

- 1 -

TRANSLATION

D E S C R I P T I O N

Broadcasting communication system

Technical Field

The present invention relates to a wide area broadcasting communication system which utilizes a wide area communication network such as a broad-band ISDN.

5 Background Art

A communication network has recently been digitized on an international level. In Japan, NTT has already put a digitized communication network to practical use and started services of INS NET 64 and INS NET 1500.

10 According to these services, a speech communication terminal, a facsimile communication terminal, a data communication terminal, and the like, which have been conventionally connected to their respective communication networks (speech communication network, facsimile

15 communication network, data communication network), have only to be connected to a single communication network. The idea of such a communication network is called an ISDN (Integrated Services Digital Network) and results from an international standardized work which has been

20 managed mainly by the CCITT (International Telegraphy and Telephone Consultative Committee). The ISDN is classified into an N-ISDN (Narrow-band ISDN) in which the upper limit of the capacity of the transmission line is 1.544 Mbps or 2.048 Mbps, and a B-ISDN (Broad-band

5 practical use and provides various types of service,
whereas a service using the B-ISDN is still in the
studying stage, and there are few specific examples
applicable to the B-ISDN.

10 The current motion image service is represented by
TV broadcasting. However, this service is provided
chiefly to the metropolitan area, and only some of the
programs provided to the metropolitan area can be
enjoyed in the local areas. Further, the TV programs
15 produced by a broadcasting station in a local area
cannot be enjoyed in the other areas. A large number of
people, who come from the country and work at companies
in the metropolitan area, can learn of the states of
their hometowns only on the local news provided by the
broadcasting stations in the metropolitan area. As
20 described above, the current TV broadcasting does not
necessarily provide the same programs throughout the
country and is therefore a service in favor of the
metropolitan area.

The present invention has been developed in
25 consideration of the above situation and its object is
to provide a broadcasting communication system which
allows multichannel videos to be uniformly received
anywhere throughout the country.

Disclosure of the Invention

30 To resolve the above problem, the broadcasting
communication system of the present invention comprises
a collection network for collecting broadcasting signals
transmitted from a plurality of broadcasting stations,
and a distribution network connected to the collection
35 network and having distribution nodes each for selecting
a broadcasting signal requested by a subscriber and
distributing the broadcasting signal to a subscriber

5 once, the collected signals are distributed to all the
distribution nodes through the distribution network, and
the broadcasting signal requested by the subscriber is
transmitted to the subscriber network. Therefore, the
10 subscribers connected to the distribution nodes can
uniformly receive all the broadcasting signals collected
by the collection network.

Brief Description of the Drawings

15 FIG. 1 is a block diagram of a broadcasting
communication system according to a first embodiment of
the present invention;

FIG. 2 is a block diagram of the broadcasting
communication system according to the first embodiment,
in which a collection network is formed like a ring or
a loop;

20 FIG. 3 is a block diagram showing an example of a
distribution node of a distribution network in the
broadcasting communication system according to the first
embodiment;

25 FIG. 4 is a block diagram showing an example of a
video package library of the distribution node shown in
FIG. 3;

FIG. 5 is a view showing an example of an informa-
tion transfer format in the broadcasting communication
system of the present invention;

30 FIGS. 6A and 6B are views showing examples of a
transfer format of cells in the broadcasting communica-
tion system of the present invention;

FIG. 7 is a block diagram showing an example of a
subscriber network shown in FIG. 3;

35 FIG. 8 is a view showing an example of the state of
use of a frequency band in the subscriber network;

FIG. 9 is a view showing an example of use of

The present invention will now be described in detail, with reference to the accompanying drawings.

FIG. 1 is a block diagram of a broadcasting communication system according to a first embodiment of the present invention. The video information of the system contains programs of lectures at universities, private or preparatory schools to supplement schoolwork, etc. received by remote control, TV programs produced by the Government, government agencies, and municipal corporations, company broadcasts, overseas broadcasts received again, as well as TV programs presented by the public broadcasting station and the commercial broadcasting station in both the metropolitan area and local areas. A number of broadcasting stations 108, which send out these programs, are connected to a single collection network 100. A collection system transmission line 103 formed of optical fibers, is connected to be formed like a tree by using cross-connect devices 102, and the collection network 100 is constituted by the tree-like communication network. The broadcasting stations 108 dotting various places are connected to the collection system transmission line 103 through the nearby cross-connect devices 102. Here the broadcasting stations 108 are informants including a video production. The programs are not limited to the videos but contain data such as a teletext. Though the capacity of the collection system transmission line 103 can be selected arbitrarily, it is set to 10 Gbps for the following reason.

It is said that, when TV broadcasting of the current NTSC is digitally transmitted, an image of sufficiently good quality can be obtained by the

5 not amount to 100 throughout Japan. Consequently, the
first embodiment of the present invention, which allows
1000 channels to be used, has a channel capacity enough
to provide the specialized broadcasts of lectures at
universities, sports, hobby, entertainment, and the
10 like, as well as the broadcasts of all the broadcasting
stations in Japan. In the United States progressing in
CATV, 150 channels are served. In the first embodiment,
video services corresponding to the number of channels
exceeding the 150 channels can be achieved.

15 As regards the hardware of the system, a submarine
cable has already been laid across the Pacific Ocean
covering 9000 km, thereby achieving the transmission of
5 Gbps. For this reason, even if a collection system is
constituted in the whole of Japan to which the present
20 invention is directed, it can be covered with an optical
transmission line of about 3000 to 4000 km. It is thus
easy to set the capacity of the optical transmission
line to 10 Gbps.

The information of programs produced by the
25 respective broadcasting stations 108 or informants
(which are not shown in FIG. 1 but synonym for the
broadcasting stations 108) is transmitted to the
collection system transmission line 103, which extends
throughout the country, via a suitable cross-connect
30 devices 102 selected from the viewpoint of economy.
Therefore, the collection system transmission line 103
always transmits the program information supplied from
all the broadcasting stations 108. The cross-connect
devices 102 each serve as a connection device having one
35 outgoing line corresponding to one incoming line, and
have an advantage in that the device can be obtained by
simpler hardware than a generally-used switching device.

5 subscriber with information, is connected to any one of
the cross-connect devices 102 of the collection network
100. The distribution system transmission line 104 is
formed of an optical fiber. The distribution network
101 is also constituted by a tree-like communication
10 network. The distribution system transmission line 104
is formed like a tree by using distributors 105. An
amplifier 106 for compensating for attenuation of
signals is connected between the distributors 105 when
the need arises. A plurality of distribution nodes 107
15 are connected to each of the distributors 105. Thus all
the program information being transmitted through the
collection network 100, is always caused to reach the
distribution nodes 107.

20 Since, as described above, a network is divided
into two networks of the collection and distribution
systems, the distribution network can be passive, and
the cost for constituting the networks can be lowered.

In the first embodiment, the collection system
transmission line 103 and broadcasting stations 108 are
25 connected by the cross-connect devices 102 having no
switching functions. However, some or all of the
cross-connect devices can be replaced with switching
devices having switching functions.

FIG. 2 is a view showing a constitution of the
30 broadcasting communication system according to the first
embodiment of the present invention, in which a ring- or
loop-shaped communication network is applied to the
major portion of the collection and distribution
networks. The distribution network 201 is connected to
35 a ring- or loop-shaped trunk line network 200 serving as
both collection and distribution networks. Network node
devices 202 are connected to form a ring or a loop by

5 and, in FIG. 2, a number of broadcasting stations 208
are connected to each of the network node devices 202.
The constitution of the distribution network 201 is the
same as that of the distribution network 101 shown in
FIG. 1. It is advisable to take into consideration a
10 loop-back function and a system switching function to
take measures against trouble.

The difference between the ring- and loop-shaped
communication networks is that, in the former network,
the network node devices 202 have the same distribution
15 function and, in the latter network, one of the devices
202 functions as a master station.

FIG. 3 is a view showing an example of a constitu-
tion of a distribution node 207 included in the
distribution network of the broadcasting communication
20 system shown in FIGS. 1 and 2. A distribution system
transmission line 204 is connected to a channel switch-
ing device 301 via a channel selection device 303. A
satellite antenna 312 for receiving a wave from a broad-
casting satellite BS/communication satellite CS is
25 connected to the channel switching device 301 via a
satellite broadcasting reception device 302. A public
network other than the system of the present invention,
for example, a B-ISDN is connected to the channel
switching device 301 through a network connection device
30 304. A video signal conversion device 305, a video
package library 306, and a service control device 308 to
which a charging device 309 is connected, are also
connected to the channel switching device 301. A
subscriber network 310 is connected to the channel
35 switching device 301 through a subscriber network
connection devices 307.

An operation of the distribution node 207 having

5 device 302, channel selection device 303, and network
connection device 304, to the subscribers in need of the
programs. The satellite broadcasting reception device
302 is a reception device of the broadcasting satellite
10 or communication satellite which has been put to
practical use, and programs of the broadcasting and
communication satellites can also be supplied to the
subscriber network through the channel switching device
301 when the need arises. Though the channel selection
15 device 303 and network connection device 304 receive
programs from the distribution network and B-ISDN,
respectively, they have a disadvantage in that it is
difficult or impossible to receive information from the
distribution network and B-ISDN when these networks are
20 disconnected by a disaster such as an earthquake since
both the networks are formed by wires on the ground.
The satellite broadcasting reception device 302 is
therefore provided in order to back up the networks in
case of the disaster.

The channel selection device 303 is connected to
25 the distribution system transmission line 204 and
intended to select a channel required by the subscriber
network from among all of 1000 channels being transmit-
ted through the distribution network 101, under the
control of the service control device 308, and send it
30 to the channel switching device 301. The network
connection device 304 is an interface interfacing with
the B-ISDN for receiving various video services of the
B-ISDN under consideration.

The subscriber network connection devices 307 are
35 interfaces interfacing with the subscriber network 310
for providing the respective subscribers with
information. Though the number of subscribers covering

for inserting an amplifier in the subscriber network
5 310. If about ten subscriber network connection devices
307 are provided for each distribution node, then the
distribution node covers about 500 subscribers. This is
intended to improve in downsizing based on the Grosh's
law relating to the performance evaluation of a computer
10 and thus improve in cost performance.

The video signal conversion device 305 converts
digital video signals supplied from the channel
selection device 303 and network connection device 304
into analog video signals which can be sent to the
15 subscriber network 310 when necessary. The video signal
conversion device 305 has a plurality of conversion
functions such that different programs can be provided
to a number of subscribers at the same time. The
channel switching device 301 has a hybrid conversion
20 function of converting both digital and analog signals
to each other.

The video package library 306 is a sort of
videodisk device for offering popular video software
packages accessed frequently by the subscribers. Since
25 the distribution node is provided with such an accumula-
tion device, an amount of traffic of the distribution
network and B-ISDN can be decreased.

The service control device 308 fulfills the role of
giving an instruction to the channel switching device
30 301, channel selection device 303, network connection
device 304, and the like in response to a subscriber's
request, and offering a program requested by the
subscriber to the subscriber network. The charging
device 309 is used to charge in accordance with each
35 subscriber's request.

FIG. 4 is a view showing the detail of the video
package library 306. The video package library

5 to record information which is fixed and accessed with
high frequency, the write once type optical disk device
402 is used to record that information recorded in the
rewritable type optical disk device which is accessed
10 disk device 403 is used to store information acquired
through the B-ISDN. Since these optical disk devices
each need a considerably large memory capacity, it is
desirable that they are a multiple optical disk device
having an autochanger mechanism and capable of accessing
15 a plurality of optical disks at the same time.

FIG. 5 is a view of an example of an information
transfer format of the collection network and distribu-
tion network, showing transfer of information to the
distribution node in the broadcasting communication
20 system of the present invention. This format is adopted
in the ATM (Asynchronous Transfer Mode) which is a
transfer technique of the B-ISDN. Information is
divided for every 48 octets (1 octet = 8 bits), and
information of 48 octets with a cell header of 5 octets
25 at the head thereof, is transferred. The cell header
contains information indicative of an address which is
called a VPI (Virtual Path Identifier) and a VCI
(Virtual Channel Identifier), information indicative of
a type of a cell which is called PT (Payload Type),
30 information indicative of the priority of a disposal
cell which is called P (Priority), and HEC (Header Error
Check) for checking a transfer error in the cell header.
The detailed description of the above information is
omitted since the function thereof is well known from an
35 advice of the CCITT, the TTC standard, etc. in relation
to the B-ISDN. Judging from the fact that the B-ISDN is
directed to the services including even a motion image

5 system wherein cells with information and blank cells
without information, which are arranged close to one
another, are transferred on the transmission line, while
FIG. 6B shows another transfer system called STM-1 in
which cells pushed into a synchronous format are
10 transferred. The system shown in FIG. 6B is now under
study to put it to practical use and, in the present
invention, too, the cells can be transferred by using
this system. In FIG. 6B, SOH (Section Over Head)
represents an information area for transmitting/
15 receiving information of the maintenance and operation
between opposing devices.

FIG. 7 shows an example of the subscriber network
310 shown in FIG. 3. FIG. 7 also shows a tree-like CATV
network 714 using coaxial cables or optical fibers and
20 an FTTH (Fiber to the Home) network 715 using optical
fibers. The CATV network 714 comprises a distributor
702, a branch circuit 703, and a subscriber's in-home
device 710. The subscriber's in-home device 710
includes a network terminal device 711 and a video
25 terminal 712. The FTTH network 715 includes a distribu-
tor 713 and a subscriber's in-home device 710. The
subscriber network is not limited to the tree-like
network, but can be formed like a loop, a ring, or a
star.

30 FIG. 8 shows an example of the state of use of a
frequency band in the subscriber network. The band
ranging from 10 to 50 MHz is used as an uplink channel,
and the band not less than 70 MHz is used as a downlink
channel. The uplink channel does not require the band
35 covering 40 MHz since it is used to transfer control
information such as a request for a program (channel)
that a user wishes to watch or listen to. However, the

5 the downlink channel requires a large band since it is
used to supply video signals to the respective
subscribers. In the present TV broadcasting, channels
are allotted for every 6 MHz. If the number of the
channels is 50, a frequency band of 300 MHz
10 (= 6 MHz × 50 channels) is needed and, in this case, the
upper limit of the downlink channel is 370 MHz.

