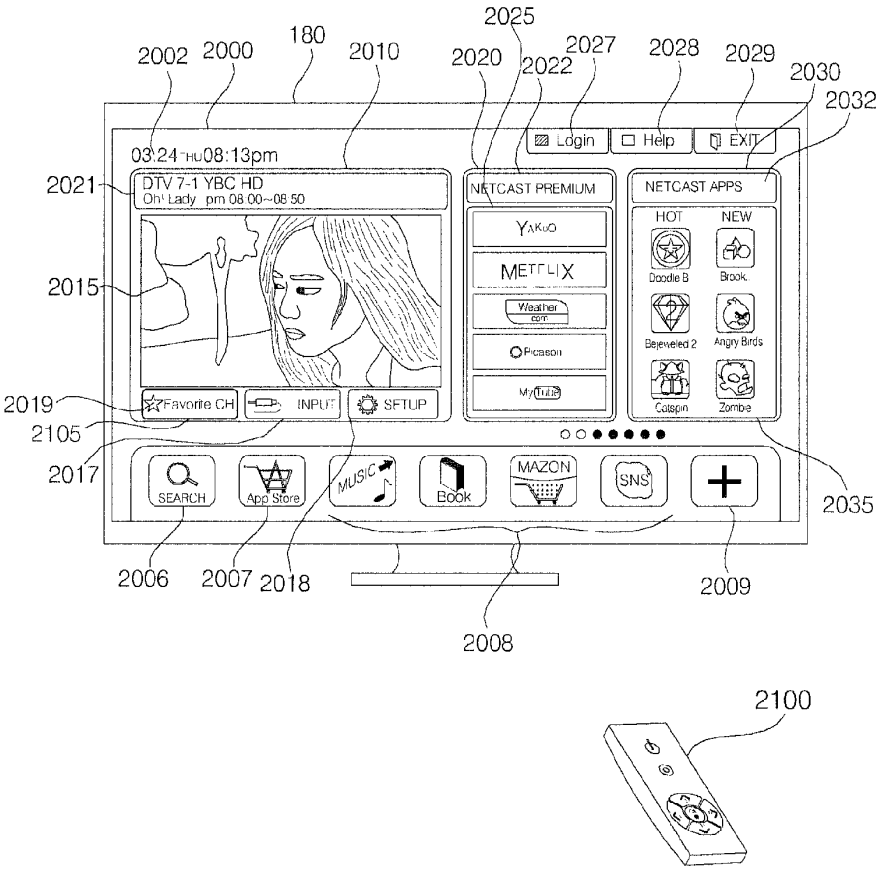

2002
2000
180
2010
2020
2025
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03:24 HU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
Doodle B
Brook
Bejeweled 2
Angry Birds
Catspin
Zombie
2015
Weather
Picasoft
My Tube
2019
Favorite CH
INPUT
SETUP
2105
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2035
2006
2007
2018
2009
2008
2100

FIG. 21B

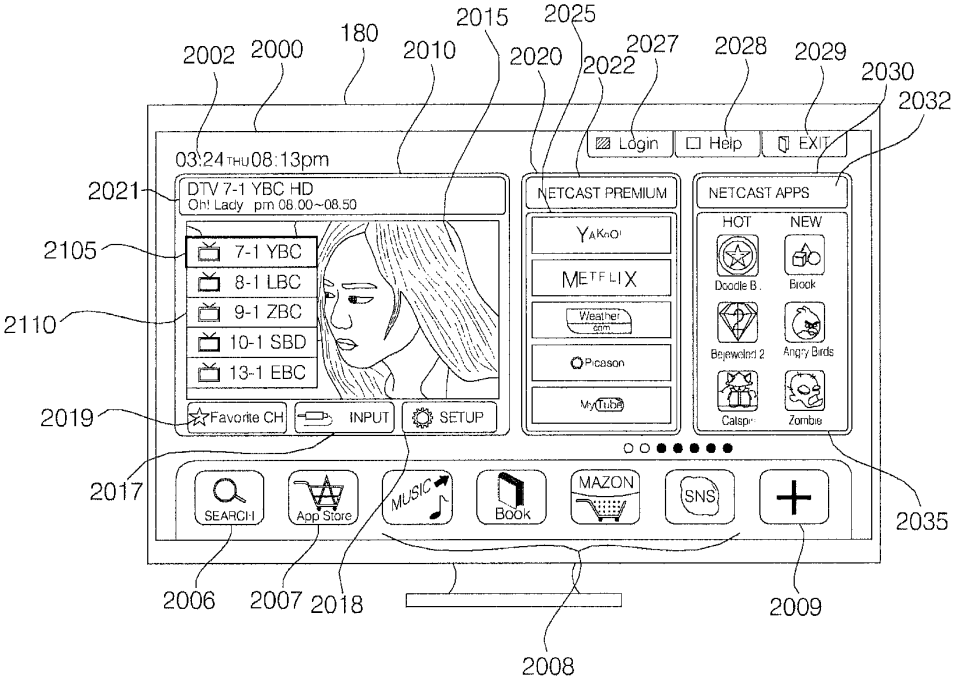

2002
2000
180
2010
2015
2020
2025
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08.00~08.50
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
2105
7-1 YBC
8-1 LBC
9-1 ZBC
10-1 SBD
13-1 EBC
2110
Weather
Picason
Doodle B.
Brook
Bejeweled 2
Angry Birds
Calspir
Zombie
2019
Favorite CH
INPUT
SETUP
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2035
2006
2007
2018
2009
2008

FIG. 21C

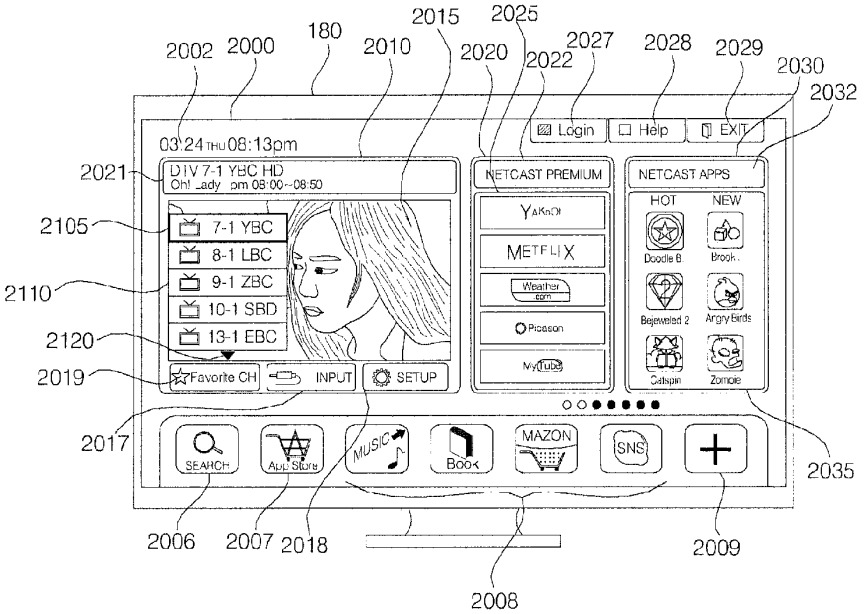

2002
2000
180
2010
2015
2020
2025
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
2105
7-1 YBC
8-1 LBC
9-1 ZBC
10-1 SBD
13-1 EBC
2110
2120
2019
Favorite CH
INPUT
SETUP
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2035
2006
2007
2018
2009
2008

FIG. 21D

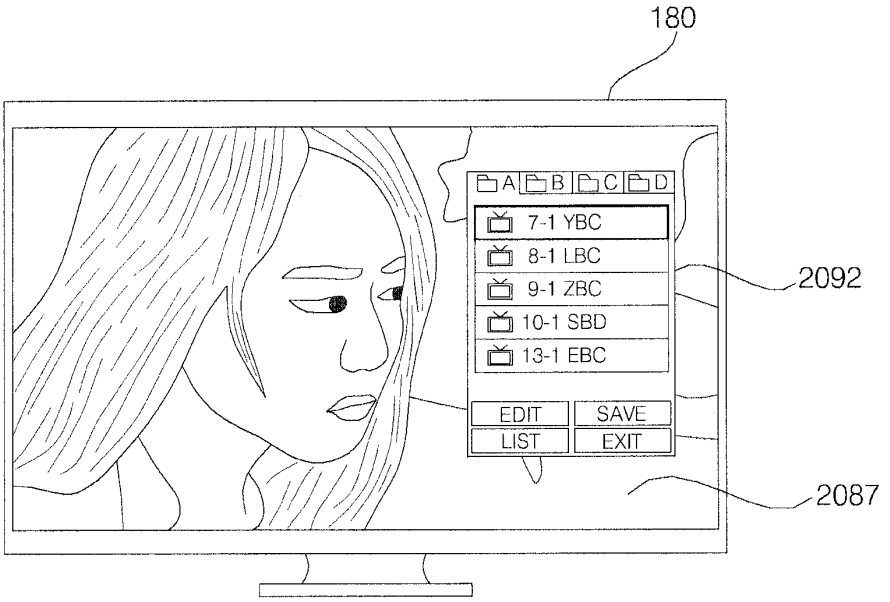
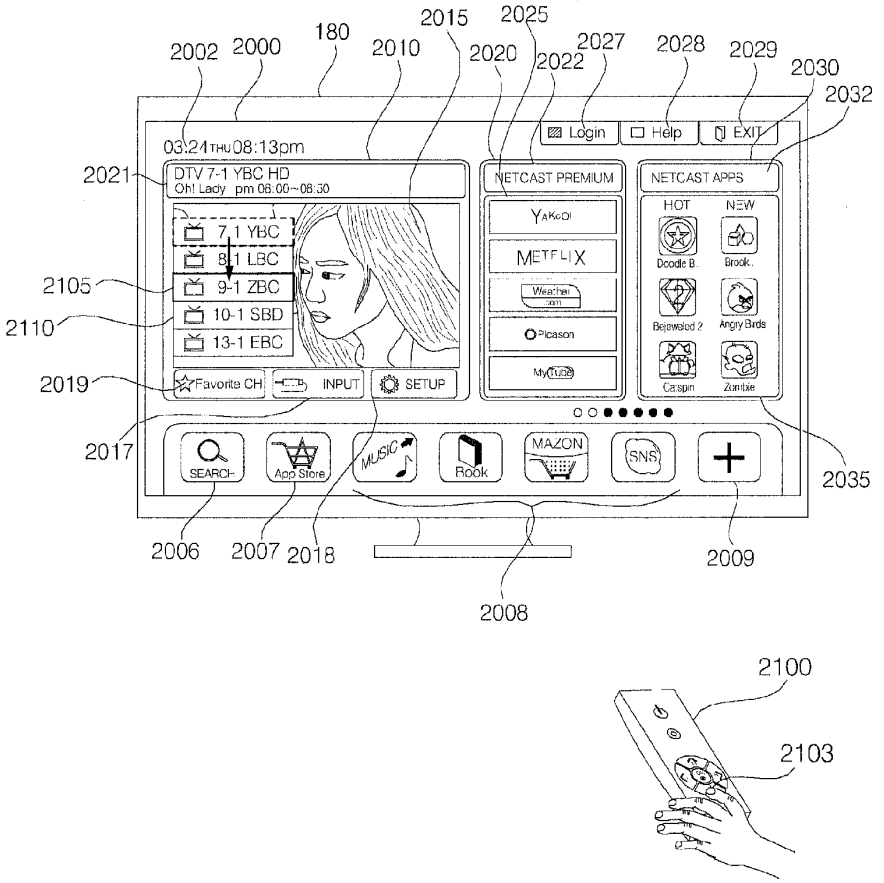

180
A
B
C
D
7-1 YBC
8-1 LBC
9-1 ZBC
10-1 SBD
13-1 EBC
EDIT
SAVE
LIST
EXIT
2092
2087

FIG. 22A


2002
2000
180
2010
2015
2025
2020
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03.24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 06:00~08:30
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
7-1 YBC
8-1 LBC
9-1 ZBC
10-1 SBD
13-1 EBC
2105
2110
2019
Favorite CH
INPUT
SETUP
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2035
2006
2007
2018
2009
2008

2100
2103

FIG. 22B

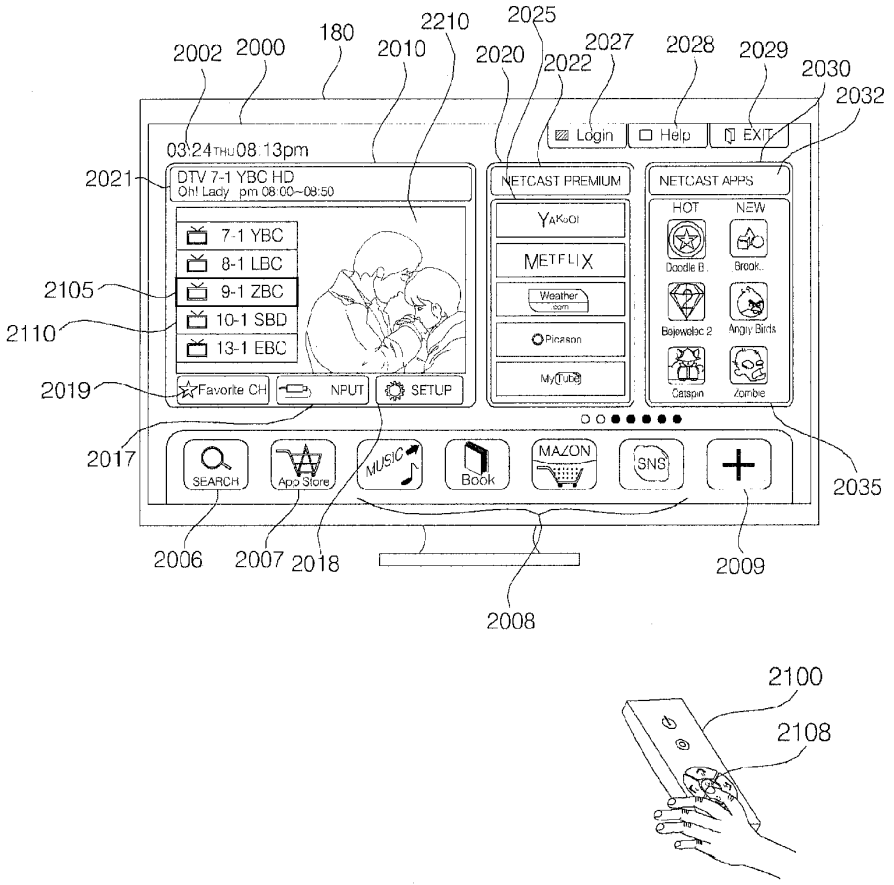

2002
2000
180
2010
2210
2020
2025
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03\24THU08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00–08:50
7-1 YBC
8-1 LBC
9-1 ZBC
10-1 SBD
13-1 EBC
2105
2110
2019
Favorite CH
NPUT
SETUP
NETCAST PREMIUM
YAHOO!
METFLIX
Weather
Pinterest
MyTube
NETCAST APPS
HOT
NEW
Doodle B.
Brook..
Bejewelac 2
Angry Birds
Catapin
Zombie
2017
SEARCH
App Store
MUSIC
Book
AMAZON
SNS
2035
2006
2007
2018
2009
2008
2100
2108

FIG. 22C

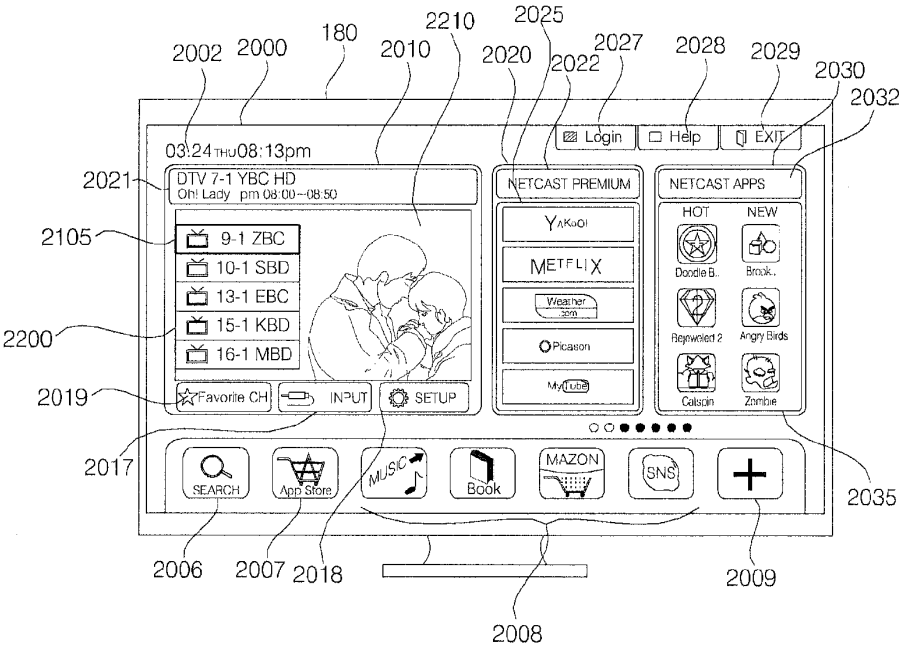

2002
2000
180
2010
2210
2020
2025
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
2105
9-1 ZBC
10-1 SBD
13-1 EBC
15-1 KBD
16-1 MBD
2200
Weather
Picasion
Doodle B..
Brook..
Rejoweled 2
Angry Birds
Calspin
Zombie
2019
Favorite CH
INPUT
SETUP
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2035
2006
2007
2018
2009
2008

FIG. 22D

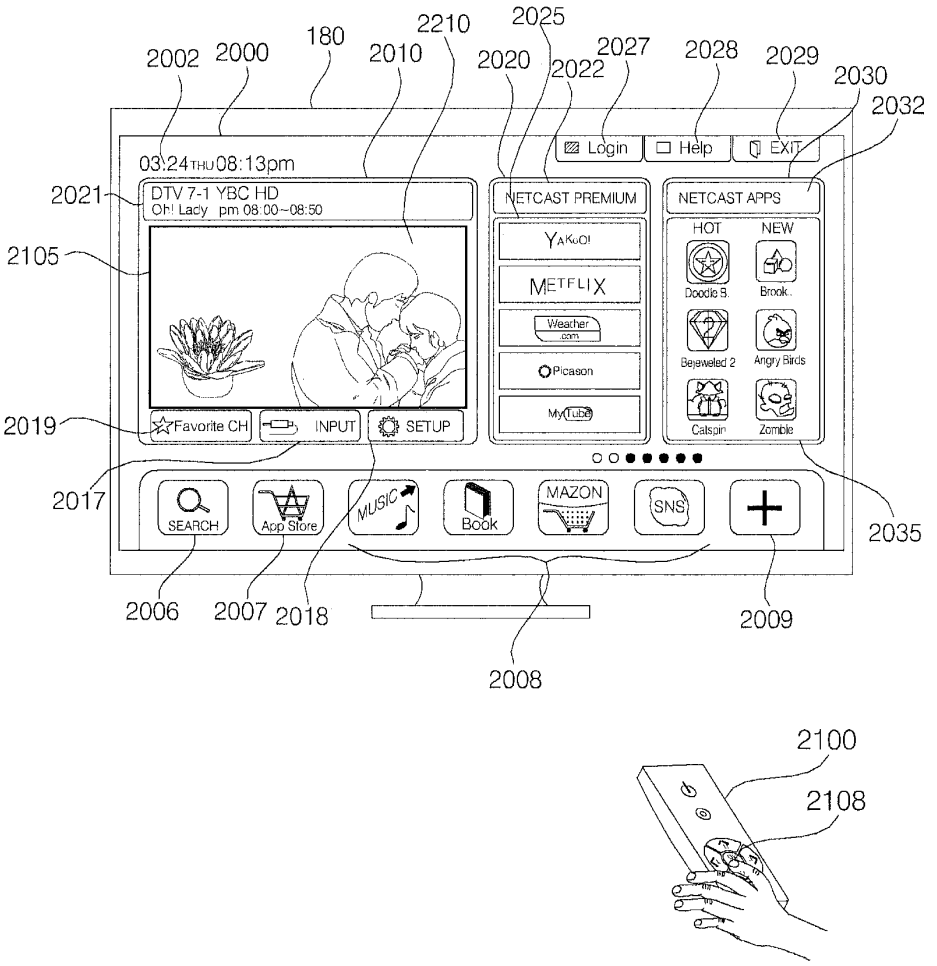

2002
2000
180
2010
2210
2020
2025
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03:24THU08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
2105
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
YAKuO!
METFLIX
Weather
Picason
MyTube
Doodle B.
Brook..
Bejeweled 2
Angry Birds
Catspin
Zombie
2019
Favorite CH
INPUT
SETUP
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2035
2006
2007
2018
2009
2008
2100
2108

FIG. 22E

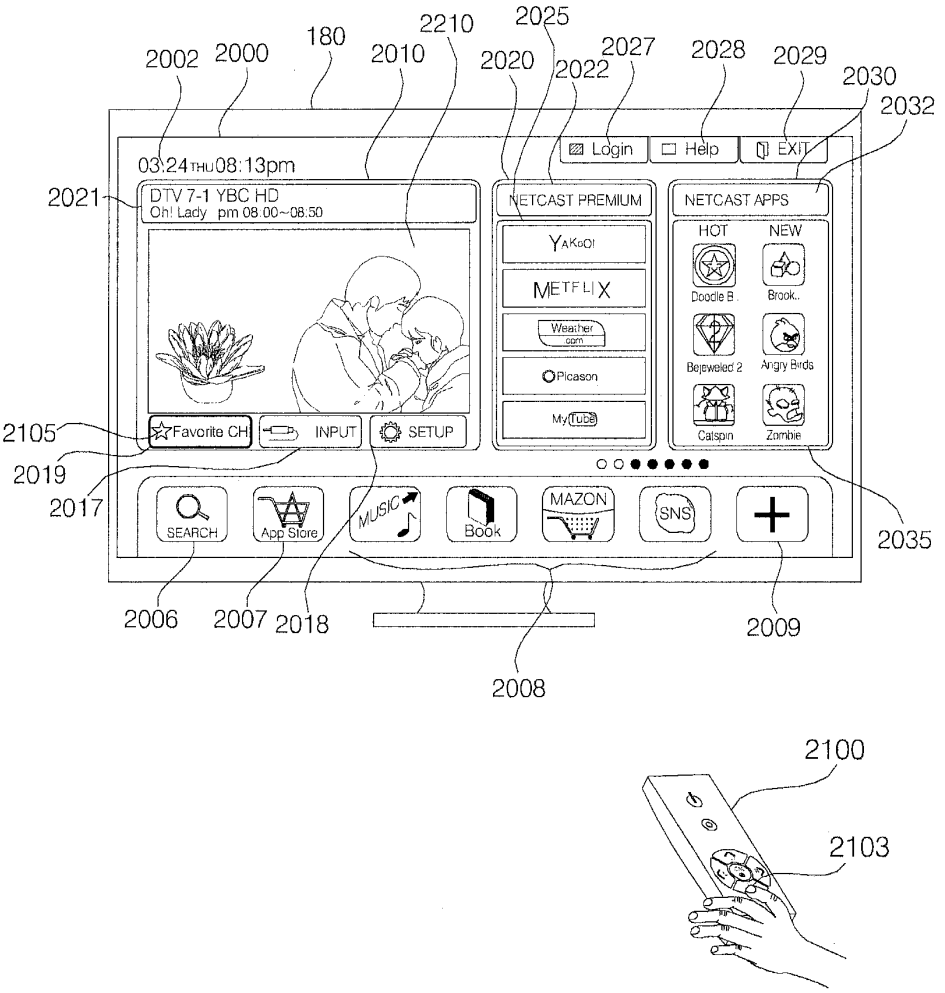

2002
2000
180
2010
2210
2020
2025
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
Doodle B.
Brook..
Bejeweled 2
Angry Birds
Catspin
Zombie
Picasa
2105
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2035
2006
2007
2018
2009
2008
2100
2103

FIG. 23

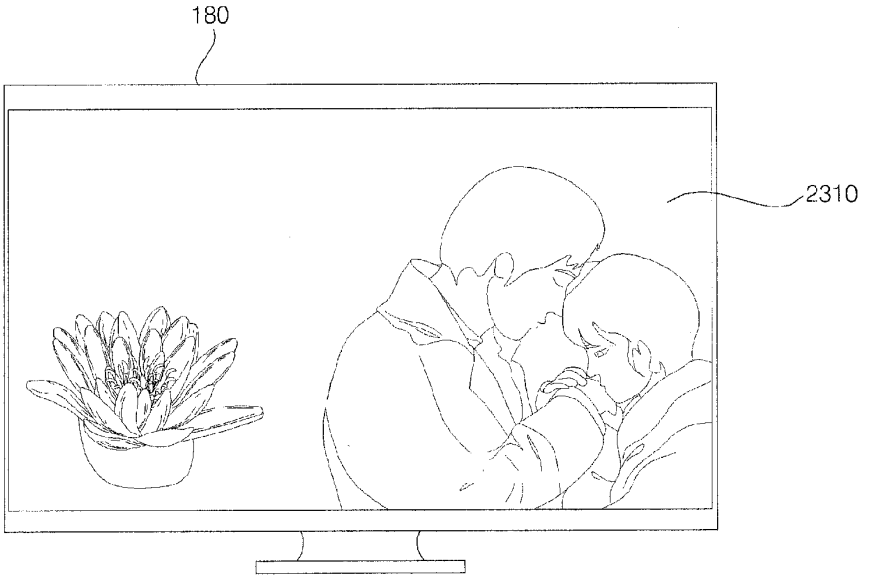


FIG. 24A

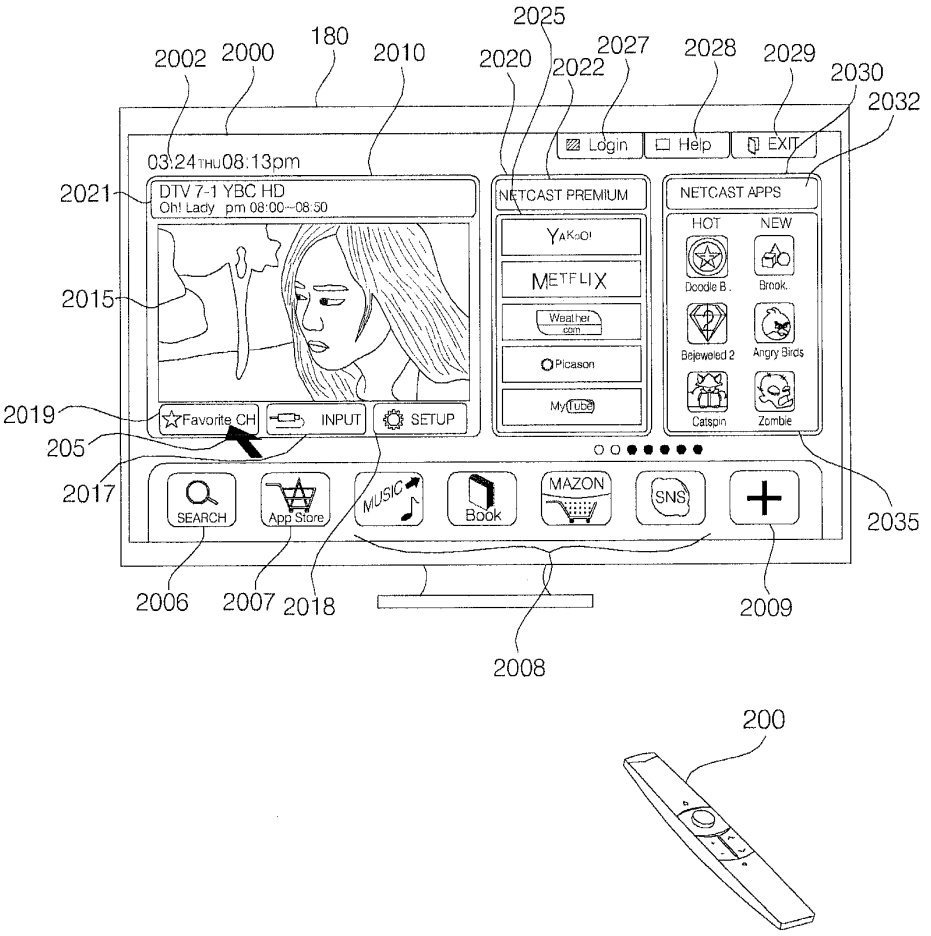

2025
180
2002
2000
2010
2020
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
YAHOO!
NETFLIX
Weather.com
Picasa
MyTube
Doodle B.
Brook.
Bejeweled 2
Angry Birds
Catspin
Zombie
2015
2019
Favorite CH
INPUT
SETUP
205
2017
SEARCH
App Store
MUSIC
Book
AMAZON
SNS
2035
2006
2007
2018
2009
2008
200

FIG. 24B

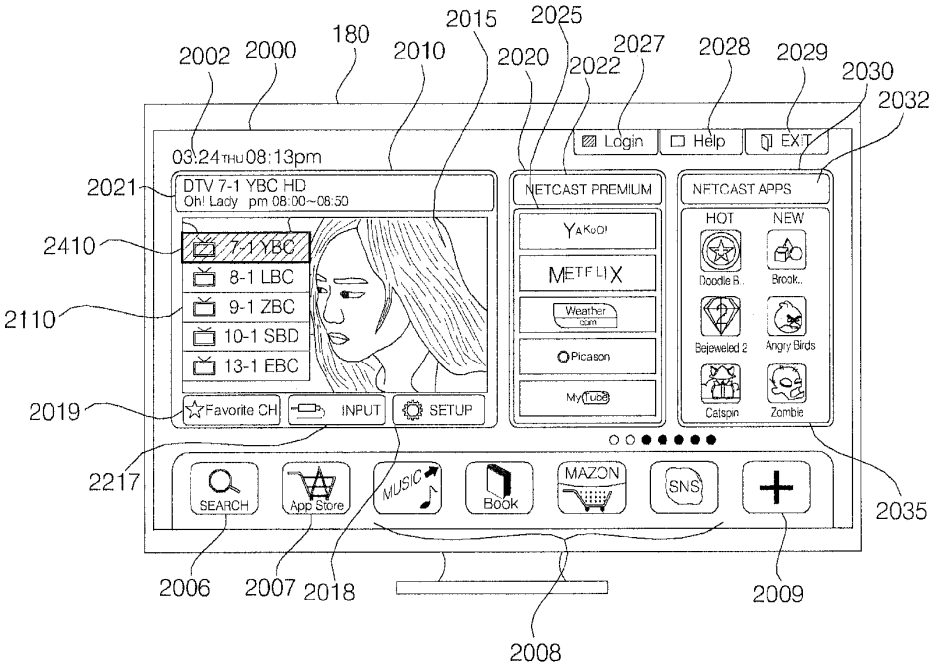

2002
2000
180
2010
2015
2025
2020
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
2410
7-1 YBC
8-1 LBC
9-1 ZBC
10-1 SBD
13-1 EBC
2110
2019
Favorite CH
INPUT
SETUP
NETCAST PREMIUM
YAHOO!
NETFLIX
Weather.com
Picasa
MyTube
NETCAST APPS
HOT
NEW
Doodle B..
Brook..
Bejeweled 2
Angry Birds
Catspin
Zombie
2217
SEARCH
App Store
MUSIC
Book
AMAZON
SNS
2035
2006
2007
2018
2009
2008