A subscriber's request for channels will now be
described. FIG. 9 is a view showing an example of a
method for using a channel. According to the example,
15 the total number of channels to be provided is 50, and
the 50 channels include 10 common channels that every
user is able to watch and listen to and 40 demand
channels provided in accordance with each subscriber's
request. For example, the common channels are directed
20 to channels which are visible and audible within the
basic charge, and the demand channels are directed to
channels whose audience rating is low; however, a charge
can be added to the demand channels as in the case of a
so-called pay TV. These channels include channels for
25 causing a program broadcasted in real time to flow
through the collection and distribution networks and
channels for causing reproduction information of a
desired video package selected by a video package device
to flow therethrough.

30 Therefore, the demand channels need to have a
function of being controlled such that only the
subscriber requesting a channel can watch or listen to
the channel and a subscriber not requesting a channel
cannot watch or listen to the channel. This technique
35 has already been put to practical use and includes, for
example, a system wherein a video signal is scrambled
and the scrambled signal is descrambled by the

5 a reservation for a program to be broadcasted later. It
is thus necessary to have two channel control systems of
an immediate type for executing a channel allocation
processing immediately after the request is received and
10 an unimmediate type for executing a channel allocation
processing after a lapse of a predetermined period of
time.

Since the band of the downlink channel is broad but
limited, it should be used effectively. Assume that, in
the allocation of the demand channels, a program
15 requested by a subscriber has been already distributed
to the subscriber network through a channel. If another
subscriber requests the same program, a new channel is
not allotted thereto, and the latter subscriber can
access the program through the same channel, with the
20 result that the limited number of channels can be
utilized effectively.

In view of the human interface, it is important to
inform a subscriber of whether a channel can be allotted
(a program can be provided) in response to both the
25 channel request of the immediate type and that of the
unimmediate type.

When a channel can be provided in response to the
channel request, the channel request is of a fixed
reservation type for securing the channel and a
30 temporary reservation type for temporarily securing the
channel. In the temporary reservation type, if the
system runs short of channels by the later request of
the fixed reservation type, a reservation is likely to
be canceled. It is however considered to be necessary
35 to provide a service in which the utilization rates in
the temporary reservation type are set lower than
those in the fixed reservation type. If, however,

5 Various ideas are applied to these service ways to sufficiently satisfy a subscriber's demand for the limited number of channels is satisfied.

FIG. 10 is a view for explaining light wavelength multiplex in optical fibers in the collection and
10 distribution networks. As is apparent from FIG. 10, it is generally known that the amount of attenuation of light is small when the wavelength of the light is in the vicinity of 1.3 μm and 1.55 μm , and a light-emitting diode having these wavelengths is selected for
15 long-distance light transmission. Light wavelength multiplex transmission can be performed using a difference in wavelength. Using the difference in wavelength, information such as speech and data can be transferred at low speed by means of an optical signal of 1.3 μm
20 (two-way transmission), and information such as a video signal can be transferred at high speed by means of an optical signal of 1.55 μm (one-way transmission).

An example of an application realized by utilizing the broadcasting communication system of the present
25 invention, will now be described. First a private or preparatory school service spreading all over the country can easily be realized. The private or preparatory school service will be described, with reference to FIG. 1. The broadcasting stations 108 pick
30 up images of lectures of a private or preparatory school, and their video signals are collected together by the collection network 100. These video signals are then transmitted to the distribution nodes 107 in various parts of the whole country through the distribu-
35 tion network 101. The signals are sent from the distribution nodes 107 to the video terminal (shown in FIG. 7) of every home, with the result that the private or

5 addition to the private or preparatory school service,
various types of educational broadcast such as lectures
at universities and foreign language lessons, can be
realized. Further, the broadcasts produced by the TV
10 broadcasting stations (irrespective of whether they are
a key station or a local station) on the respective
parts of the whole country can easily be provided
throughout the country. In this case, too, these TV
broadcasting stations correspond to the broadcasting
stations shown in FIG. 1, and the images formed thereby
15 are sent to the collection network via the cross-connect
devices, with the result that they can be received by
every home throughout the country as can be the above
application. Furthermore, it is evident from the above
description that the nationwide service of specialized
20 channels for sports, movie, hobby, economy, etc., the
broadcasts of public relations and assemblies of the
Government and municipal corporations, and domestic
broadcasts of overseas broadcasts can easily be
realized.

25 In the above embodiment, the current NTSC is
exemplified to describe the TV broadcasting. In HDTV
(High Definition TV) broadcasting which is now being put
to practical use, if the transmission capacity, which is
about five times as large as that of the NTSC TV
30 broadcasting, is simply allotted to each channel, the
HDTV broadcasting can easily be applied to the present
invention.

In the above embodiment, the video package library
is connected to the distribution nodes. However, a
35 program, which cannot be hardly accessed, can be
transmitted through the B-ISDN or the collection and
distribution networks by providing a plurality of

5 present invention, broadcasting signals of super-multichannels can be received in every part of the whole country, and a wide area multichannel broadcasting service, which is not provided by the conventional TV broadcasting or CATV, can be realized.

a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and

5 a distribution network connected to said collection network and having a distribution node for distributing broadcasting signal selected by a subscriber to a subscriber network.

10 2. The broadcasting communication system according to claim 1, wherein said collection network and said distribution network divide the broadcasting signals into cells having a fixed length and transmit the cells.

15 3. The broadcasting communication system according to claim 1, wherein said collection network is a tree-like network.

 4. The broadcasting communication system according to claim 1, wherein said collection network is a ring-like network.

20 5. The broadcasting communication system according to claim 1, wherein said collection network is a loop-like network.

25 6. The broadcasting communication system according to claim 1, wherein said collection network includes a cross-connect device to which said plurality of broadcasting stations are connected.

 7. The broadcasting communication system according to claim 1, wherein said distribution network is a tree-like network.

30 8. The broadcasting communication system according to claim 1, wherein said distribution network is a ring-like network.

 9. The broadcasting communication system according to claim 1, wherein said distribution network is a loop-like network.

35 10. The broadcasting communication system

5 tree-like network.

12. The broadcasting communication system according to claim 1, wherein said subscriber network is a ring-like network.

10 13. The broadcasting communication system according to claim 1, wherein said subscriber network is a loop-like network.

14. The broadcasting communication system according to claim 1, wherein said subscriber network is a passive network.

15 15. The broadcasting communication system according to claim 1, wherein said subscriber network is a star-like network.

16. The broadcasting communication system according to claim 1, wherein said collection network and said distribution network transmit a digital signal, said distribution network transmits an analog signal, and said distribution node comprises means for converting the digital signal into the analog signal.

17. The broadcasting communication system according to claim 1, wherein said subscriber network divides the broadcasting signals into cells having a fixed length and transmit the cells.

18. The broadcasting communication system according to claim 1, wherein said subscriber network comprises a two-way transmission function of transmitting the broadcasting signals from the distribution node to the subscriber and transmitting a subscriber's request to the distribution node.

19. The broadcasting communication system according to claim 1, wherein each of said collection network and said distribution network comprises a first channel for transmitting a program to be provided to all

5 according to claim 19, wherein said second channel is
allowed to be received by a subscriber requesting said
second channel and unable to be received by a subscriber
not requesting said second channel.

21. The broadcasting communication system
10 according to claim 19, wherein said request has an
immediate type in which the program is provided to the
subscriber immediately in accordance with said request
and an unimmediate type in which the program starts to
be provided to the subscriber after a lapse of a
15 predetermined period of time after said request.

22. The broadcasting communication system accord-
ing to claim 19, wherein, when a subscriber makes a
request for a program, if a program equal to the program
is allotted to a second channel, a new channel is
20 prevented from being allotted by the request.

23. The broadcasting communication system accord-
ing to claim 19, wherein, when a subscriber makes a
request for a program, if a program equal to the program
is allotted to a second channel, the program is provided
25 to the subscriber using the second channel.

24. The broadcasting communication system accord-
ing to claim 21, wherein the subscriber is informed of
whether a channel can be provided in accordance with a
channel request of the immediate type.

25. The broadcasting communication system accord-
ing to claim 21, wherein the subscriber is informed of
whether a channel can be provided by scheduling alloca-
tion of channels, in accordance with a channel request
of the unimmediate type.

26. The broadcasting communication system according
35 to claim 19, wherein said request has a fixed reserva-
tion type for immediately securing a program in

5 vation type is made, if the fixed reservation type is made afterward, a reservation is canceled.

27. The broadcasting communication system according to claim 26, wherein, when the request of the temporary reservation type is made and the reservation is
10 canceled, a subscriber who made the reservation is informed that the reservation was canceled.

28. The broadcasting communication system according to claim 1, wherein said broadcasting stations include a TV broadcasting station and a production for producing a
15 video program sponsored by a program sponsor.

29. The broadcasting communication system according to claim 1, wherein each of said collection network and said distribution network is an optical fiber network.

30. The broadcasting communication system according to claim 1, wherein said distribution node comprises a channel selection device connected to said distribution network, a satellite broadcasting reception device, a network connection device connected to a B-ISDN, and a channel switching device for transmitting a signal from
20 a video package library to the subscriber network.

31. The broadcasting communication system according to claim 30, wherein said video package library comprises a read only type optical disk device, a rewritable type optical disk device for accumulating
30 information obtained from the B-ISDN, and a write once type optical disk device.

32. The broadcasting communication system according to claim 1, wherein said subscriber network comprises a CATV network and an FTH network.

33. The broadcasting communication system according to claim 1, wherein each of said collection network and said distribution network comprises means for executing
35

5 comprising:

a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations;

10 a distribution network for distributing the broadcasting signals collected by said collection network;

a distribution node for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network; and

15 a subscriber network, connected to said distribution node and including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

20 35. A subscriber equipment connected to a broadcasting communication system for receiving a broadcasting signal, the broadcasting communication system comprising:

25 a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations;

a distribution network for distributing the broadcasting signals collected by said collection network;

30 a distribution node for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network; and

35 a subscriber network, connected to said distribution node and including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

36. A collection network for collecting broadcasting signals transmitted from a plurality of

5 said distribution network is connected to a distribution node for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network; and

10 said distribution node is connected to a subscriber network, including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

15 37. A distribution network connected to a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations for distributing the broadcasting signals, wherein:

20 said distribution network is connected to a distribution node for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network; and

25 said distribution node is connected to a subscriber network, including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

30 38. A distribution node connected to a distribution network, which is connected to a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations, for distributing the broadcasting signals and for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network, wherein said distribution node is

35 connected to a subscriber network, including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

5 said distribution node being connected to a distribution
network for distributing a plurality of broadcasting
signals, and said distribution network being connected
to a collection network for collecting transmitting
signals transmitted from a plurality of broadcasting
10 stations, wherein said subscriber network includes at
least one subscriber, and distributes the broadcasting
signal selected by said distribution node.

like a tree by a collection system transmission line (103) of optical fibers, thereby to form a collection network (100). A distribution network (101) including distributors (105) connected like a tree by a distribution system transmission line (104) of optical fibers, is connected to one of the cross-connect devices (102) of the collection network (100). A plurality of distribution nodes (107) are connected like a star to each of the distributors (105). The distribution nodes (107) are connected to a subscriber network to distribute broadcasting signals transmitted from the collection network (100) to each subscriber.

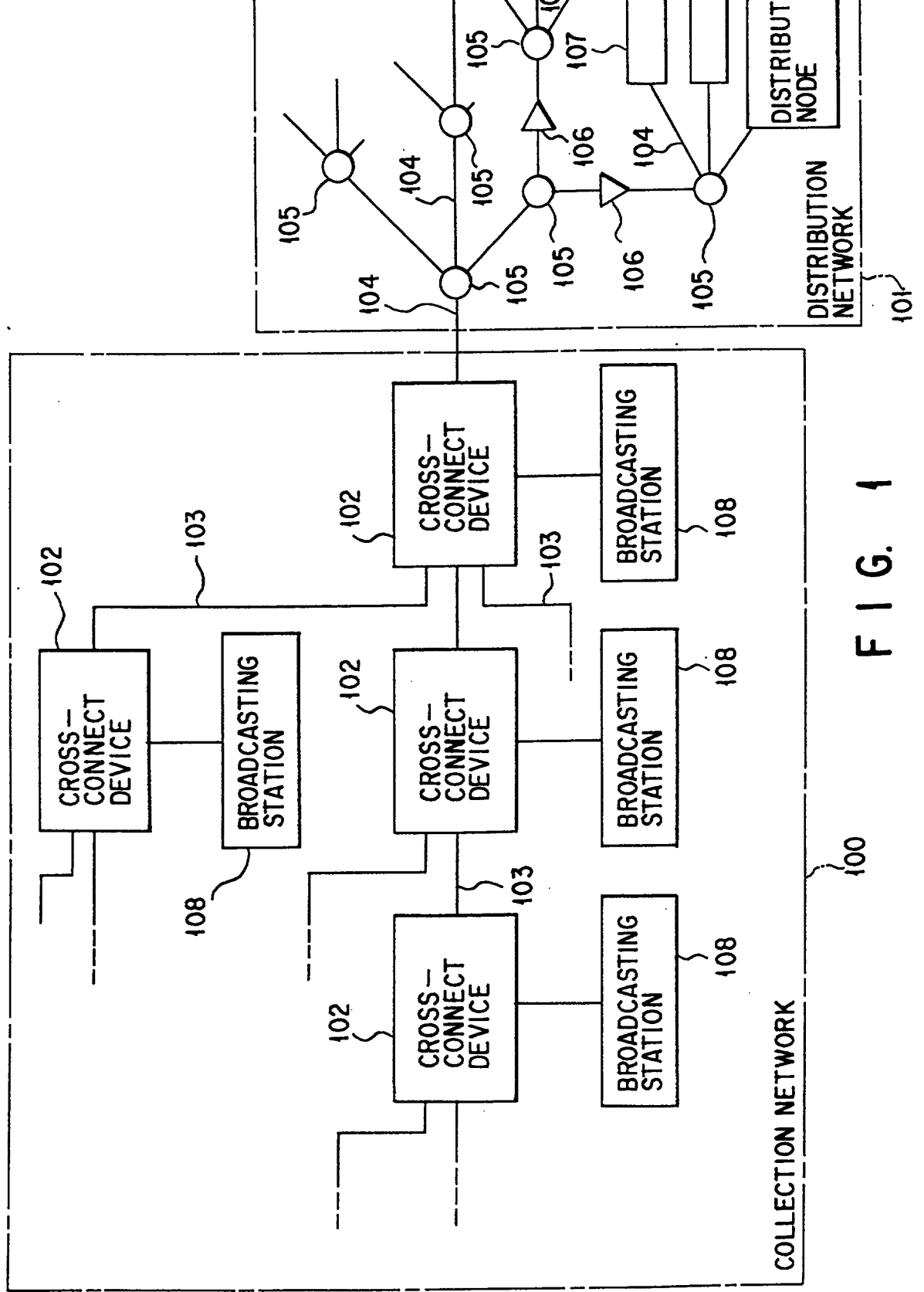


FIG. 1

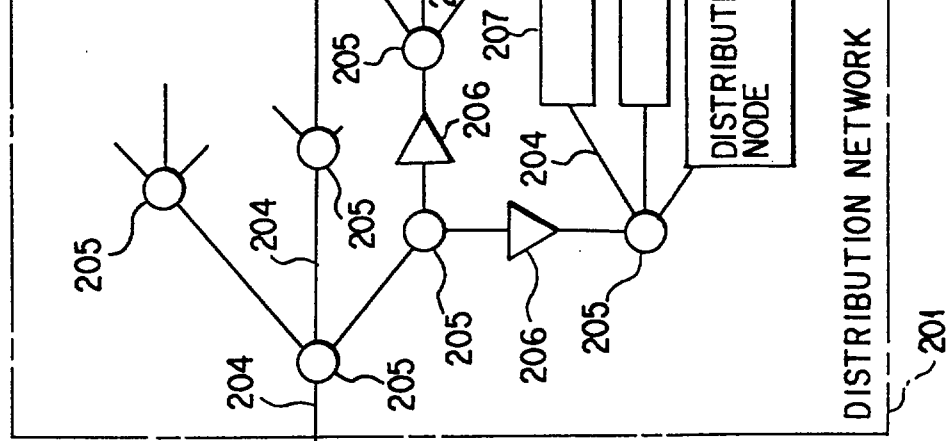
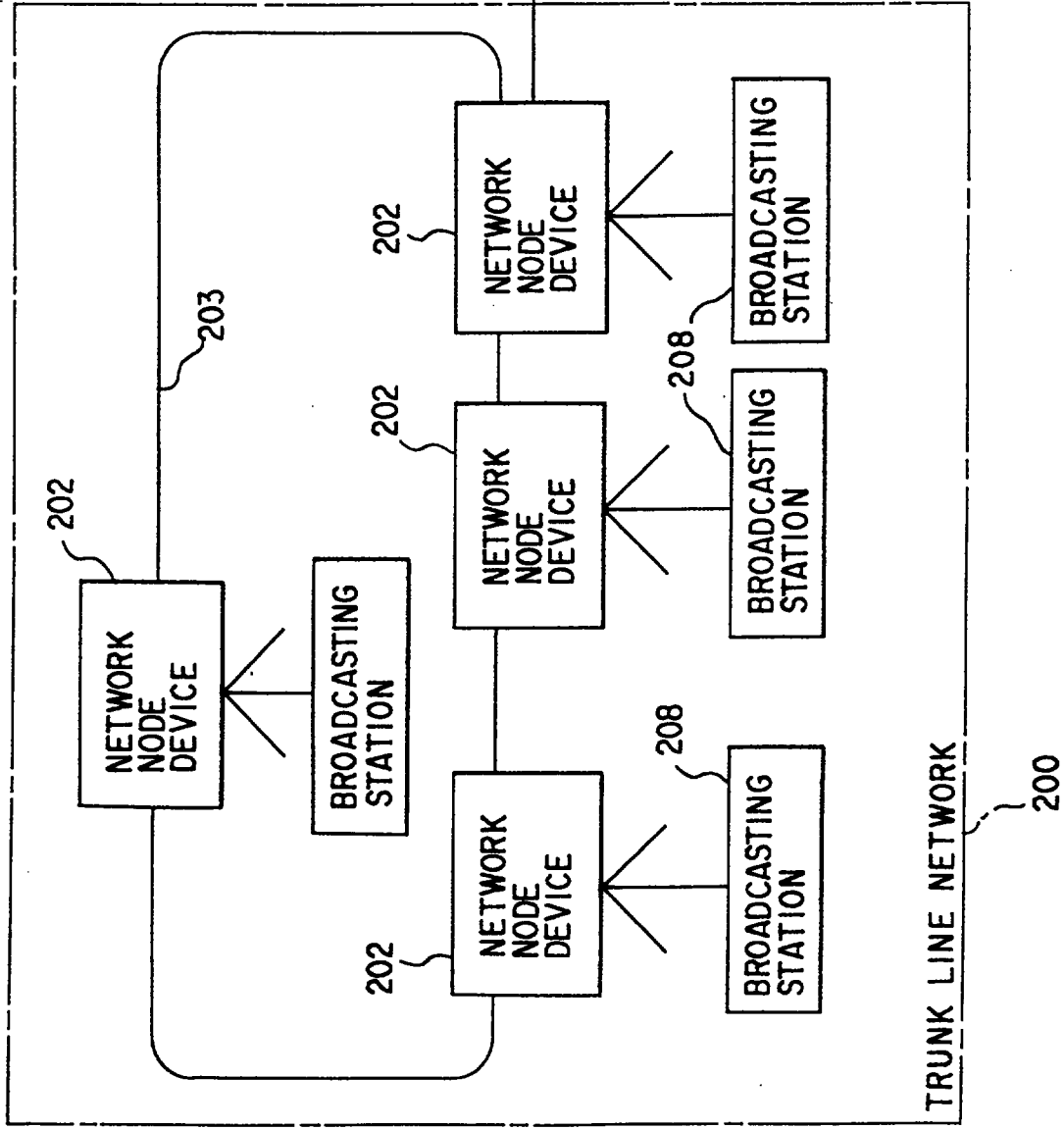


FIG. 2

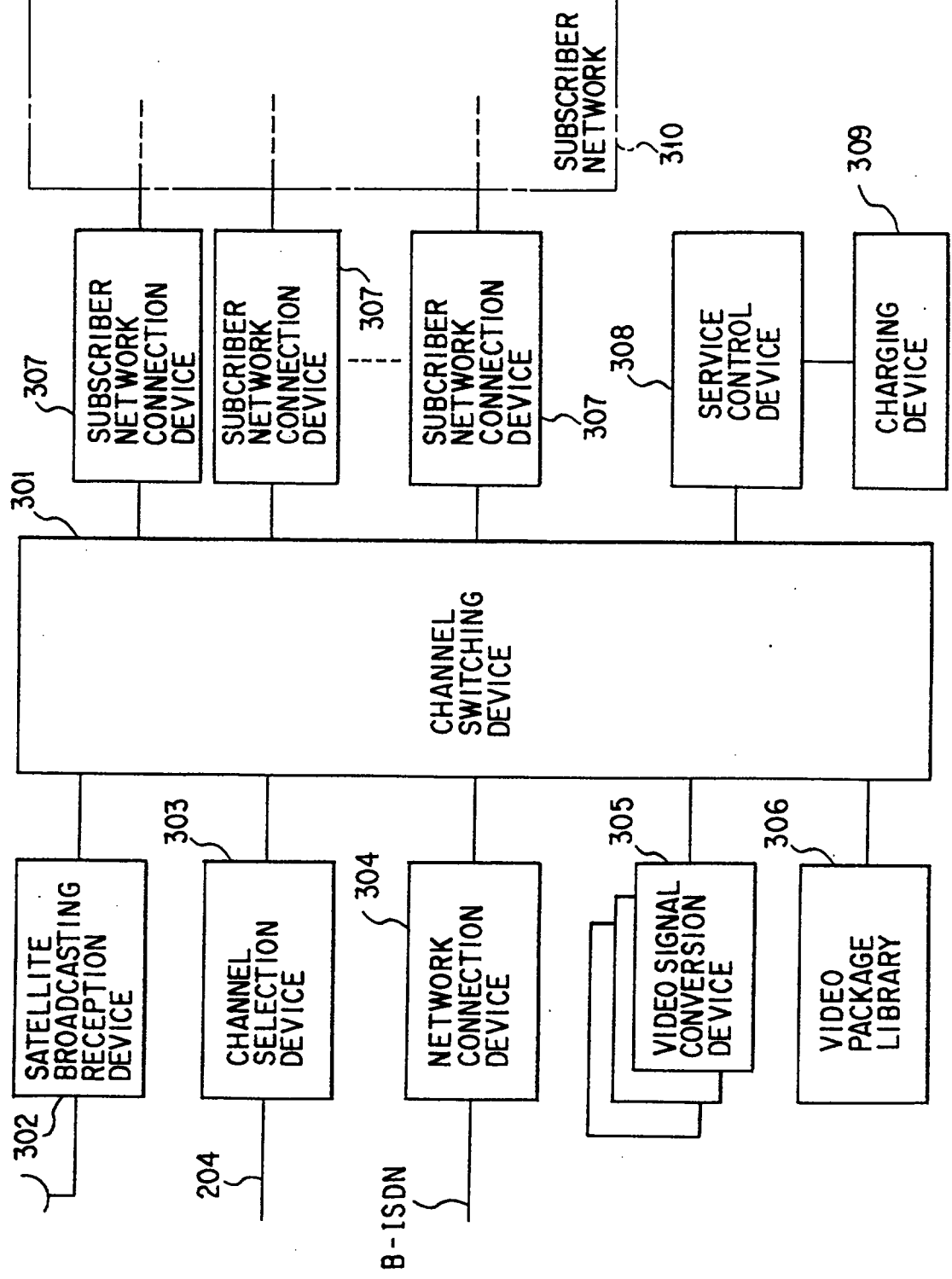


FIG. 3

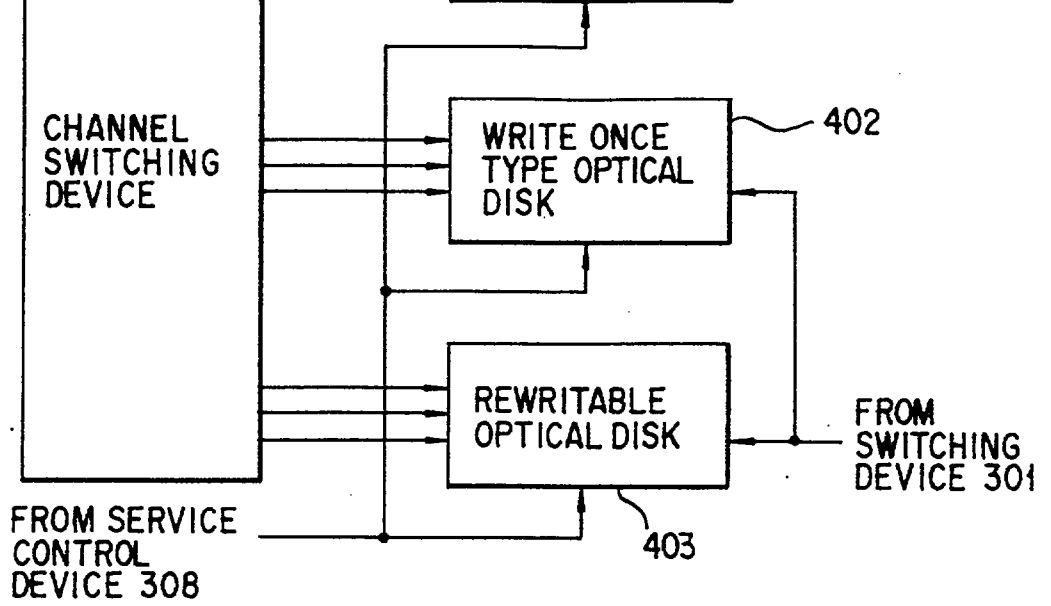


FIG. 4

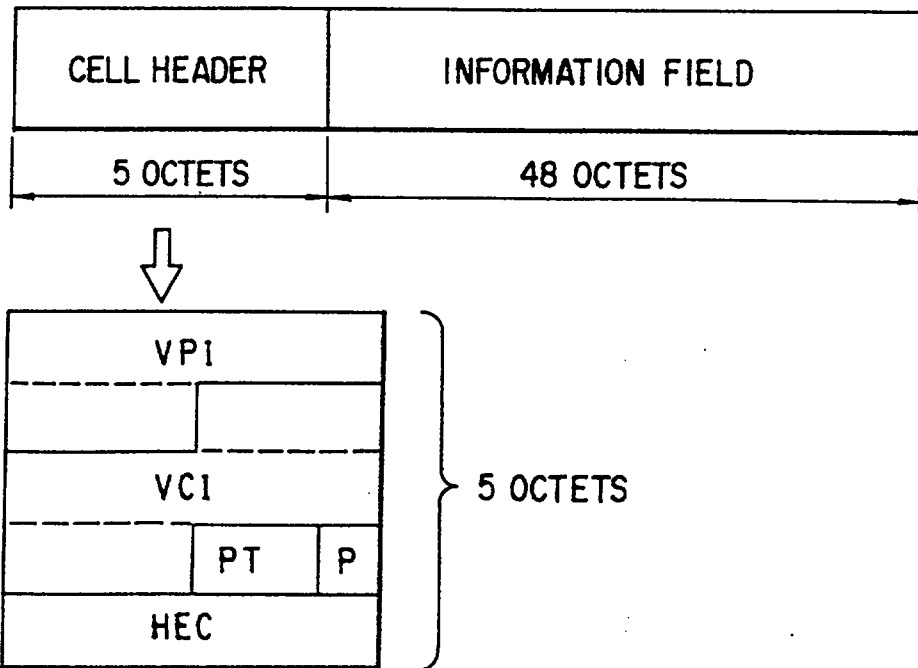


FIG. 5

CELL	CELL	BLANK CELL	CELL	BLANK CELL	CELL	BLANK CELL	CELL	---
------	------	---------------	------	---------------	------	---------------	------	-----