FIG. 24C

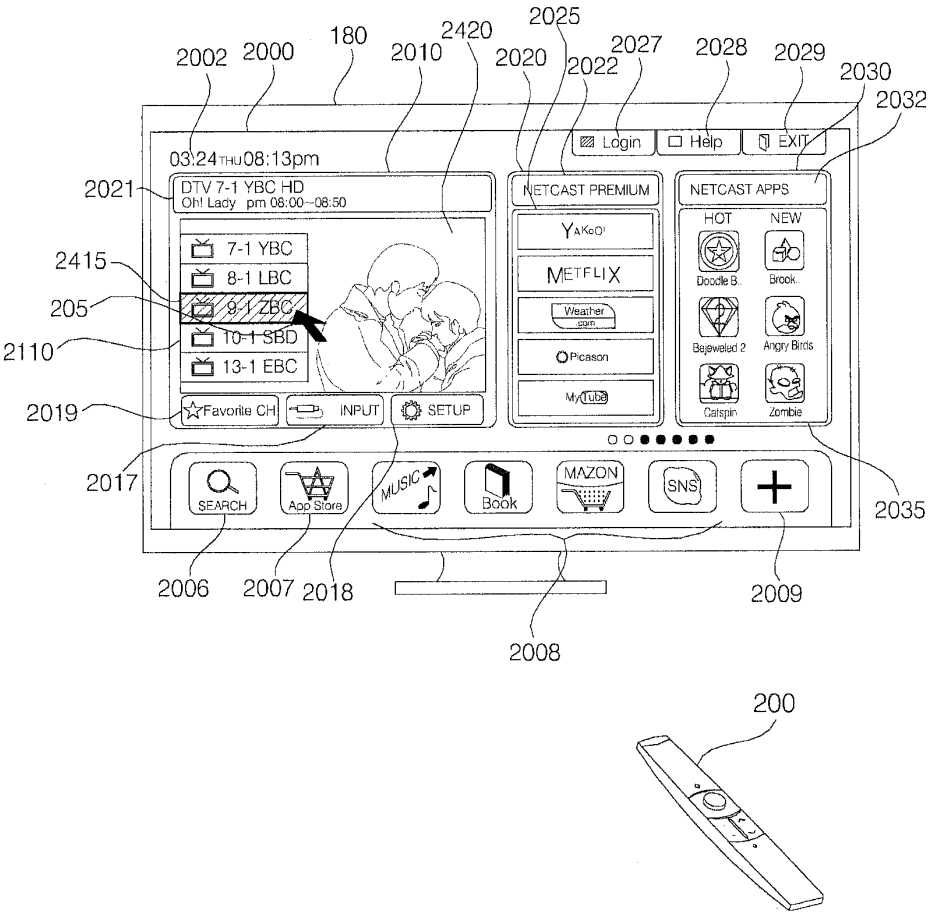

2002
2000
180
2010
2420
2020
2025
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
2415
7-1 YBC
8-1 LBC
9-1 ZBC
10-1 SBD
13-1 EBC
205
2110
YAHOO!
NETFLIX
Weather
Picasa
MyTube
Doodle B..
Brook..
Bejeweled 2
Angry Birds
Catspin
Zombie
2019
Favorite CH
INPUT
SETUP
2017
SEARCH
App Store
MUSIC
Book
AMAZON
SNS
2035
2006
2007
2018
2009
2008
200

FIG. 25

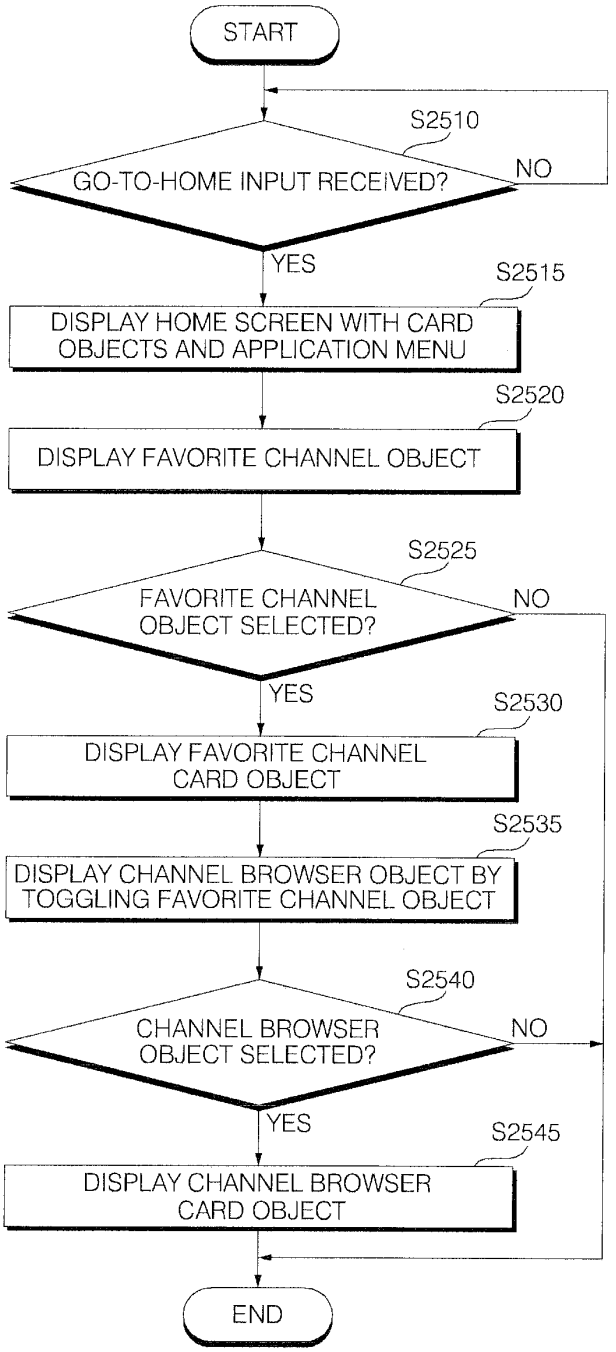

START
S2510
GO-TO-HOME INPUT RECEIVED?
NO
YES
S2515
DISPLAY HOME SCREEN WITH CARD OBJECTS AND APPLICATION MENU
S2520
DISPLAY FAVORITE CHANNEL OBJECT
S2525
FAVORITE CHANNEL OBJECT SELECTED?
NO
YES
S2530
DISPLAY FAVORITE CHANNEL CARD OBJECT
S2535
DISPLAY CHANNEL BROWSER OBJECT BY TOGGLING FAVORITE CHANNEL OBJECT
S2540
CHANNEL BROWSER OBJECT SELECTED?
NO
YES
S2545
DISPLAY CHANNEL BROWSER CARD OBJECT
END

FIG. 26A

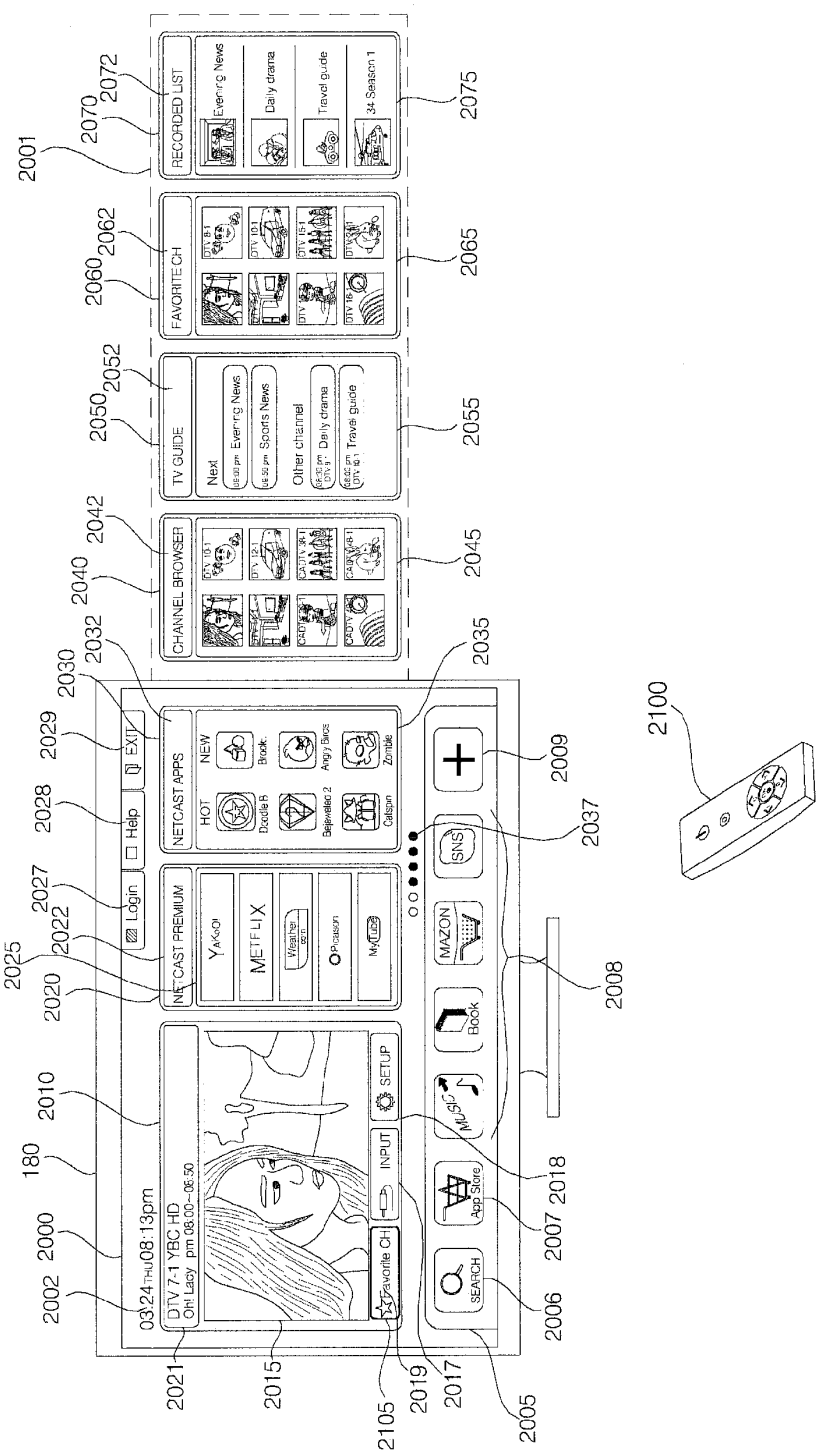

RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
FAVORITE CH
TV GUIDE
Next
Evening News
Sports News
Other channel
Daily drama
Travel guide
CHANNEL BROWSER
NETCAST APPS
HOT
NEW
Dzodle B
Angry Birds
Zombie
Calspin
Help
EXIT
Login
NETCAST PREMIUM
METFLIX
Weather
Picasson
MyTube
DTV 7-1 YBC HD
Oh! Lacy pm 08:00~08:50
03:24 THU 08:13pm
Favorite CH
INPUT
SETUP
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2001
2070
2072
2075
2060
2062
2065
2050
2052
2055
2040
2042
2045
2030
2032
2035
2029
2028
2027
2022
2025
2020
2010
180
2000
2002
2021
2015
2105
2019
2017
2005
2006
2007
2018
2008
2037
2009
2100

FIG. 26B

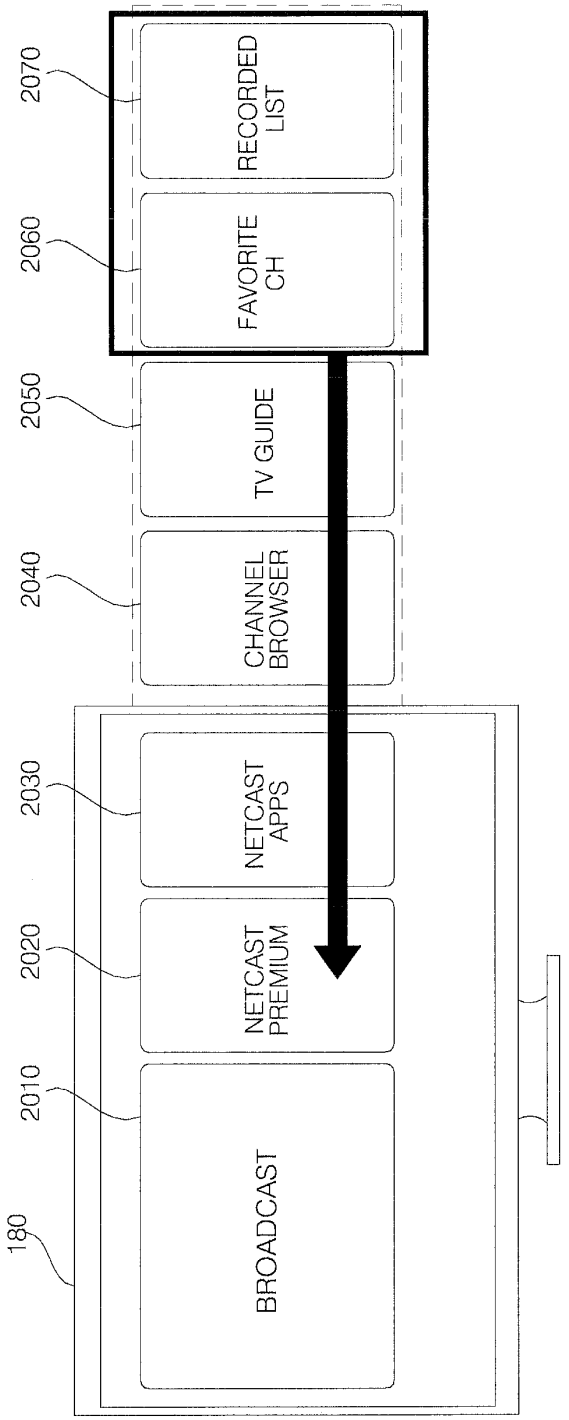
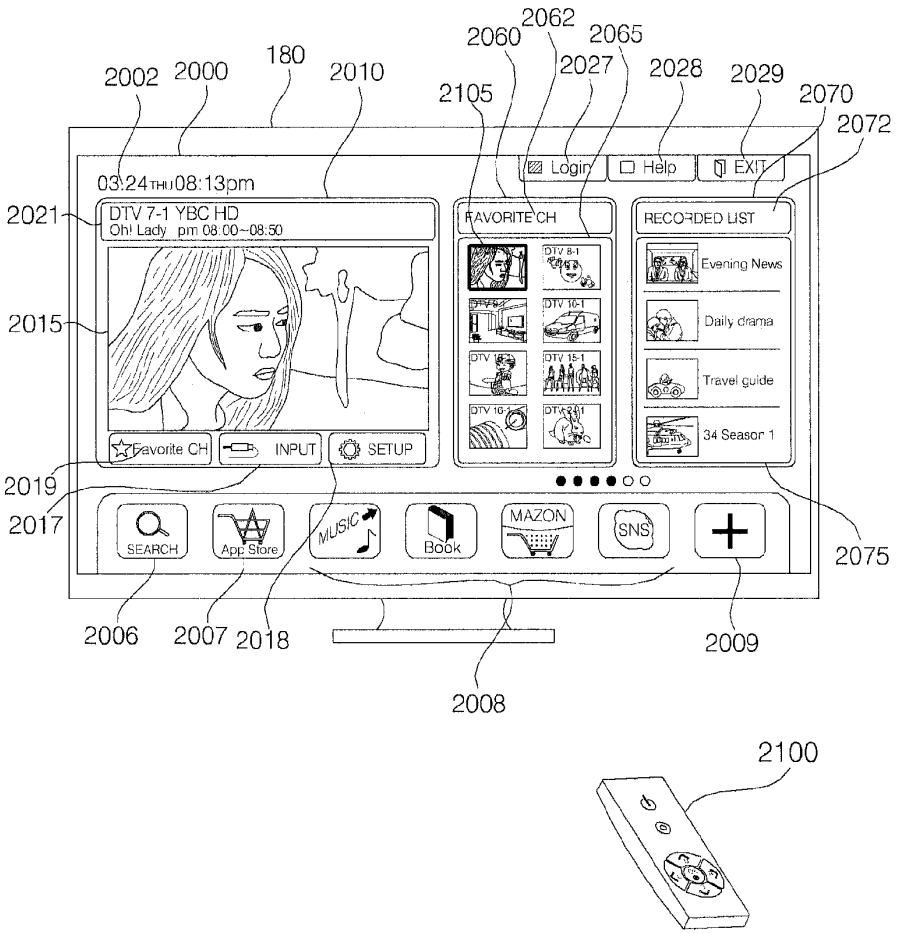

2070
RECORDED LIST
2060
FAVORITE CH
2050
TV GUIDE
2040
CHANNEL BROWSER
2030
NETCAST APPS
2020
NETCAST PREMIUM
2010
BROADCAST
180

FIG. 26C


2002
2000
180
2010
2060
2062
2065
2027
2028
2029
2070
2072
2105
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
FAVORITE CH
RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
2015
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008

2100

FIG. 27A

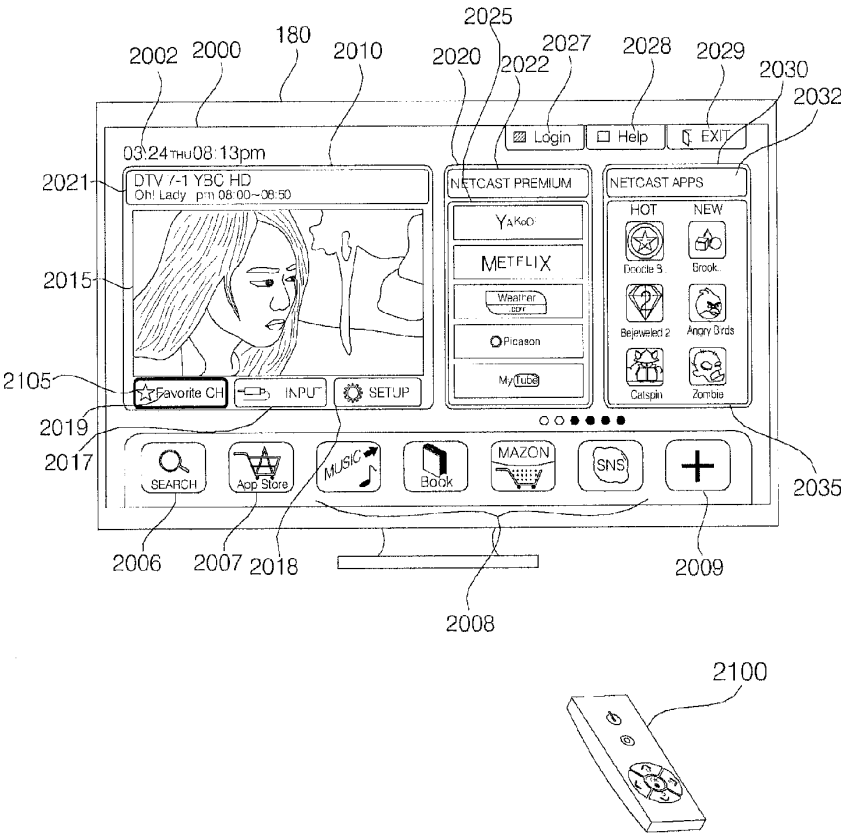

2002
2000
180
2010
2020
2025
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03:24 THU 08:13pm
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
METFLIX
Weather
Picasoon
Favorite CH
INPUT
SETUP
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2021
2015
2105
2019
2017
2035
2006
2007
2018
2009
2008
2100

FIG. 27B

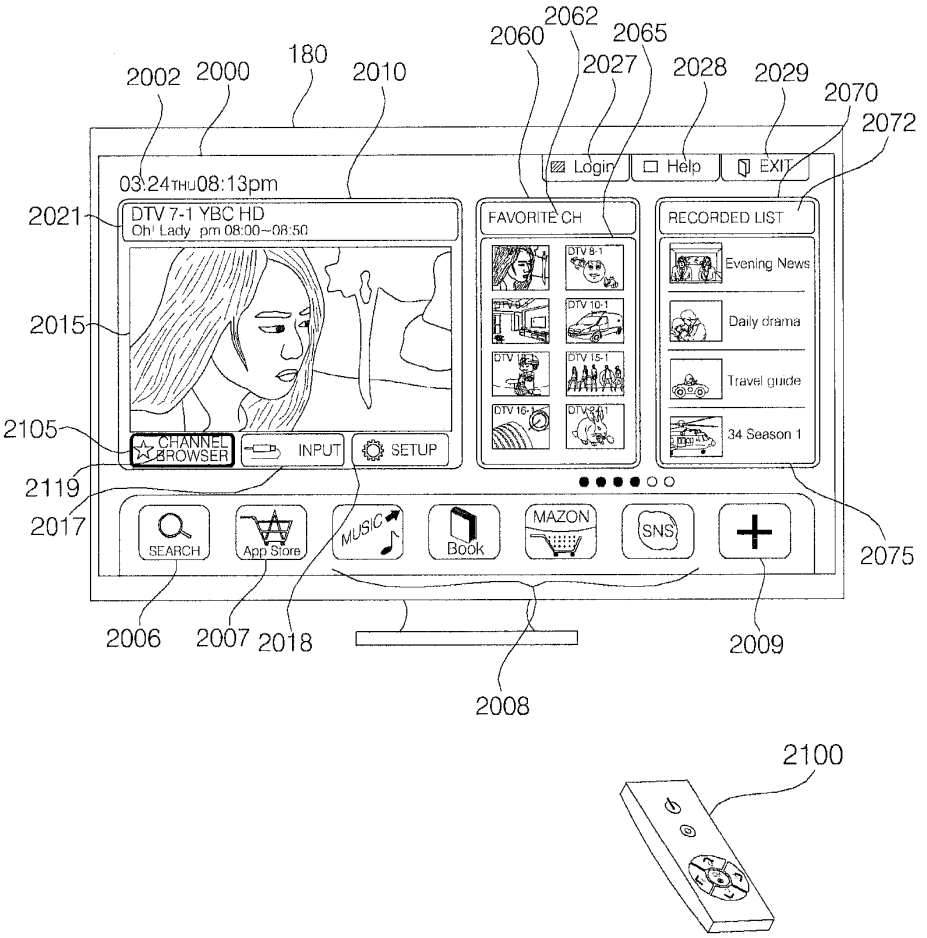

2062
2060
2065
180
2027
2028
2029
2002
2000
2010
2070
2072
Login
Help
EXIT
03:24THU08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
FAVORITE CH
RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
2015
2105
CHANNEL BROWSER
INPUT
SETUP
2119
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008
2100

FIG. 27C

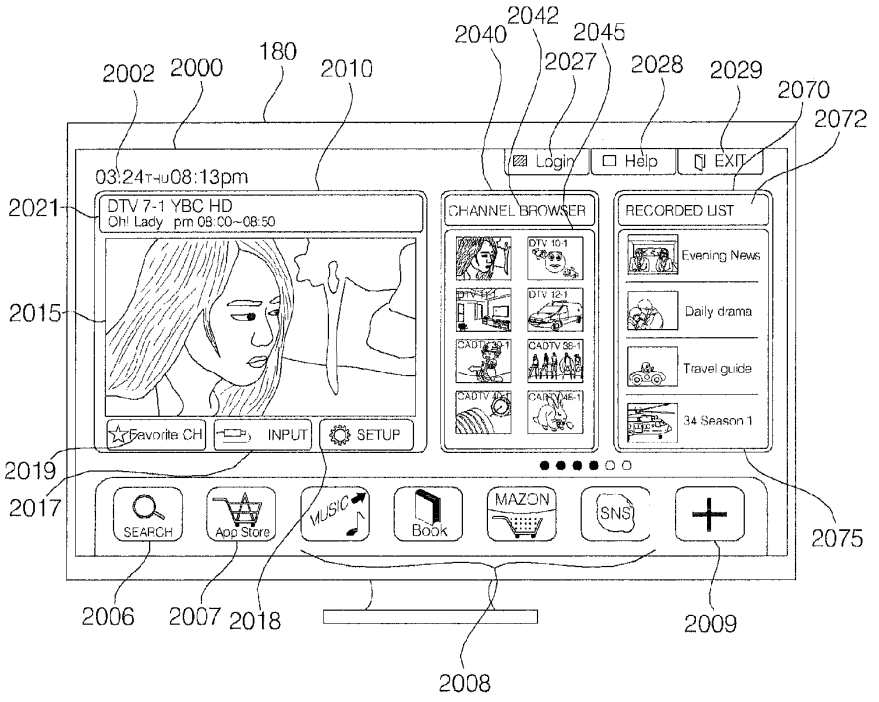

2042
2040
2045
180
2002
2000
2010
2027
2028
2029
2070
2072
Login
Help
EXIT
03:24THU08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
CHANNEL BROWSER
RECORDED LIST
2015
Evening News
Daily drama
Travel guide
34 Season 1
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008

FIG. 27D

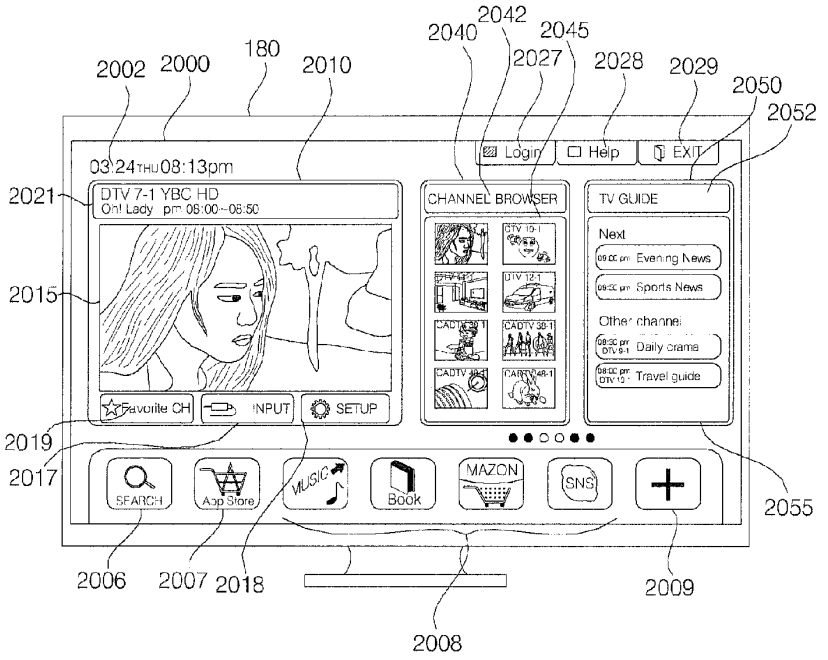

2002
2000
180
2010
2040
2042
2045
2027
2028
2029
2050
2052
03.24THU08:13pm
Login
Help
EXIT
2021
DTV 7-1 YBC HD
Oh! Lady pm 06:00~06:50
CHANNEL BROWSER
TV GUIDE
Next
Evening News
Sports News
Other channel
Daily drama
Travel guide
2015
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2055
2006
2007
2018
2009
2008

FIG. 28A

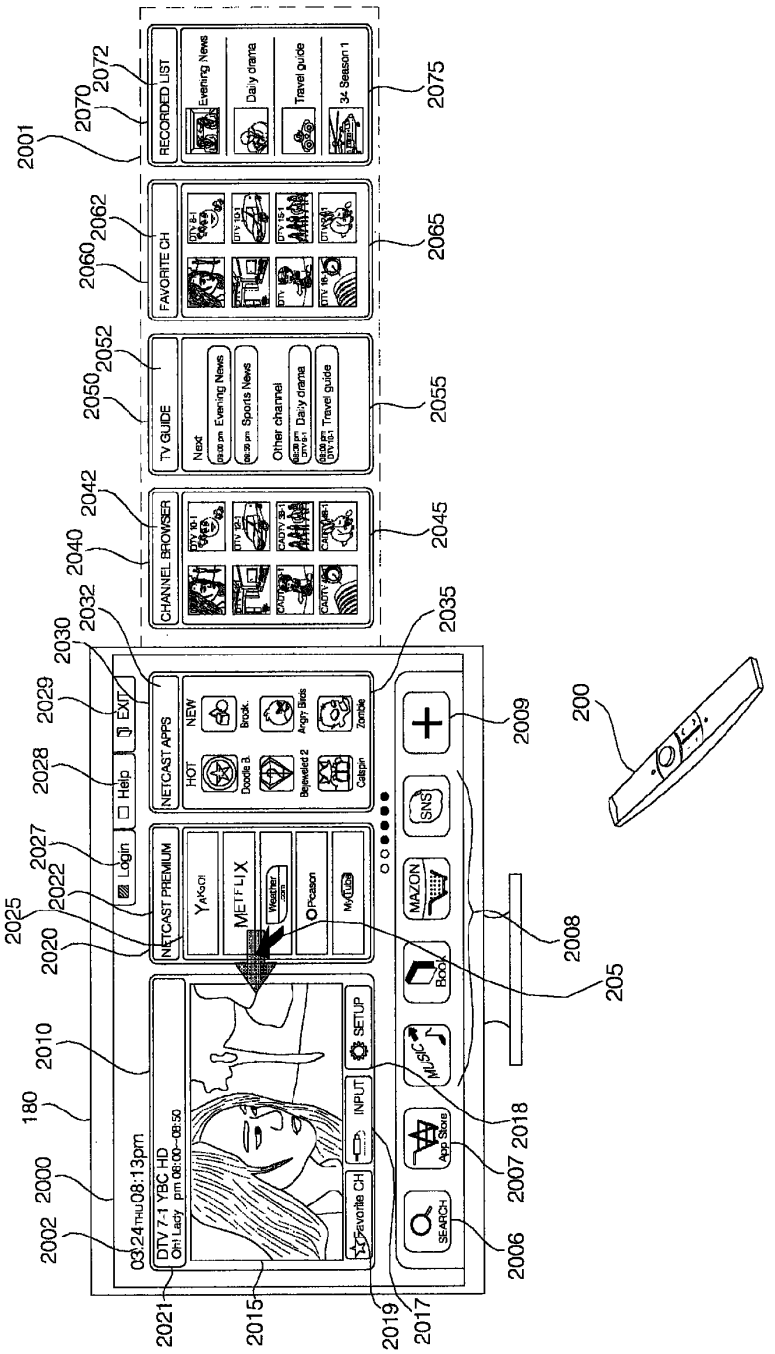

RECORDED LIST
Evening News
Daily drama
Travel guide
3rd Season 1
FAVORITE CH
TV GUIDE
Next
Evening News
Sports News
Other channel
Daily drama
Travel guide
CHANNEL BROWSER
NETCAST APPS
HOT
NEW
Doodle 3
Brook
Bejeweled 2
Angry Birds
Calspin
Zombie
NETCAST PREMIUM
YAHOO!
METFLIX
Weather
Picasso
MyTube
Login
Help
EXIT
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
03:24THU08:13pm
SETUP
INPUT
Favorite CH
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2001
2070
2072
2075
2060
2062
2065
2050
2052
2055
2040
2042
2045
2030
2032
2035
2029
2028
2027
2022
2025
2020
2010
180
2000
2002
2021
2015
2019
2017
2006
2007
2018
2008
205
2009
200

FIG. 28B

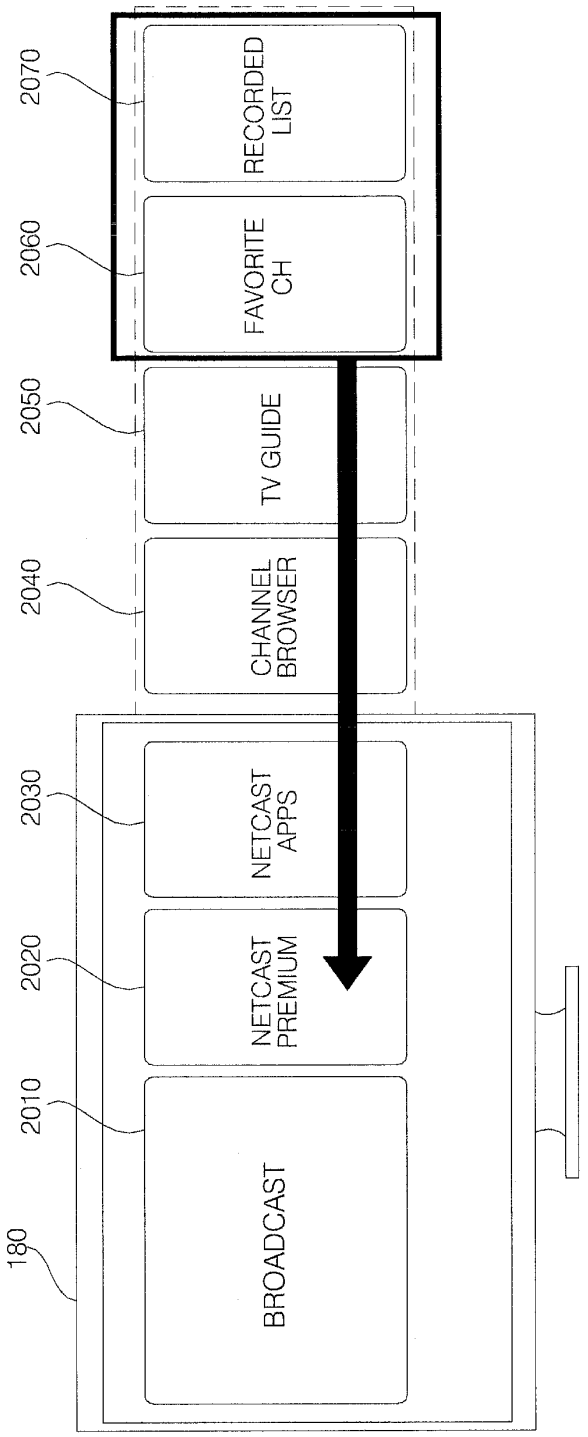

180
2010
BROADCAST
2020
NETCAST PREMIUM
2030
NETCAST APPS
2040
CHANNEL BROWSER
2050
TV GUIDE
2060
FAVORITE CH
2070
RECORDED LIST