FIG. 6A

SOH	CELL	CELL	BLANK CELL	---
	BLANK CELL	CELL	BLANK CELL	---

FIG. 6B

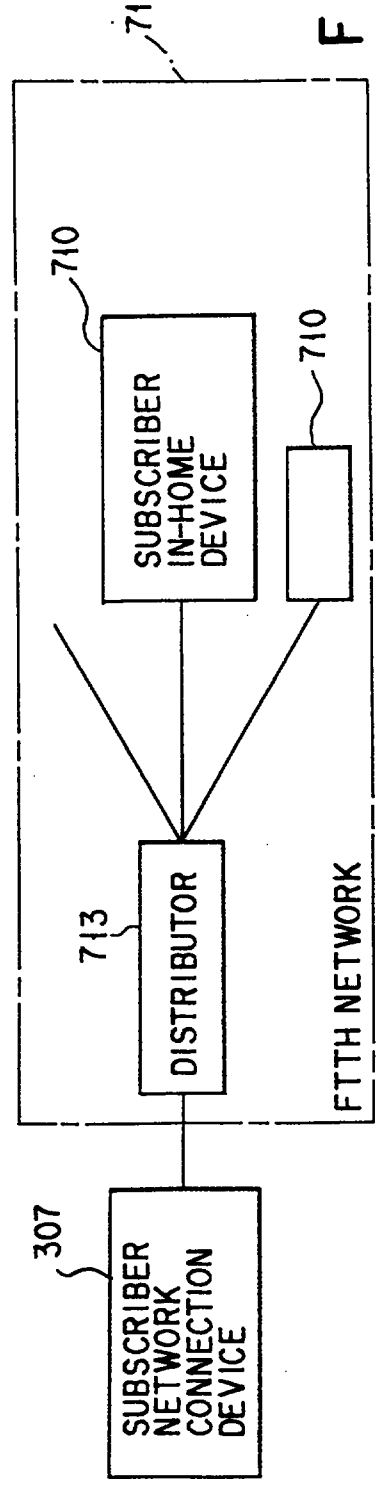
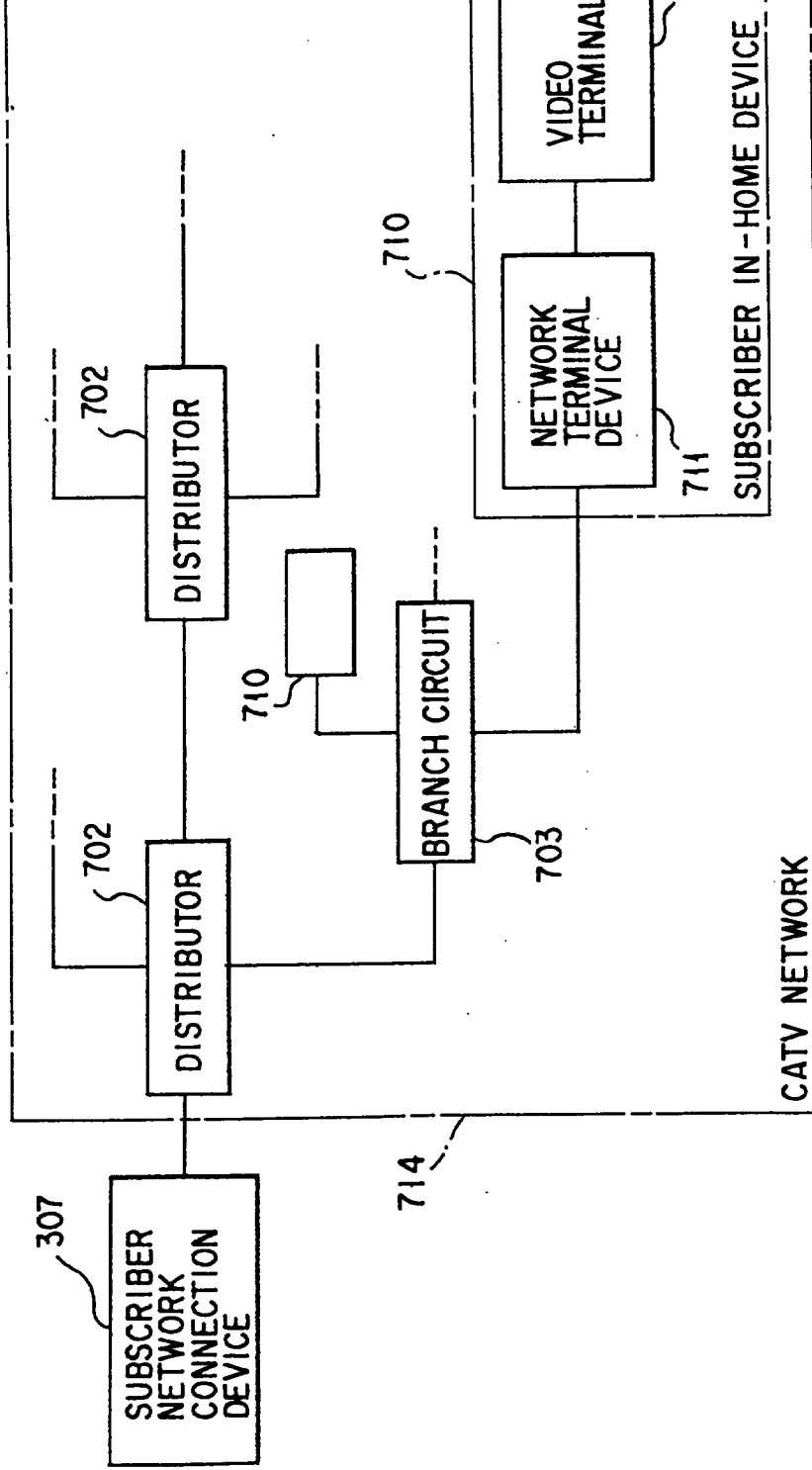


FIG. 8

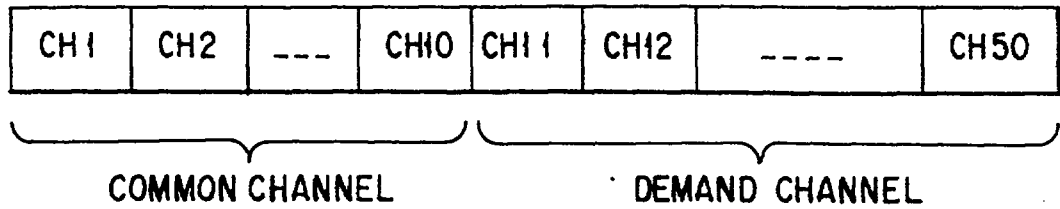


FIG. 9

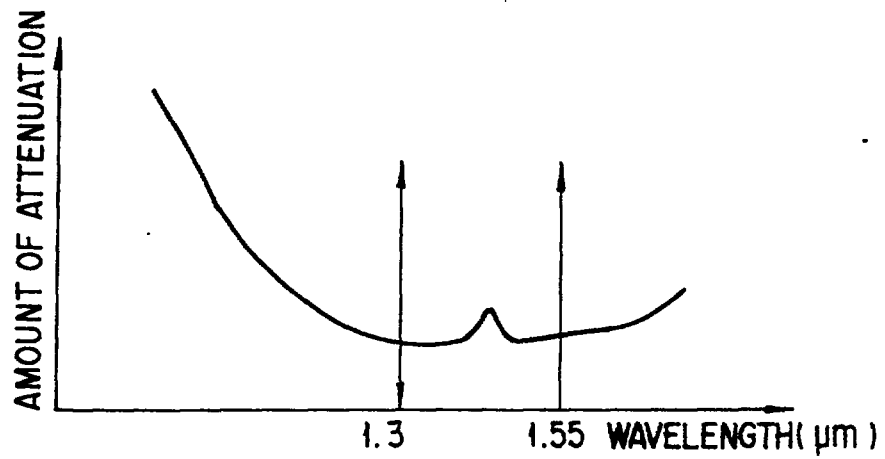


FIG. 10

TRANSLATION

D E S C R I P T I O N

Broadcasting communication system

Technical Field

The present invention relates to a wide area broadcasting communication system which utilizes a wide area communication network such as a broad-band ISDN.

5 Background Art

A communication network has recently been digitized on an international level. In Japan, NTT has already put a digitized communication network to practical use and started services of INS NET 64 and INS NET 1500.
10 According to these services, a speech communication terminal, a facsimile communication terminal, a data communication terminal, and the like, which have been conventionally connected to their respective communication networks (speech communication network, facsimile
15 communication network, data communication network), have only to be connected to a single communication network. The idea of such a communication network is called an ISDN (Integrated Services Digital Network) and results from an international standardized work which has been
20 managed mainly by the CCITT (International Telegraphy and Telephone Consultative Committee). The ISDN is classified into an N-ISDN (Narrow-band ISDN) in which the upper limit of the capacity of the transmission line is 1.544 Mbps or 2.048 Mbps, and a B-ISDN (Broad-band

5 practical use and provides various types of service,
whereas a service using the B-ISDN is still in the
studying stage, and there are few specific examples
applicable to the B-ISDN.

10 The current motion image service is represented by
TV broadcasting. However, this service is provided
chiefly to the metropolitan area, and only some of the
programs provided to the metropolitan area can be
enjoyed in the local areas. Further, the TV programs
15 produced by a broadcasting station in a local area
cannot be enjoyed in the other areas. A large number of
people, who come from the country and work at companies
in the metropolitan area, can learn of the states of
their hometowns only on the local news provided by the
20 broadcasting stations in the metropolitan area. As
described above, the current TV broadcasting does not
necessarily provide the same programs throughout the
country and is therefore a service in favor of the
metropolitan area.

The present invention has been developed in
25 consideration of the above situation and its object is
to provide a broadcasting communication system which
allows multichannel videos to be uniformly received
anywhere throughout the country.

Disclosure of the Invention

30 To resolve the above problem, the broadcasting
communication system of the present invention comprises
a collection network for collecting broadcasting signals
transmitted from a plurality of broadcasting stations,
and a distribution network connected to the collection
35 network and having distribution nodes each for selecting
a broadcasting signal requested by a subscriber and
distributing the broadcasting signal to a subscriber

5 once, the collected signals are distributed to all the
distribution nodes through the distribution network, and
the broadcasting signal requested by the subscriber is
transmitted to the subscriber network. Therefore, the
subscribers connected to the distribution nodes can
10 uniformly receive all the broadcasting signals collected
by the collection network.

Brief Description of the Drawings

FIG. 1 is a block diagram of a broadcasting
communication system according to a first embodiment of
15 the present invention;

FIG. 2 is a block diagram of the broadcasting
communication system according to the first embodiment,
in which a collection network is formed like a ring or
a loop;

20 FIG. 3 is a block diagram showing an example of a
distribution node of a distribution network in the
broadcasting communication system according to the first
embodiment;

FIG. 4 is a block diagram showing an example of a
25 video package library of the distribution node shown in
FIG. 3;

FIG. 5 is a view showing an example of an informa-
tion transfer format in the broadcasting communication
system of the present invention;

30 FIGS. 6A and 6B are views showing examples of a
transfer format of cells in the broadcasting communica-
tion system of the present invention;

FIG. 7 is a block diagram showing an example of a
subscriber network shown in FIG. 3;

35 FIG. 8 is a view showing an example of the state of
use of a frequency band in the subscriber network;

FIG. 9 is a view showing an example of use of

The present invention will now be described in detail, with reference to the accompanying drawings.

FIG. 1 is a block diagram of a broadcasting communication system according to a first embodiment of the present invention. The video information of the system contains programs of lectures at universities, private or preparatory schools to supplement schoolwork, etc. received by remote control, TV programs produced by the Government, government agencies, and municipal corporations, company broadcasts, overseas broadcasts received again, as well as TV programs presented by the public broadcasting station and the commercial broadcasting station in both the metropolitan area and local areas. A number of broadcasting stations 108, which send out these programs, are connected to a single collection network 100. A collection system transmission line 103 formed of optical fibers, is connected to be formed like a tree by using cross-connect devices 102, and the collection network 100 is constituted by the tree-like communication network. The broadcasting stations 108 dotting various places are connected to the collection system transmission line 103 through the nearby cross-connect devices 102. Here the broadcasting stations 108 are informants including a video production. The programs are not limited to the videos but contain data such as a teletext. Though the capacity of the collection system transmission line 103 can be selected arbitrarily, it is set to 10 Gbps for the following reason.

It is said that, when TV broadcasting of the current NTSC is digitally transmitted, an image of sufficiently good quality can be obtained by the

5 not amount to 100 throughout Japan. Consequently, the
first embodiment of the present invention, which allows
1000 channels to be used, has a channel capacity enough
to provide the specialized broadcasts of lectures at
universities, sports, hobby, entertainment, and the
10 like, as well as the broadcasts of all the broadcasting
stations in Japan. In the United States progressing in
CATV, 150 channels are served. In the first embodiment,
video services corresponding to the number of channels
exceeding the 150 channels can be achieved.

15 As regards the hardware of the system, a submarine
cable has already been laid across the Pacific Ocean
covering 9000 km, thereby achieving the transmission of
5 Gbps. For this reason, even if a collection system is
constituted in the whole of Japan to which the present
20 invention is directed, it can be covered with an optical
transmission line of about 3000 to 4000 km. It is thus
easy to set the capacity of the optical transmission
line to 10 Gbps.

The information of programs produced by the
25 respective broadcasting stations 108 or informants
(which are not shown in FIG. 1 but synonym for the
broadcasting stations 108) is transmitted to the
collection system transmission line 103, which extends
throughout the country, via a suitable cross-connect
30 devices 102 selected from the viewpoint of economy.
Therefore, the collection system transmission line 103
always transmits the program information supplied from
all the broadcasting stations 108. The cross-connect
devices 102 each serve as a connection device having one
35 outgoing line corresponding to one incoming line, and
have an advantage in that the device can be obtained by
simpler hardware than a generally-used switching device.

5 subscriber with information, is connected to any one of
the cross-connect devices 102 of the collection network
100. The distribution system transmission line 104 is
formed of an optical fiber. The distribution network
101 is also constituted by a tree-like communication
10 network. The distribution system transmission line 104
is formed like a tree by using distributors 105. An
amplifier 106 for compensating for attenuation of
signals is connected between the distributors 105 when
the need arises. A plurality of distribution nodes 107
15 are connected to each of the distributors 105. Thus all
the program information being transmitted through the
collection network 100, is always caused to reach the
distribution nodes 107.

Since, as described above, a network is divided
20 into two networks of the collection and distribution
systems, the distribution network can be passive, and
the cost for constituting the networks can be lowered.

In the first embodiment, the collection system
transmission line 103 and broadcasting stations 108 are
25 connected by the cross-connect devices 102 having no
switching functions. However, some or all of the
cross-connect devices can be replaced with switching
devices having switching functions.

FIG. 2 is a view showing a constitution of the
30 broadcasting communication system according to the first
embodiment of the present invention, in which a ring- or
loop-shaped communication network is applied to the
major portion of the collection and distribution
networks. The distribution network 201 is connected to
35 a ring- or loop-shaped trunk line network 200 serving as
both collection and distribution networks. Network node
devices 202 are connected to form a ring or a loop by

5 and, in FIG. 2, a number of broadcasting stations 208
are connected to each of the network node devices 202.
The constitution of the distribution network 201 is the
same as that of the distribution network 101 shown in
FIG. 1. It is advisable to take into consideration a
10 loop-back function and a system switching function to
take measures against trouble.

The difference between the ring- and loop-shaped
communication networks is that, in the former network,
the network node devices 202 have the same distribution
15 function and, in the latter network, one of the devices
202 functions as a master station.

FIG. 3 is a view showing an example of a constitu-
tion of a distribution node 207 included in the
distribution network of the broadcasting communication
20 system shown in FIGS. 1 and 2. A distribution system
transmission line 204 is connected to a channel switch-
ing device 301 via a channel selection device 303. A
satellite antenna 312 for receiving a wave from a broad-
casting satellite BS/communication satellite CS is
25 connected to the channel switching device 301 via a
satellite broadcasting reception device 302. A public
network other than the system of the present invention,
for example, a B-ISDN is connected to the channel
switching device 301 through a network connection device
30 304. A video signal conversion device 305, a video
package library 306, and a service control device 308 to
which a charging device 309 is connected, are also
connected to the channel switching device 301. A
subscriber network 310 is connected to the channel
35 switching device 301 through a subscriber network
connection devices 307.

An operation of the distribution node 207 having

5 device 302, channel selection device 303, and network
connection device 304, to the subscribers in need of the
programs. The satellite broadcasting reception device
302 is a reception device of the broadcasting satellite
10 or communication satellite which has been put to
practical use, and programs of the broadcasting and
communication satellites can also be supplied to the
subscriber network through the channel switching device
301 when the need arises. Though the channel selection
15 device 303 and network connection device 304 receive
programs from the distribution network and B-ISDN,
respectively, they have a disadvantage in that it is
difficult or impossible to receive information from the
distribution network and B-ISDN when these networks are
20 disconnected by a disaster such as an earthquake since
both the networks are formed by wires on the ground.
The satellite broadcasting reception device 302 is
therefore provided in order to back up the networks in
case of the disaster.

The channel selection device 303 is connected to
25 the distribution system transmission line 204 and
intended to select a channel required by the subscriber
network from among all of 1000 channels being transmit-
ted through the distribution network 101, under the
control of the service control device 308, and send it
30 to the channel switching device 301. The network
connection device 304 is an interface interfacing with
the B-ISDN for receiving various video services of the
B-ISDN under consideration.

The subscriber network connection devices 307 are
35 interfaces interfacing with the subscriber network 310
for providing the respective subscribers with
information. Though the number of subscribers covering

5 310. If about ten subscriber network connection devices
307 are provided for each distribution node, then the
distribution node covers about 500 subscribers. This is
intended to improve in downsizing based on the Grosh's
law relating to the performance evaluation of a computer
10 and thus improve in cost performance.

The video signal conversion device 305 converts
digital video signals supplied from the channel
selection device 303 and network connection device 304
into analog video signals which can be sent to the
15 subscriber network 310 when necessary. The video signal
conversion device 305 has a plurality of conversion
functions such that different programs can be provided
to a number of subscribers at the same time. The
channel switching device 301 has a hybrid conversion
20 function of converting both digital and analog signals
to each other.

The video package library 306 is a sort of
videodisk device for offering popular video software
packages accessed frequently by the subscribers. Since
25 the distribution node is provided with such an accumula-
tion device, an amount of traffic of the distribution
network and B-ISDN can be decreased.

The service control device 308 fulfills the role of
giving an instruction to the channel switching device
30 301, channel selection device 303, network connection
device 304, and the like in response to a subscriber's
request, and offering a program requested by the
subscriber to the subscriber network. The charging
device 309 is used to charge in accordance with each
35 subscriber's request.

FIG. 4 is a view showing the detail of the video
package library 306. The video package library

5 to record information which is fixed and accessed with
high frequency, the write once type optical disk device
402 is used to record that information recorded in the
rewritable type optical disk device which is accessed
10 disk device 403 is used to store information acquired
through the B-ISDN. Since these optical disk devices
each need a considerably large memory capacity, it is
desirable that they are a multiple optical disk device
having an autochanger mechanism and capable of accessing
15 a plurality of optical disks at the same time.

FIG. 5 is a view of an example of an information
transfer format of the collection network and distribu-
tion network, showing transfer of information to the
distribution node in the broadcasting communication
20 system of the present invention. This format is adopted
in the ATM (Asynchronous Transfer Mode) which is a
transfer technique of the B-ISDN. Information is
divided for every 48 octets (1 octet = 8 bits), and
information of 48 octets with a cell header of 5 octets
25 at the head thereof, is transferred. The cell header
contains information indicative of an address which is
called a VPI (Virtual Path Identifier) and a VCI
(Virtual Channel Identifier), information indicative of
a type of a cell which is called PT (Payload Type),
30 information indicative of the priority of a disposal
cell which is called P (Priority), and HEC (Header Error
Check) for checking a transfer error in the cell header.
The detailed description of the above information is
omitted since the function thereof is well known from an
35 advice of the CCITT, the TTC standard, etc. in relation
to the B-ISDN. Judging from the fact that the B-ISDN is
directed to the services including even a motion image

5 system wherein cells with information and blank cells
without information, which are arranged close to one
another, are transferred on the transmission line, while
FIG. 6B shows another transfer system called STM-1 in
which cells pushed into a synchronous format are
10 transferred. The system shown in FIG. 6B is now under
study to put it to practical use and, in the present
invention, too, the cells can be transferred by using
this system. In FIG. 6B, SOH (Section Over Head)
represents an information area for transmitting/
15 receiving information of the maintenance and operation
between opposing devices.

FIG. 7 shows an example of the subscriber network
310 shown in FIG. 3. FIG. 7 also shows a tree-like CATV
network 714 using coaxial cables or optical fibers and
20 an FTTH (Fiber to the Home) network 715 using optical
fibers. The CATV network 714 comprises a distributor
702, a branch circuit 703, and a subscriber's in-home
device 710. The subscriber's in-home device 710
includes a network terminal device 711 and a video
25 terminal 712. The FTTH network 715 includes a distribu-
tor 713 and a subscriber's in-home device 710. The
subscriber network is not limited to the tree-like
network, but can be formed like a loop, a ring, or a
star.

30 FIG. 8 shows an example of the state of use of a
frequency band in the subscriber network. The band
ranging from 10 to 50 MHz is used as an uplink channel,
and the band not less than 70 MHz is used as a downlink
channel. The uplink channel does not require the band
35 covering 40 MHz since it is used to transfer control
information such as a request for a program (channel)
that a user wishes to watch or listen to. However, the

5 the downlink channel requires a large band since it is
used to supply video signals to the respective
subscribers. In the present TV broadcasting, channels
are allotted for every 6 MHz. If the number of the
channels is 50, a frequency band of 300 MHz
10 (= 6 MHz × 50 channels) is needed and, in this case, the
upper limit of the downlink channel is 370 MHz.

A subscriber's request for channels will now be
described. FIG. 9 is a view showing an example of a
method for using a channel. According to the example,
15 the total number of channels to be provided is 50, and
the 50 channels include 10 common channels that every
user is able to watch and listen to and 40 demand
channels provided in accordance with each subscriber's
request. For example, the common channels are directed
20 to channels which are visible and audible within the
basic charge, and the demand channels are directed to
channels whose audience rating is low; however, a charge
can be added to the demand channels as in the case of a
so-called pay TV. These channels include channels for
25 causing a program broadcasted in real time to flow
through the collection and distribution networks and
channels for causing reproduction information of a
desired video package selected by a video package device
to flow therethrough.

30 Therefore, the demand channels need to have a
function of being controlled such that only the
subscriber requesting a channel can watch or listen to
the channel and a subscriber not requesting a channel
cannot watch or listen to the channel. This technique
35 has already been put to practical use and includes, for
example, a system wherein a video signal is scrambled
and the scrambled signal is descrambled by the

5 a reservation for a program to be broadcasted later. It
is thus necessary to have two channel control systems of
an immediate type for executing a channel allocation
processing immediately after the request is received and
10 an unimmediate type for executing a channel allocation
processing after a lapse of a predetermined period of
time.

Since the band of the downlink channel is broad but
limited, it should be used effectively. Assume that, in
the allocation of the demand channels, a program
15 requested by a subscriber has been already distributed
to the subscriber network through a channel. If another
subscriber requests the same program, a new channel is
not allotted thereto, and the latter subscriber can
access the program through the same channel, with the
20 result that the limited number of channels can be
utilized effectively.

In view of the human interface, it is important to
inform a subscriber of whether a channel can be allotted
(a program can be provided) in response to both the
25 channel request of the immediate type and that of the
unimmediate type.

When a channel can be provided in response to the
channel request, the channel request is of a fixed
reservation type for securing the channel and a
30 temporary reservation type for temporarily securing the
channel. In the temporary reservation type, if the
system runs short of channels by the later request of
the fixed reservation type, a reservation is likely to
be canceled. It is however considered to be necessary
35 to provide a service in which the utilization rates in
the temporary reservation type are set lower than
those in the fixed reservation type. If, however,

5 Various ideas are applied to these service ways to sufficiently satisfy a subscriber's demand for the limited number of channels is satisfied.

FIG. 10 is a view for explaining light wavelength multiplex in optical fibers in the collection and
10 distribution networks. As is apparent from FIG. 10, it is generally known that the amount of attenuation of light is small when the wavelength of the light is in the vicinity of 1.3 μm and 1.55 μm , and a light-emitting diode having these wavelengths is selected for
15 long-distance light transmission. Light wavelength multiplex transmission can be performed using a difference in wavelength. Using the difference in wavelength, information such as speech and data can be transferred at low speed by means of an optical signal of 1.3 μm
20 (two-way transmission), and information such as a video signal can be transferred at high speed by means of an optical signal of 1.55 μm (one-way transmission).

An example of an application realized by utilizing the broadcasting communication system of the present
25 invention, will now be described. First a private or preparatory school service spreading all over the country can easily be realized. The private or preparatory school service will be described, with reference to FIG. 1. The broadcasting stations 108 pick
30 up images of lectures of a private or preparatory school, and their video signals are collected together by the collection network 100. These video signals are then transmitted to the distribution nodes 107 in various parts of the whole country through the distribu-
35 tion network 101. The signals are sent from the distribution nodes 107 to the video terminal (shown in FIG. 7) of every home, with the result that the private or

5 addition to the private or preparatory school service,
various types of educational broadcast such as lectures
at universities and foreign language lessons, can be
realized. Further, the broadcasts produced by the TV
10 broadcasting stations (irrespective of whether they are
a key station or a local station) on the respective
parts of the whole country can easily be provided
throughout the country. In this case, too, these TV
broadcasting stations correspond to the broadcasting
stations shown in FIG. 1, and the images formed thereby
15 are sent to the collection network via the cross-connect
devices, with the result that they can be received by
every home throughout the country as can be the above
application. Furthermore, it is evident from the above
description that the nationwide service of specialized
20 channels for sports, movie, hobby, economy, etc., the
broadcasts of public relations and assemblies of the
Government and municipal corporations, and domestic
broadcasts of overseas broadcasts can easily be
realized.

25 In the above embodiment, the current NTSC is
exemplified to describe the TV broadcasting. In HDTV
(High Definition TV) broadcasting which is now being put
to practical use, if the transmission capacity, which is
about five times as large as that of the NTSC TV
30 broadcasting, is simply allotted to each channel, the
HDTV broadcasting can easily be applied to the present
invention.

In the above embodiment, the video package library
is connected to the distribution nodes. However, a
35 program, which cannot be hardly accessed, can be
transmitted through the B-ISDN or the collection and
distribution networks by providing a plurality of

5 present invention, broadcasting signals of super-multichannels can be received in every part of the whole country, and a wide area multichannel broadcasting service, which is not provided by the conventional TV broadcasting or CATV, can be realized.

signals transmitted from a plurality of broadcasting stations; and

5 a distribution network connected to said collection network and having a distribution node for distributing broadcasting signal selected by a subscriber to a subscriber network.

10 2. The broadcasting communication system according to claim 1, wherein said collection network and said distribution network divide the broadcasting signals into cells having a fixed length and transmit the cells.

15 3. The broadcasting communication system according to claim 1, wherein said collection network is a tree-like network.

4. The broadcasting communication system according to claim 1, wherein said collection network is a ring-like network.

20 5. The broadcasting communication system according to claim 1, wherein said collection network is a loop-like network.

25 6. The broadcasting communication system according to claim 1, wherein said collection network includes a cross-connect device to which said plurality of broadcasting stations are connected.

7. The broadcasting communication system according to claim 1, wherein said distribution network is a tree-like network.

30 8. The broadcasting communication system according to claim 1, wherein said distribution network is a ring-like network.

9. The broadcasting communication system according to claim 1, wherein said distribution network is a loop-like network.

35 10. The broadcasting communication system

This Sheet Has Been Replaced



5 tree-like network.

12. The broadcasting communication system according to claim 1, wherein said subscriber network is a ring-like network.

13. The broadcasting communication system according to claim 1, wherein said subscriber network is a loop-like network.

14. The broadcasting communication system according to claim 1, wherein said subscriber network is a passive network.

15. The broadcasting communication system according to claim 1, wherein said subscriber network is a star-like network.

16. The broadcasting communication system according to claim 1, wherein said collection network and said distribution network transmit a digital signal, said distribution network transmits an analog signal, and said distribution node comprises means for converting the digital signal into the analog signal.

17. The broadcasting communication system according to claim 1, wherein said subscriber network divides the broadcasting signals into cells having a fixed length and transmit the cells.

18. The broadcasting communication system according to claim 1, wherein said subscriber network comprises a two-way transmission function of transmitting the broadcasting signals from the distribution node to the subscriber and transmitting a subscriber's request to the distribution node.

19. The broadcasting communication system according to claim 1, wherein each of said collection network and said distribution network comprises a first channel for transmitting a program to be provided to all

This Sheet Has Been Replaced



5 according to claim 19, wherein said second channel is
allowed to be received by a subscriber requesting said
second channel and unable to be received by a subscriber
not requesting said second channel.

21. The broadcasting communication system
10 according to claim 19, wherein said request has an
immediate type in which the program is provided to the
subscriber immediately in accordance with said request
and an unimmediate type in which the program starts to
be provided to the subscriber after a lapse of a
15 predetermined period of time after said request.

22. The broadcasting communication system accord-
ing to claim 19, wherein, when a subscriber makes a
request for a program, if a program equal to the program
is allotted to a second channel, a new channel is
20 prevented from being allotted by the request.