FIG. 28C

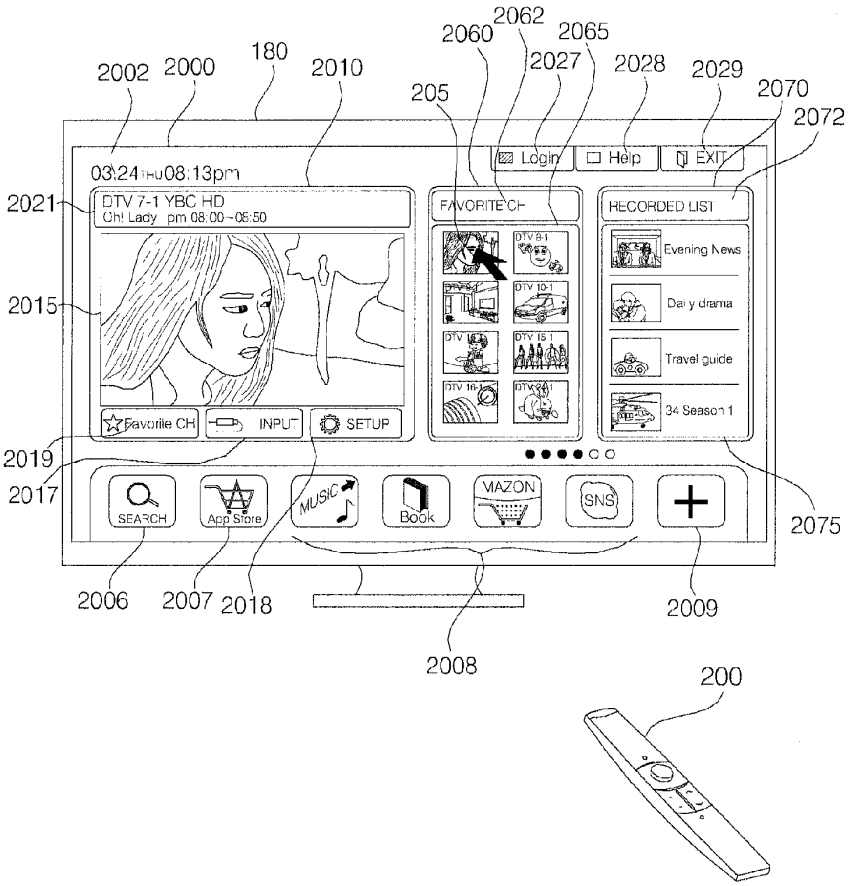

2062
2060
2065
2027
2028
2029
2070
2072
2002
2000
180
2010
205
Login
Help
EXIT
03:24 Thu 08:13pm
DTV 7-1 YBC HD
Oh! Lady pm 08:00~05:50
2021
2015
FAVORITE CH
RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
AMAZON
SNS
2075
2006
2007
2018
2009
2008
200

FIG. 29A

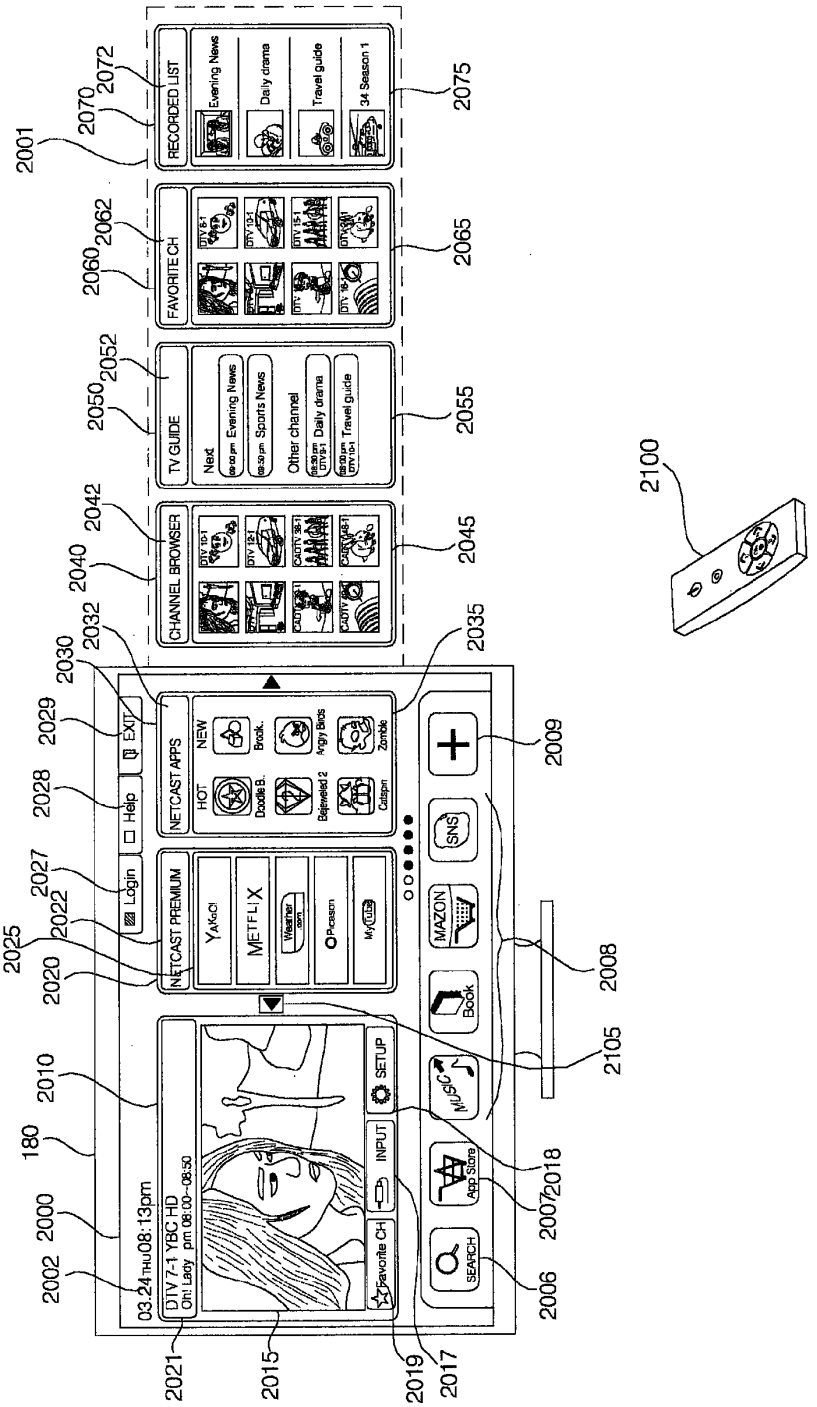

RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
FAVORITE CH
TV GUIDE
Next
Evening News
Sports News
Other channel
Daily drama
Travel guide
CHANNEL BROWSER
NETCAST APPS
HOT
NEW
NETCAST PREMIUM
Login
Help
EXIT
03.24 THU 08:13pm
DTV 7-1 YBC HD
Oh! Lady pm 06:00~06:50
Favorite CH
INPUT
SETUP
SEARCH
App Store
Book
SNS
2001
2002
2000
180
2010
2020
2022
2025
2027
2028
2029
2030
2032
2040
2042
2050
2052
2060
2062
2070
2072
2075
2065
2055
2045
2035
2009
2008
2105
2018
2007
2006
2017
2019
2015
2021
2100

FIG. 29B

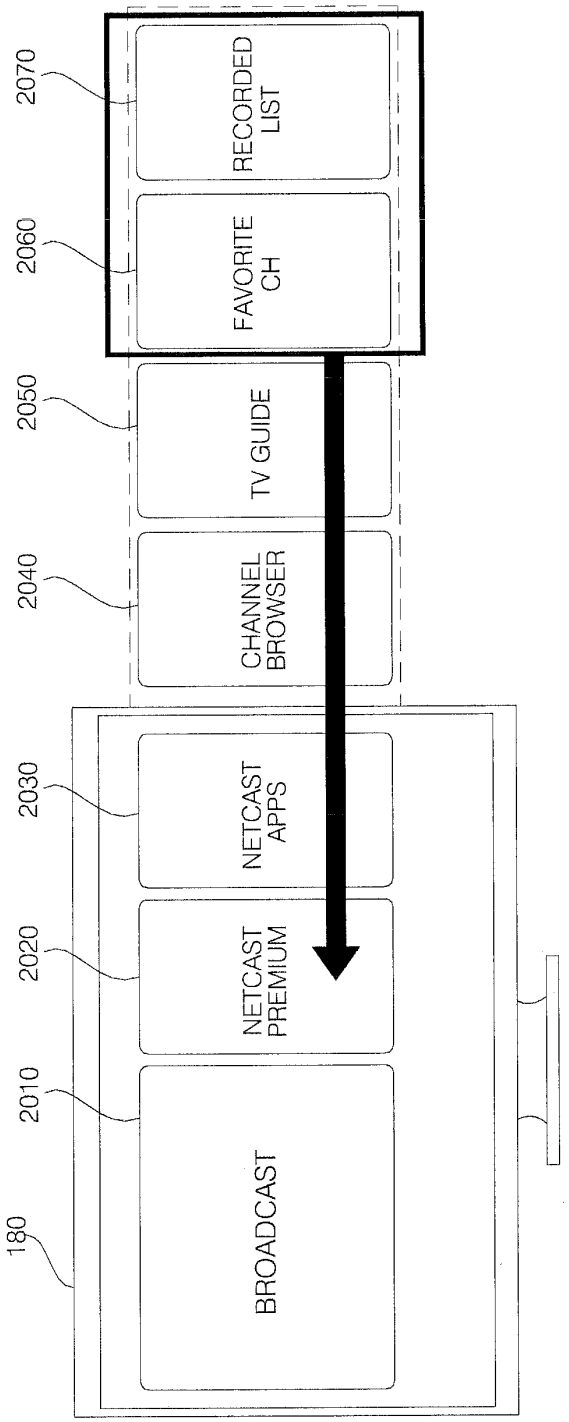

2070
RECORDED LIST
2060
FAVORITE CH
2050
TV GUIDE
2040
CHANNEL BROWSER
2030
NETCAST APPS
2020
NETCAST PREMIUM
2010
BROADCAST
180

FIG. 29C

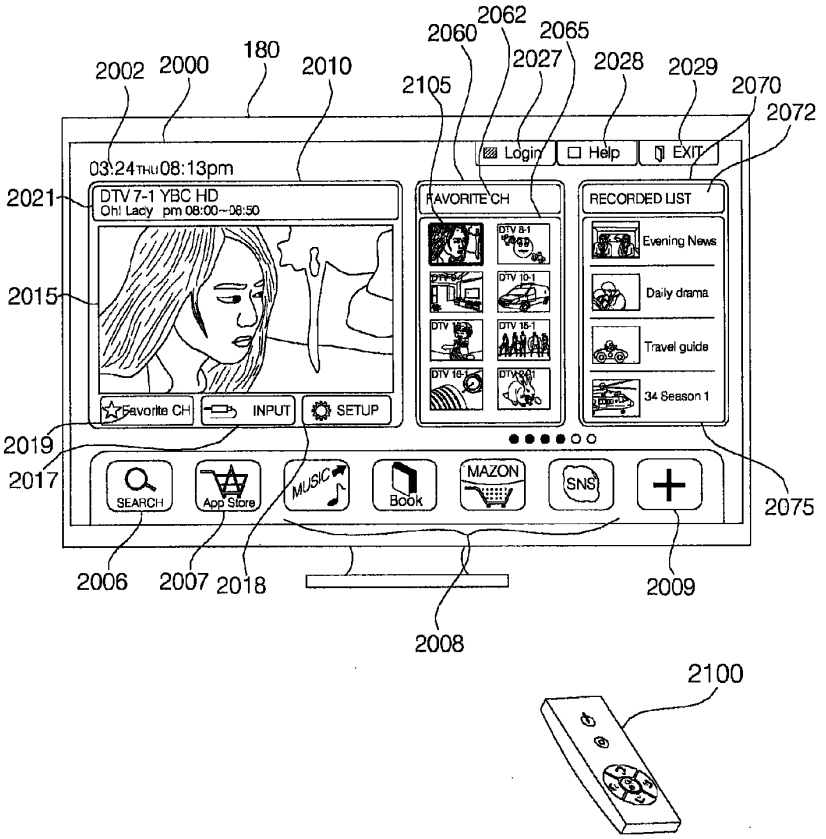

2002
2000
180
2010
2060
2062
2065
2027
2028
2029
2105
2070
2072
Login
Help
EXIT
03.24THU08:13pm
2021
DTV 7-1 YBC HD
Oh! Lacy pm 08:00~08:50
FAVORITE CH
RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
2015
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008
2100

FIG. 30A

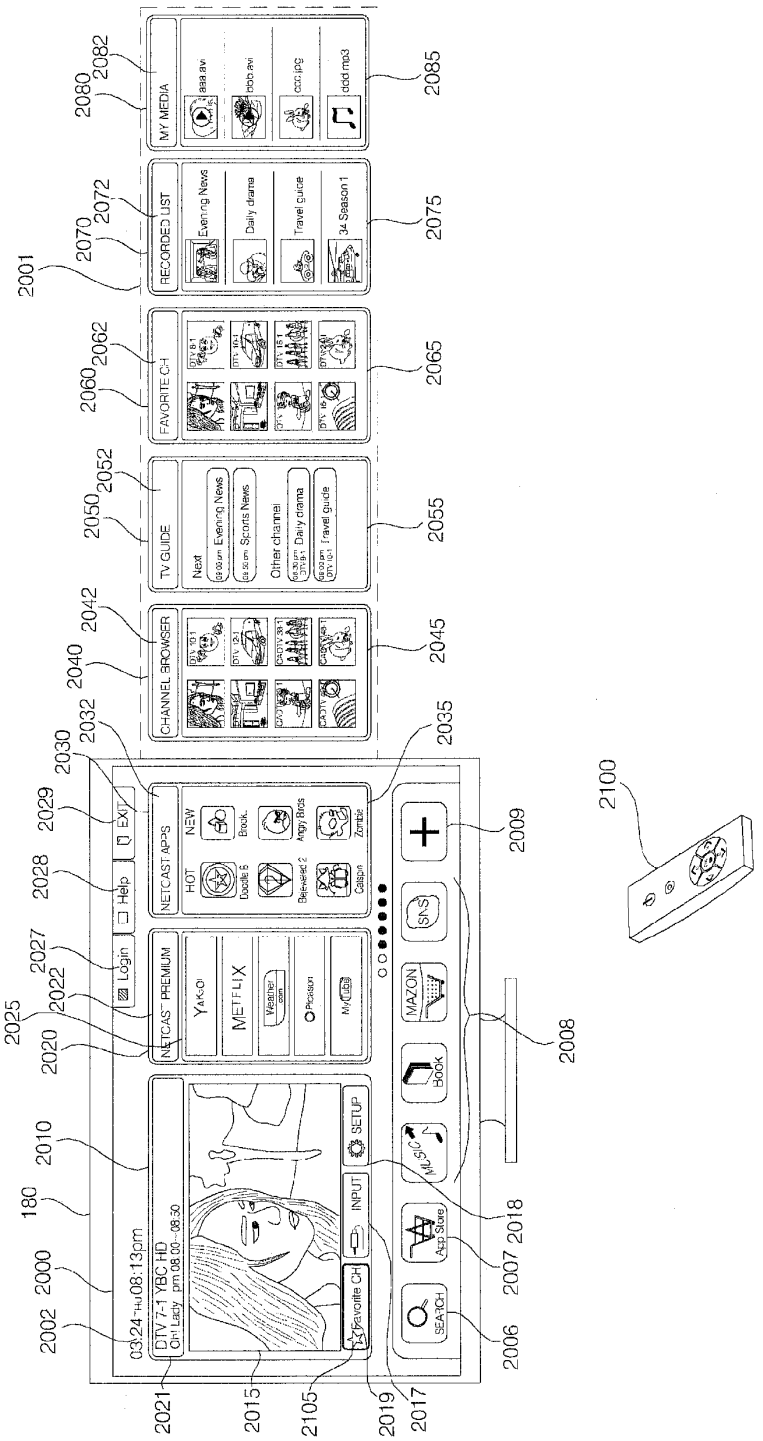

MY MEDIA
aaa.avi
dbb.avi
ccc.jpg
ddd.mp3
RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
FAVORITE CH
TV GUIDE
Next
Evening News
Sports News
Other channel
Daily drama
Travel guide
CHANNEL BROWSER
NETCAST APPS
HOT
NEW
Doodle 6
Brook
Angry Birds
Bejeweled 2
Catspin
Zombie
Login
Help
EXIT
NETCAST PREMIUM
YAKOO
METFLIX
Weather
Picasson
MyTube
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
03:24 Thu 08:13pm
Favorite CH
INPUT
SETUP
SEARCH
App Store
MUSIC
BOOK
MAZON
SNS
2001
2002
2000
180
2010
2015
2105
2019
2017
2018
2007
2006
2008
2009
2020
2022
2025
2027
2028
2029
2030
2032
2035
2040
2042
2045
2050
2052
2055
2060
2062
2065
2070
2072
2075
2080
2082
2085
2100

FIG. 30B

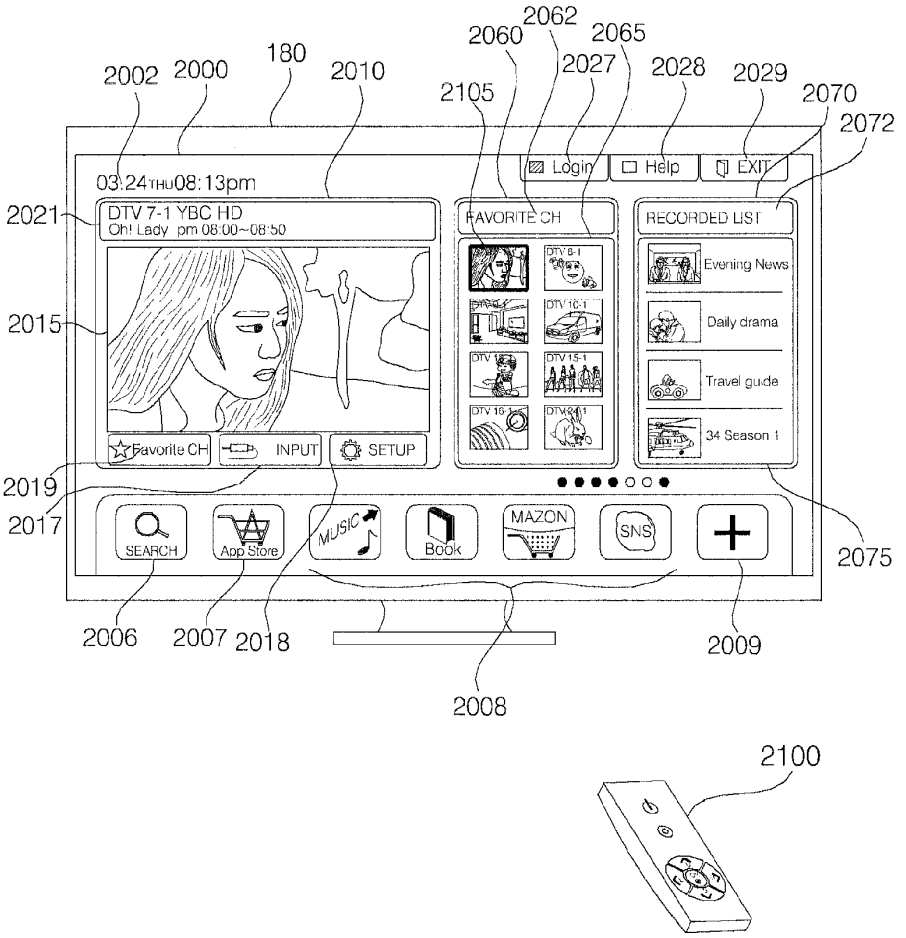

2002
2000
180
2010
2060
2062
2065
2027
2028
2029
2070
2072
2105
Login
Help
EXIT
03:24THU08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
FAVORITE CH
RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
2015
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008
2100

FIG. 31A

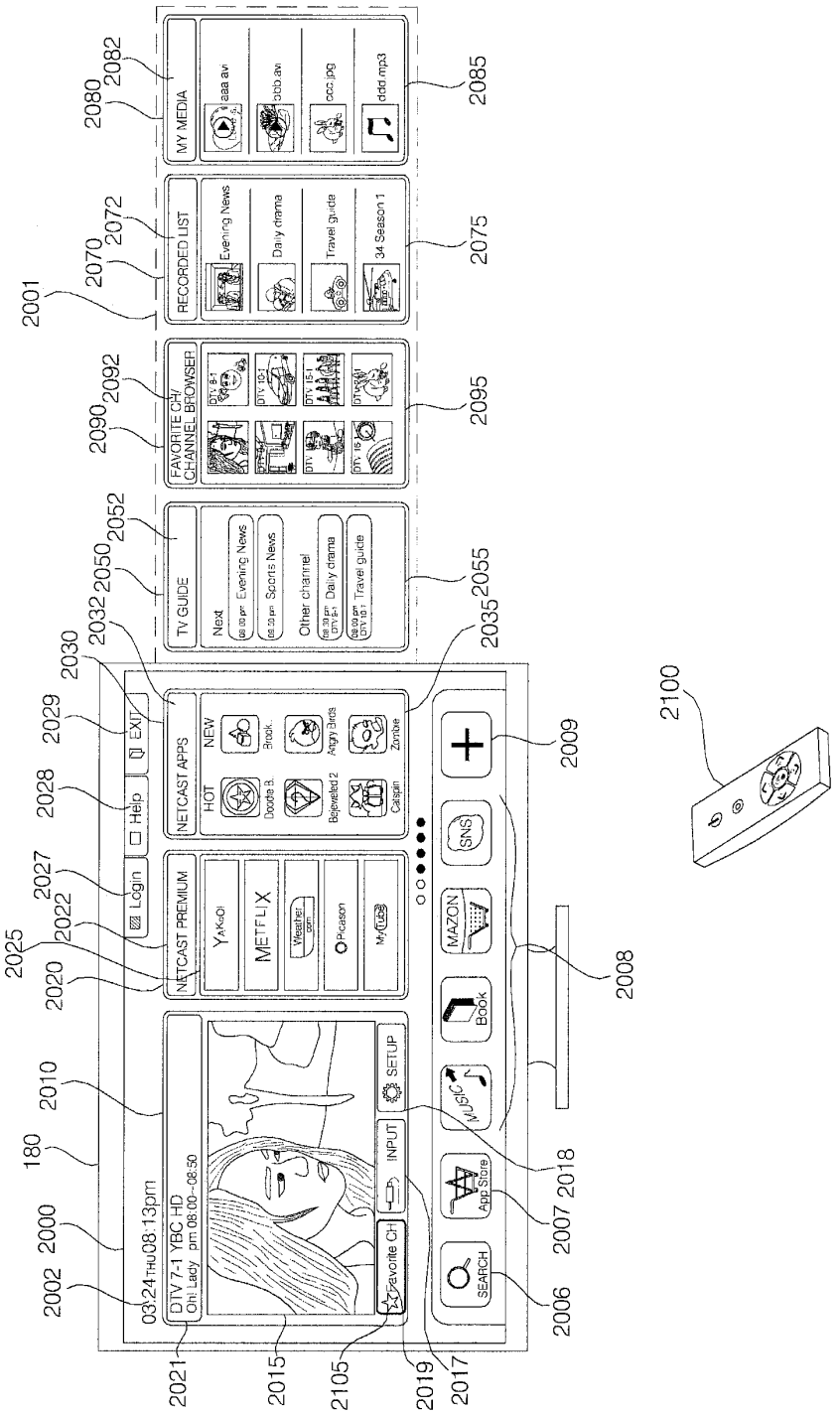

03.24 THU 08:13pm
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
Favorite CH
INPUT
SETUP
SEARCH
App Store
Music
Book
MAZON
SNS
NETCAST PREMIUM
Login
Help
EXIT
YAHOO!
NETFLIX
Weather.com
Picasa
MyTube
NETCAST APPS
HOT
NEW
Doodle B.
Brook.
Bejeweled 2
Angry Birds
Caspain
Zombie
TV GUIDE
Next
Evening News
Sports News
Other channel
Daily drama
Travel guide
FAVORITE CH/ CHANNEL BROWSER
RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
MY MEDIA
aaa.avi
bbb.avi
ccc.jpg
ddd.mp3
2001
2002
2000
180
2010
2021
2015
2105
2019
2017
2006
2007
2018
2008
2009
2020
2022
2025
2027
2028
2029
2030
2032
2050
2052
2035
2055
2090
2092
2095
2070
2072
2075
2080
2082
2085
2100

FIG. 31B

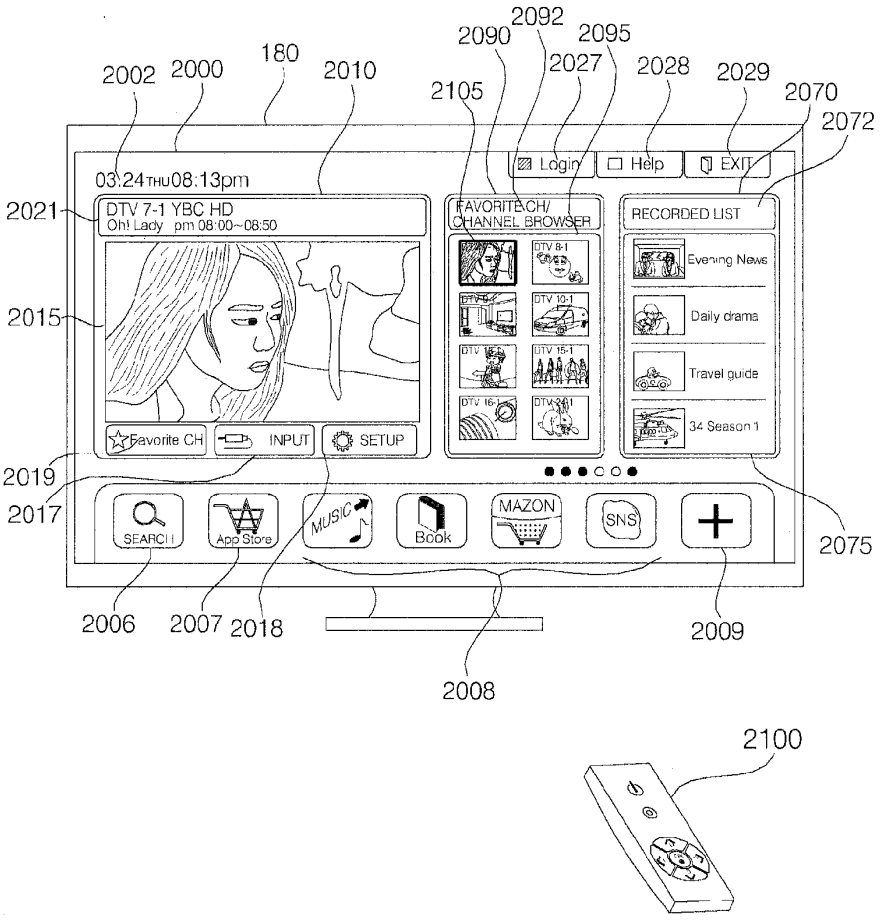

2092
2090
2095
180
2002
2000
2010
2027
2028
2029
2105
2070
2072
Login
Help
EXIT
03:24THU08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
FAVORITE CH/
CHANNEL BROWSER
RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
2015
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008
2100

FIG. 32A

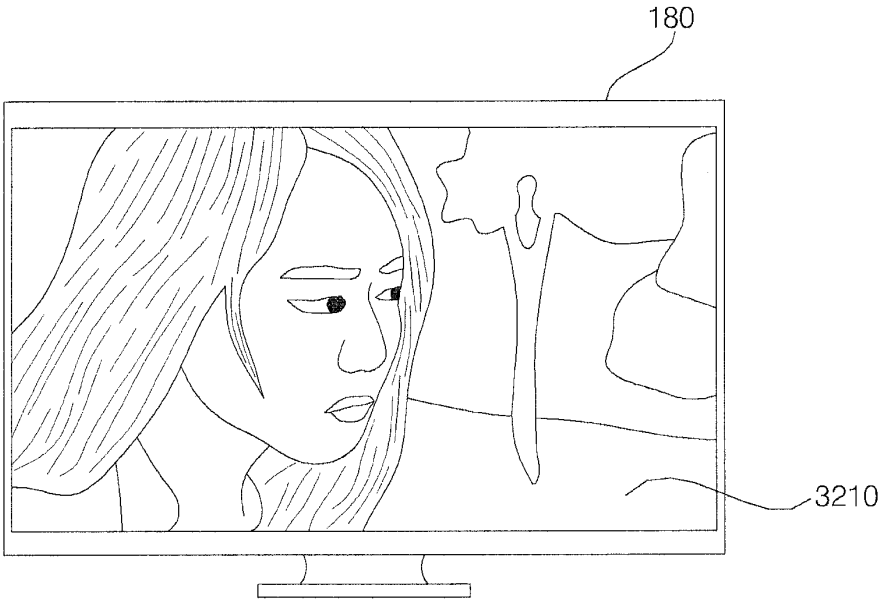


FIG. 32B

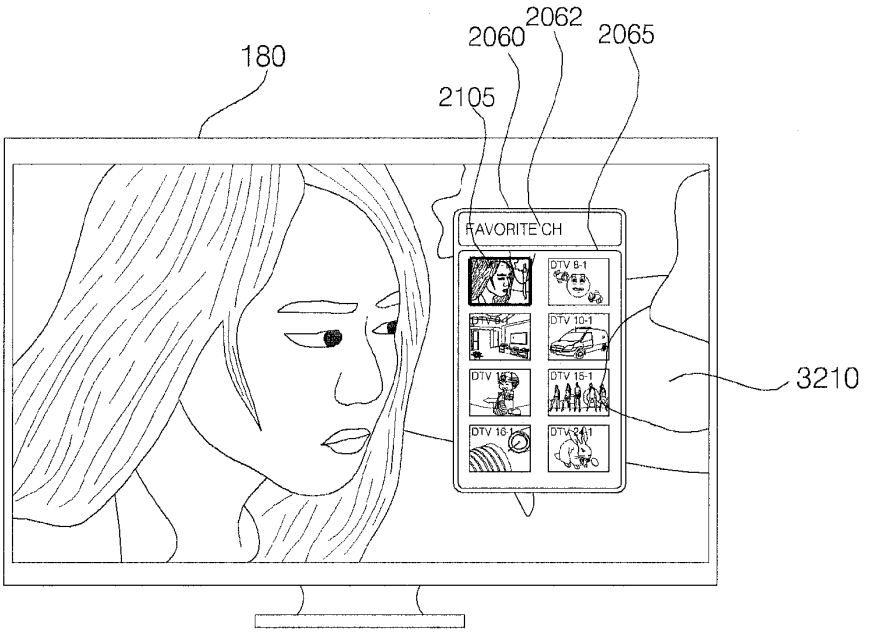

180
2060
2062
2065
2105
FAVORITE CH
DTV 8-1
DTV 10-1
DTV 15-1
3210

FIG. 33A

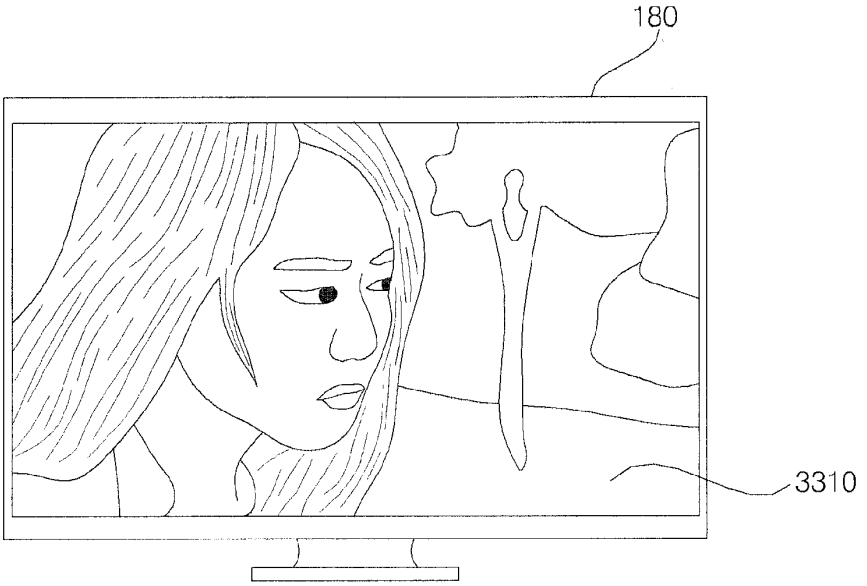


FIG. 33B

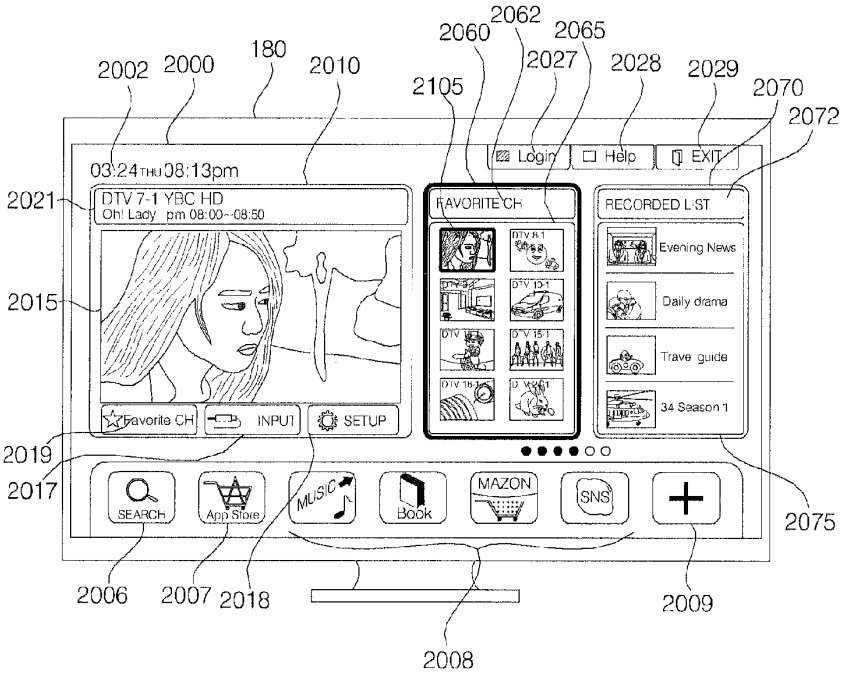

2002
2000
180
2010
2060
2062
2065
2027
2028
2029
2070
2072
2105
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
2015
Favorite CH
INPUT
SETUP
FAVORITE CH
RECORDED LIST
Evening News
Daily drama
Trave guide
34 Season 1
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008