23. The broadcasting communication system accord-
ing to claim 19, wherein, when a subscriber makes a
request for a program, if a program equal to the program
is allotted to a second channel, the program is provided
25 to the subscriber using the second channel.

24. The broadcasting communication system accord-
ing to claim 21, wherein the subscriber is informed of
whether a channel can be provided in accordance with a
channel request of the immediate type.

25. The broadcasting communication system accord-
30 ing to claim 21, wherein the subscriber is informed of
whether a channel can be provided by scheduling alloca-
tion of channels, in accordance with a channel request
of the unimmediate type.

26. The broadcasting communication system according
35 to claim 19, wherein said request has a fixed reserva-
tion type for immediately securing a program in

This Sheet Has Been Replaced



5 vation type is made, if the fixed reservation type is
made afterward, a reservation is canceled.

27. The broadcasting communication system according
to claim 26, wherein, when the request of the temporary
reservation type is made and the reservation is
10 canceled, a subscriber who made the reservation is
informed that the reservation was canceled.

28. The broadcasting communication system according
to claim 1, wherein said broadcasting stations include a
TV broadcasting station and a production for producing a
15 video program sponsored by a program sponsor.

29. The broadcasting communication system according
to claim 1, wherein each of said collection network and
said distribution network is an optical fiber network.

30. The broadcasting communication system according
20 to claim 1, wherein said distribution node comprises a
channel selection device connected to said distribution
network, a satellite broadcasting reception device, a
network connection device connected to a B-ISDN, and a
channel switching device for transmitting a signal from
25 a video package library to the subscriber network.

31. The broadcasting communication system according
to claim 30, wherein said video package library
comprises a read only type optical disk device, a
rewritable type optical disk device for accumulating
30 information obtained from the B-ISDN, and a write once
type optical disk device.

32. The broadcasting communication system according
to claim 1, wherein said subscriber network comprises a
CATV network and an FTTH network.

33. The broadcasting communication system according
35 to claim 1, wherein each of said collection network and
said distribution network comprises means for executing

This Sheet Has Been Replaced



5 comprising:

a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations;

10 a distribution network for distributing the broadcasting signals collected by said collection network;

a distribution node for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network; and

15 a subscriber network, connected to said distribution node and including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

20 35. A subscriber equipment connected to a broadcasting communication system for receiving a broadcasting signal, the broadcasting communication system comprising:

25 a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations;

a distribution network for distributing the broadcasting signals collected by said collection network;

30 a distribution node for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network; and

35 a subscriber network, connected to said distribution node and including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

36. A collection network for collecting broadcasting signals transmitted from a plurality of

This Sheet Has Been Replaced



5 said distribution network is connected to a distribution node for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network; and

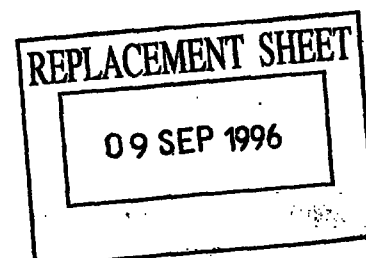
10 said distribution node is connected to a subscriber network, including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

15 37. A distribution network connected to a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations for distributing the broadcasting signals, wherein:

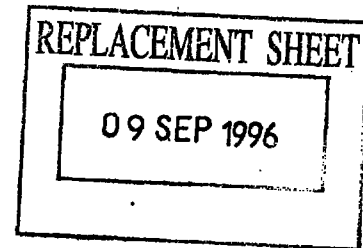
20 said distribution network is connected to a distribution node for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network; and

25 said distribution node is connected to a subscriber network, including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

30 38. A distribution node connected to a distribution network, which is connected to a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations, for distributing the broadcasting signals and for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network, wherein said distribution node is
35 connected to a subscriber network, including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.



5 said distribution node being connected to a distribution
network for distributing a plurality of broadcasting
signals, and said distribution network being connected
to a collection network for collecting transmitting
signals transmitted from a plurality of broadcasting
10 stations, wherein said subscriber network includes at
least one subscriber, and distributes the broadcasting
signal selected by said distribution node.



Cross-connect devices (102) to which a plurality of broadcasting stations (108) are connected, are connected like a tree by a collection system transmission line (103) of optical fibers, thereby to form a collection network (100). A distribution network (101) including distributors (105) connected like a tree by a distribution system transmission line (104) of optical fibers, is connected to one of the cross-connect devices (102) of the collection network (100). A plurality of distribution nodes (107) are connected like a star to each of the distributors (105). The distribution nodes (107) are connected to a subscriber network to distribute broadcasting signals transmitted from the collection network (100) to each subscriber.

FIG. 1

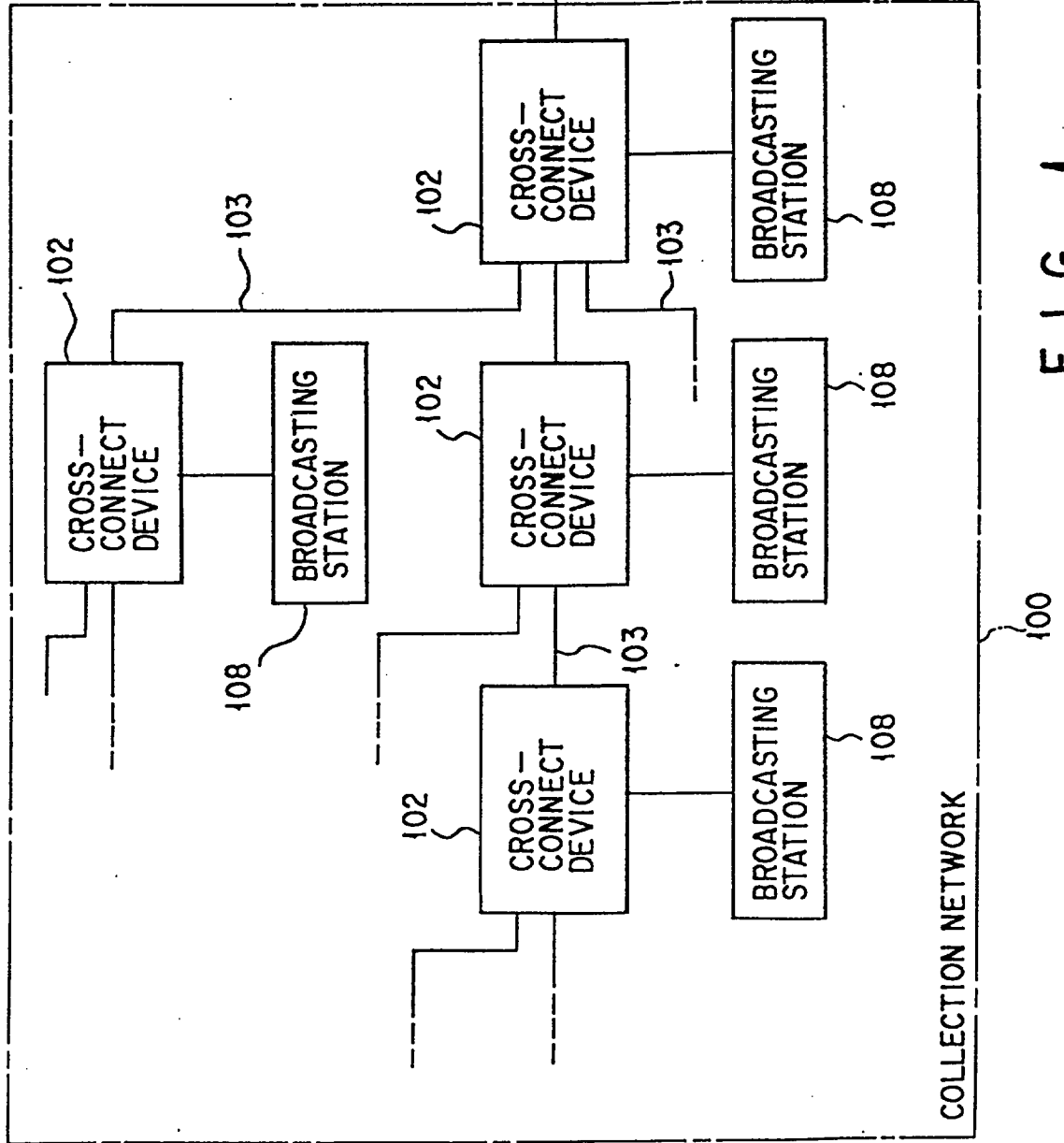


FIG. 1

09 SEP 1996

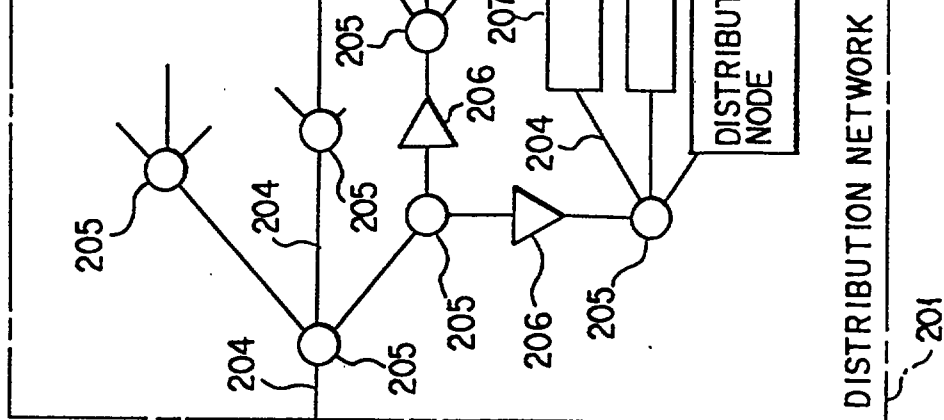
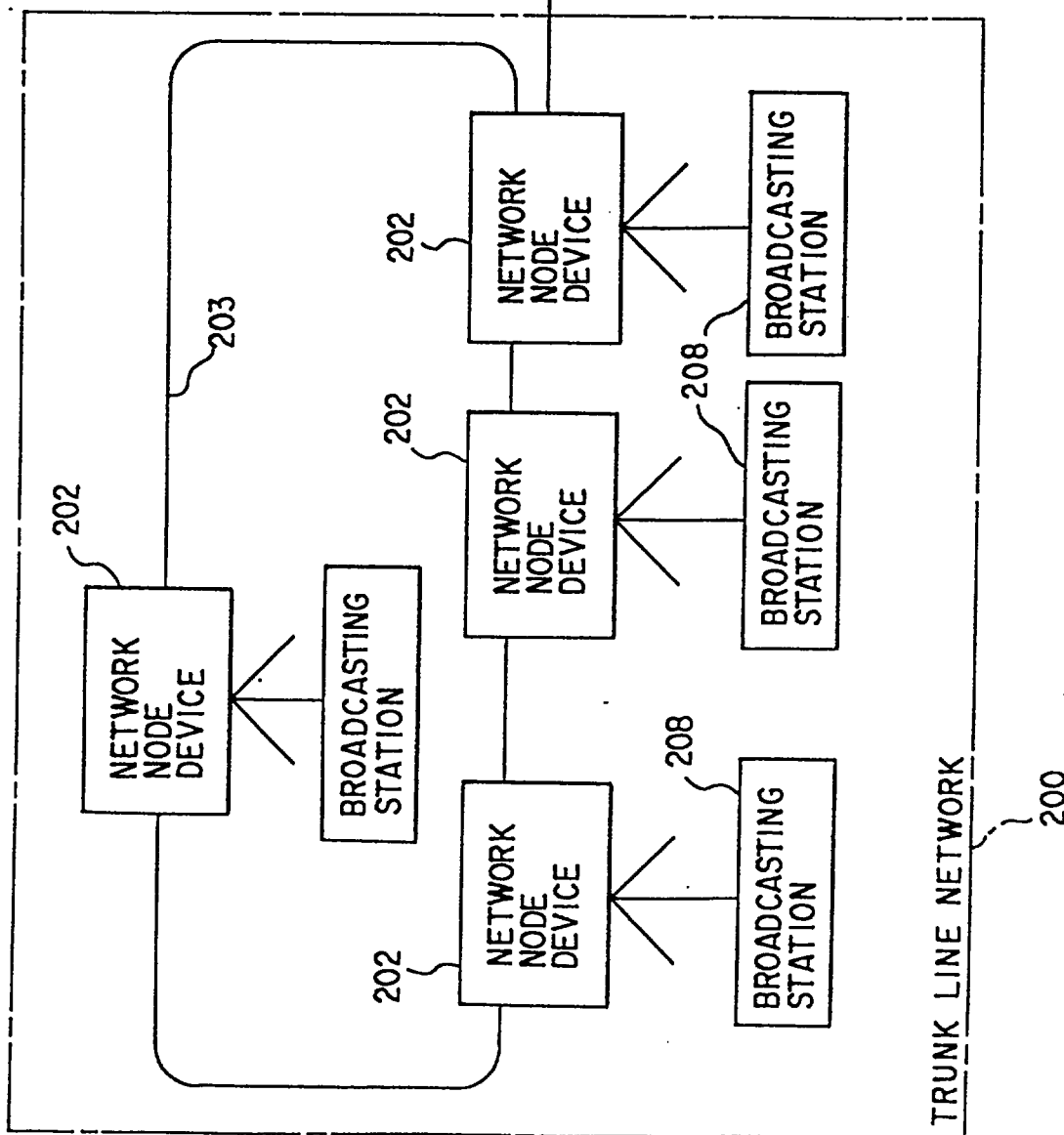