FIG. 34

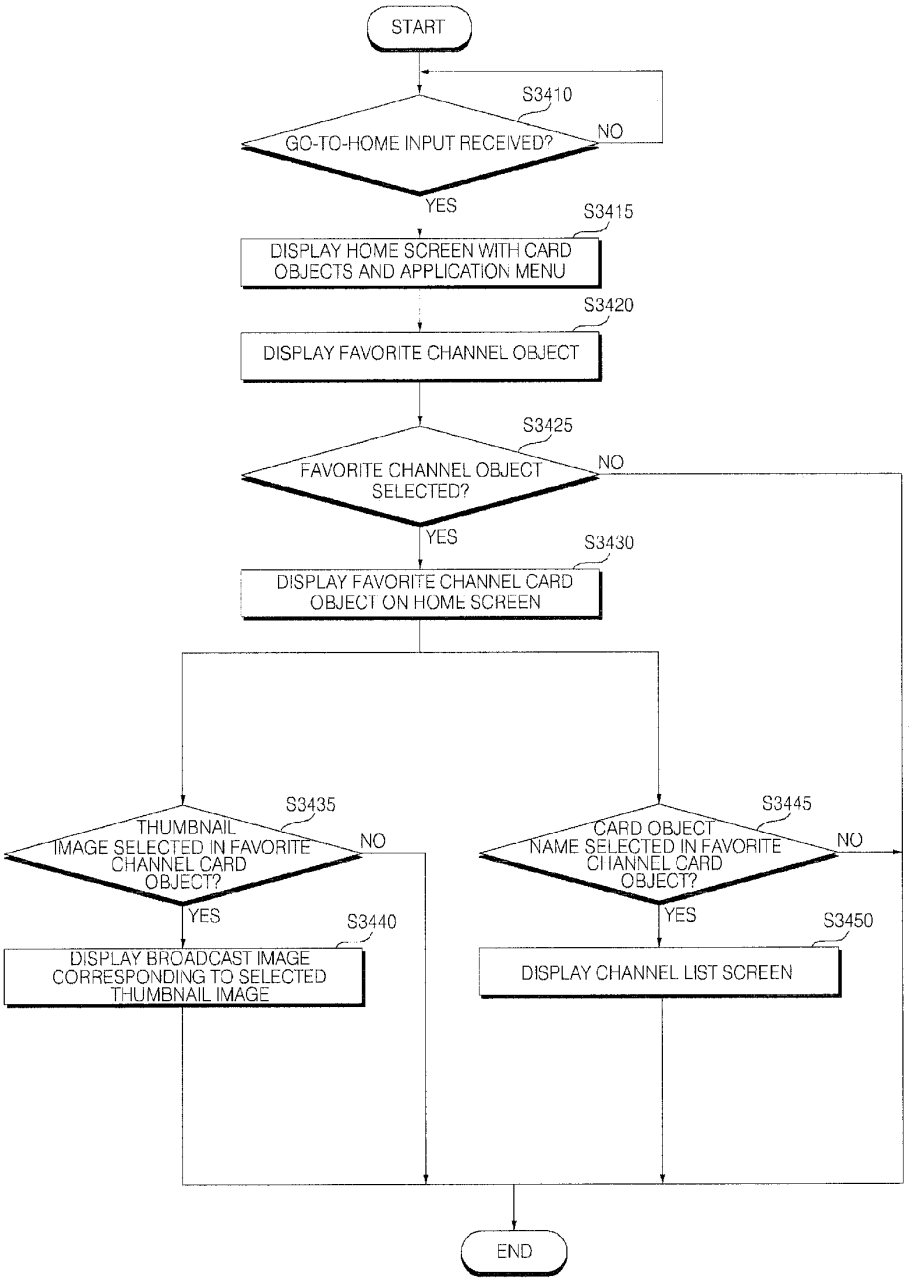

START
S3410
GO-TO-HOME INPUT RECEIVED?
NO
YES
S3415
DISPLAY HOME SCREEN WITH CARD OBJECTS AND APPLICATION MENU
S3420
DISPLAY FAVORITE CHANNEL OBJECT
S3425
FAVORITE CHANNEL OBJECT SELECTED?
NO
YES
S3430
DISPLAY FAVORITE CHANNEL CARD OBJECT ON HOME SCREEN
S3435
THUMBNAIL IMAGE SELECTED IN FAVORITE CHANNEL CARD OBJECT?
NO
YES
S3440
DISPLAY BROADCAST IMAGE CORRESPONDING TO SELECTED THUMBNAIL IMAGE
S3445
CARD OBJECT NAME SELECTED IN FAVORITE CHANNEL CARD OBJECT?
NO
YES
S3450
DISPLAY CHANNEL LIST SCREEN
END

FIG. 35A

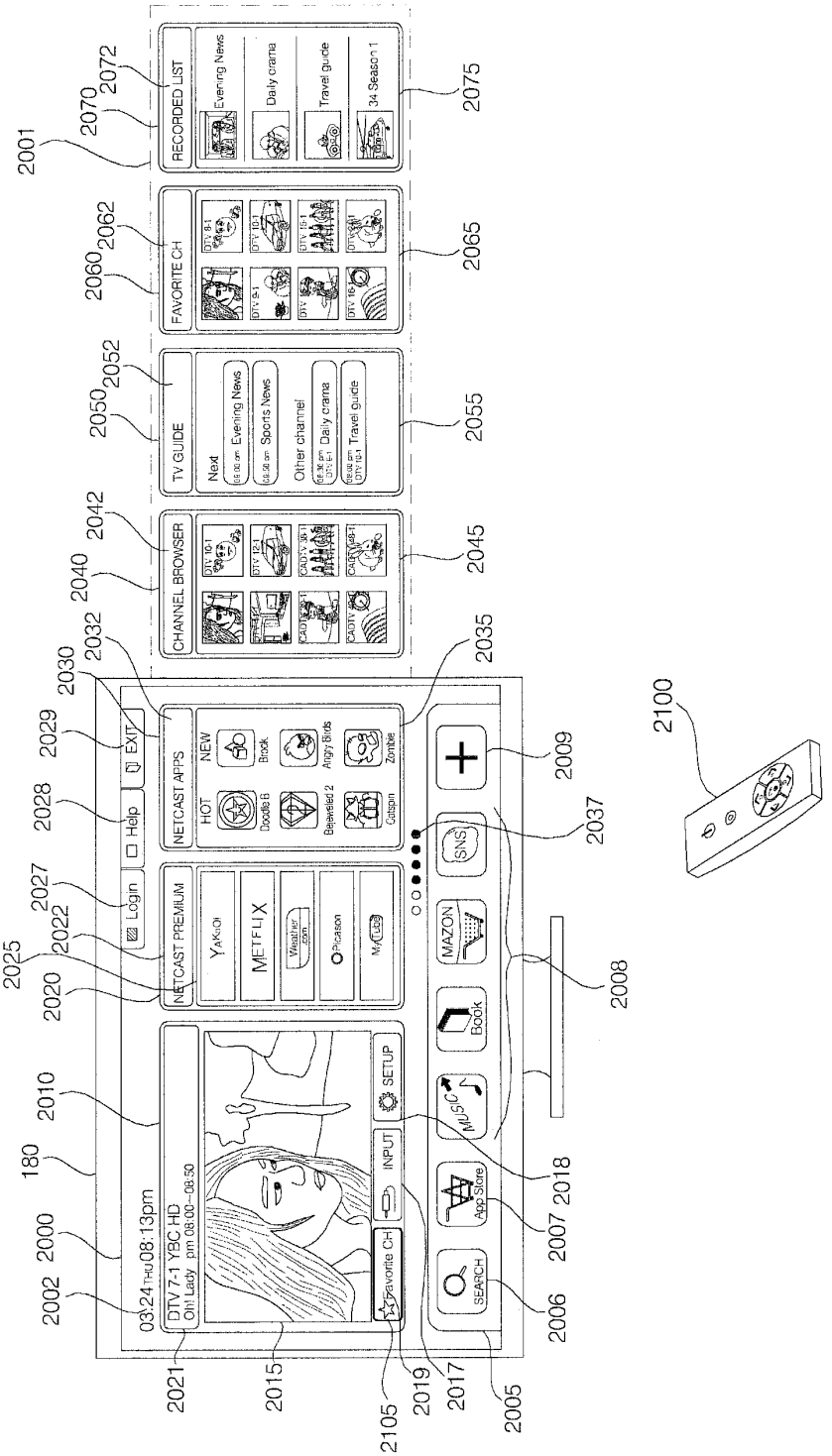

RECORDED LIST
Evening News
Daily crama
Travel guide
34 Season 1
FAVORITE CH
TV GUIDE
Next
Evening News
Sports News
Other channel
Daily crama
Travel guide
CHANNEL BROWSER
NETCAST APPS
HOT
NEW
Brook
Angry Birds
Zombie
Doodle 6
Bejeweled 2
Catspin
NETCAST PREMIUM
YAKiOi
METFLIX
Weather.com
Picasson
MyTube
Login
Help
EXIT
03:24THU08:13pm
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
Favorite CH
INPUT
SETUP
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2001
2070
2072
2075
2060
2062
2065
2050
2052
2055
2040
2042
2045
2030
2032
2035
2029
2028
2027
2022
2025
2020
2010
180
2000
2002
2021
2015
2105
2019
2017
2005
2006
2007
2018
2008
2037
2009
2100

FIG. 35B

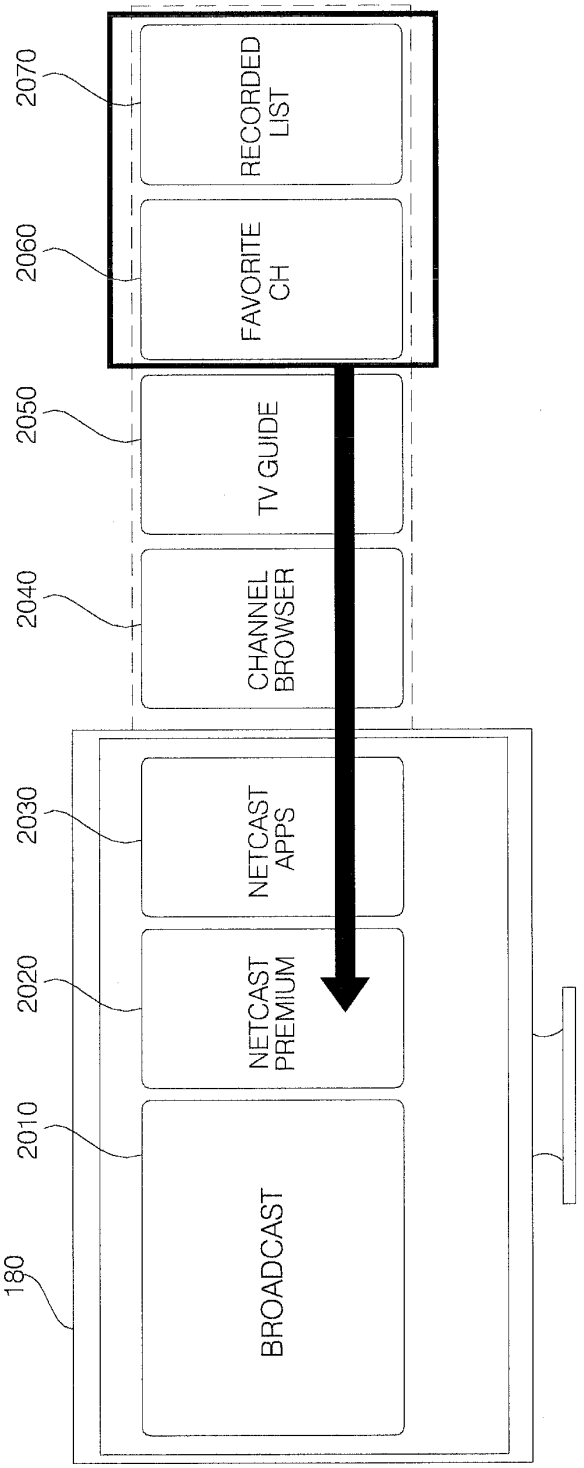

180
2010
BROADCAST
2020
NETCAST PREMIUM
2030
NETCAST APPS
2040
CHANNEL BROWSER
2050
TV GUIDE
2060
FAVORITE CH
2070
RECORDED LIST

FIG. 35C

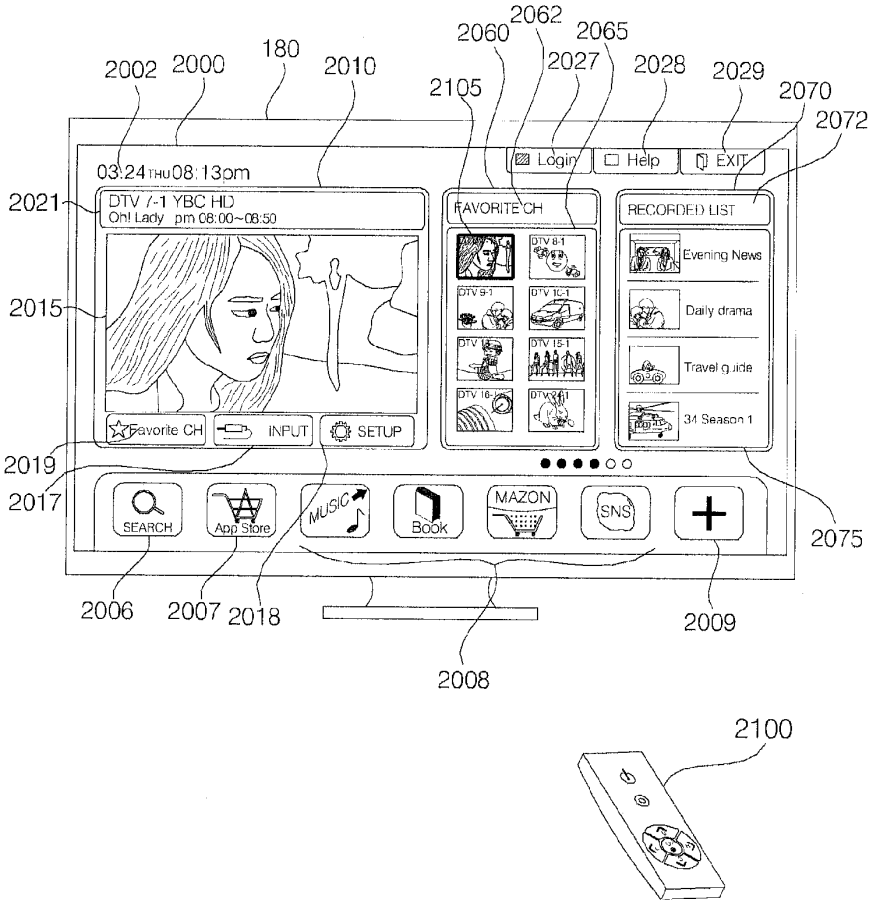

2002
2000
180
2010
2060
2062
2065
2027
2028
2029
2070
2072
2105
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
FAVORITE CH
RECORDED LIST
Evening News
Daily drama
Travel guide
34 Season 1
2015
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008
2100

FIG. 36

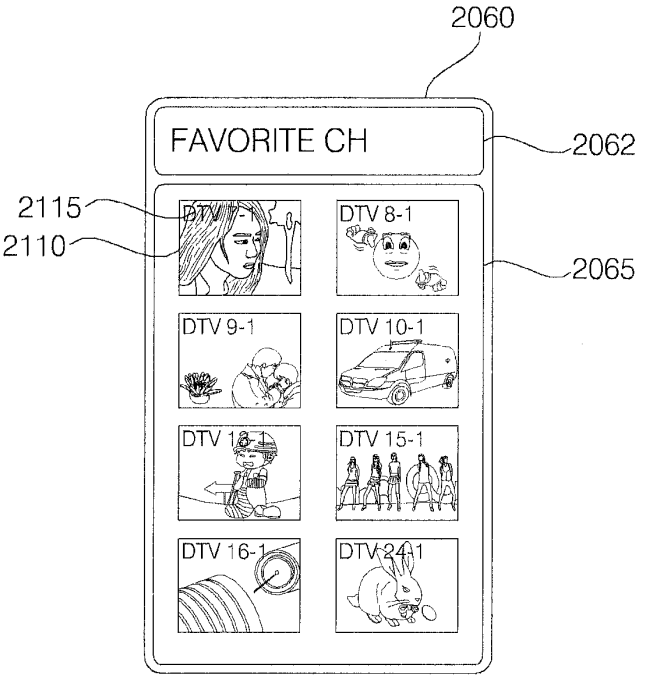

2060
FAVORITE CH
2062
2115
2110
2065
DTV 8-1
DTV 9-1
DTV 10-1
DTV 15-1
DTV 16-1

FIG. 37A

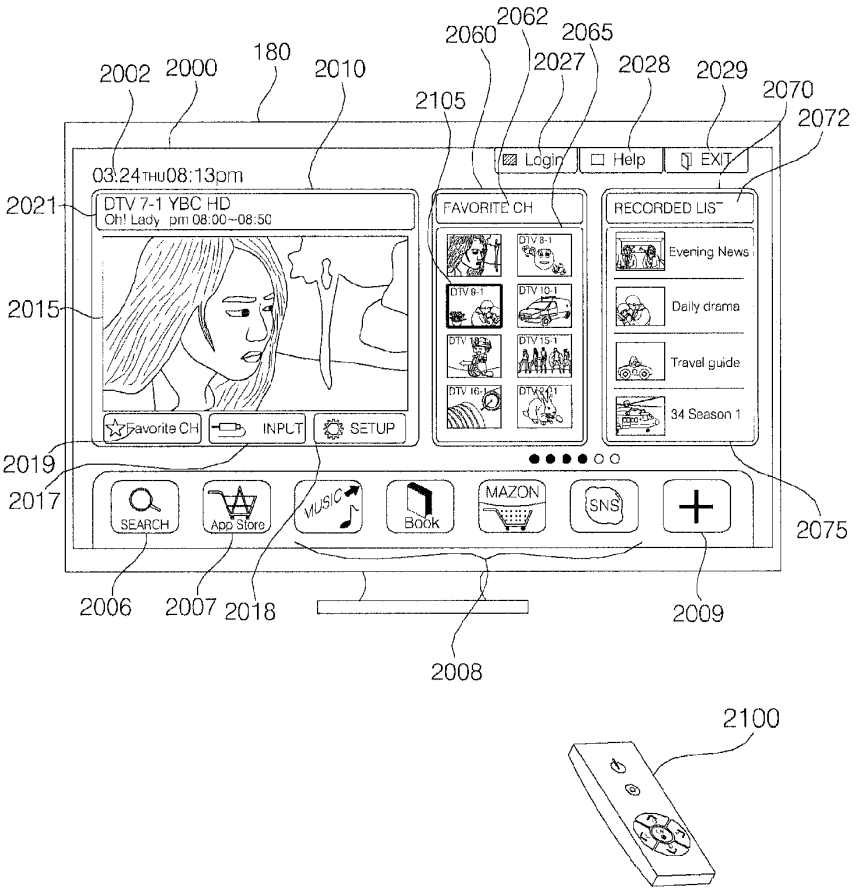

2062
2060
2065
180
2002
2000
2010
2027
2028
2029
2070
2105
2072
Login
Help
EXIT
03:24THU08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
FAVORITE CH
RECORDED LIS
Evening News
Daily drama
Travel guide
34 Season 1
2015
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008
2100

FIG. 37B

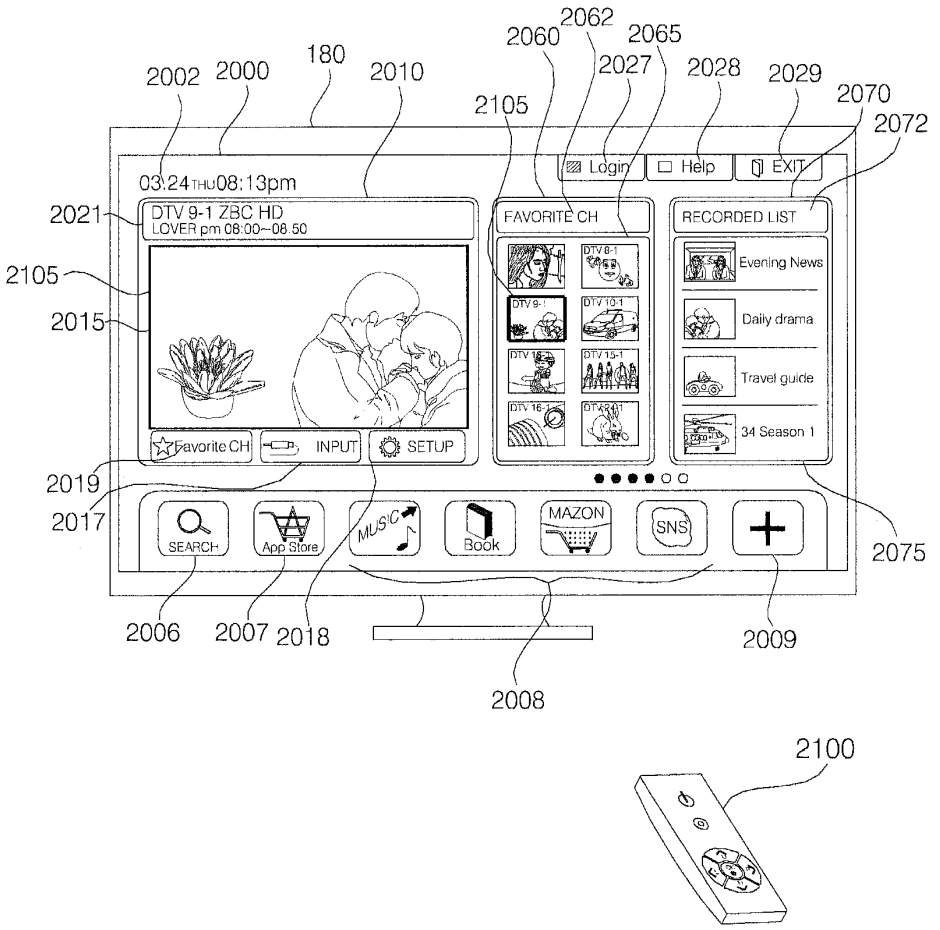

2062
2060
2065
180
2002
2000
2010
2027
2028
2029
2070
2105
2072
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 9-1 ZBC HD
LOVER pm 08:00~08:50
FAVORITE CH
RECORDED LIST
2105
2015
Evening News
Daily drama
Travel guide
34 Season 1
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008
2100

FIG. 37C

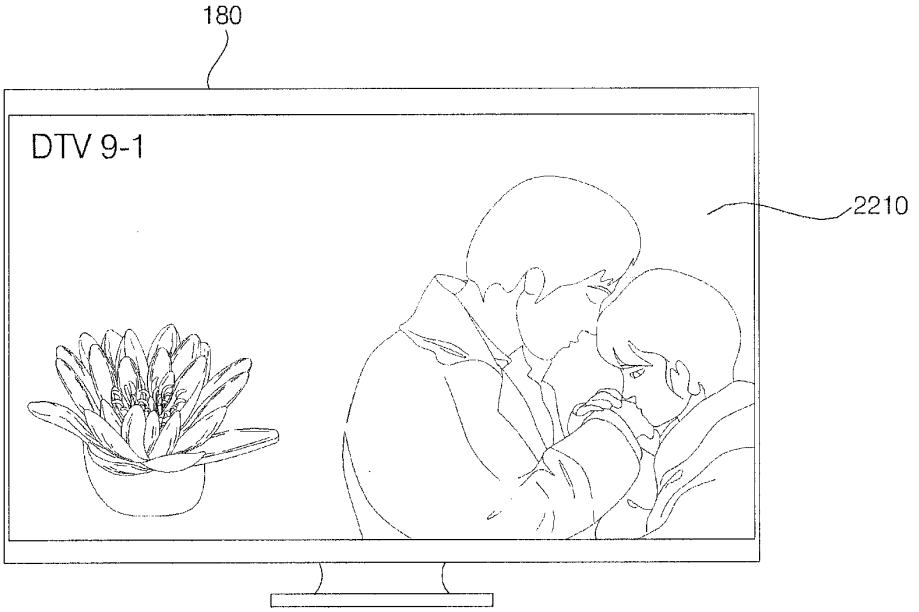
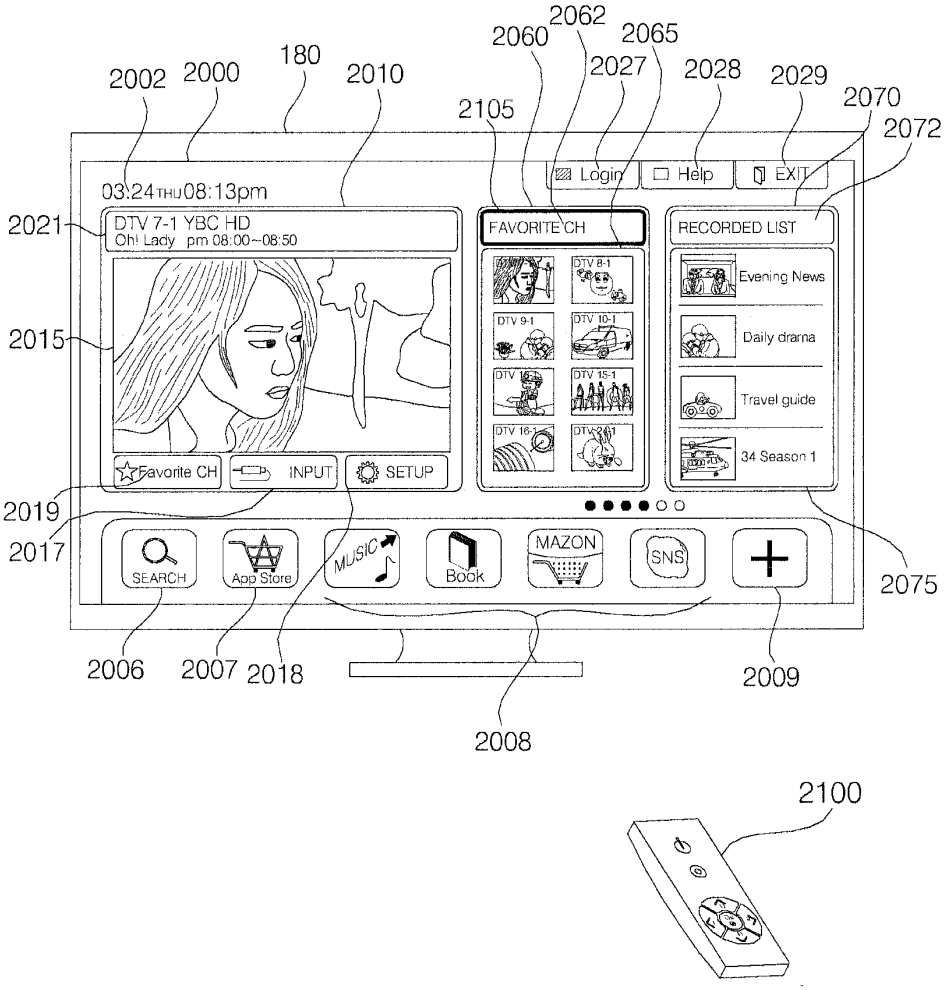


FIG. 38A


2062
2060
2065
180
2002
2000
2010
2027
2028
2029
2070
2105
2072
Login
Help
EXIT
03:24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
FAVORITE CH
RECORDED LIST
2015
DTV 8-1
DTV 9-1
DTV 10-1
DTV 15-1
DTV 16-1
Evening News
Daily drama
Travel guide
34 Season 1
Favorite CH
INPUT
SETUP
2019
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2075
2006
2007
2018
2009
2008

2100

FIG. 38B

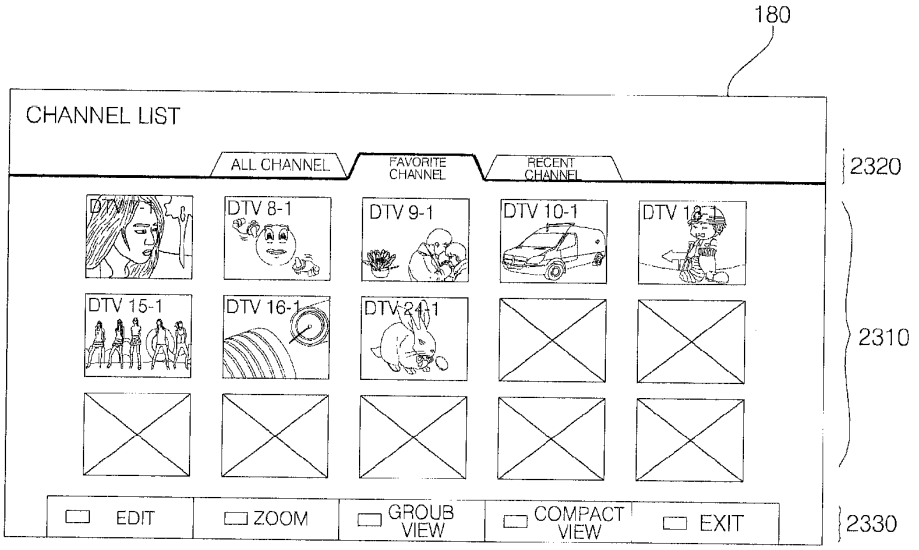

180
CHANNEL LIST
ALL CHANNEL
FAVORITE CHANNEL
RECENT CHANNEL
2320
DTV 8-1
DTV 9-1
DTV 10-1
DTV 15-1
DTV 16-1
2310
EDIT
ZOOM
GROUB VIEW
COMPACT VIEW
EXIT
2330

FIG. 38C

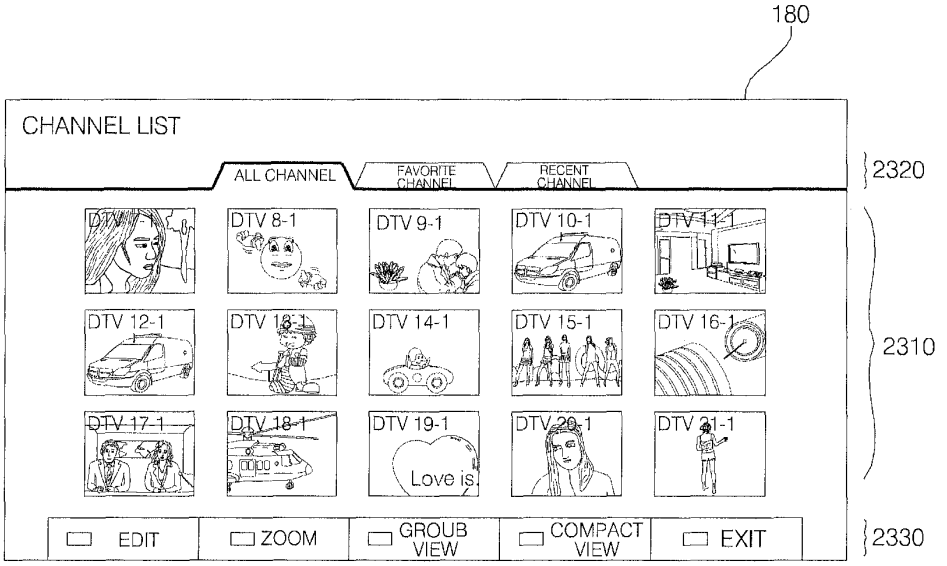

180
CHANNEL LIST
ALL CHANNEL
FAVORITE CHANNEL
RECENT CHANNEL
2320
DTV 8-1
DTV 9-1
DTV 10-1
DTV 12-1
DTV 14-1
DTV 15-1
DTV 16-1
DTV 17-1
DTV 19-1
Love is
DTV 21-1
2310
EDIT
ZOOM
GROUB VIEW
COMPACT VIEW
EXIT
2330

FIG. 38D

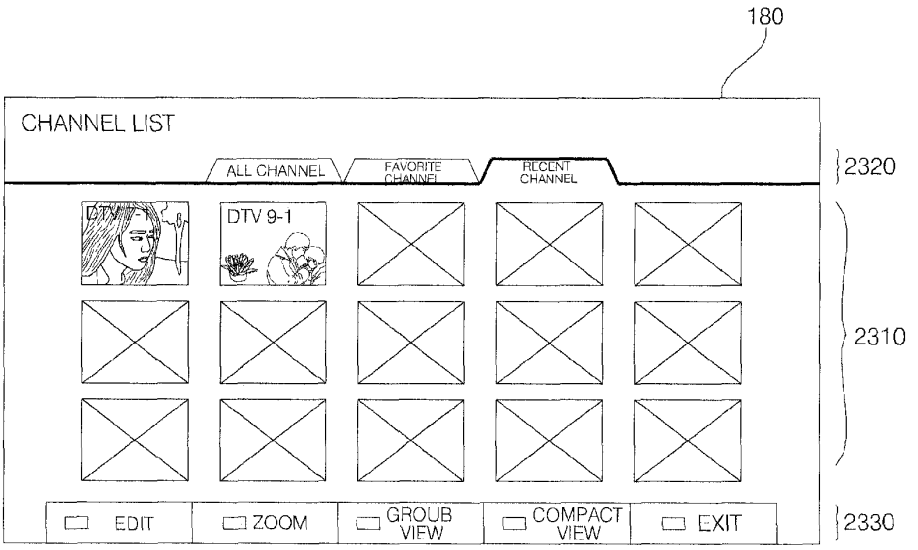
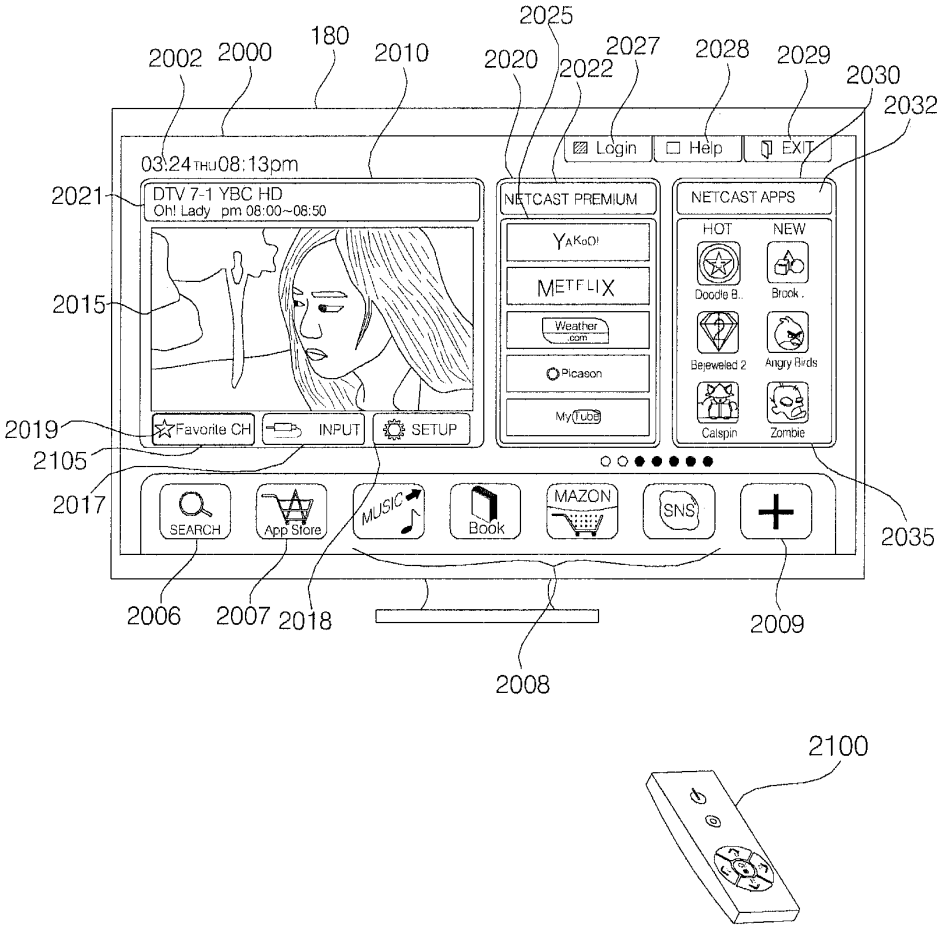

180
CHANNEL LIST
ALL CHANNEL
FAVORITE CHANNEL
RECENT CHANNEL
2320
DTV 9-1
2310
EDIT
ZOOM
GROUB VIEW
COMPACT VIEW
EXIT
2330

FIG. 39A


2002
2000
180
2010
2020
2025
2022
2027
2028
2029
2030
2032
Login
Help
EXIT
03.24 THU 08:13pm
2021
DTV 7-1 YBC HD
Oh! Lady pm 08:00~08:50
NETCAST PREMIUM
NETCAST APPS
HOT
NEW
Doodle B..
Brook .
Bejeweled 2
Angry Birds
Calspin
Zombie
2015
2019
Favorite CH
INPUT
SETUP
2105
2017
SEARCH
App Store
MUSIC
Book
MAZON
SNS
2035
2006
2007
2018
2009
2008

2100

FIG. 39B

180
FAVORITE CHANNEL LIST
A
B
C
D
3920
DTV 8-1
DTV 9-1
DTV 10-1
DTV 11-1
DTV 12-1
DTV 14-1
DTV 15-1
DTV 16-1
3910
DTV 17-1
DTV 18-1
DTV 19-1
Love is
DTV 21-1
EDIT
ZOOM
GROUB VIEW
COMPACT VIEW
EXIT
3930

IMAGE DISPLAY APPARATUS AND METHOD FOR OPERATING THE SAME

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of Korean Patent Application No. 10-2010-0086149, 10-2010-0086152 and 10-2010-0086153, filed on Sep. 2, 2010 in the Korean Intellectual Property Office, and the benefit of and priority to U.S. Provisional Application Nos. 61/379,363, 61/379,367 and 61/379,372 filed on Sep. 1, 2010 in the USPTO, contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an image display apparatus and a method for operating the same, and more particularly, to an image display apparatus and a method for operating the same, which increase user convenience.

2. Description of the Related Art

An image display apparatus has a function of displaying images to a user. The image display apparatus can display a broadcast program selected by the user on a display from among broadcast programs transmitted from broadcasting stations. The recent trend in broadcasting is a worldwide shift from analog broadcasting to digital broadcasting.

As it transmits digital audio and video signals, digital broadcasting offers many advantages over analog broadcasting, such as robustness against noise, less data loss, ease of error correction, and the ability to provide high-definition, clear images. Digital broadcasting also allows interactive viewer services, compared to analog broadcasting.

SUMMARY OF THE INVENTION

Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide an image display apparatus and a method for operating the same, which can increase user convenience.

It is another object of the present invention to provide an image display apparatus and a method for operating the same, which can provide various user interfaces.

In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a method for operating an image display apparatus that receives and processes a broadcast signal, including displaying a home screen including a plurality of card objects, displaying a broadcast image and a favorite channel object representing favorite channels in a broadcast card object representing a broadcast image among the plurality of card objects, and displaying a favorite channel list including favorite channel items on the display, upon selection of the favorite channel object.

In accordance with another aspect of the present invention, there is provided a method for operating an image display apparatus that receives and processes a broadcast signal, including displaying a favorite channel object representing favorite channels on a display, generating a favorite channel card object using a pre-stored favorite channel list by a card object generator, upon selection of the favorite channel object, and displaying the favorite channel card object on a home screen including a plurality of card objects.

In accordance with a further aspect of the present invention, there is provided an image display apparatus for receiving and processing a broadcast image, including a display for displaying a home screen including a plurality of card objects, a user input interface for receiving an input for selecting a favorite channel object representing favorite channels, displayed on the home screen, and a controller for controlling display of a favorite channel list including favorite channel items on the display, upon selection of the favorite channel object.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. **1** illustrates the overall configuration of a broadcasting system including an image display apparatus according to an embodiment of the present invention;

FIG. **2** illustrates the overall configuration of a broadcasting system including an image display apparatus according to another embodiment of the present invention;

FIG. **3** is a diagram illustrating a signal flow for an operation for attaching to a Service Provider (SP) and receiving channel information from the SP in the image display apparatus illustrated in FIG. **1** or **2** according to an embodiment of the present invention;

FIG. **4** illustrates an example of data used in the operation illustrated in FIG. **3**;

FIG. **5** is a detailed block diagram of the image display apparatus illustrated in FIG. **1** or **2** according to an embodiment of the present invention;

FIG. **6** is a detailed block diagram of the image display apparatus illustrated in FIG. **1** or **2** according to another embodiment of the present invention;

FIGS. **7** and **8** are block diagrams illustrating either of the image display apparatuses separately as a set-top box and a display device according to embodiments of the present invention;

FIG. **9** illustrates an operation for communicating with third devices in either of the image display apparatuses according to an embodiment of the present invention;

FIG. **10** is a block diagram of a controller illustrated in FIG. **6**;

FIG. **11** illustrates a platform architecture for either of the image display apparatuses according to an embodiment of the present invention;

FIG. **12** illustrates a platform architecture for either of the image display apparatuses according to another embodiment of the present invention;

FIG. **13** illustrates a method for controlling either of the image display apparatuses in a remote controller according to an embodiment of the present invention;

FIG. **14** is a detailed block diagram of the remote controller in either of the image display apparatuses according to an embodiment of the present invention;

FIG. **15** illustrates a UI in either of the image display apparatuses according to an embodiment of the present invention;

FIG. **16** illustrates a UI in either of the image display apparatuses according to another embodiment of the present invention;

FIG. **17** illustrates a UI in either of the image display apparatuses according to another embodiment of the present invention;

FIG. **18** illustrates a UI in either of the image display apparatuses according to a further embodiment of the present invention;

FIG. **19** is a flowchart illustrating a method for operating an image display apparatus according to an embodiment of the present invention;

FIGS. **20** to **24**C are views referred to for describing various examples of the method for operating an image display apparatus, illustrated in FIG. **19**;

FIG. **25** is a flowchart illustrating a method for operating an image display apparatus according to another embodiment of the present invention;

FIGS. **26**A to **33**B are views referred to for describing various examples of the method for operating an image display apparatus, illustrated in FIG. **25**;

FIG. **34** is a flowchart illustrating a method for operating an image display apparatus according to a further embodiment of the present invention; and

FIGS. **35**A to **39**B are views referred to for describing various examples of the method for operating an image display apparatus, illustrated in FIG. **34**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will be described below with reference to the attached drawings.

The terms "module" and "unit" used to signify components are used herein to help the understanding of the components and thus they should not be considered as having specific meanings or roles. Accordingly, the terms "module" and "unit" may be used interchangeably.

An image display apparatus as set forth herein is an intelligent image display apparatus equipped with a computer support function in addition to a broadcast reception function, for example. Thus the image display apparatus may have user-friendly interfaces such as a handwriting input device, a touch screen, or a pointing device. Further, because the image display apparatus supports wired or wireless Internet, it is capable of e-mail transmission/reception, Web browsing, banking, gaming, etc. by connecting to the Internet or a computer. To implement these functions, the image display apparatus may operate based on a standard general-purpose Operating System (OS).

Various applications can be freely added to or deleted from, for example, a general-purpose OS kernel in the image display apparatus according to the present invention. Therefore, the image display apparatus may perform a number of user-friendly functions. The image display apparatus may be a network TV, a Hybrid broadcast broadband TV (HbbTV), a smart TV, etc. for example. The image display apparatus is applicable to a smart phone, as needed.

Embodiments of the present invention will be described in detail with reference to the attached drawings, but it should be understood that they are merely illustrative of the present invention and should not be interpreted as limiting the scope of the present invention.

In addition, although the terms used in the present invention are selected from generally known and used terms, some of the terms mentioned in the description of the present invention, the detailed meanings of which are described in relevant parts of the description herein, have been selected by the applicant at his or her discretion. Furthermore, the present invention must be understood, not simply by the actual terms used but by the meanings of each term lying within.

FIG. **1** illustrates the overall configuration of a broadcasting system including an image display apparatus according to an embodiment of the present invention.

Referring to FIG. **1**, the broadcasting system may include a Content Provider (CP) **10**, a Service Provider (SP) **20**, a Network Provider (NP) **30**, and a Home Network End Device (HNED) **40**. The HNED **40** corresponds to, for example, a client **100** which is an image display apparatus according to an embodiment of the present invention. As stated before, the image display apparatus may be a network TV, a smart TV, an Internet Protocol TV (IPTV), etc.

The CP **10** creates and provides content. The CP **10** may be, for example, a terrestrial broadcaster, a cable System Operator (SO) or Multiple System Operator (MSO), a satellite broadcaster, or an Internet broadcaster, as illustrated in FIG. **1**.

Besides broadcast content, the CP **10** may provide various applications, which will be described later in detail.

The SP **20** may provide content received from the CP **10** in a service package. For instance, the SP **20** may package first terrestrial broadcasting, second terrestrial broadcasting, cable broadcasting, satellite broadcasting, Internet broadcasting, and applications and provide the package to users.

The SP **20** may unicast or multicast a service to the client **100**. Unicast is a form of transmission in which information is sent from only one transmitter to only one receiver. In other words, unicast transmission is point-to-point, involving two nodes only. In an example of unicast transmission, upon receipt of a request for data from a receiver, a server transmits the data to only one receiver. Multicast is a type of transmission or communication in which a transmitter transmits data to a group of receivers. For example, a server may transmit data to a plurality of pre-registered receivers at one time. For multicast registration, the Internet Group Management Protocol (IGMP) may be used.

The NP **30** may provide a network over which a service is provided to the client **100**. The client **100** may construct a home network and receive a service over the home network.

Content transmitted in the above-described broadcasting system may be protected through conditional access or content protection. CableCard and Downloadable Conditional Access System (DCAS) are examples of conditional access or content protection.

The client **100** may also transmit content over a network. In this case, the client **100** serves as a CP and thus the CP **10** may receive content from the client **100**. Therefore, an interactive content service or data service can be provided.

FIG. **2** illustrates the overall configuration of a broadcasting system including an image display apparatus according to another embodiment of the present invention.

Referring to FIG. **2**, the image display apparatus **100** according to another embodiment of the present invention is connected to a broadcast network and the Internet. The image display apparatus **100** is, for example, a network TV, a smart TV, an HbbTV, etc.

The image display apparatus **100** includes, for example, a broadcast interface **101**, a section filter **102**, an Application Information Table (AIT) filter **103**, an application data processor **104**, a broadcast data processor **111**, a media player **106**, an IP processor **107**, an Internet interface **108**, and a runtime module **109**.

The image display apparatus **100** receives AIT data, real-time broadcast content, application data, and stream events through the broadcast interface **101**. The real-time broadcast content may be referred to as linear Audio/Video (A/V) content.

The section filter **102** performs section filtering on the four types of data received through the broadcast interface **101**, and outputs the AIT data to the AIT filter **103**, the linear A/V content to the broadcast data processor **111**, and the stream events and application data to the application data processor **104**.

Meanwhile, the image display apparatus **100** receives non-linear A/V content and application data through the Internet interface **108**. The non-linear A/V content may be, for example, a Content On Demand (CoD) application.

The non-linear A/V content and the application data are transmitted to the media player **106** and the runtime module **109**, respectively.

The runtime module **109** includes, for example, an application manager and a browser as illustrated in FIG. **2**. The application manager controls the life cycle of an interactive application using the AIT data, for example. The browser displays and processes the interactive application.

FIG. **3** is a diagram illustrating a signal flow for an operation for attaching to an SP and receiving channel information from the SP in the image display apparatus illustrated in FIG. **1** or **2**. Needless to say, the operation illustrated in FIG. **3** is an embodiment, which should not be interpreted as limiting the scope of the present invention.

Referring to FIG. **3**, an SP performs an SP Discovery operation (S**301**) and the image display apparatus transmits a Service Provider Attachment Request signal to the SP (S**302**). Upon completion of attachment to the SP, the image display apparatus receives provisioning information from the SP (S**303**). Further, the image display apparatus receives Master System Information (SI) Tables, Virtual Channel Map Tables, Virtual Channel Description Tables, and Source Tables from the SP (S**304** to S**307**).

More specifically, SP Discovery is a process by which SPs that provide IPTV services search for Service Discovery (SD) servers having information about the offerings of the SPs.

In order to receive information about the SD servers, an SD server address list can be detected, for example, using three methods, specifically use of an address preset in the image display apparatus or an address manually set by a user, Dynamic Host Configuration Protocol (DHCP)-based SP Discovery, and Domain Name System Service (DNS SRV)-based SP Discovery. The image display apparatus accesses a specific SD server using the SD server address list obtained through one of the above three methods and receives a SP Discovery record from the specific SD server. The Service Provider Discovery record includes information needed to perform Service Discovery on an SP basis. The image display apparatus then starts a Service Discovery operation using the SP Discovery record. These operations can be performed in a push mode or a pull mode.

The image display apparatus accesses an SP attachment server specified by an SP attachment locator included in the SP Discovery record and performs a registration procedure (or a service attachment procedure).

Further, after accessing an authentication service server of an SP specified by an SP authentication locator and performing an authentication procedure, the image display apparatus may perform a service authentication procedure.

After service attachment is successfully performed, a server may transmit data in the form of a provision information table to the image display apparatus.

During service attachment, the image display apparatus may include an Identifier (ID) and location information thereof in data and transmit the data to the service attachment server. Thus the service attachment server may specify a service that the image display apparatus has subscribed to based on the ID and location information. In addition, the service attachment server provides, in the form of a provisioning information table, address information from which the image display apparatus can obtain Service Information (SI). The address information corresponds to access information about a Master SI Table. This method facilitates provision of a customized service to each subscriber.

The SI is divided into a Master SI Table record for managing access information and version information about a Virtual Channel Map, a Virtual Channel Map Table for providing a list of services in the form of a package, a Virtual Channel Description Table that contains details of each channel, and a Source Table that contains access information about actual services.

FIG. **4** illustrates an example of data used in the signal flow illustrated in FIG. **3**.

FIG. **4** is a detailed diagram of FIG. **3**, illustrating a relationship among data in the SI.

Referring to FIG. **4**, a Master SI Table contains information about the location and version of each Virtual Channel MAP.

Each Virtual Channel MAP is identified by its Virtual Channel MAP identifier. VirtualChannelMAPVersion specifies the version number of the Virtual Channel MAP. If any of the tables connected to the Master SI Table in the arrowed direction is modified, the versions of the modified table and overlying tables thereof (up to the Master SI Table) are incremented. Accordingly, a change in any of the SI tables can be readily identified by monitoring the Master SI Table.

For example, when the Source Table is changed, the version of the Source Table is incremented and the version of the Virtual Channel Description Table that references the Source Table is also incremented. In conclusion, a change in any lower table leads to a change in its higher tables and, eventually, a change in the Master SI Table.

One Master SI Table may exist for each SP. However, in the case where service configurations differ for regions or subscribers (or subscriber groups), an SP may have a plurality of Master SI Tables in order to provide a customized service on a region, subscriber or subscriber group basis. Thus it is possible to provide a customized service to a subscriber according to a region in which the subscriber is located and subscriber information regarding the subscriber.

A Virtual Channel Map Table may contain a list of one or more virtual channels. A Virtual Channel Map includes not details of the channels but information about the locations of the details of the channels. In the Virtual Channel Map Table, VirtualChannelDescriptionLocation specifies the location of a Virtual Channel Description Table that provides virtual channel descriptions.

The Virtual Channel Description Table contains the details of the virtual channels. The Virtual Channel Description Table can be accessed using VirtualChannelDescriptionLocation of the Virtual Channel Map Table.

A Source Table provides information necessary to access actual services (e.g. IP addresses, ports, AV Codecs, transmission protocols, etc.) on a service basis.

The above-described Master SI Table, the Virtual Channel Map Table, the Virtual Channel Description Table and the Source Table are delivered in four logically separate flows, in a push mode or a pull mode. For version management, the Master SI Table may be multicast and thus a version change can be monitored by receiving a multicast stream of the Master SI Table.

FIG. **5** is a detailed block diagram of the image display apparatus illustrated in FIG. **1** or **2** according to an embodiment of the present invention. The structure of the image display apparatus in FIG. **5** is purely exemplary and should not be interpreted as limiting the scope of the present invention.

Referring to FIG. **5**, an image display apparatus **700** includes a network interface **701**, a Transmission Control Protocol/Internet Protocol (TCP/IP) manager **702**, a service

delivery manager **703**, a Demultiplexer (DEMUX) **705**, a Program Specific Information (PSI) & (Program and System Information Protocol (PSIP) and/or SI) decoder **704**, a display A/V and On Screen Display (OSD) module **708**, a service control manager **709**, a service discovery manager **710**, a metadata manager **712**, an SI & metadata DataBase (DB) **711**, a User Interface (UI) manager **714**, and a service manager **713**.

The network interface **701** transmits packets to and receives packets from a network. Specifically, the network interface **701** receives services and content from an SP over the network.

The TCP/IP manager **702** is involved in packet reception and transmission of the image display apparatus **700**, that is, packet delivery from a source to a destination. The TCP/IP manager **702** classifies received packets according to appropriate protocols and outputs the classified packets to the service delivery manager **705**, the service discovery manager **710**, the service control manager **709**, and the metadata manager **712**.

The service delivery manager **703** controls received service data. For example, when controlling real-time streaming data, the service delivery manager **703** may use the Real-time Transport Protocol/Real-time Transport Control Protocol (RTP/RTCP). If real-time streaming data is transmitted over RTP/RTCP, the service delivery manager **703** parses the received real-time streaming data using RTP and outputs the parsed real-time streaming data to the DEMUX **705** or stores the parsed real-time streaming data in the SI & metadata DB **711** under the control of the service manager **713**. In addition, the service delivery manager **703** feeds back network reception information to a server that provides the real-time streaming data service using RTCP.

The DEMUX **705** demultiplexes a received packet into audio data, video data and PSI data and outputs the audio data, video data and PSI data to the audio decoder **706**, the video decoder **707**, and the PSI & (PSIP and/or SI) decoder **704**, respectively.

The PSI & (PSIP and/or SI) decoder **704** decodes SI such as PSI. More specifically, the PSI & (PSIP and/or SI) decoder **704** decodes PSI sections, PSIP sections or SI sections received from the DEMUX **705**.

The PSI & (PSIP and/or SI) decoder **704** constructs an SI DB by decoding the received sections and stores the SI DB in the SI & metadata DB **711**.

The audio decoder **706** and the video decoder **707** decode the audio data and the video data received from the DEMUX **705** and output the decoded audio and video data to a user through the display A/V and OSD module **708**.

The UI manager **714** and the service manager **713** manage the overall state of the image display apparatus **700**, provide UIs, and manage other managers.

The UI manager **714** provides a Graphical User Interface (GUI) in the form of an OSD and performs a reception operation corresponding to a key input received from the user. For example, upon receipt of a key input signal regarding channel selection from the user, the UI manager **714** transmits the key input signal to the service manager **713**.

The service manager **713** controls managers associated with services, such as the service delivery manager **703**, the service discovery manager **710**, the service control manager **709**, and the metadata manager **712**.

The service manager **713** also makes a channel map and selects a channel using the channel map according to the key input signal received from the UI manager **714**. The service manager **713** sets the audio/video Packet ID (PID) of the selected channel based on SI about the channel received from the PSI & (PSIP and/or SI) decoder **704**.

The service discovery manager **710** provides information necessary to select an SP that provides a service. Upon receipt of a channel selection signal from the service manager **713**, the service discovery manager **710** detects a service based on the channel selection signal.

The service control manager **709** takes charge of selecting and control services. For example, if a user selects live broadcasting, like a conventional broadcasting service, the service control manager selects and controls the service using Internet Group Management Protocol (IGMP) or Real-Time Streaming Protocol (RTSP). If the user selects Video on Demand (VoD), the service control manager **709** selects and controls the service. RTSP supports trick mode for real-time streaming. Further, the service control manager **709** may initialize and manage a session through an IP Multimedia Control (IMC) gateway using IP Multimedia Subsystem (IMS) and Session Initiation Protocol (SIP). The protocols are given by way of example and thus other protocols are also applicable according to other embodiments.

The metadata manager **712** manages metadata related to services and stores the metadata in the SI & metadata DB **711**.

The SI & metadata DB **711** stores the SI decoded by the PSI & (PSIP and/or SI) decoder **704**, the metadata managed by the metadata manager **712**, and the information required to select an SP, received from the service discovery manager **710**. The SI & metadata DB **711** may store setup data for the system.

The SI & metadata DB **711** may be constructed in a Non-Volatile RAM (NVRAM) or a flash memory.

An IMS gateway **705** is a gateway equipped with functions needed to access IMS-based IPTV services.

FIG. **6** is a detailed block diagram of the image display apparatus illustrated in FIG. **1** or **2** according to another embodiment of the present invention.

Referring to FIG. **6**, an image display apparatus **100** according to another embodiment of the present invention includes a broadcasting receiver **105**, an external device interface **135**, a memory **140**, a user input interface **150**, a controller **170**, a display **180**, an audio output unit **185**, a power supply **190**, and a camera module (not shown). The broadcasting receiver **105** may include a tuner **110**, a demodulator **120** and a network interface **130**. As needed, the broadcasting receiver **105** may be configured so as to include only the tuner **110** and the demodulator **120** or only the network interface **130**.

The tuner **110** selects a Radio Frequency (RF) broadcast signal corresponding to a channel selected by a user from among a plurality of RF broadcast signals received through an antenna and downconverts the selected RF broadcast signal into a digital Intermediate Frequency (IF) signal or an analog baseband A/V signal.

More specifically, if the selected RF broadcast signal is a digital broadcast signal, the tuner **110** downconverts the selected RF broadcast signal into a digital IF signal DIF. On the other hand, if the selected RF broadcast signal is an analog broadcast signal, the tuner **110** downconverts the selected RF broadcast signal into an analog baseband A/V signal, CVBS/SIF. That is, the tuner **110** may be a hybrid tuner capable of processing not only digital broadcast signals but also analog broadcast signals. The analog baseband A/V signal CVBS/SIF may be directly input to the controller **170**.

The tuner **110** may be capable of receiving RF broadcast signals from an Advanced Television Systems Committee (ATSC) single-carrier system or from a Digital Video Broadcasting (DVB) multi-carrier system.

The tuner **110** may sequentially select a number of RF broadcast signals corresponding to all broadcast channels previously stored in the image display apparatus **100** by a channel add function from a plurality of RF signals received through the antenna and may downconvert the selected RF broadcast signals into IF signals or baseband A/V signals.

The demodulator **120** receives the digital IF signal DIF from the tuner **110** and demodulates the digital IF signal DIF.

For example, if the digital IF signal DIF is an ATSC signal, the demodulator **120** may perform 8-Vestigal SideBand (VSB) demodulation on the digital IF signal DIF. The demodulator **120** may also perform channel decoding. For channel decoding, the demodulator **120** may include a Trellis decoder (not shown), a de-interleaver (not shown) and a Reed-Solomon decoder (not shown) so as to perform Trellis decoding, de-interleaving and Reed-Solomon decoding.

For example, if the digital IF signal DIF is a DVB signal, the demodulator **120** performs Coded Orthogonal Frequency Division Multiple Access (COFDMA) demodulation upon the digital IF signal DIF. The demodulator **120** may also perform channel decoding. For channel decoding, the demodulator **120** may include a convolution decoder (not shown), a de-interleaver (not shown), and a Reed-Solomon decoder (not shown) so as to perform convolution decoding, de-interleaving, and Reed-Solomon decoding.

The demodulator **120** may perform demodulation and channel decoding on the digital IF signal DIF, thereby obtaining a stream signal TS. The stream signal TS may be a signal in which a video signal, an audio signal and a data signal are multiplexed. For example, the stream signal TS may be an MPEG-2 TS in which an MPEG-2 video signal and a Dolby AC-3 audio signal are multiplexed. An MPEG-2 TS may include a 4-byte header and a 184-byte payload.

In order to properly handle not only ATSC signals but also DVB signals, the demodulator **120** may include an ATSC demodulator and a DVB demodulator.

The stream signal TS may be input to the controller **170** and thus subjected to demultiplexing and A/V signal processing. The processed video and audio signals are output to the display **180** and the audio output unit **185**, respectively.

The external device interface **135** may serve as an interface between an external device and the image display apparatus **100**. For interfacing, the external device interface **135** may include an A/V Input/Output (I/O) unit (not shown) and/or a wireless communication module (not shown).

The external device interface **135** may be connected to an external device such as a Digital Versatile Disk (DVD) player, a Blu-ray player, a game console, a camera, a camcorder, or a computer (e.g., a laptop computer), wirelessly or by wire. Then, the external device interface **135** externally receives video, audio, and/or data signals from the external device and transmits the received input signals to the controller **170**. In addition, the external device interface **135** may output video, audio, and data signals processed by the controller **170** to the external device. In order to receive or transmit audio, video and data signals from or to the external device, the external device interface **135** includes the A/V I/O unit (not shown) and/or the wireless communication module (not shown).

The A/V I/O unit of the external device interface **135** may include a Universal Serial Bus (USB) port, a Composite Video Banking Sync (CUBS) port, a Component port, a Super-video (S-video) (analog) port, a Digital Visual Interface (DVI) port, a High-Definition Multimedia Interface (HDMI) port, a Red-Green-Blue (RGB) port, and a D-sub port.

The wireless communication module of the external device interface **135** may perform short-range wireless communication with other electronic devices. For short-range wireless communication, the wireless communication module may use Bluetooth, Radio-Frequency IDentification (RFID), Infrared Data Association (IrDA), Ultra WideBand (UWB), ZigBee, and Digital Living Network Alliance (ULNA).