FIG. 2

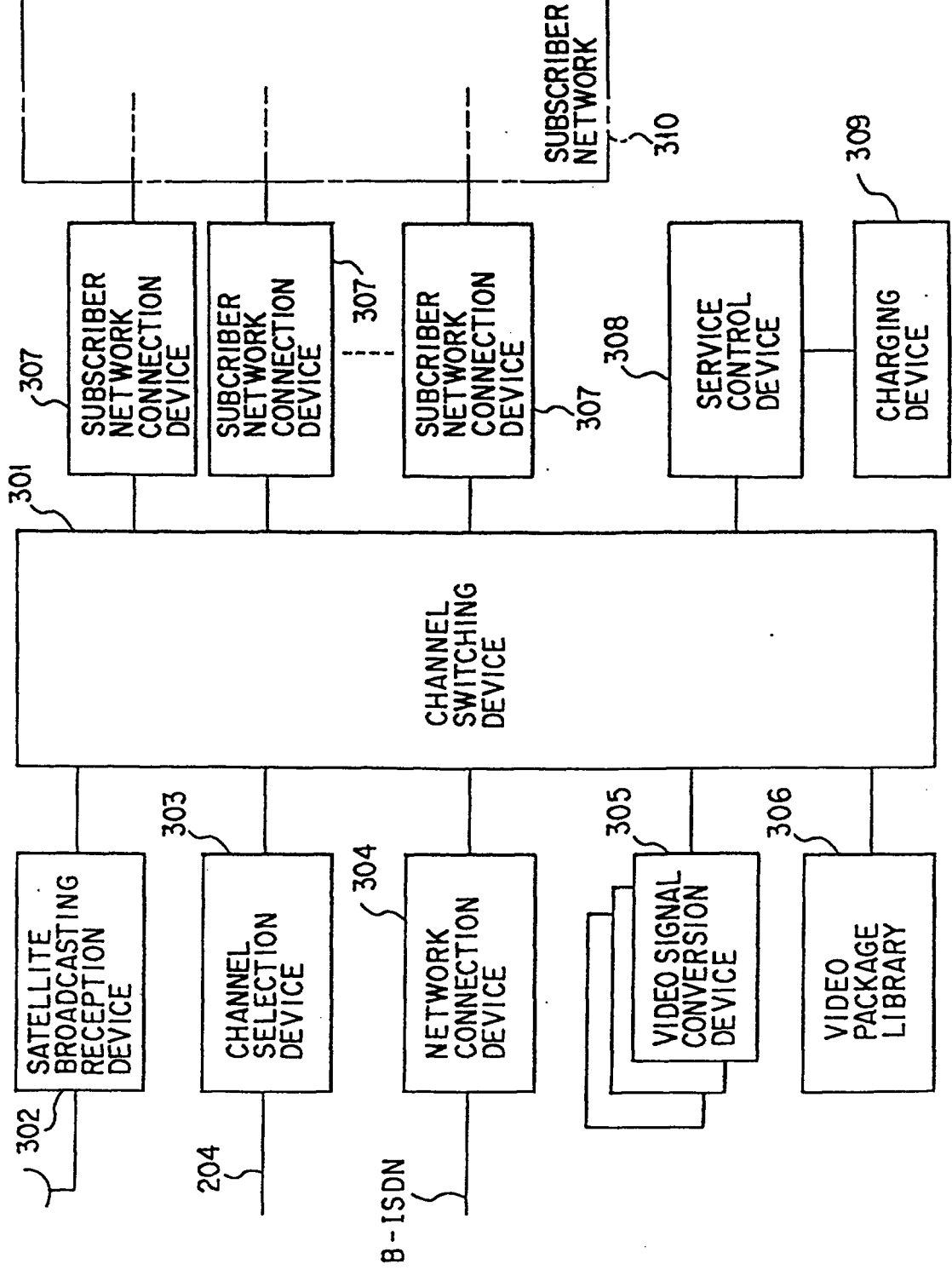


FIG. 3

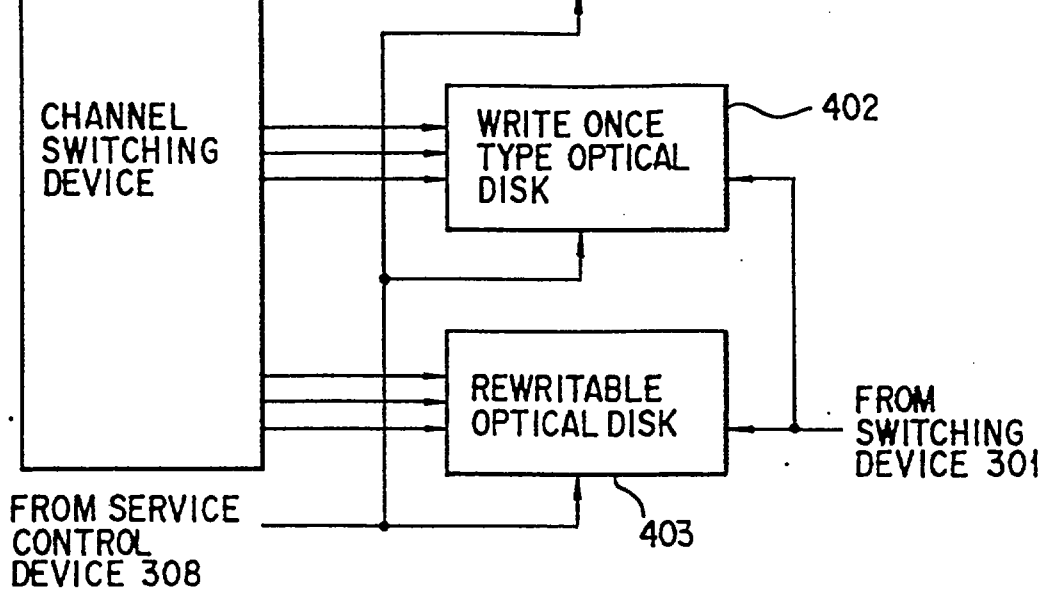


FIG. 4

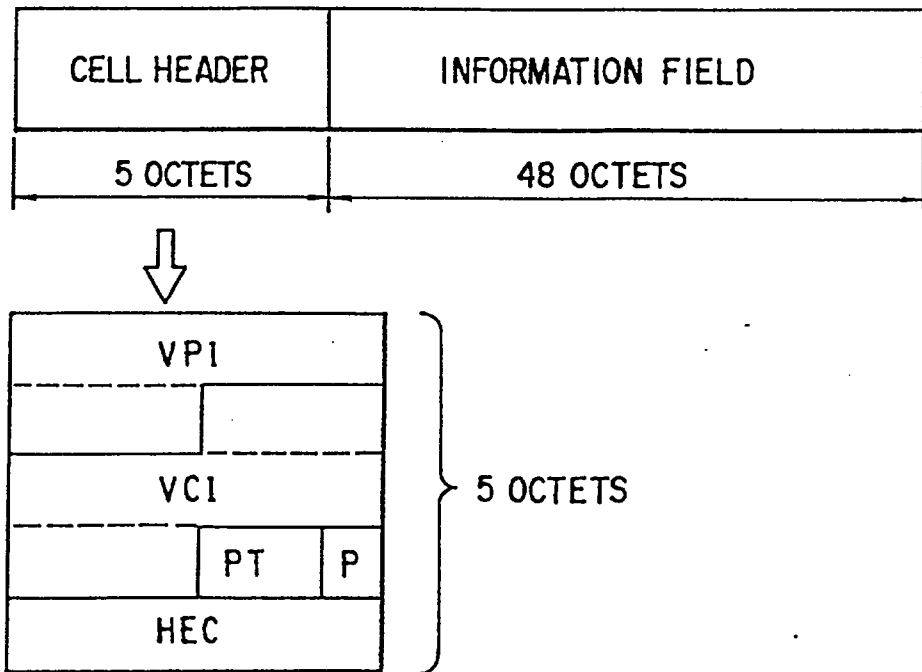


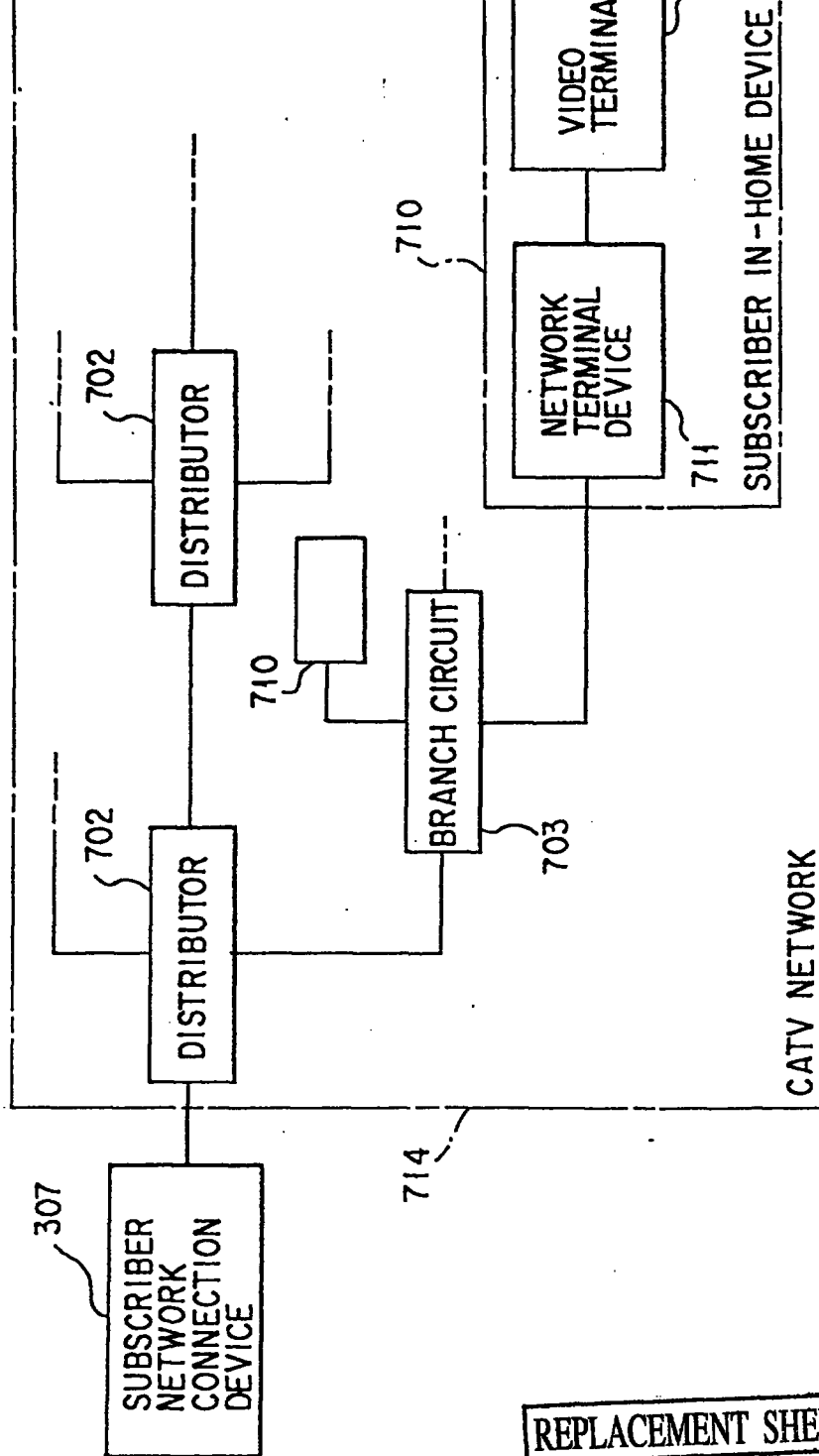
FIG. 5

CELL	CELL	BLANK CELL	CELL	BLANK CELL	BLANK CELL	CELL	---
------	------	---------------	------	---------------	---------------	------	-----

FIG. 6A

SOH	CELL	CELL	BLANK CELL	---
	BLANK CELL	CELL	BLANK CELL	---

FIG. 6B



REPLACEMENT SHEET

09 SEP 1996

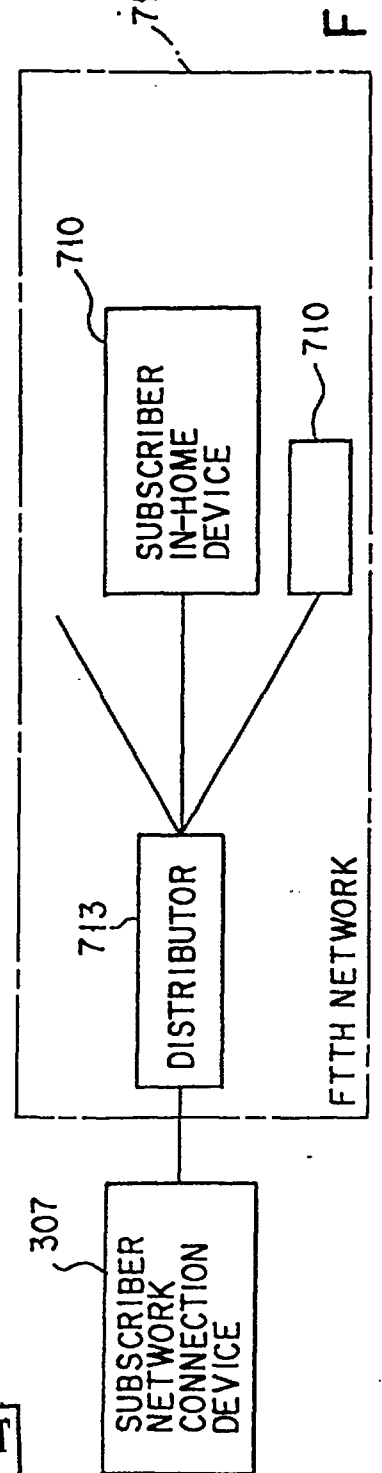


FIG. 8

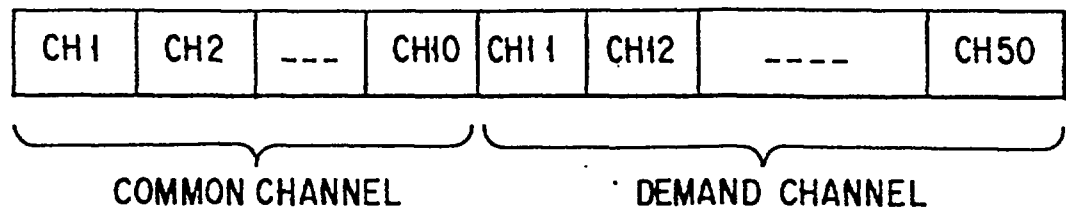


FIG. 9

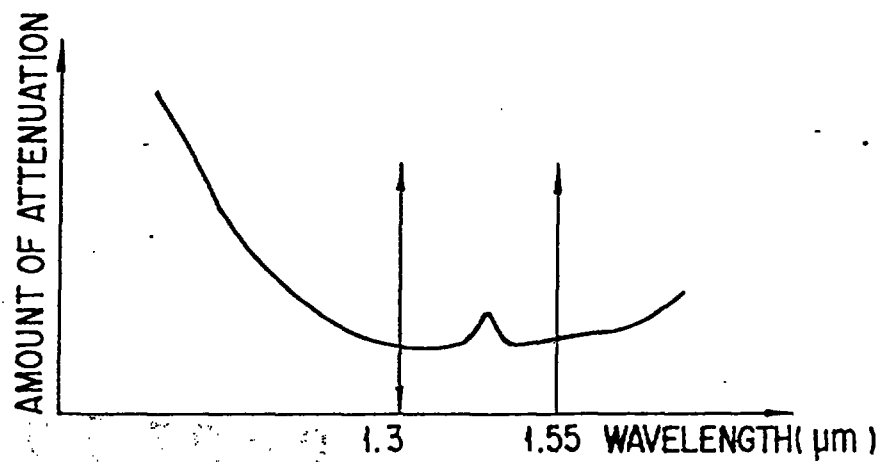


FIG. 10

a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and
a distribution network connected to said collection network and having a distribution node for distributing broadcasting signal selected by a subscriber to a subscriber network, wherein said collection network and said distribution network divide the broadcasting signals into cells having a fixed length and transmit the cells.