The external device interface **135** may be connected to various set-top boxes through at least one of the above-described ports and may thus receive data from or transmit data to the various set-top boxes.

The external device interface **135** may receive applications or an application list from an adjacent external device and provide the applications or the application list to the controller **170** or the memory **140**.

The network interface **130** serves as an interface between the image display apparatus **100** and a wired/wireless network such as the Internet. The network interface **130** may include an Ethernet port for connection to a wired network. The wireless communication module of the external signal I/O unit **128** may wirelessly access the Internet. For connection to wireless networks, the network interface **130** may use Wireless Local Area Network (WLAN) (i.e., Wi-Fi), Wireless Broadband (WiBro), World Interoperability for Microwave Access (WiMax), and High Speed Downlink Packet Access (HSDPA).

The network interface **130** may transmit data to or receive data from another user or electronic device over a connected network or another network linked to the connected network. Especially, the network interface **130** may transmit data stored in the image display apparatus **100** to a user or electronic device selected from among users or electronic devices pre-registered with the image display apparatus **100**.

The network interface **130** may access a specific Web page over a connected network or another network linked to the connected network. That is, the network interface **130** may access a specific Web page over a network and transmit or receive data to or from a server. Additionally, the network interface **130** may receive content or data from a CP or an NP. Specifically, the network interface **130** may receive content such as movies, advertisements, games, VoD files, and broadcast signals, and information related to the content from a CP or an NP. Also, the network interface **130** may receive update information about firmware and update files of the firmware from the NP. The network interface **130** may transmit data over the Internet or to the CP or the NP.

The network interface **130** may selectively receive a desired application among open applications over a network.

In an embodiment of the present invention, when a game application is executed in the image display apparatus **100**, the network interface **130** may transmit data to or receive data from a user terminal connected to the image display apparatus **100** through a network. In addition, the network interface **130** may transmit specific data to or receive specific data from a server that records game scores.

The memory **140** may store various programs necessary for the controller **170** to process and control signals, and may also store processed video, audio and data signals.

The memory **140** may temporarily store a video, audio and/or data signal received from the external device interface **135** or the network interface **130**. The memory **140** may store information about broadcast channels by the channel-add function.

The memory **140** may store applications or a list of applications received from the external device interface **135** or the network interface **130**.

The memory **140** may store a variety of platforms which will be described later.

In an embodiment of the present invention, when the image display apparatus **100** executes a game application, the memory **140** may store user-specific information and game play information about a user terminal used as a game controller.

The memory **140** may include, for example, at least one of a flash memory-type storage medium, a hard disk-type storage medium, a multimedia card micro-type storage medium, a card-type memory (e.g. a Secure Digital (SD) or eXtreme Digital (XD) memory), a Random Access Memory (RAM), or a Read-Only Memory (ROM) such as an Electrically Erasable and Programmable Read Only Memory. The image display apparatus **100** may reproduce content stored in the memory **140** (e.g. video files, still image files, music files, text files, and application files) to the user.

While the memory **140** is shown in FIG. **6** as configured separately from the controller **170**, to which the present invention is not limited, the memory **140** may be incorporated into the controller **170**, for example.

The user input interface **150** transmits a signal received from the user to the controller **170** or transmits a signal received from the controller **170** to the user.

For example, the user input interface **150** may receive various user input signals such as a power-on/off signal, a channel selection signal, and a screen setting signal from a remote controller **200** or may transmit a signal received from the controller **170** to the remote controller **200**, according to various communication schemes, for example, RF communication and IR communication.

For example, the user input interface **150** may provide the controller **170** with user input signals or control signals received from local keys (not shown), such as inputs of a power key, a channel key, and a volume key, and setting values.

Also, the user input interface **150** may transmit a control signal received from a sensor unit (not shown) for sensing a user gesture to the controller **170** or transmit a signal received from the controller **170** to the sensor unit. The sensor unit may include a touch sensor, a voice sensor, a position sensor, a motion sensor, etc.

The controller **170** may demultiplex the stream signal TS received from the tuner **110**, the demodulator **120**, or the external device interface **135** into a number of signals and process the demultiplexed signals into audio and video data.

The video signal processed by the controller **170** may be displayed as an image on the display **180**. The video signal processed by the controller **170** may also be transmitted to an external output device through the external device interface **135**.

The audio signal processed by the controller **170** may be output to the audio output unit **185**. Also, the audio signal processed by the controller **170** may be transmitted to the external output device through the external device interface **135**.

While not shown in FIG. **6**, the controller **170** may include a DEMUX and a video processor, which will be described later with reference to FIG. **10**.

In addition, the controller **170** may provide overall control to the image display apparatus **100**. For example, the controller **170** may control the tuner **110** to select an RF broadcast signal corresponding to a user-selected channel or a pre-stored channel.

The controller **170** may control the image display apparatus **100** according to a user command received through the user input interface **150** or according to an internal program. Especially the controller **170** may access a network and download an application or application list selected by the user to the image display apparatus **100** over the network.

For example, the controller **170** controls the tuner **110** to receive a channel selected according to a specific channel selection command received through the user input interface **150** and processes a video, audio and/or data signal of the selected channel. The controller **170** outputs the processed video or audio signal along with information about the user-selected channel to the display **180** or the audio output unit **185**.

In another example, the controller **170** outputs a video or audio signal received from an external device such as a camera or a camcorder through the external device interface **135** to the display **180** or the audio output unit **185** according to an external device video playback command received through the external device interface **150**.

The controller **170** may control the display **180** to display images. For instance, the controller **170** may control the display **180** to display a broadcast image received from the tuner **110**, an external input image received through the external device interface **135**, an image received through the network interface **130**, or an image stored in the memory **140**. The image displayed on the display **180** may be a Two-Dimensional (2D) or Three-Dimensional (3D) still image or moving picture.

The controller **170** may control content playback. The content may include any content stored in the image display apparatus **100**, received broadcast content, and external input content. The content includes at least one of a broadcast image, an external input image, an audio file, a still image, a Web page, or a text file.

Upon receipt of a go-to-home input, the controller **170** may control display of the home screen on the display **180** in an embodiment of the present invention.

The home screen may include a plurality of card objects classified according to content sources. The card objects may include at least one of a card object representing a thumbnail list of broadcast channels, a card object representing a broadcast program guide, a card object representing a program reservation list or a program recording list, or a card object representing a media list of a device connected to the image display apparatus **100**. The card objects may further include at least one of a card object representing a list of connected external devices or a card object representing a call-associated list.

The home screen may further include an application menu with at least one application that can be executed.

Upon receipt of a card object move input, the controller **170** may control movement of a card object corresponding to the card object move input on the display **180**, or if the card object is not displayed on the display **180**, the controller **170** may control display of the card object on the display **180**.

When a card object is selected from among the card objects on the home screen, the controller **170** may control display of an image corresponding to the selected card object on the display **180**.

The controller **170** may control display of an input broadcast image and an object representing information about the broadcast image in a card object representing broadcast images. The broadcast image may be fixed in size through lock setting.

The controller **170** may control display of a set-up object for at least one of image setting, audio setting, screen setting, reservation setting, setting of a pointer of the remote controller, or network setting on the home screen.

The controller **170** may control display of a log-in object, a help object, or an exit object on a part of the home screen.

The controller **170** may control display of an object representing the total number of available card objects or the number of card objects displayed on the display **180** among all card objects, on a part of the home screen.

If one of the card objects displayed on the display **180** is selected, the controller **170** may fullscreen the selected card object to cover the entirety of the display **180**.

Upon receipt of an incoming call at a connected external device or the image display apparatus **100**, the controller **170** may control focusing-on or shift of a call-related card object among the plurality of card objects.

If an application view menu item is selected, the controller **170** may control display of applications or a list of applications that are available in the image display apparatus or downloadable from an external network.

The controller **170** may control installation and execution of an application downloaded from the external network along with various UIs. Also, the controller **170** may control display of an image related to the executed application on the display **180**, upon user selection.

In an embodiment of the present invention, when the image display apparatus **100** provides a game application, the controller **170** may control assignment of player IDs to specific user terminals, creation of game play information by executing the game application, transmission of the game play information to the user terminals through the network interface **130**, and reception of the game play information at the user terminals.

The controller **170** may control detection of user terminals connected to the image display apparatus **100** over a network through the network interface **130**, display of a list of the detected user terminals on the display **180** and reception of a selection signal indicating a user terminal selected for use as a user controller from among the listed user terminals through the user input interface **150**.

The controller **170** may control output of a game play screen of the game application, inclusive of player information about each user terminal and game play information, through the display **180**.

The controller **170** may determine the specific signal received from a user terminal through the network interface **130** as game play information and thus control the game play information to be reflected in the game application in progress.

The controller **170** may control transmission of the game play information about the game application to a specific server connected to the image display apparatus **100** over a network through the network interface **130**.

As another embodiment, upon receipt of information about a change in the game play information from the server through the network interface **130**, the controller **170** may control output of a notification message in a predetermined area of the display **180**.

The image display apparatus **100** may further include a channel browsing processor (not shown) for generating thumbnail images corresponding to channel signals or external input signals.

The channel browsing processor may extract some of the video frames of each of stream signals TS received from the demodulator **120** or stream signals received from the external device interface **135** and display the extracted video frames on the display **180** as thumbnail images. The thumbnail images may be directly output to the controller **170** or may be output after being encoded. Also, it is possible to encode the thumbnail images into a stream and output the stream to the controller **170**. The controller **170** may display a thumbnail list including a plurality of received thumbnail images on the display **180**. The thumbnail images may be updated sequentially or simultaneously in the thumbnail list. Therefore, the user can readily identify the content of broadcast programs received through a plurality of channels.

The display **180** may convert a processed video signal, a processed data signal, and an OSD signal received from the controller **170** or a video signal and a data signal received from the external device interface **135** into RGB signals, thereby generating driving signals.

The display **180** may be various types of displays such as a Plasma Display Panel (PDP), a Liquid Crystal Display (LCD), an Organic Light-Emitting Diode (OLED) display, a flexible display, and a 3D display.

The display **180** may also be a touch screen that can be used not only as an output device but also as an input device.

The audio output unit **185** may receive a processed audio signal (e.g., a stereo signal, a 3.1-channel signal or a 5.1-channel signal) from the controller **170** and output the received audio signal as sound. The audio output unit **185** may employ various speaker configurations.

To sense a user gesture, the image display apparatus **100** may further include the sensor unit (not shown) that has at least one of a touch sensor, a voice sensor, a position sensor, and a motion sensor, as stated before. A signal sensed by the sensor unit may be output to the controller **170** through the user input interface **150**.

The image display apparatus **100** may further include the camera unit (not shown) for capturing images of a user. Image information captured by the camera unit may be input to the controller **170**.

The controller **170** may sense a user gesture from an image captured by the camera unit or a signal sensed by the sensor unit, or by combining the captured image and the sensed signal.

The power supply **190** supplies power to the image display apparatus **100**. Particularly, the power supply **190** may supply power to the controller **170**, the display **180**, and the audio output unit **185**, which may be implemented as a System On Chip (SOC).

For supplying power, the power supply **190** may include a converter (not shown) for converting Alternating Current (AC) into Direct Current (DC). If the display **180** is configured with, for example, a liquid crystal panel having a plurality of backlight lamps, the power supply **190** may further include an inverter (not shown) capable of performing Pulse Width Modulation (PWM) for luminance change or dimming driving.

The remote controller **200** transmits a user input to the user input interface **150**. For transmission of user input, the remote controller **200** may use various communication techniques such as Bluetooth, RF communication, IR communication, UWB and ZigBee.

In addition, the remote controller **200** may receive a video signal, an audio signal or a data signal from the user input interface **150** and output the received signals visually, audibly or as vibrations.

The above-described image display apparatus **100** may be a fixed digital broadcast receiver capable of receiving at least one of ATSC (8-VSB) broadcast programs, DVB-T (COFDM) broadcast programs, and ISDB-T (BST-OFDM) broadcast programs.

The block diagram of the image display apparatus **100** illustrated in FIG. **6** is purely exemplary. Depending upon the specifications of the image display apparatus **100** in actual implementation, the components of the image display apparatus **100** may be combined or omitted or new components may be added. That is, two or more components are incorpo-

rated into one component or one component may be configured as separate components, as needed. In addition, the function of each block is described for the purpose of describing the embodiment of the present invention and thus specific operations or devices should not be construed as limiting the scope and spirit of the present invention.

Unlike the configuration illustrated in FIG. **6**, the image display apparatus **100** may be configured so as to receive and playback video content through the network interface **130** or the external device interface **135**, without the tuner **100** and the demodulator **120**.

The image display apparatus **100** is an example of image signal processing apparatus that processes a stored image or an input image. Other examples of the image signal processing apparatus include a set-top box without the display **180** and the audio output unit **185**, a DVD player, a Blu-ray player, a game console, and a computer. The set-top box will be described later with reference to FIGS. **7** and **8**.

FIGS. **7** and **8** are block diagrams illustrating either of the image display apparatuses separately as a set-top box and a display device according to embodiments of the present invention.

Referring to FIG. **7**, a set-top box **250** and a display device **300** may transmit or receive data wirelessly or by wire.

The set-top box **250** may include a network interface **255**, a memory **258**, a signal processor **260**, a user input interface **263**, and an external device interface **265**.

The network interface **255** serves as an interface between the set-top box **250** and a wired/wireless network such as the Internet. The network interface **255** may transmit data to or receive data from another user or another electronic device over a connected network or over another network linked to the connected network.

The memory **258** may store programs necessary for the signal processor **260** to process and control signals and temporarily store a video, audio and/or data signal received from the external device interface **265** or the network interface **255**. The memory **258** may also store platforms illustrated in FIGS. **11** and **12**, as described later.

The signal processor **260** processes an input signal. For example, the signal processor **260** may demultiplex or decode an input video or audio signal. For signal processing, the signal processor **260** may include a video decoder or an audio decoder. The processed video or audio signal may be transmitted to the display device **300** through the external device interface **265**.

The user input interface **263** transmits a signal received from the user to the signal processor **260** or a signal received from the signal processor **260** to the user. For example, the user input interface **263** may receive various control signals such as a power on/off signal, an operation input signal, and a setting input signal through a local key (not shown) or the remote controller **200** and output the control signals to the signal processor **260**.

The external device interface **265** serves as an interface between the set-top box **250** and an external device that is connected wirelessly or by wire, particularly the display device **300**, for signal transmission or reception. The external device interface **265** may also interface with an external device such as a game console, a camera, a camcorder, and a computer (e.g. a laptop computer), for data transmission or reception.

The set-top box **250** may further include a media input unit for media playback. The media input unit may be a Blu-ray input unit, for example. That is, the set-top box **250** may include a Blu-ray player. After signal processing such as demultiplexing or decoding in the signal processor **260**, a media signal from a Blu-ray disk may be transmitted to the display device **300** through the external device interface **265** so as to be displayed on the display device **300**.

The display device **300** may include a tuner **270**, an external device interface **273**, a demodulator **275**, a memory **278**, a controller **280**, a user input interface **283**, a display **290**, and an audio output unit **295**.

The tuner **270**, the demodulator **275**, the memory **278**, the controller **280**, the user input interface **283**, the display **290**, and the audio output unit **295** are identical respectively to the tuner **110**, the demodulator **120**, the memory **140**, the controller **170**, the user input interface **150**, the display **180**, and the audio output unit **185** illustrated in FIG. **6** and thus a description thereof is not provided herein.

The external device interface **273** serves as an interface between the display device **300** and a wireless or wired external device, particularly the set-top box **250**, for data transmission or reception.

Hence, a video signal or an audio signal received through the set-top box **250** is output through the display **290** or the audio output unit **295** through the controller **280**.

Referring to FIG. **8**, the configuration of the set-top box **250** and the display device **300** illustrated in FIG. **8** is similar to that of the set-top box **250** and the display device **300** illustrated in FIG. **7**, except that the tuner **270** and the demodulator **275** reside in the set-top box **250**, not in the display device **300**. Thus the following description is given focusing on such difference.

The signal processor **260** may process a broadcast signal received through the tuner **270** and the demodulator **275**. The user input interface **263** may receive a channel selection input, a channel store input, etc.

FIG. **9** illustrates an operation for communicating with third devices in either of the image display apparatuses according to an embodiment of the present invention. The image display apparatus illustrated in FIG. **9** may be one of the afore-described image display apparatuses according to the embodiments of the present invention.

Referring to FIG. **9**, the image display apparatus **100** may communicate with a broadcasting station **210**, a network server **220**, or an external device **230**.

The image display apparatus **100** may receive a broadcast signal including a video signal from the broadcasting station **210**. The image display apparatus **100** may process the audio and video signals of the broadcast signal or the data signal of the broadcast signal, suitably for transmission from the image display apparatus **100**. The image display apparatus **100** may output images or sound based on the processed video or audio signal.

Meanwhile, the image display apparatus **100** may communicate with the network server **220**. The network server **200** is capable of transmitting signals to and receiving signals from the image display apparatus **100** over a network. For example, the network server **220** may be a portable terminal that can be connected to the image display apparatus **100** through a wired or wireless base station. In addition, the network server **200** may provide content to the image display apparatus **100** over the Internet. A CP may provide content to the image display apparatus **100** through the network server **220**.

The image display apparatus **100** may communicate with the external device **230**. The external device **230** can transmit and receive signals directly to and from the image display apparatus **100** wirelessly or by wire. For instance, the external device **230** may be a media memory device or a player. That is, the external device **230** may be any of a camera, a DVD player, a Blu-ray player, a PC, etc.

The broadcasting station **210**, the network server **220** or the external device **230** may transmit a signal including a video signal to the image display apparatus **100**. The image display apparatus **100** may display an image based on the video signal included in the received signal. Also, the image display apparatus **100** may transmit a signal received from the broadcasting station **210** or the network server **220** to the external device **230** and may transmit a signal received from the external device **230** to the broadcasting station **210** or the network server **220**. That is, the image display apparatus **100** may transmit content included in signals received from the broadcasting station **210**, the network server **220**, and the external device **230**, as well as playback the content immediately.

FIG. **10** is a block diagram of the controller illustrated in FIG. **6**.

Referring to FIG. **10**, the controller **170** may include a DEMUX **310**, a video processor **320**, an OSD generator **340**, a card object generator **345**, a mixer **350**, a Frame Rate Converter (FRC) **355**, and a formatter **360** according to an embodiment of the present invention. The controller **170** may further include an audio processor (not shown) and a data processor (not shown).

The DEMUX **310** demultiplexes an input stream. For example, the DEMUX **310** may demultiplex an MPEG-2 TS into a video signal, an audio signal, and a data signal. The input stream signal may be received from the tuner **110**, the demodulator **120** or the external device interface **135**.

The video processor **320** may process the demultiplexed video signal. For video signal processing, the video processor **320** may include a video decoder **325** and a scaler **335**.

The video decoder **325** decodes the demultiplexed video signal and the scaler **335** scales the resolution of the decoded video signal so that the video signal can be displayed on the display **180**.

The video decoder **325** may be provided with decoders that operate based on various standards.

If the demultiplexed video signal is, for example, an MPEC-2 encoded video signal, the video signal may be decoded by an MPEC-2 decoder.

On the other hand, if the video signal is an H.264-encoded DMB or DVB-handheld (DVB-H) signal, the video signal may be decoded by an H.264 decoder.

The video signal decoded by the video processor **320** is provided to the mixer **350**.

The OSD generator **340** generates an OSD signal autonomously or according to user input. For example, the OSD generator **340** may generate signals by which a variety of information is displayed as images or text on the display **180**, according to control signals received from the user input interface **150**. The OSD signal may include various data such as a UI, a variety of menu screens, widgets, icons, etc.

For example, the OSD generator **340** may generate a signal by which subtitles are displayed for a broadcast image or Electronic Program Guide (EPG)-based broadcasting information.

The card object generator **345** may generate a plurality of card objects displayed on the home screen according to go-to-home input. The card object generator **345** may be included in the controller **170**. While not shown in FIG. **10**, the card object generator **345** may be included in the OSD generator **340** of the controller **170** or may be configured as a separate GPU. The plurality of card objects generated from the card object generator may be transmitted to and displayed on the display **180**.

The mixer **350** may mix the decoded video signal with the OSD signal and output the mixed signal to the formatter **360**. As the decoded broadcast video signal or the external input signal is mixed with the OSD signal, an OSD may be overlaid on the broadcast image or the external input image.

The FRC **355** may change the frame rate of an input image. For example, a frame rate of 60 Hz is converted into a frame rate of 120 or 240 Hz. When the frame rate is to be changed from 60 Hz to 120 Hz, a first frame is inserted between the first frame and a second frame, or a predicted third frame is inserted between the first and second frames. If the frame rate is to be changed from 60 Hz to 240 Hz, three identical frames or three predicted frames are inserted between the first and second frames. It is also possible to maintain the frame rate of the input image without frame rate conversion.

The formatter **360** changes the format of the signal received from the FRC **355** to be suitable for the display **180**. For example, the formatter **360** may convert a received signal into an RGB data signal. The RGB signal may be output in the form of a Low Voltage Differential Signal (LVDS) or mini-LVDS.

The audio processor (not shown) of the controller **170** may process the demultiplexed audio signal. For audio signal processing, the audio processor may have a plurality of decoders.

If the demultiplexed audio signal is a coded audio signal, the audio processor of the controller **170** may decode the audio signal. For example, the demultiplexed audio signal may be decoded by an MPEG-2 decoder, an MPEG-4 decoder, an Advanced Audio Coding (AAC) decoder, or an AC-3 decoder.

The audio processor of the controller **170** may also adjust the bass, treble or volume of the audio signal.

The data processor (not shown) of the controller **170** may process the data signal obtained by demultiplexing the input stream signal. For example, if the data signal is an encoded signal such as an EPG which includes broadcasting information specifying the start time, end time, etc. of scheduled broadcast TV or radio programs, the controller **170** may decode the data signal. Examples of an EPG include ATSC-Program and System Information Protocol (PSIP) information and DVB-Service Information (SI).

ATSC-PSIP information or DVB-SI may be included in the header of a TS, i.e., a 4-byte header of an MPEG-2 TS.

The block diagram of the controller **170** illustrated in FIG. **10** is an embodiment of the present invention. Depending upon the specifications of the controller **170**, the components of the controller **170** may be combined, or omitted. Or new components are added to the controller **170**.

FIG. **11** illustrates a platform architecture for either of the image display apparatuses according to an embodiment of the present invention and FIG. **12** illustrates a platform architecture for either of the image display apparatuses according to another embodiment of the present invention.

A platform for either of the image display apparatuses may have OS-based software to implement the above-described various operations according to an embodiment of the present invention.

Referring to FIG. **11**, a platform for either of the image display apparatuses is a separate type according to an embodiment of the present invention. The platform may be designed separately as a legacy system platform **400** and a smart system platform **405**. An OS kernel **410** may be shared between the legacy system platform **400** and the smart system platform **405**.

The legacy system platform **400** may include a stack of a driver **420**, middleware **430**, and an application layer **450** on the OS kernel **410**.

On the other hand, the smart system platform **405** may include a stack of a library **435**, a framework **440**, and an application layer **455** on the OS kernel **410**.

The OS kernel **410** is the core of an operating system. When the image display apparatus is driven, the OS kernel **410** may be responsible for operation of at least one of hardware drivers, security protection for hardware and processors in the image display apparatus, efficient management of system resources, memory management, hardware interfacing by hardware abstraction, multi-processing, or scheduling associated with the multi-processing. Meanwhile, the OS kernel **410** may further perform power management.

The hardware drivers of the OS kernel **410** may include, for example, at least one of a display driver, a Wi-Fi driver, a Bluetooth driver, a USB driver, an audio driver, a power manager, a binder driver, or a memory driver.

Alternatively or additionally, the hardware drivers of the OS kernel **410** may be drivers for hardware devices within the OS kernel **410**. The hardware drivers may include a character device driver, a block device driver, and a network device driver. The block device driver may need a buffer for buffering data on a block basis, because data is transmitted on a block basis. The character device driver may not need a buffer since data is transmitted on a basic data unit basis, that is, on a character basis.

The OS kernel **410** may be implemented based on any of various OSs such as Unix (Linux), Windows, etc. The OS kernel **410** may be a general-purpose open OS kernel which can be implemented in other electronic devices.

The driver **420** is interposed between the OS kernel **410** and the middleware **430**. Along with the middleware **430**, the driver **420** drives devices for operations of the application layer **450**. For example, the driver **420** may include a driver(s) for a microcomputer, a display module, a Graphic Processing Unit (GPU), the FRC, a General-Purpose Input/Output (GPIO) pin, a High-Definition Multimedia Interface (HDMI), a System Decoder (SDEC) or DEMUX, a Video Decoder (VDEC), an Audio Decoder (ADEC), a Personal Video Recorder (PVR), and/or an Inter-Integrated Circuit (I2C). These drivers operate in conjunction with the hardware drivers of the OS kernel **410**.

In addition, the driver **420** may further include a driver for the remote controller **200**, especially a pointing device to be described below. The remote controller driver may reside in the OS kernel **410** or the middleware **430**, instead of the driver **420**.

The middleware **430** resides between the OS kernel **410** and the application layer **450**. The middleware **430** may mediate between different hardware devices or different software programs, for data transmission and reception between the hardware devices or the software programs. Therefore, the middleware **430** can provide standard interfaces, support various environments, and enable interaction between tasks conforming to heterogeneous communication protocols.

Examples of the middleware **430** in the legacy system platform **400** may include Multimedia and Hypermedia information coding Experts Group (MHEG) and Advanced Common Application Platform (ACAP) as data broadcasting-related middleware, PSIP or SI middleware as broadcasting information-related middleware, and DLNA middleware as peripheral device communication-related middleware.

The application layer **450** that runs atop the middleware **430** in the legacy system platform **400** may include, for example, UI applications associated with various menus in the image display apparatus. The application layer **450** may allow editing and updating over a network by user selection. With use of the application layer **450**, the user may enter a desired menu among various UIs by manipulating the remote controller **210** while viewing a broadcast program.

The application layer **450** may further include at least one of a TV guide application, a Bluetooth application, a reservation application, a Digital Video Recorder (DVR) application, and a hotkey application.

In the smart system platform **405**, the library **435** is positioned between the OS kernel **410** and the framework **440**, forming the basis of the framework **440**. For example, the library **435** may include Secure Socket Layer (SSL) being a security-related library, WebKit being a Web engine-related library, c library (libc), and Media Framework being a media-related library specifying, for example, a video format and an audio format. The library **435** may be written in C or C++. Also, the library **435** may be exposed to a developer through the framework **440**.

The library **435** may include a runtime **437** with a core Java library and a Virtual Machine (VM). The runtime **437** and the library **435** form the basis of the framework **440**.

The VM may be a virtual machine that enables concurrent execution of a plurality of instances, that is, multi-tasking. For each application of the application layer **455**, a VM may be allocated and executed. For scheduling or interconnection between instances, the binder driver (not shown) of the OS kernel **410** may operate.

The binder driver and the runtime **437** may connect Java applications to C-based libraries.

The library **435** and the runtime **437** may correspond to the middleware **430** of the legacy system platform **400**.

In the smart system platform **405**, the framework **440** includes programs on which applications of the application layer **455** are based. The framework **440** is compatible with any application and may allow component reuse, movement or exchange. The framework **440** may include supporting programs and programs for interconnecting different software components. For example, the framework **440** may include an activity manager related to activities of applications, a notification manager, and a CP for abstracting common information between applications. This framework **440** may be written in Java.

The application layer **455** on top of the framework **440** includes a variety of programs that are executed and displayed in the image display apparatus. The application layer **455** may include, for example, a core application that is a suit having at least one solution of e-mail, Short Message Service (SMS), calendar, map, or browser. The application layer **455** may be written in Java.

In the application layer **455**, applications may be categorized into user-undeletable applications **465** stored in the image display apparatus **100** that cannot be modified and user-installable or user-deletable applications **475** that are downloaded from an external device or a network and stored in the image display apparatus.

With the applications of the application layer **455**, a variety of functions such as Internet telephony, VoD, Web album, Social Networking Service (SNS), Location-Based Service (LBS), map service, Web browsing, and application search may be performed through network access. In addition, other functions such as gaming and schedule management may be performed by the applications.

Referring to FIG. **12**, a platform for the image display apparatus according to another embodiment of the present invention is an integrated type. The integrated platform may include an OS kernel **510**, a driver **520**, middleware **530**, a framework **540**, and an application layer **550**.

Compared to the separate-type platform illustrated in FIG. **11**, the integrated-type platform is characterized by the absence of the library **435** and the application layer **550** being

an integrated layer. The driver **520** and the framework **540** correspond to the driver **420** and the framework **440** of FIG. **5**, respectively.

The library **435** of FIG. **11** may be incorporated into the middleware **530**. That is, the middleware **530** may include both the legacy system middleware and the image display system middleware. As described before, the legacy system middleware includes MHEG or ACAP as data broadcasting-related middleware, PSIP or SI middleware as broadcasting information-related middleware, and DLNA middleware as peripheral device communication-related middleware, whereas the image display system middleware includes SSL as a security-related library, WebKit as a Web engine-related library, libc, and Media Framework as a media-related library. The middleware **530** may further include the afore-described runtime.

The application layer **550** may include a menu-related application, a TV guide application, a reservation application, etc. as legacy system applications, and e-mail, SMS, a calendar, a map, and a browser as image display system applications.

In the application layer **550**, applications may be categorized into user-undeletable applications **565** that are stored in the image display apparatus and user-installable or user-deletable applications **575** that are downloaded from an external device or a network and stored in the image display apparatus.

Based on the afore-described platforms illustrated in FIGS. **11** and **12**, a variety of Application Programming Interfaces (APIs) and Software Development Kits (SDKs) necessary to develop applications may be opened. APIs may be implemented functions that provide connectivity to specific subroutines, for execution of the functions within a program. Or APIs may be implemented programs.

For example, sources related to hardware drivers of the OS kernel **410**, such as a display driver, a WiFi driver, a Bluetooth driver, a USB driver or an audio driver, may be opened. Related sources within the driver **420** such as a driver for a microcomputer, a display module, a GPU, an FRC, an SDEC, a VDEC, an ADEC or a pointing device may be opened. In addition, sources related to PSIP or SI middleware as broadcasting information-related middleware or sources related to DLNA middleware may be opened.

Such various open APIs allow developers to create applications executable in the image display apparatus **100** or applications required to control operations of the image display apparatus **100** based on the platforms illustrated in FIGS. **11** and **12**.

The platforms illustrated in FIGS. **11** and **12** may be general-purpose ones that can be implemented in many other electronic devices as well as in image display apparatuses. The platforms may be stored or loaded in the memory **140**, the controller **170**, or any other processor (not shown). To execute applications, an additional application processor (not shown) may be further provided.

FIG. **13** illustrates a method for controlling either of the image display apparatuses using a remote controller according to an embodiment of the present invention.

FIG. **13**(*a*) illustrates a pointer **205** representing movement of the remote controller **200** displayed on the display **180**.

The user may move or rotate the remote controller **200** up and down, side to side (FIG. **13**(*b*)), and back and forth (FIG. **13**(*c*)). Since the pointer **205** moves in accordance with the movement of the remote controller **200**, the remote controller **200** may be referred to as a pointing device.

Referring to FIG. **13**(*b*), if the user moves the remote controller **200** to the left, the pointer **205** moves to the left on the display **180**. A sensor of the remote controller **200** detects the movement of the remote controller **200** and transmits motion information corresponding to the result of the detection to the image display apparatus. Then, the image display apparatus determines the movement of the remote controller **200** based on the motion information received from the remote controller **200**, and calculates the coordinates of a target point to which the pointer **205** should be shifted in accordance with the movement of the remote controller **200** based on the result of the determination. The image display apparatus then displays the pointer **205** at the calculated coordinates.

Referring to FIG. **13**(*c*), while pressing a predetermined button of the remote controller **200**, the user moves the remote controller **200** away from the display **180**. Then, a selected area corresponding to the pointer **205** may be zoomed in on and enlarged on the display **180**. On the contrary, if the user moves the remote controller **200** toward the display **180**, the selection area corresponding to the pointer **205** is zoomed out and thus contracted on the display **180**. The opposite case is possible. That is, when the remote controller **200** moves away from the display **180**, the selection area may be zoomed out and when the remote controller **200** approaches the display **180**, the selection area may be zoomed in.

With the predetermined button pressed in the remote controller **200**, the up, down, left and right movements of the remote controller **200** may be ignored. That is, when the remote controller **200** moves away from or approaches the display **180**, only the back and forth movements of the remote controller **200** are sensed, while the up, down, left and right movements of the remote controller **200** are ignored. Unless the predetermined button is pressed in the remote controller **200**, the pointer **205** moves in accordance with the up, down, left or right movement of the remote controller **200**.

The speed and direction of the pointer **205** may correspond to the speed and direction of the remote controller **200**.

The pointer **205** is an object displayed on the display **180** in correspondence with the movement of the remote controller **200**. Therefore, the pointer **205** may have various shapes other than the arrow illustrated in FIG. **13**. For example, the pointer **205** may be a dot, a cursor, a prompt, a thick outline, etc. The pointer **205** may be displayed across a plurality of points, such as a line and a surface, as well as at a single point on horizontal and vertical axes.

FIG. **14** is a detailed block diagram of the remote controller in either of the image display apparatuses according to an embodiment of the present invention.

Referring to FIG. **14**, the remote controller **200** may include a wireless communication module **225**, a user input unit **235**, a sensor unit **240**, an output unit **250**, a power supply **260**, a memory **270**, and a controller **280**.

The wireless communication module **225** transmits signals to and/or receives signals from either of the afore-described image display apparatuses according to the embodiments of the present invention, herein, the image display apparatus **100**.

The wireless communication module **225** may include an RF module **221** for transmitting RF signals to and/or receiving RF signals from the image display apparatus **100** according to an RF communication standard. The wireless communication module **225** may also include an IR module **223** for transmitting IR signals to and/or receiving IR signals from the image display apparatus **100** according to an IR communication standard.

The remote controller **200** transmits motion information representing the movement of the remote controller **200** to the image display apparatus **100** through the RF module **221** in this embodiment. The remote controller **200** may also receive

signals from the image display apparatus **100** through the RF module **221**. As needed, the remote controller **200** may transmit commands such as a power on/off command, a channel switch command, or a volume change command to the image display apparatus **100** through the IR module **223**.

The user input unit **235** may include a keypad, a plurality of buttons, a touchpad and/or a touch screen. The user may enter commands to the image display apparatus **100** by manipulating the user input unit **235**. If the user input unit **235** includes a plurality of hard buttons, the user may input various commands to the image display apparatus **100** by pressing the hard buttons. Alternatively or additionally, if the user input unit **235** includes a touch screen displaying a plurality of soft keys, the user may input various commands to the image display apparatus **100** by touching the soft keys. The user input unit **235** may also include various input tools other than those set forth herein, such as a scroll key and/or a jog wheel, which should not be construed as limiting the present invention.

The sensor unit **240** may include a gyro sensor **241** and/or an acceleration sensor **243**. The gyro sensor **241** may sense the movement of the remote controller **200**, for example, in X-, Y-, and Z-axis directions, and the acceleration sensor **243** may sense the speed of the remote controller **200**. The sensor unit **240** may further include a distance sensor for sensing the distance between the remote controller **200** and the display **180**.

The output unit **250** may output a video and/or audio signal corresponding to manipulation of the user input unit **235** or corresponding to a signal received from the image display apparatus **100**. The user may easily identify whether the user input unit **235** has been manipulated or whether the image display apparatus **100** has been controlled, based on the video and/or audio signal output by the output unit **250**.

The output unit **250** may include a Light Emitting Diode (LED) module **351** which is turned on or off whenever the user input unit **235** is manipulated or whenever a signal is received from or transmitted to the image display apparatus **100** through the wireless communication module **225**, a vibration module **253** which generates vibrations, an audio output module **255** which outputs audio data, and/or a display module **257** which outputs video data.

The power supply **260** supplies power to the remote controller **200**. If the remote controller **200** is kept stationary for a predetermined time or longer, the power supply **260** may, for example, reduce or shut off supply of power to the spatial remote controller **200** in order to save power. The power supply **260** may resume power supply if a predetermined key on the spatial remote controller **200** is manipulated.

The memory **270** may store various types of programs and application data necessary to control or drive the remote controller **200**. The spatial remote controller **200** may wirelessly transmit signals to and/or receive signals from the image display apparatus **100** over a predetermined frequency band with the aid of the RF module **221**. The controller **280** of the remote controller **200** may store information regarding the frequency band used for the remote controller **200** to wirelessly transmit signals to and/or wirelessly receive signals from the paired image display apparatus **100** in the memory **270**, for later use.

The controller **280** provides overall control to the remote controller **200**. The controller **280** may transmit a signal corresponding to a key manipulation detected from the user input unit **235** or a signal corresponding to motion of the spatial remote controller **200**, as sensed by the sensor unit **240**, to the image display apparatus **100**.

FIGS. **15** to **18** illustrate UIs in either of the image display apparatuses according to embodiments of the present invention.

Referring to FIG. **15**, an application list available from a network is displayed on the display **180**. A user may access a CP or an NP directly, search for various applications, and download the applications from the CP or the NP.

Specifically, FIG. **15**(*a*) illustrates an application list **610** available in a connected server, displayed on the display **180**. The application list **610** may include an icon representing each application and a brief description of the application. Because each of the image display apparatuses according to the embodiments of the present invention is capable of full browsing, it may enlarge the icons or descriptions of applications received from the connected server on the display **180**. Accordingly, the user can readily identify applications, which will be described later.

FIG. **15**(*b*) illustrates selection of one application **620** from the application list **610** using the pointer **205** of the remote controller **200**. Thus, the selected application **620** may be easily downloaded.

FIG. **16** illustrates an application list available in the image display apparatus, displayed on the display **180**. Referring to FIG. **16**(*a*), when the user selects an application list view menu by manipulating the remote controller **200**, a list of applications **660** stored in the image display apparatus is displayed on the display **180**. While only icons representing the applications are shown in FIG. **16**, the application list **660** may further include brief descriptions of the applications, like the application list **610** illustrated in FIG. **15**. Therefore, the user can readily identify the applications.

FIG. **16**(*b*) illustrates selection of one application **670** from the application list **660** using the pointer **205** of the remote controller **200**. Thus, the selected application **670** may be easily executed.

While it is shown in FIGS. **15** and **16** that the user selects a desired application by moving the pointer **205** using the remote controller **200**, the application may be selected in many other ways. For example, the user may select a specific application using a cursor displayed on the display **180** by a combined input of a local key and an OK key in the remote controller **200**.

In another example, if the remote controller **200** has a touch pad, the pointer **205** moves on the display **180** according to touch input of the touch pad. Thus the user may select a specific menu using the touch-based pointer **205**.

FIG. **17** illustrates a Web page displayed on the display **180**. Specifically, FIG. **17**(*a*) illustrates a Web page **710** with a search window **720**, displayed on the display **180**. The user may enter a character into the search window **720** by use of character keys (not shown) of a keypad displayed on a screen, character keys (not shown) provided as local keys, or character keys (not shown) of the remote controller **200**.

FIG. **17**(*b*) illustrates a search result page **730** having search results matching a keyword entered into the search window **720**. Since the image display apparatuses according to the embodiments of the present invention are capable of fully browsing a Web page, the user can easily read the Web page.

FIG. **18** illustrates another Web page displayed on the display **180**. Specifically, FIG. **18**(*a*) illustrates a mail service page **810** including an ID input window **820** and a password input window **825**, displayed on the display **180**. The user may enter a specific numeral and/or text into the ID input window **820** and the password input window **825** using a keypad (not shown) displayed on the mail service page **810**, character keys (not shown) provided as local keys, or charac-

ter keys (not shown) of the remote controller **200**. Hence, the user can log in to a mail service.

FIG. **18**(*b*) illustrates a mail page **830** displayed on the display **180**, after log-in to the mail service. For example, the mail page **830** may contains items "read mail", "write mail", "sent box", "received box", "recycle bin", etc. In the "received box" item, mail may be ordered by sender or by title.

The image display apparatuses according to the embodiments of the present invention are capable of full browsing when displaying a mail service page. Therefore, the user can use the mail service conveniently.

FIG. **19** is a flowchart illustrating a method for operating an image display apparatus according to an embodiment of the present invention and FIGS. **20** to **24**C are views referred to for describing various examples of the method for operating an image display apparatus, illustrated in FIG. **19**.

Referring to FIG. **19**, it is determined whether a go-to-home input has been received (S**1910**). Upon receipt of a go-to-home input, a home screen including a card object area and an application menu area is displayed (S**1915**).

Specifically, the controller **170** determines whether a go-to-home input has been received through input of a local key (not shown) or manipulation of the remote controller **200**. The go-to-home input may be generated when the image display apparatus is powered on or wakes from standby mode, or when a local key (not shown) or a home key or menu key of the remote controller **200** is manipulated.

Upon receipt of the go-to-home input, the controller **170** may control display of a home screen including a plurality of card objects and an application menu on the display **180**. The plurality of card objects and the application menu may be sequentially displayed.

On the home screen, the card object area may include a plurality of card objects classified according to content sources. For example, the card objects may be a card object for displaying a broadcast image, a card object for providing a CP list, and a card object for providing a list of applications. The card objects will be described later with reference to FIGS. **20** to **38**D.

These card objects may be generated in a card object generator **345** of the image display apparatus **100**. The card object generator **345** may be included in the OSD generator **340** of the controller **170** or may be configured as a separate GPU. The plurality of card objects generated from the card object generator **345** may be transmitted to and displayed on the display **180**.

On the home screen, the application menu area includes a plurality of application menu items, particularly mandatory application menu items and optional application menu items set by the user. The application menu is an application compact-view menu, which may include a view more menu item for a fullscreen-view function. The application menu will be described later with reference to FIGS. **20** to **38**D.

The application menu may be generated in an application menu generator (not shown) of the image display apparatus **100**. The application menu generator may be included in the OSD generator **340** of the controller **170** or may be configured as a separate GPU. The application menu generated from the application menu generator may be transmitted to and displayed on the display **180**.

A favorite channel object representing favorite channels may be displayed on the home screen. Especially, the favorite channel object may be included in the card object that displays a broadcast image among the plurality of card objects. The favorite channel object will be described later with reference to FIGS. **20** to **38**D.

As stated before, the display **180** may display the home screen, when the image display apparatus is powered on or a home key is input. The configuration of the home screen allows the user to easily select a desired service, thus increasing user convenience.

It is then determined whether the favorite channel object has been selected (S**1920**). Upon selection of the favorite channel object, a favorite channel list is displayed on the home screen (S**1925**).

Specifically, the controller **170** determines whether the favorite channel object has been selected through input of a local key (not shown) or manipulation of the remote controller **200**, with the home screen displayed on the display **180**. Upon selection of the favorite channel object, the controller **170** may control display of a favorite channel list. For example, the favorite channel list may be displayed in the card object for displaying a broadcast image, and also along with an on-going broadcast image. This operation will be described later with reference to FIGS. **21**A, **21**B, **21**C and **21**D.

Subsequently, it is determined whether a specific channel item has been selected from the favorite channel list (S**1930**). Upon selection of a specific channel item, a broadcast image of a program airing on a channel indicated by the selected channel item is displayed on the display **180** (S**1935**).

Specifically, with the favorite channel list displayed on the home screen, the controller **170** determines whether a specific channel item has been selected from the favorite channel list through input of a local key (not shown) or manipulation of the remote controller **200**. Upon selection of a specific channel item, the controller **170** controls display of a broadcast image of a program airing on a channel indicated by the selected channel item. For example, the broadcast image may be displayed in the card object for displaying a broadcast image, or may be displayed fullscreen on the display **180**, which will be described later with reference to FIGS. **22**B, **22**C and **23**.

It is then determined whether a predetermined time has elapsed without input of a local key or manipulation of the remote controller **200** or a move input has been received a plurality of times successively (S**1940**). If the predetermined time has elapsed without input of the local key or manipulation of the remote controller **200** or the consecutive move inputs have been received, the favorite channel list disappears from the display **180** (S**1945**).

Specifically, with the home screen displayed on the display **180**, the controller **170** determines whether a predetermined time has elapsed without input of a local key (not shown) or manipulation of the remote controller **200** or move inputs have been received successively. If the predetermined time has elapsed without input of the local key or manipulation of the remote controller **200** or the successive move inputs have been received, the controller **170** controls termination of displaying the favorite channel list. This operation will be described later in detail with reference to FIGS. **22**D and **22**E.

As described before, if the image display apparatus **100** is a set-top box without the display **180**, the operation method illustrated in FIG. **19** may amount to output of data for displaying an image or a screen on the display **180**.

For example, the controller **170** determines whether a go-to-home input has been received in step S**1910**. Upon receipt of the go-to-home input, the controller **170** may output data needed to display a home screen including a card object area and an application menu area. The display **180**, which is separately configured, may display the home screen using the data.

In the same manner, steps S**1925**, S**1935** and S**1945** may be performed as the process of outputting data for displaying an image or a screen on the display **180**.

FIG. **20** illustrates an exemplary home screen displayed on the display **180**.

The home screen configuration illustrated in FIG. **20**A may be an example of a default screen configuration for a smart TV. The home screen may be set as an initial screen that is displayed when the image display apparatus is powered on or wakes from standby mode, or as a default screen that is displayed when a local key (not shown) or a home key of the remote controller **200** is manipulated.

Referring to FIG. **20**, a card object area and an application menu area may be defined in a home screen **2000**.

The card object area may include a plurality of card objects **2010**, **2020** and **2030** classified according to content sources.

In the illustrated case of FIG. **20**, the card object **2010** is named BROADCAST and displays a broadcast image. The card object **2020** is named NETCAST PREMIUM and provides a CP list. The card object **2030**, which is named NETCAST APPS, provides a list of applications.

Other card objects may be arranged in a hidden area **2001** and thus not displayed on the display **180**. These card objects may be shifted to show up on the display **180**, substituting for card objects displayed on the display **180**. The hidden card objects are a CHANNEL BROWSER card object **2040** for providing a list of thumbnail images corresponding to broadcast channels, a TV GUIDE card object **2050** for providing a program list, a FAVORITE CH card object **2060** for providing a favorite channel list, and a RECORDED LIST card object **2070** for providing a list of recorded programs.

While four card objects are hidden in the hidden area **2001**, the number of hidden card objects may vary. Card objects other than the card objects illustrated in FIG. **20** may be hidden in the hidden area **2001**, such as a MY MEDIA card object for providing a media list available in the image display apparatus or in a device connected to the image display apparatus and a RECOMMENDED card object for providing a list of content recommended by a CP.

The BROADCAST card object **2010** may contain a broadcast image **2015** received through the tuner **110** or the network interface **130**, an object **2021** for providing information about the broadcast image **2015**, an object **2017** representing an external device, a setup object **2018**, and a favorite channel object **2019** for indicating favorite channels.

The broadcast image **2015** is displayed as a card object. Since the broadcast image **2015** may be fixed in size by a lock function, the user may continue viewing the broadcast image **2015** conveniently.

It is also possible to scale the broadcast image **2015** according to user manipulation. For instance, the broadcast image **2015** may be enlarged or contracted by dragging the broadcast image **2015** with the pointer **205** of the remote controller **200**. As the broadcast image **2015** is scaled up or down, four or two card objects may be displayed on the display **180**, instead of the current three card objects.

When the broadcast image **2015** is selected in the card object **2010**, the broadcast image **2015** may be fullscreened on the display **180**.

The object **2021** representing information about the broadcast image **2015** may include a channel number (DTV7-1), a channel name (YBC HD), the title of a broadcast program (Oh! Lady), and airing time (8:00-8:50 PM) of the broadcast program. Therefore, the user can readily be aware of information about the displayed broadcast image **2015**.

If the user selects the object **2021**, related EPG information may be displayed on the display **180**.

An object **2002** for notifying a date (03.24), a day (THU), and a current time (8:13 PM) may be positioned above the card object **2010** that displays a broadcast image. Thus the user can readily identify time information through the object **2002**.

The object **2017** may represent an external device connected to the image display apparatus **100**. For example, if the object **2017** is selected, a list of external devices connected to the image display apparatus **100** may be displayed.

The setup object **2018** may be used to set various settings of the image display apparatus **100**, such as video settings, audio settings, screen settings, program scheduling settings, setting of the pointer **205** of the remote controller **200**, and network settings.

The favorite channel object **2019** may be used to list favorite channels. For example, upon selection of the favorite channel object **2019**, the FAVORITE CH card object **2060** may be displayed.

The card object **2020** representing a CP list may contain a card object name **2022** (NETCAST PREMIUM) and a CP list **2025**. While Yakoo, Metflix, weather.com, Picason, and My tube are shown as CPs in the CP list **2025** in FIG. **20**, it is obvious that many other options are possible.

Upon selection of the card object name **2022**, the card object **2020** may be displayed fullscreen on the display **180**.

If a specific CP is selected from the CP list **2025**, a screen with a list of content provided by the selected CP may be displayed on the display **180**.

The card object **2030** representing an application list may include a card object name **2032** (NETCAST APPS) and an application list **2035**. Applications may be sorted into predetermined categories in the application list **2035**. In the illustrated case of FIG. **20**, applications are sorted by popularity (HOT) and by time (NEW), which should not be interpreted as limiting the present invention.

Upon selection of the card object name **2032**, the card object **2030** may be displayed fullscreen on the display **180**.

Upon selection of an application from the application list **2035**, a screen that provides information about the selected application may be displayed on the display **180**.

A Login menu item **2027**, a Help menu item **2028**, and an EXIT menu item **2029** may be displayed above the card objects **2020** and **2030**.

The user may log in to an app store or a network connected to the image display apparatus using the Login menu item **2027**. The Help menu item **2028** provides guidance on operation of the image display apparatus **100**. The EXIT menu item **2029** is used to exit the home screen. When the EXIT menu item **2029** is selected, a received broadcast image may be fullscreened on the display **180**.

An object **2037** may be displayed under the card objects **2020** and **2030** to indicate the total number of available card objects. Alternatively or additionally, the object **2037** may indicate the number of card objects being displayed on the display **180** as well.

The card object **2040** representing a thumbnail list of broadcast channels may include a card object name **2042** (CHANNEL BROWSER) and a thumbnail list of broadcast channels **2045**. Sequentially received broadcast channels are represented as thumbnail images in FIG. **20**, to which the present invention is not limited. Instead, the received broadcast channels may be represented as moving pictures. The thumbnail list **2045** may include information about the channels along with the thumbnail images of the channels, so that the user can readily identify broadcast programs of the channels. The thumbnail images may include a thumbnail image of a broadcast image that the user is viewing or thumbnail

images of channels following or previous to the channel of the broadcast image **2015** displayed in the card object **2010**. Although eight thumbnail images are displayed in FIG. **20**, many other configurations are possible. Thumbnail images may be updated in the thumbnail list **2045**.

Upon selection of the card object name **2042**, the card object **2040** may be fullscreened on the display **180**. That is, information about the thumbnail list **2045** may be displayed on the display **180**.

Upon selection of a thumbnail image from the thumbnail list **2045**, a broadcast image corresponding to the channel of the selected thumbnail image may be displayed on the display **180**.

The card object **2050** for providing a program list may contain a card object name **2052** (TV GUIDE) and a program list **2055**. The program list **2055** may list broadcast programs that air after the broadcast program of the broadcast image **2015** or broadcast programs of other channels, to which the present invention is not limited.

Upon selection of the card object name **2052**, the card object **2050** may be fullscreened on the display **180**.

If a program is selected from the program list **2055**, a broadcast image of the selected program or broadcast information about the selected program may be displayed on the display **180**.

The card object **2060** representing favorite channels may include a card object name **2062** (FAVORITE CH) and a list of pre-stored favorite channels **2065**. While favorite channels are represented as thumbnail images, to which the present invention is not limited, they may be represented as moving pictures. The favorite channel list **2065** may include information about the favorite channels as well as the thumbnail images of the favorite channels. Hence, the user can readily identify programs that air on the favorite channels. While the FAVORITE CH card object **2060** contains eight favorite channels in FIG. **20**, many other configurations are possible. The thumbnail images may be updated in the FAVORITE CH card object **2060**.

Upon selection of the card object name **2062**, the card object **2060** may be displayed fullscreen on the display **180**. Thus, information about the favorite channel list **2065** may be displayed.

Upon selection of a thumbnail image in the favorite channel card list **2065**, a broadcast image of a channel corresponding to the thumbnail image may be displayed on the display **180**.

The card object **2070** representing a recorded list may include a card object name (RECORDED LIST) **2072** and a scheduled or recorded program list **2075**. The scheduled or recorded program list **2075** may include programs scheduled for recording or programs recorded by scheduling. Although a thumbnail image is displayed for each program, this is merely an exemplary application and thus various examples can be considered.

Upon selection of the card object name **2072**, the card object **2070** may be fullscreened on the display **180**.

Upon selection of a scheduled program or a recorded program from the scheduled or recorded program list **2075**, broadcast information about the scheduled or recorded broadcast program or broadcast images of the scheduled or recorded broadcast program may be displayed on the display **180**.

The card objects **2020** and **2030** displayed on the display **180** may be exchanged with the hidden card objects **2040** to **2070** according to a card object move input. Specifically, at least one of the card objects **2020** and **2030** being displayed on the display **180** may move to the hidden area **2001** and in turn, at least one of the hidden objects **2040** to **2070** may appear on the display **180**.

An application menu **2005** includes a plurality of application menu items, particularly predetermined menu items **2006** to **2009** selected from among all available application menu items on the display **180**. Thus the application menu **2005** may be referred to as an application compact-view menu.

The application menu items **2006** to **2009** may be divided into mandatory application menu items **2006**, **2007** and **2009** (SEARCH, App Store, and +) and optional application menu items **2008** (Music, Book, MAZON, and SNS) set by the user.

The mandatory application menu items **2006**, **2007** and **2009** may be preset as default menu items such that the user is not allowed to edit the same.

The SEARCH application menu item **2006** provides a search function based on an input search keyword. The App Store application menu item **2007** enables the user to access an app store directly. The + (View More) application menu item **2009** may provide a fullscreen function for displaying application menu items fullscreen.

The user-set application menu items **2008** may be edited to represent applications that the user most frequently uses.

In an embodiment of the present invention, an Internet application menu item (not shown) and a mail application menu item (not shown) may be added to the application menu **2005**.

For example, upon selection of the Internet application menu item, a Web page may be displayed fullscreen on the display **180**, as illustrated in FIG. **17**. Upon selection of the mail application menu item from the application menu **2005**, a mail service page may be displayed on the display **180**, as illustrated in FIG. **18**.

The Internet application menu item and the mail application menu item may be fixed items and, accordingly, the user may not delete, rearrange, change or otherwise edit these items. On the other hand, the Internet application menu item and the mail application menu item may be added as user-set application items **2008** so that the user may delete, rearrange, change or otherwise edit these items.

FIGS. **21**A, **21**B, **21**C and **21**D illustrate an exemplary operation for displaying a channel list.

Referring to FIG. **21**A, while the home screen **2000** including the card objects **2010**, **2020** and **2030** and the application menu **2005** is displayed, the favorite channel object **2019** is selected from the BROADCAST card object **2010** using a remote controller **2100**. Thus the user input interface **150** receives a favorite channel object selection input and provides the favorite channel object selection input to the controller **170**. The favorite channel object **2019** is used to display a favorite channel list.

Referring to FIG. **21**B, upon selection of the favorite channel object **2019**, a favorite channel list **2110** is displayed. As illustrated in FIG. **21**B, the favorite channel list **2110** may be displayed in the BROADCAST card object **2010**. Specifically, the favorite channel list **2010** may be located within the broadcast image **2015**. While the favorite channel list **2110** is shown as overlaid on the broadcast image **2015** in FIG. **21**B, the favorite channel list **2110** and the broadcast image **2015** may be displayed in separate areas.

The favorite channel list **2110** lists favorite channels pre-stored in the memory **140**. In the favorite channel list **2110**, each channel item representing a favorite channel includes a channel name such as YBC, LBC or ZBC and a channel number such as 7-1, 8-1, or 9-1. While the channel items take the form of text in FIG. **21**B, they may be represented as

thumbnail images. In this case, channel numbers may be overlaid on the thumbnail images.

While five channel items are contained in the favorite channel list **2110** in FIG. **21**B, the number of channel items may be changed. For example, if the favorite channel list **2110** is confined to five channel items but six favorite channels are pre-stored, the favorite channel list **2110** may further include an object **2120** for displaying more channel items additionally as illustrated in FIG. **21**C.

A channel item corresponding to a channel that the user is currently watching may be included in the favorite channel list **2110**. In FIGS. **21**B and **21**C, a channel item indicating channel 7-1 corresponding to the broadcast image **2015** is listed in the favorite channel list **2110**. The channel item indicating channel 7-1 that the user is watching may be indicated by a cursor **2105** or highlighted. As illustrated in FIGS. **21**B and **21**C, the channel item indicating channel 7-1 may be positioned at the top of the favorite channel list **2110**. Thus, the user can easily identify the channel that he or she is watching.

Referring to FIG. **21**D, upon selection of the favorite channel object **2019**, an image **2087** and a favorite channel list **2092** may be displayed together on the same screen. Here, the image **2087** may correspond to a broadcast image **2015** within the BROADCAST card object **2010** and may be displayed fullscreen on the display **180**.

The favorite channel list **2092** may be divided in a plurality of the groups A through D. For example, each group favorite channel list may correspond to the favorite channel list of each user.

Also, the favorite channel list **2092** may include menu item, EDIT for editing channels, SAVE for saving channels, List for viewing the favorite channel list, EXIT for exiting the favorite channel list **2092**.

FIGS. **22**A, **22**B and **22**C illustrate an exemplary operation for selecting a channel item in the favorite channel list.

Referring to FIG. **22**A, with the favorite channel list **2110** displayed on the home screen **200** having the card objects **2010**, **2020** and **2030** and the application menu **2005**, the cursor **2105** is moved through manipulation of the remote controller **2100**. For example, upon input of a down directional key of the remote controller, the cursor **2105** moves from the channel item for channel 7-1 to a channel item for channel 9-1.

Then the channel item for channel 9-1 is selected by an OK key of the remote controller **2100**. Therefore, the channel of the broadcast image displayed in the BROADCAST card object **2010** is switched to another channel as illustrated in FIG. **22**B. That is, a broadcast image **2210** of a program airing on the selected channel, channel 9-1 is displayed in the BROADCAST card object **2010**. In this manner, the user can easily watch a program on a favorite channel.

Unlike FIG. **22**B, the broadcast image **2210** of channel 9-1 may be displayed fullscreen. FIG. **23** illustrates exemplary fullscreen display of a broadcast image **2310** corresponding to the selected channel, channel 9-1 on the display **180**.

Referring to FIG. **22**B, the cursor **2105** may be positioned on the channel item indicating channel 9-1 so as to indicate the current channel. Meanwhile, each time the cursor **2105** is moved in response to a move input from the remote controller **2100**, a broadcast image corresponding to a channel indicated by the cursor **2105** may be displayed in the BROADCAST card object **2010**.

If the selected channel item is not at the top of the favorite channel list **2110**, channel items may be re-sorted in the favorite channel list **2110** in order to display additional channels.

For example, the selected channel item indicating channel 9-1 may be moved to the top in the favorite channel list **2110** and thus new channel items indicating channels 15-1 and 16-1 may be added to the favorite channel list **2110**. Therefore, the user can check more favorite channels.

FIGS. **22**D and **22**E illustrate an exemplary operation for ending displaying of the favorite channel list.

For example, if no input has been received from a local key or the remote controller for a predetermined time after the broadcast image **2210** and the favorite channel list **2110** are displayed upon selection of the channel item indicating channel 9-1 as illustrated in FIG. **22**B, the favorite channel list **2110** may not be displayed any longer within the broadcast image **2210**.

Referring to FIG. **22**D, if no input has been received for a predetermined time, the favorite channel list **2110** disappears and thus only the broadcast image **2210** is displayed on the home screen **2000**. At the same time, the cursor **2105** positioned on the favorite channel list **2110** may be moved onto the broadcast image **2210**. Therefore, the user can watch the broadcast image **2210** without being bothered.

In the mean time, upon input of an OK key of the remote controller **2100** while the broadcast image **2210** and the favorite channel list **2110** are displayed upon selection of the channel item indicating channel 9-1 as illustrated in FIG. **22**B, the favorite channel list **2110** may disappear and thus only the broadcast image **2210** may be displayed on the home screen **2000** as illustrated in FIG. **22**D.

Upon receipt of consecutive move inputs from the remote controller **2100** while the broadcast image **2210** and the favorite channel list **2110** are displayed upon selection of the channel item indicating channel 9-1 as illustrated in FIG. **22**B, the favorite channel list **2110** may disappear.

Referring to FIG. **22**E, upon receipt of a down directional key input a predetermined number of times or more times successively from the remote controller **2100** while the cursor **2105** is positioned on the channel item indicating channel 7-1 in the favorite channel list **2110**, the favorite channel list **2110** disappears and the cursor **2105** is moved onto the favorite channel object **2019**. Thus the user can easily view the broadcast image **2210** without being bothered.

While a channel item is selected by moving the cursor **2105** through input of a directional key, an OK key, etc. of the remote controller **2100** in FIGS. **21**A to **22**E, this is purely exemplary and many other configurations are possible. For example, a pointer may be displayed on the display **180** in correspondence with movement of the remote controller. Now a description will be given of a method for displaying a favorite channel list using a pointer with reference to FIGS. **24**A, **24**B and **24**C.

Referring to FIG. **24**A, the favorite channel object **2019** is selected by pointing at the favorite channel object **2019** with the pointer **205** in correspondence with movement of the remote controller **200** on the home screen **2000**. To select the favorite channel object **2019**, the OK key of the remote controller **200** may be used.

Hence, the favorite channel list **2110** is displayed on the home screen **2000** as illustrated in FIG. **24**B. The channel item indicating channel 7-1 that the user is watching may be highlighted, as indicated by reference numeral **2410**.

Referring to FIG. **24**C, as the pointer **205** is positioned on the channel item indicating channel 9-1 in correspondence with movement of the remote controller **200**, with the favorite channel list **2110** displayed on the home screen **2000**, channel 9-1 is selected. To select channel 9-1, the OK key of the remote controller **200** may be used.

Since channel 7-1 is switched to another channel, channel 9-1, the broadcast image **2015** of channel 7-1 is replaced with a broadcast image **2420** of the selected channel, channel 9-1. Herein, the channel item indicating the selected channel, channel 9-1 may be highlighted as indicated by reference numeral **2415**.

FIG. **25** is a flowchart illustrating a method for operating an image display apparatus according to another embodiment of the present invention and FIGS. **26**A to **33**B are views referred to for describing various examples of the method for operating an image display apparatus, illustrated in FIG. **25**.

Referring to FIG. **25**, it is determined whether a go-to-home input has been received (S**2510**). Upon receipt of a go-to-home input, a home screen including a card object area and an application menu area is displayed (S**2515**) and a favorite channel object is displayed on the home screen (S**2520**).

Specifically, the controller **170** determines whether a go-to-home input has been received, through input of a local key (not shown) or manipulation of the remote controller **200**. The go-to-home input may be generated when the image display apparatus is powered on or wakes from standby mode, or when a local key (not shown) or a home key or menu key of the remote controller **200** is manipulated.

Upon receipt of the go-to-home input, the controller **170** may control display of a home screen including a plurality of card objects and an application menu on the display **180**

On the home screen, the card object area may include a plurality of card objects classified according to content sources. For example, the card objects may be a card object for displaying a broadcast image, a card object for providing a CP list, and a card object for providing a list of applications.

On the home screen, the application menu area includes a plurality of application menu items, particularly mandatory application menu items and optional application menu items set by the user. The application menu is an application compact-view menu, which may include a view more menu item for a fullscreen-view function.

A favorite channel object for indicating favorite channels may be displayed on the home screen. Especially, the favorite channel object may be included in the card object that displays a broadcast image among the plurality of card objects.

As stated before, the display **180** may display the home screen when the image display apparatus is powered on or a home key is input. The configuration of the home screen allows the user to easily select a desired service, thus increasing user convenience.

It is then determined whether the favorite channel object has been selected (S**2525**). Upon selection of the favorite channel object, a FAVORITE CH card object is displayed on the home screen (S**2530**).

Specifically, the controller **170** determines whether the favorite channel object has been selected through input of a local key (not shown) or manipulation of the remote controller **200**, with the home screen displayed on the display **180**. Upon selection of the favorite channel object, the controller **170** may control display of the FAVORITE CH card object. For example, upon selection of the favorite channel object, a FAVORITE CH card object hidden from the display **180** in a hidden area may show up on the display **180**. This operation will be described later with reference to FIGS. **26**A, **26**B and **26**C.