2. A broadcasting communication system comprising:
a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and
a distribution network connected to said collection network and having a distribution node for distributing broadcasting signal selected by a subscriber to a subscriber network, wherein said collection network is a tree-like network, a ring-like network or a loop-like network.

3. A broadcasting communication system comprising:
a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and
a distribution network connected to said collection network and having a distribution node for distributing broadcasting signal selected by a subscriber to a subscriber network, wherein said collection network includes a cross-connect device to which said plurality of broad-casting stations are connected.

4. A broadcasting communication system comprising:
a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and
a distribution network connected to said collection network and having a distribution node for distributing

5. A broadcasting communication system comprising:
a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and
a distribution network connected to said collection network and having a distribution node for distributing broadcasting signal selected by a subscriber to a subscriber network, wherein said subscriber network is a tree-like network, a ring-like network, a loop-like network, a passive network or a star-like network.

6. A broadcasting communication system comprising:
a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and
a distribution network connected to said collection network and having a distribution node for distributing broadcasting signal selected by a subscriber to a subscriber network, wherein said subscriber network divides the broadcasting signals into cells having a fixed length and transmit the cells.

7. A broadcasting communication system comprising:
a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and
a distribution network connected to said collection network and having a distribution node for distributing broadcasting signal selected by a subscriber to a subscriber network, wherein said subscriber network comprises a two-way transmission function of transmitting the broadcasting signals from the distribution node to the subscriber and transmitting a subscriber's request to the distribution node.

8. A broadcasting communication system comprising:
a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and
a distribution network connected to said collection

transmitting a program to be provided to all subscribers and a second channel for transmitting a program to be selected in accordance with each subscriber's request.

9. The broadcasting communication system according to claim 8, wherein said second channel is allowed to be received by a subscriber requesting said second channel and unable to be received by a subscriber not requesting said second channel.

10. The broadcasting communication system according to claim 8, wherein said request has an immediate type in which the program is provided to the subscriber immediately in accordance with said request and an unimmediate type in which the program starts to be provided to the subscriber after a lapse of a predetermined period of time after said request.

11. The broadcasting communication system according to claim 8, wherein, when a subscriber makes a request for a program, if a program equal to the requested program is allotted to a second channel, a new channel is prevented from being allotted by the request.

12. The broadcasting communication system according to claim 8, wherein, when a subscriber makes a request for a program, if a program equal to the requested program is allotted to a second channel, the program is provided to the subscriber using the second channel.

13. The broadcasting communication system according to claim 10, wherein the subscriber is informed of whether a channel can be provided in accordance with a channel request of the immediate type.

14. The broadcasting communication system according to claim 10, wherein the subscriber is informed of whether a channel can be provided by scheduling allocation of channels, in accordance with a channel request of the

type for immediately securing a program in accordance with said request when a channel is allowed to be allotted, and a temporary reservation type for temporarily securing a program in accordance with said request, and, when said request of the temporary reservation type is made, if the fixed reservation type is made afterward, a reservation is cancelled.

16. The broadcasting communication system according to claim 15, wherein, when the request of the temporary reservation type is made and the reservation is cancelled, a subscriber who made the reservation is informed that the reservation was cancelled.

17. A broadcasting communication system comprising: a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and a distribution network connected to said collection network and having a distribution node for distributing broadcasting signal selected by a subscriber to a subscriber network, wherein said broadcasting stations include a TV broadcasting station and a production for producing a video program sponsored by a program sponsor.

18. A broadcasting communication system comprising: a collection network for collecting broadcasting signals transmitted from a plurality of broadcasting stations; and a distribution network connected to said collection network and having a distribution node for distributing broadcasting signal selected by a subscriber to a subscriber network, wherein said video package library comprises a read only type optical disk device, a rewritable type optical disk device for accumulating information obtained from the B-ISDN, and a write once type optical disk device.

This Sheet Has Been Replaced



In the invention, the broadcasting signals transmitted from the broadcasting stations are collected by the collection network at once, the collected signals are distributed to all the distribution nodes through the distribution network, and the broadcasting signal requested by the subscriber is transmitted to the subscriber network. Therefore, the subscribers connected to the distribution nodes can uniformly receive all the broadcasting signals collected by the collection network.

In accordance with the present invention, there is provided a broadcasting communication system comprising:

a collection network (100;200) for collecting broadcasting signals transmitted from a plurality of broadcasting stations (108;208) and for multiplexing collected broadcasting signals; and

a distribution network (101;201) which is connected to said collection network (100;200) via at least one transmission path (104) which is smaller in number than the broadcasting signals transmitted from the broadcasting stations, has distribution nodes (107;207) connected to subscriber networks (310), receives the multiplexed collected broadcasting signals, and transmits the received multiplexed collected broadcasting signals to the distribution nodes (107;207), in the distribution network at least one of the multiplexed collected broadcasting signals being selected by a subscriber or at least predetermined one of the multiplexed collected broadcasting signals are distributed to a subscriber network (310) corresponding to the subscriber.

Brief Description of the Drawings

FIG. 1 is a block diagram of a broadcasting communication system according to a first embodiment of the present invention;

FIG. 2 is a block diagram of the broadcasting communication system according to the first embodiment, in which a collection network is formed like a ring or a loop;

FIG. 3 is a block diagram showing an example of a distribution node of a distribution network in the broadcasting communication system according to the first embodiment;

FIG. 4 is a block diagram showing an example of a video package library of the distribution node shown in FIG. 3;

FIG. 5 is a view showing an example of an information transfer format in the broadcasting communication system of the present invention;

FIGS. 6A and 6B are views showing examples of a transfer format of cells in the broadcasting communication system of the present invention;

FIG. 7 is a block diagram showing an example of a subscriber network shown in FIG. 3;

FIG. 8 is a view showing an example of the state of use of a frequency band in the subscriber network;

FIG. 9 is a view showing an example of use of

CLAIMS

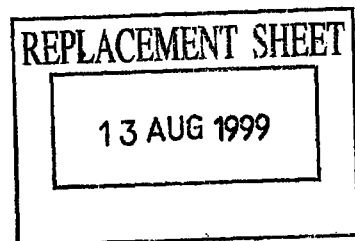
1. A broadcasting communication system comprising:

a collection network (100;200) for collecting
broadcasting signals transmitted from a plurality of
broadcasting stations (108;208) and for multiplexing
collected broadcasting signals; and

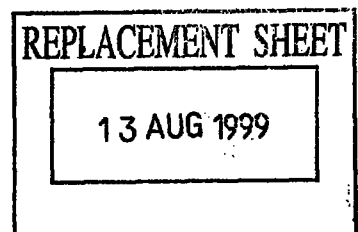
a distribution network (101;201) which is connected to
said collection network (100;200) via at least one
transmission path (104) which is smaller in number than the
broadcasting signals transmitted from the broadcasting
stations, has distribution nodes (107;207) connected to
subscriber networks (310), receives the multiplexed collected
broadcasting signals, and transmits the received multiplexed
collected broadcasting signals to the distribution nodes
(107;207), in the distribution network at least one of the
multiplexed collected broadcasting signals being selected by
a subscriber or at least predetermined one of the multiplexed
collected broadcasting signals are distributed to a
subscriber network (310) corresponding to the subscriber.

2. The broadcasting communication system according to claim
1, wherein said collection network (100;200) and said
distribution network (101;201) divide the broadcasting
signals into cells having a fixed length and transmit the
cells.

3. The broadcasting communication system according to claim
1 or 2, wherein said collection network (100) is a treelike
network.



- 5 5. The broadcasting communication system according to claim
1 or 2, wherein said collection network is a looplike
network.
- 10 6. The broadcasting communication system according to claim
1 or 2, wherein said collection network (100) includes a
cross-connect device (102) to which said plurality of
broadcasting stations (108) are connected.
- 15 7. The broadcasting communication system according to one
of claims 1 to 6, wherein said distribution network (101;102)
is a treelike network.
- 20 8. The broadcasting communication system according to one
of claims 1 to 6, wherein said distribution network is a
ringlike network.
- 25 9. The broadcasting communication system according to one
of claims 1 to 6, wherein said distribution network is a
looplike network.
- 30 10. The broadcasting communication system according to one
of claims 1 to 9, wherein said distribution network (101;102)
is a passive network.
- 35 11. The broadcasting communication system according to one
of claims 1 to 10, wherein said subscriber network (310) is a
tree-like network.
12. The broadcasting communication system according to one
of claims 1 to 10, wherein said subscriber network (310) is a
ring-like network.



5 14. The broadcasting communication system according to one
of claims 1 to 13, wherein said subscriber network (310) is a
passive network.

10 15. The broadcasting communication system according to one
of claims 1 to 13, wherein said subscriber network (310) is a
star-like network.

15 16. The broadcasting communication system according to one
of the preceding claims, wherein said collection network
(100;200) and said distribution network (101;201) transmit a
digital signal, said subscriber network (310) transmits an
analog signal, and said distribution nodes (107;207) comprise
means (305) for converting the digital signal into the analog
signal.

20 17. The broadcasting communication system according to one
of the preceding claims, wherein said subscriber network
(310) divides the broadcasting signals into cells having a
fixed length and transmits the cells.

25 18. The broadcasting communication system according to one
of the preceding claims, wherein said subscriber network
(310) comprises a two-way transmission function of
transmitting the broadcasting signals from the distribution
30 node (107;207) to the subscriber and transmitting a
subscribers request to the distribution node (107;207).

35 19. The broadcasting communication system according to one
of the preceding claims, wherein each of said collection
network (100;200) and said distribution network (101;201)
comprises a first channel for transmitting a program to be
provided to all subscribers and a second channel for

5 19, wherein said second channel is allowed to be received by
a subscriber requesting said second channel and unable to be
received by a subscriber not requesting said second channel.

10 21. The broadcasting communication system according to claim
19, wherein said request has an immediate type in which the
program is provided to the subscriber immediately in
accordance with said request and an un-immediate type in
which the program starts to be provided to the subscriber
15 after a lapse of a predetermined period of time after said
request.

20 22. The broadcasting communication system according to claim
19, wherein, when a subscriber makes a request for a program,
if a program equal to the program is allotted to a second
channel, a new channel is prevented from being allotted by
the request.

25 23. The broadcasting communication system according to claim
19, wherein, when a subscriber makes a request for a program,
if a program equal to the program is allotted to a second
channel, the program is provided to the subscriber using the
second channel.

30 24. The broadcasting communication system according to claim
21, wherein the subscriber is informed of whether a channel
can be provided in accordance with a channel request of the
immediate type.

35 25. The broadcasting communication system according to claim
21, wherein the subscriber is informed of whether a channel
can be provided by scheduling allocation of channels, in
accordance with a channel request of the un-immediate type.

immediately securing a program in accordance with said
5 request when a channel is allowed to be allotted, and a
temporary reservation type for temporarily securing a program
in accordance with said request, and, when said request of
the temporary reservation type is made, if the fixed
reservation type is made afterwards, a reservation is
10 canceled.

27. The broadcasting communication system according to claim
26, further comprising means for informing the subscriber who
made a reservation of canceling the reservation when a
15 request of the temporary reservation type is canceled.

28. The broadcasting communication system according to one
of the preceding claims, wherein each of said collection
network (100;200) and said distribution network (101;201) is
20 an optical fiber network.

29. The broadcasting communication system according to one
of the preceding claims, wherein said distribution node
(107;207) comprises a channel selection device (303)
25 connected to said distribution network (101;201), a satellite
broadcasting reception device (302), a network connection
device (304) connected to a B-ISDN, and a channel switching
device (301) for transmitting a signal from a video package
library (306) to the subscriber network (310).

30. The broadcasting communication system according to claim
29, wherein said video package library (306) comprises a read
only type optical disk device (401), a rewritable type
optical disk device (403) for accumulating information
35 obtained from the B-ISDN, and a write once type optical disk
device (402).

(310) comprises a CATV network and an FTH network.

5 32. The broadcasting communication system according to one of the preceding claims, wherein each of said collection network (100;200) and said distribution network (101;201) comprises means for executing light wavelength multiplex communication.

10

33. A broadcasting station connected to a broadcasting communication system as defined in one of claims 1 to 32, for transmitting a broadcasting signal.

15

34. A subscriber equipment connected to a broadcasting communication system as defined in one of claims 1 to 32, for receiving a broadcasting signal.

20

35. A collection network being part of a broadcasting communication system as defined in one of claims 1 to 32, for collecting broadcasting signals transmitted from a plurality of broadcasting stations and being connected to the distribution network for distributing the collected broadcasting signals.

25

36. A distribution network being part of a broadcasting communication system as defined in one of claims 1 to 32, for distributing the broadcasting signals collected by the collection network,

30

said distribution network is connected to the distribution node for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined broadcasting signal from said distribution network; and

35

said distribution node is connected to the subscriber network, including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

said distribution node being connected to the distribution network, which is connected to the collection network for
5 collecting the broadcasting signals transmitted from the plurality of broadcasting stations, for distributing the broadcasting signals and for selecting and transmitting one of a subscriber requested broadcasting signal and a
predetermined broadcasting signal from said distribution
10 network, wherein said distribution node is connected to a subscriber network, including at least one subscriber, for distributing the broadcasting signal selected by said distribution node.

15 38. A subscriber network being part of a broadcasting communication system as defined in one of claims 1 to 32, said subscriber network being connected to a distribution node for selecting and transmitting one of a subscriber requested broadcasting signal and a predetermined
20 broadcasting signal from a distribution network, said distribution node being connected to the distribution network for distributing a plurality of broadcasting signals, and said distribution network being connected to the collection network for collecting transmitting signals transmitted from
25 the plurality of broadcasting stations, wherein said subscriber network includes at least one subscriber, and distributes the broadcasting signal selected by said distribution node.