As described before, the card object generator **345** may generate the FAVORITE CH card object using a list of favorite channels pre-stored in the memory **140**. A channel that the user is watching may be included in the FAVORITE CH card object.

Then the displayed favorite channel object is toggled to a channel browser object (S**2535**).

Because upon selection of the favorite channel object, the FAVORITE CH card object is displayed on the home screen of the display **180**, there is no need for further displaying the favorite channel object in the card object that provides a broadcast image.

Therefore, the channel browser object may be provided to facilitate access to a thumbnail list through a channel browser, as the favorite channel object facilitates access to a favorite channel list. That is, when the favorite channel object is selected once, the favorite channel object is toggled to the channel browser object. Similarly, when the channel browser object is selected, the channel browser object is toggled to the favorite channel object. Therefore, user convenience is increased.

With the channel browser object displayed on the home screen, it is determined whether the channel browser object has been selected (S**2540**). Upon selection of the channel browser object, a CHANNEL BROWSER card object is displayed (S**2545**).

Specifically, with the home screen displayed on the display **180**, the controller **170** determines whether the channel browser object has been selected on the home screen through input of a local key (not shown) or manipulation of the remote controller **200**. Upon selection of the channel browser object, the controller **170** controls display of the CHANNEL BROWSER card object. For example, the CHANNEL BROWSER card object is hidden in the hidden area and upon selection of the channel browser object, the CHANNEL BROWSER card object appears on the display **180**. This operation will be described later with reference to FIGS. **27**A to **27**D.

As described before, if the image display apparatus **100** is a set-top box without the display **180**, the operation method illustrated in FIG. **19** may amount to output of data for displaying an image or a screen on the display **180**.

For example, the controller **170** determines whether a go-to-home input has been received in step S**2510**. Upon receipt of the go-to-home input, the controller **170** may output data needed to display a home screen including a card object area and an application menu area. The display **180**, which is separately configured, may display the home screen using the data.

In the same manner, steps S**2520**, S**2530**, S**2535** and S**2545** may be performed as the process of outputting data for displaying an image or a screen on the display **180**.

FIG. **26**A illustrates an exemplary home screen displayed on the display **180**. The home screen illustrated in FIG. **26**A is identical to the home screen illustrated in FIG. **20** and thus a description of the home screen is not provided herein.

FIGS. **26**A, **26**B and **26**C illustrate an exemplary operation for displaying the FAVORITE CH card object.

Referring to FIG. **26**A, with the home screen **2000** having the card objects **2010**, **2020** and **2030** and the application menu **2005** displayed on the display **180**, the cursor **2105** is moved to the favorite channel object **2019** on the home screen **2000** through manipulation of the remote controller **2100**. Upon selection of the favorite channel object **2019** through input of the OK key of the remote controller **2100**, the FAVORITE CH card object **2060** is moved from the hidden area **2001**.

Referring to FIG. **26**B, the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** are moved from the hidden area. Specifically, the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** initially appear at the right side of the display **180** and finally

reach in the vicinity of the BROADCAST card object **2010**. Thus the user can easily notice the movement of the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070**.

Therefore, the BROADCAST card object **2010**, the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** are arranged side by side on the home screen **2000** as illustrated in FIG. **26**C. Therefore, the user can easily view the contents of the FAVORITE CH card object **2060**.

As described above, the FAVORITE CH card object **2060** may include a list of thumbnail images for broadcast images of pre-stored favorite channels. The thumbnail images may contain channel information such as channel numbers.

A thumbnail image of channel 7-1 may be displayed in the FAVORITE CH card object **2060**, in relation to the broadcast image **2015** of channel 7-1 displayed in the BROADCAST card object **2010**. The thumbnail image of channel 7-1 that the user is watching may be indicated by the cursor **2105** or highlighted. As illustrated in FIG. **26**C, the thumbnail image of channel 7-1 may be positioned at the top of the favorite channel list **2065**. Thus the user can readily identify the channel that he or she is watching.

While eight thumbnail images representing channels are listed in the favorite channel list **2065** in FIG. **26**C, this is purely exemplary. Thus various numbers of thumbnail images can be set. For example, if the favorite channel list **2065** is confined to eight thumbnail images for channels but nine or more favorite channels are pre-stored, the favorite channel list **2065** may further include an object (not shown) for displaying more thumbnail images additionally.

Upon selection of a specific thumbnail image in the favorite channel list **2065**, a broadcast image of a channel corresponding to the selected thumbnail image may be displayed in the BROADCAST card object **2010** or may be fullscreened on the display **180**. In this manner, the user can conveniently view a program airing on a favorite channel.

While it is shown in FIGS. **26**A and **26**B that the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** reside in the hidden area **2001** and appear on the display **180** according to a card object move input, alternatively, the card object generator **345** may generate the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** upon receipt of the card object move input and then display the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** on the display **180**. The FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** may be generated in real time or stored in advance.

FIGS. **27**A to **27**D illustrate an exemplary operation for toggling between the favorite channel object **2019** and the channel browser object **2019** in the BROADCAST card object **2010**.

Upon selection of the favorite channel object **2019** in the BROADCAST card object **2010** in **27**A, the favorite channel object **2019** is toggled to the channel browser object **2019** in FIG. **27**B. In this manner, various objects can simply be represented.

In addition, the NETCAST PREMIUM card object **2020** and the NETCAST APPS card object **2030** are replaced with the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** on the home screen **2000**. Accordingly, the user can easily view the favorite channel list **2065** in the FAVORITE CH card object **2060**.

Upon selection of the displayed channel browser object **2019** using the cursor **2105** of the remote controller **2100** in FIG. **27**B, the channel browser object **2019** is toggled to the favorite channel object **2019** in FIG. **27**C.

In addition, the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** are replaced with the CHANNEL BROWSER card object **2040** and the TV GUIDE card object **2050** on the home screen **2000**. Accordingly, the user can easily view the thumbnail list **2045** in the CHANNEL BROWSER card object **2040** irrespective of favorite channels.

Alternatively or additionally, the FAVORITE CH card object **2060** may be toggled to the CHANNEL BROWSER card object **2040**, rather than the CHANNEL BROWSER card object **2040** & the TV GUIDE card object **2050** are moved, substituting for the FAVORITE CH card object **2060** & the RECORDED LIST card object **2070**.

Referring to FIG. **27**D, upon selection of the channel browser object **2019** using the cursor **2105** of the remote controller **2100** in FIG. **27**B, the channel browser object **2019** is toggled to the favorite channel object **2019** and the FAVORITE CH card object **2060** is also toggled to the CHANNEL BROWSER card object **2040**. As a consequence, the TV GUIDE card object **2050** is positioned beside the CHANNEL BROWSER card object **2040**, compared to FIG. **27**C in which the RECOMMENDED LIST card object **2070** is positioned beside the CHANNEL BROWSER card object **2040**.

FIGS. **28**A, **28**B and **28**C illustrate an exemplary operation for moving card objects using a pointer that moves in correspondence with movement of the remote controller.

Referring to FIG. **28**A, while the BROADCAST card object **2010**, the NETCAST PREMIUM card object **2020**, and the NETCAST APPS card object **2030** are displayed on the home screen **2000**, a card object, particularly the NETCAST PREMIUM card object **2020** is flicked to the left by the pointer **205** of the remote controller **200**, by way of example.

Referring to FIG. **28**B, the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** are moved.

Therefore, the BROADCAST card object **2010**, the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** are displayed side by side on the home screen **2000**, as illustrated in FIG. **28**C. Accordingly, the user can readily identify the contents of the FAVORITE CH card object **2060**. Herein, the pointer **205** of the remote controller **200** may automatically point at the thumbnail image of channel 7-1 that the user is watching.

While card objects are moved in twos by moving another card object in FIG. **28**B, they may be moved one by one. The number of moved card objects may depend on the strength and/or speed with which another card object is flicked.

FIGS. **29**A and **29**B illustrate an exemplary operation for moving card objects through input of a directional key of the remote controller, similarly to FIGS. **28**A, **28**B and **28**C.

To move a card object through input of a directional key of the remote controller, a home screen may be configured so that a left movement object and a right movement object are further displayed at the left side of the NETCAST PREMIUM card object **2020** and at the right side of the NETCAST APPS card object **2030**, respectively.

Referring to FIG. **29**A, with the BROADCAST card object **2010**, the NETCAST PREMIUM card object **2020** and the NETCAST APPS card object **2030** displayed on the home screen **2000**, the left movement object may be selected by means of a left directional key or an OK key of the remote controller **2100**. Herein, the left movement object is selected using the cursor **2105** of the remote controller **2100**, by way of example.

Referring to FIG. **29**B, the FAVORITE CH card object **2060**, and the RECORDED LIST card object **2070** are moved.

Therefore, the BROADCAST card object **2010**, the FAVORITE CH card object **2060**, and the RECORDED LIST card object **2070** are displayed side by side on the home screen **2000**, as illustrated in FIG. **29**C. Accordingly, the user can readily identify the contents of the FAVORITE CH card object **2060**. Herein, the cursor **2105** of the remote controller **2100** may automatically be positioned on the thumbnail image of channel 7-1 that the user is watching.

While card objects are moved in twos in FIG. **29**B, they may be moved one by one. The number of moved card objects may depend on the number of times the left movement object is selected.

FIGS. **30**A and **30**B illustrate exemplary addition of a card object.

Referring to FIG. **30**A, the hidden area **2001** further includes a card object **2080** for providing a media list available in the image display apparatus or in an external device connected to the image display apparatus, at the right side of the RECORDED LIST card object **2070**, compared to FIG. **26**A.

The card object **2080** representing a media list may include a card object name **2082** (MY MEDIA) and a media list **2085**. The media list **2085** may a list of media available in the image display apparatus **100** or a device connected to the image display apparatus **100**. While the media are shown as moving pictures, still images, and audio in FIG. **30**A, many other media such as text, e-books, etc. may be added to the media list.

Upon selection of the card object name **2082**, the card object **2080** may be fullscreened on the display **180**.

Upon selection of a file from the media list **2085**, the selected file may be opened and a screen corresponding to the selected file may be displayed on the display **180**.

Meanwhile, upon selection of the favorite channel object **2019** using the remote controller **2100**, the FAVORITE CH card object **2060** hidden in the hidden area **2001** appears on the display **180**, as illustrated in FIG. **30**B. While not shown, the favorite channel object **2019** may be toggled to the channel browser object **2019**.

FIGS. **31**A and **31**B illustrate an exemplary new card object **2090** in which the FAVORITE CH card object and the CHANNEL BROWSER card object are integrated.

The FAVORITE CH/CHANNEL BROWSER card object **2090** disposed in the hidden area **2001** may include both thumbnail images corresponding to favorite channels of a favorite channel list and thumbnail images corresponding to received channels. The thumbnail images of the favorite channels may contain information indicating favorite channels as well as channel information so that the user can identify the favorite channels.

Upon selection of the favorite channel object **2019** using the remote controller **2100**, the FAVORITE CH/CHANNEL BROWSER card object **2090** hidden in the hidden area **2001** is displayed on the home screen **2000**, as illustrated in FIG. **31**B. While not shown, the favorite channel object **2019** may be toggled to the channel browser object **2019**.

FIGS. **32**A to **33**B illustrate examples of displaying the FAVORITE CH card object, while a specific image is displayed fullscreen on the display **180**.

Referring to FIG. **32**A, an image **3210** is displayed fullscreen on the display **180**. Upon input of a local key (not shown) or a favorite channel key (not shown) of the remote controller, the FAVORITE CH card object **2060** may be displayed on the display **180** as illustrated in FIG. **32**B. The FAVORITE CH card object **2060** may be displayed together with the image **3210** on the same screen. Therefore, the user can instantly be aware of the FAVORITE CH card object **2060** including the favorite channel list **2065**.

Referring to FIG. **33**A, an image **3310** is displayed fullscreen on the display **180**. Upon input of a local key (not shown) or a favorite channel key (not shown) of the remote controller, the home screen **2000** may be displayed as illustrated in FIG. **33**B. The home screen **2000** may include the FAVORITE CH card object **2060**. Particularly, the FAVORITE CH card object **2060** may be highlighted. Therefore, the user can readily view the FAVORITE CH card object **2060** including the favorite channel list **2065**.

FIG. **34** is a flowchart illustrating a method for operating an image display apparatus according to a further embodiment of the present invention, and FIGS. **35**A to **39**B are views referred to for describing various examples of the method for operating an image display apparatus, illustrated in FIG. **34**.

Referring to FIG. **34**, steps S**3410** to S**3430** are identical to steps S**2510** to S**2530** illustrated in FIG. **25** and thus a description of steps S**3410** to S**3430** is not provided herein to avoid redundancy.

It is determined whether a thumbnail image has been selected from the FAVORITE CH card object (S**3435**). Upon selection of the thumbnail image from the FAVORITE CH card object, a broadcast image of a channel corresponding to the selected thumbnail image is displayed (S**3440**).

Specifically, with the FAVORITE CH card object displayed on the home screen, the controller **170** determines whether a thumbnail image has been selected from the FAVORITE CH card object through input of a local key (not shown) or manipulation of the remote controller **200**. Upon selection of a thumbnail image from the FAVORITE CH card object, the controller **170** controls reception of a channel corresponding to the selected thumbnail image and controls fullscreen display of a broadcast image of the channel or display of a broadcast image of the channel in the BROADCAST card object. This operation will be described later with reference to FIGS. **37**A, **37**B and **37**C.

Meanwhile, with the FAVORITE CH card object displayed on the home screen, it is determined whether the card object name has been selected in the FAVORITE CH card object (S**3445**). Upon selection of the card object name in the FAVORITE CH card object, a channel list screen is displayed (S**3450**).

Specifically, with the FAVORITE CH card object displayed on the home screen, the controller **170** determines whether the card object name has been selected in the FAVORITE CH card object through input of a local key (not shown) or manipulation of the remote controller. Upon selection of the card object name in the FAVORITE CH card object, the controller **170** controls display of a channel list screen including a recent channel list, etc. on the display **180**. This operation will be described later with reference to FIGS. **38**A to **38**D.

As described before, if the image display apparatus **100** is a set-top box without the display **180**, the operation method illustrated in FIG. **34** may amount to output of data for displaying an image or a screen on the display **180**.

For example, the controller **170** determines whether a go-to-home input has been received in step S**3410**. Upon receipt of the go-to-home input, the controller **170** may output data needed to display a home screen including a card object area and an application menu area. The display **180**, which is separately configured, may display the home screen using the data.

In the same manner, steps S**3415**, S**3420**, S**3430** and S**3440** may be performed as the process of outputting data for displaying an image or a screen on the display **180**.

FIG. **35**A illustrates an exemplary home screen displayed on the display **180**. This home screen is identical to the home screen illustrated in FIG. **20** and thus will not be described herein.

Referring to FIG. **35**A, the favorite channel object **2019** is selected using the cursor **2105** of the remote controller **2100**, while the BROADCAST card object **2010**, the NETCAST PREMIUM card object **2020**, and the NETCAST APPS card object **2030** are displayed on the home screen **2000**. Thus the FAVORITE CH card object **2060** moves out of the hidden area **2001**.

Referring to FIG. **35**B, the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** are moved according to the selection of the favorite channel object **2019**. As a consequence, the BROADCAST card object **2010**, the FAVORITE CH card object **2060**, and the RECORDED LIST card object **2070** are arranged side by side on the home screen **2000** as illustrated in FIG. **35**C. Therefore, the user can easily identify thumbnail images in the FAVORITE CH card object **2060**.

FIG. **36** is an enlarged view of the FAVORITE CH card object **2060** illustrated in FIG. **35**A. Referring to FIG. **36**, the FAVORITE CH card object **2060** representing thumbnail images may include the card object name (FAVORITE CH) **2062** and the list of pre-stored favorite channels **2065**.

The favorite channel list **2065** may include thumbnail images for favorite channels. While favorite channel items are represented as thumbnail images in the favorite channel list **2065** in FIG. **36**, they may be represented as moving pictures.

A thumbnail image of channel 7-1 may be displayed in the favorite channel list **2065** of the FAVORITE CH card object **2060**, in relation to the broadcast image **2015** of channel 7-1 displayed in the BROADCAST card object **2010**. The thumbnail image of channel 7-1 that the user is watching may be indicated by the cursor **2105** or highlighted. As illustrated in FIG. **36**, the thumbnail image of channel 7-1 may be positioned at the top of the favorite channel list **2065**. Thus the user can readily identify the channel that he or she is watching.

While eight thumbnail images representing channels are listed in the favorite channel list **2065** in FIG. **36**, this is purely exemplary. Thus a variable number of thumbnail images can be included in the favorite channel list **2065**. For example, if the favorite channel list **2065** is confined to eight thumbnail images for channels but nine or more favorite channels are pre-stored, the favorite channel list **2065** may further include an object (not shown) for displaying more thumbnail images additionally.

The thumbnail images may be updated in the favorite channel list **2065**. For example, if a predetermined number of or more thumbnail images are updated, the FAVORITE CH card object **2060** hidden in the hidden area as illustrated in FIG. **35**A may automatically move into the home screen **2000** even though a card object move input has not been received, as illustrated in FIG. **35**C.

The favorite channel list **2065** may provide channel information. Channel information about a favorite channel may include at least one of the channel number of the favorite channel, or the airing time, rating or viewed rank of a program airing on the favorite channel. While only channel numbers are shown as channel information in FIG. **36**, many other options are available.

The channel information may be overlaid on the thumbnail images as illustrated in FIG. **36**. Thus the user can readily identify channel information (DTV 7-1) about a thumbnail image **2115**.

Upon selection of the card object name **2062**, a channel list screen may be displayed in full screen on the display **180**, which will be described later with reference to FIGS. **38**A to **38**D.

Upon selection of a thumbnail image in the favorite channel list **2065**, a broadcast image of a channel corresponding to the selected thumbnail image may be displayed on the display **180**. Display of a broadcast image of a channel corresponding to the selected thumbnail image will be described with reference to FIGS. **37**A, **37**B and **37**C.

FIGS. **37**A, **37**B and **37**C illustrate exemplary selection of a thumbnail image in the FAVORITE CH card object **2060**.

Referring to FIG. **37**A, with the BROADCAST card object **2010**, the FAVORITE CH card object **2060**, and the RECORDED LIST card object **2070** displayed on the home screen **2000**, a thumbnail image of a specific channel, channel DTV 9-1 is selected from the favorite channel list **2065** using the cursor **2105** of the remote controller **2100**. Meanwhile, the broadcast image **2015** of a channel that the user is watching, channel DTV 7-1 is displayed in the BROADCAST card object **2010**.

Referring to FIG. **37**B, upon selection of the thumbnail image of channel DTV 9-1 in the favorite channel list **2065** in FIG. **37**A, a broadcast image **2105** of channel DTV 9-1 is displayed in the BROADCAST card object **2010**. In this manner, the user can easily watch a program airing on a favorite channel.

Referring to FIG. **37**C, alternatively or additionally, upon selection of the thumbnail image of channel DTV 9-1 in the favorite channel list **2065**, the broadcast image **2015** of channel DTV 9-1 may be displayed as a fullscreen image **2210** on the display **180**. In this manner, the user can easily watch a program airing on a favorite channel.

FIGS. **38**A to **38**D illustrate an exemplary operation for selecting the card object name in the FAVORITE CH card object **2060**.

Referring to FIG. **38**A, while the BROADCAST card object **2010**, the FAVORITE CH card object **2060** and the RECORDED LIST card object **2070** are displayed on the home screen **2000**, the card object name **2062** is selected from the FAVORITE CH card object **2060** using the cursor **2105** of the remote controller **2100**.

Referring to FIG. **38**B, upon selection of the card object name **2062** in FIG. **38**A, a channel list screen including a favorite channel list is displayed fullscreen.

The channel list screen may include at least one of a favorite channel list, an all channel list or a recent channel list.

In FIG. **38**B, a menu area **2320** includes tabbed menus including ALL CHANNEL (an all channel list), FAVORITE CHANNEL (a favorite channel list) and RECENT CHANNEL (a recent channel list).

Since the channel list screen is displayed upon selection of the card object name **2062** in the FAVORITE CH card object **2060**, the FAVORITE CHANNEL tabbed menu may be selected by default. The selected FAVORITE CHANNEL tabbed menu may be focused on or highlighted, as illustrated in FIG. **38**B.

Accordingly, the favorite channel list is displayed in a channel list area **2310**. Thumbnail images are shown for eight channels in FIG. **38**B. The thumbnail images may be sequentially updated. Thus the user may readily identify up-to-date information about favorite channels.

The number of thumbnail images in the FAVORITE CH card object **2060** may be different from the number of thumbnail images on the channel list screen. Since the channel list screen is displayed in full screen, it preferably contains more thumbnail images than the FAVORITE CH card object **2060**.

While 15 thumbnail images are shown by default in FIG. **38**B, many other options are available.

The channel list screen may further include a channel setup menu **2330**. For example, the channel setup menu **2330** may include menu items, EDIT for editing channels, ZOOM for changing the number of displayed thumbnail images, GROUP VIEW for viewing thumbnail images by group, COMPACT VIEW for displaying a broadcast image in a part and a channel list in another part, and EXIT.

FIG. **38**C illustrates an exemplary operation for selecting the ALL CHANNEL tabbed menu in the menu area **2320** to display the all channel list.

Referring to FIG. **38**C, the selected ALL CHANNEL tabbed menu may be focused on or highlighted. All available channels are listed in the channel list area **2310**. In FIG. **38**C, 15 thumbnail images are displayed. The channels may be received through the afore-described channel browser function. The thumbnail images for these channels may be sequentially updated. Thus the user can instantly identify information about all channels.

FIG. **38**D illustrates an exemplary operation for selecting the RECENT CHANNEL tabbed menu in the menu area **2320** to display the recent channel list.

Referring to FIG. **38**D, the selected RECENT CHANNEL tabbed menu may be focused on or highlighted. Recently viewed channels are listed in the channel list area **2310**. In FIG. **38**D, two thumbnail images are displayed, with the remaining space capable of accommodating 13 thumbnail images left empty. Thus the user can instantly identify information about the recent channels.

FIGS. **39**A to **39**B illustrate an exemplary operation for selecting a favorite channel object in BROADCAST card object **2010**.

Referring to FIG. **39**A, while the home screen **2000** including the card objects **2010**, **2020** and **2030** and the application menu **2005** is displayed, the favorite channel object **2019** is selected from the BROADCAST card object **2010** using a remote controller **2100**. The favorite channel object **2019** is used to display a favorite channel list.

Referring to FIG. **39**B, upon selection of the favorite channel object **2019**, a favorite channel list screen including a favorite channel list is displayed fullscreen.

The favorite channel list screen may include a plurality of groups A through D.

In FIG. **39**B, a group area **3920** includes tabbed menus including the plurality of groups, for example, A group, B group, C group, and D group. Each group favorite channel list may correspond to the favorite channel list of each user.

Since the channel list screen is displayed upon selection of the favorite channel object **2019** in the BROADCAST card object **2010** by a B user, the B group tabbed menu may be selected by default. The selected B group tabbed menu may be focused on or highlighted, as illustrated in FIG. **39**B.

Accordingly, the favorite channel list of B group is displayed in a channel list area **3910**. Thumbnail images are shown for 15 channels in FIG. **39**B. The thumbnail images may be sequentially updated. Thus the user may readily identify up-to-date information about favorite channels.

The favorite channel list screen may further include a channel setup menu **3930**. For example, the channel setup menu **3930** may include menu items, EDIT for editing channels, ZOOM for changing the number of displayed thumbnail images, GROUP VIEW for viewing thumbnail images by group, COMPACT VIEW for displaying a broadcast image in a part and a channel list in another part, and EXIT.

As is apparent from the above description of the embodiments of the present invention, since a favorite channel list is displayed on a home screen, a user can easily identify favorite channels and thus user convenience is increased.

Upon selection of a favorite channel object on the home screen, this favorite channel list is displayed. Therefore, the user can easily access the favorite channel list.

As a broadcast image of a program airing on a channel is displayed by selecting a channel item indicating the channel in a displayed channel list, user convenience is further increased.

When a cursor moves on the channel list or a channel item is selected from the channel list, channel items are sorted differently in the channel list to thereby allow the user for search for a channel.

A favorite channel card object including thumbnail images for favorite channels is displayed on the home screen, which allows the user to easily identify favorite channels. Accordingly, user convenience is increased.

Since channel information and thumbnail images of channels are displayed together, the channel information can be readily identified.

Upon selection of a thumbnail image in the favorite channel card object, a broadcast image of a channel corresponding to the thumbnail image can be displayed fullscreen or displayed in a broadcast card object. Hence, the user can easily watch the broadcast image.

Upon selection of a card object name in the favorite channel card object, a channel list screen including a favorite channel list is displayed so that the user can easily identify favorite channels. Other channel lists such as an all channel list or a recent channel list can also be displayed, thereby increasing user convenience.

The image display apparatus provides a variety of UIs. Therefore, user convenience is further increased.

The image display apparatus and the method for operating the same according to the foregoing exemplary embodiments are not restricted to the embodiments set forth herein. Therefore, variations and combinations of the embodiments set forth herein may fall within the scope of the present invention.

The details of the thumbnail images and lists are disclosed in U.S. application Ser. No. 12/651,730 filed Jan. 4, 2010, whose entire disclosure is incorporated herein by reference.

The method for operating an image display apparatus according to the foregoing embodiments may be implemented as code that can be written on a computer-readable recording medium and thus read by a processor. The computer-readable recording medium may be any type of recording device in which data is stored in a computer-readable manner. Examples of the computer-readable recording medium include a ROM, a RAM, a CD-ROM, a magnetic tape, a floppy disc, an optical data storage, and a carrier wave (e.g., data transmission over the Internet). The computer-readable recording medium can be distributed over a plurality of computer systems connected to a network so that computer-readable code is written thereto and executed therefrom in a decentralized manner. Programs, code and code segments to realize the embodiments herein can easily be realized by one of ordinary skill in the art.

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

What is claimed is:

1. A method for operating an image display apparatus, the method comprising:

receiving a broadcast signal;

displaying, on a display, a broadcast image from the broadcast signal, and an application list including at least one of a plurality of applications;

in response to a first user input, displaying a favorite channel list including favorite channel items in a first area of the display, wherein each of the favorite channel items includes a channel name and a channel number;

receiving motion information from a remote controller;

determining a movement of the remote controller based on the motion information;

calculating coordinates of a pointer;

displaying the pointer representing the movement of the remote controller according to the calculated coordinates, wherein the pointer is displayed with the favorite channel list;

in response to focusing or selecting a first favorite channel item by the pointer, highlighting the first favorite channel item;

displaying a broadcast image of a channel corresponding to the first favorite channel item selected from the favorite channel list, upon selection of the first favorite channel item; and

in response to a second user input while displaying the favorite channel list, displaying, in the first area of the display, a content list including a plurality of contents, rather than the favorite channel list in the first area of the display,

wherein the displaying the favorite channel list includes displaying a first object for indicating a total number of content lists available for displaying in the first area and indicating position information concerning currently displayed content list among content lists in the first area.

2. The method according to claim 1,

wherein the image display apparatus includes a platform for controlling transmission or reception of data through a network according to a control signal received from a remote controller,

wherein the platform includes an Operating System (OS) kernel, an application layer that runs on the OS kernel, a middleware configured to mediate data transmission between different hardware or different software or to provide a standard interface, and a driver configured to drive a device to run applications of the application layer,

wherein the middleware includes a virtual machine configured to execute a plurality of instances, and wherein a binder driver of the OS kernel schedules the plurality of instances.

3. The method according to claim 1, further comprising re-sorting channel items in the favorite channel list, after the selection of the channel item, wherein the displayed favorite channel list corresponds to one of a plurality of favorite channel lists of a plurality of users.

4. The method according to claim 1, wherein the favorite channel item corresponding to the displayed broadcast image is positioned at a top of the favorite channel list, and

wherein the favorite channel list further includes an object for displaying more channel items additionally.

5. The method according to claim 1, further comprising re-sorting channel items in the favorite channel list, after the selection of the channel item.

6. The method according to claim 1, wherein the application list is displayed under the broadcast image,

wherein the application list includes a social network service (SNS) application item, and a book application item.

7. A method for operating an image display apparatus, the method comprising:

displaying, on a display, a broadcast image and an application list including at least one of a plurality of applications;

generating a favorite channel list including favorite channel items upon a first user input, wherein each of the favorite channel items includes a channel name and a channel number;

displaying, in a first area of the display, the favorite channel list;

receiving motion information from a remote controller;

determining a movement of the remote controller based on the motion information;

calculating coordinates of a pointer;

displaying the pointer representing the movement of the remote controller according to the calculated coordinates, wherein the pointer is displayed with the favorite channel list;

in response to focusing or selecting a first favorite channel item by the pointer, highlighting the first favorite channel item;

displaying, in the first area, a content list including a plurality of contents, instead of the favorite channel list in the first area, upon receiving a second user input while displaying the favorite channel list,

wherein the displaying the favorite channel list includes displaying a first object for indicating a total number of content lists available for displaying in the first area and indicating position information concerning currently displayed content list among content lists in the first area.

8. The method according to claim 7, further comprising:

displaying, on the display, a favorite channel object representing favorite channels,

wherein in response to a selection of the favorite channel object, generating and displaying the favorite channel list.

9. The method according to claim 7,

wherein the image display apparatus includes a platform for controlling transmission or reception of data through a network according to a control signal received from a remote controller,

wherein the platform includes an Operating System (OS) kernel, an application layer that runs on the OS kernel, a middleware configured to mediate data transmission between different hardware or different software or to provide a standard interface, and a driver configured to drive a device to run applications of the application layer,

wherein the middleware includes a virtual machine configured to execute a plurality of instances, and

wherein a binder driver of the OS kernel schedules the plurality of instances.

10. The method according to claim 7, wherein the favorite channel item corresponding to the displayed broadcast image is positioned at a top of the favorite channel list, and

wherein the favorite channel list includes an object for displaying more channel items additionally.

11. The method according to claim 7, wherein the application list is displayed under the broadcast image,

wherein the application list includes a social network service (SNS) application item, and a book application item.

12. An image display apparatus, comprising:

a tuner configured to receive a broadcast signal;

a memory configured to store a plurality of applications;

a display configured to display a broadcast image from the broadcast signal, and an application list including at least one of a plurality of applications;

a user input interface configured to receive a control signal from a remote controller; and

a controller configured to:

in response to a first user input, display a favorite channel list including favorite channel items in a first area of the display, wherein each of the favorite channel items includes a channel name and a channel number,

display a broadcast image of a channel corresponding to a favorite channel item selected in the favorite channel list, upon selection of one of the favorite channel items, and

in response to a second user input while displaying the favorite channel list, display a content list including a plurality of contents, instead of the favorite channel list in the first area of the display,

wherein during the displaying of the favorite channel list, the controller is configured to display a first object for indicating a total number of content lists available for displaying in the first area and indicating position information concerning currently displayed content list among content lists in the first area,

wherein the user input interface receives motion information from the remote controller,

wherein the controller determines a movement of the remote controller based on the motion information, and calculates coordinates of a pointer, and

wherein the display displays the pointer at the calculated coordinates with the favorite channel list,

wherein in response to focusing or selecting a first favorite channel item by the pointer, the controller highlights the first favorite channel item.

13. The image display apparatus according to claim **12**, wherein the memory including a platform configured to control data transmission or reception over the network according to the received control signal, wherein the platform includes an Operating System (OS) kernel, an application layer that runs on the OS kernel, a middleware configured to mediate data transmission between different hardware or different software or to provide a standard interface, and a driver configured to drive a device to run applications of the application layer,

wherein the middleware includes a virtual machine configured to execute a plurality of instances, and

wherein a binder driver of the OS kernel schedules the plurality of instances.

14. The image display apparatus according to claim **12**, wherein the favorite channel item corresponding to the displayed broadcast image is positioned at a top of the favorite channel list, and

wherein the favorite channel list further includes an object for displaying more channel items additionally.

15. The image display apparatus according to claim **12**, wherein a size of the broadcast image is larger than a size of the favorite channel list.

16. The image display apparatus according to claim **12**, wherein the application list is displayed under the broadcast image,

wherein the application list includes a social network service (SNS) application item, and a book application item.

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