

FORM 1

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

596035

APPLICATION FOR A STANDARD PATENT

I\We,

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

of

1006, OAZA KADOMA
KADOMA-SHI
OSAKA
JAPAN

hereby apply for the grant of a standard patent for an invention entitled:

INFORMATION TRANSMISSION SYSTEM HAVING COLLECTIVE
DATA TRANSMISSION AND COLLECTION DEVICES

which is described in the accompanying complete specification

Details of basic application(s):

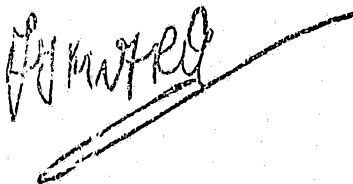
Number of basic application	Name of Convention country in which basic application was filed	Date of basic application
62-319431	JP	17 DEC 87
63-222711	JP	06 SEP 88

My/our address for service is care of GRIFFITH HACK & CO., Patent Attorneys, 601 St. Kilda Road, Melbourne 3004, Victoria, Australia.

DATED this 13th day of December 1988

MATSUSHITA ELECTRIC INDUSTRIAL
CO., LTD.

GRIFFITH HACK & CO.



TO: The Commissioner of Patents.

APPLICATION ACCEPTED AND AMENDMENTS

ALLOWED 8.2.90

Australian Patent Declaration Form

Forms 7 and 8

COMMONWEALTH OF AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION
APPLICATION FOR A PATENT OR A PATENT OF ADDITION

In support of the application No.26827/88 made by
MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.,
for a patent for an invention entitled
"INFORMATION TRANSMISSION SYSTEM HAVING COLLECTIVE DATA
TRANSMISSION AND COLLECTION DEVICES"
I/We, Shigetaka Awano, c/o MATSUSHITA ELECTRIC INDUSTRIAL CO.,
LTD.,
of 1006, Oaza Kadoma, Kadoma-shi, Osaka, Japan,

do solemnly and sincerely declare as follows:-

1. I am/we are the applicant(s) for the patent, or am/are
authorised by the abovementioned applicant(s) to make this
declaration on its behalf.
2. The basic application(s) as defined by Section 141 of the Act
was/were made in the following country or countries on the
following date(s) by the following applicant(s) namely:-

in	Japan.	on	December 17,	1987
by	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.			
in	Japan	on	September 6,	1988
by	MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.			

3. The said basic application(s) was/were the first
application(s) made in a Convention country in respect of the
invention the subject of the application.

4. The actual inventor(s) of the said invention is/are

Please see reverse side.

5. The facts upon which the applicant(s) is/are entitled to make
this application are as follows:-

The applicant is the assignee of the invention
from the inventors.

DECLARED at Osaka, Japan this 1st day of February, 1989.

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

Shigetaka Awano
Shigetaka Awano
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4.

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of: Osuka Kori 608, 3-3, Miiminamimachi, Neyagawa-shi,
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46-1-307, Yamadaikehigashimachi, Hirakata-shi,
Japan; and

46-16, Muranohigashimachi, Hirakata-shi, Japan;

respectively.



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- (54) Title
**INFORMATION TRANSMISSION SYSTEM HAVING COLLECTIVE DATA
TRANSMISSION AND COLLECTION DEVICES**
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- (56) Prior Art Documents
AU 49072/85 H04L 11/18 H04B 3/04
- (57) Claim

3. A communication control unit in a bus type communication network having an information transmission path for transmitting broadcasting information and at least two communication control units, which communicate with each other through said information transmission path, wherein an optional one of said communication control units collectively transmits the broadcasting information by using one message to other plural communication control units through said information transmission path, comprising:

 a communication controller and a controller;
 said communication controller communicating
with those of other communication control units through

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said information transmission path,

said controller generating, decoding and processing the information transmitted through said communication controller,

said communication control unit thereby performing the following operational steps:

(a) transmitting one broadcasting message from said controller of said optional communication control unit, which transmits the broadcasting information, to said information transmission path through said communication controller, said broadcasting message having a destination address field containing a code indicating that a plurality of predetermined communication control units are destined;

(b) receiving the broadcasting message only until the destination address field thereof by said controller through said communication controller in all said communication control units connected to said information transmission path other than said optional communication control unit which transmits the broadcasting information; and,

(c) comparing the received destination address with values of a plurality of preassigned receiving addresses by said controller in each of said communication control units which have received the broadcasting message, and continuing the reception, if the broadcasting message is determined to be received, or

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interrupting the reception, if the broadcasting message
is determined not to be received;

whereby the broadcasting information is
broadcasted to said plurality of communication control
units.

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PATENTS ACT 1952

Form 10

COMPLETE SPECIFICATION

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Related Art:

TO BE COMPLETED BY APPLICANT

Name of Applicant:

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Complete Specification for the invention entitled:
INFORMATION TRANSMISSION SYSTEM HAVING COLLECTIVE
DATA TRANSMISSION AND COLLECTION DEVICES

The following statement is a full description of this invention
including the best method of performing it known to me:-

1 BACKGROUND OF THE INVENTION

The present invention relates to a method for collectively transmitting and collecting communication information in an information transmission system, and a system using the method.

As the information transmission system, a digital data bus (D^2B) for communicating information between audio/video equipments has been known (IEC "84 Secretariat 47 Draft Peritelevision/ D^2B "). The conventional D^2B information transmission system has a function to communicate one information message from one source communication control unit connected to an information transmission line to one destination communication control unit connected to the information transmission line in one-to-one communication fashion.

Fig. 8 shows a block diagram of a prior art information transmission system. Numeral 101 denotes an information transmission line for transmitting information messages, and numerals 102 and 103 denote communication control units for mutually communicating through the information transmission line.

Fig. 9 shows a format of a conventional information message. It comprises a start bit indicating the beginning of the information message, a master address indicating a source address, a parity bit

1 indicating a parity of the master address, a slave
address indicating a destination address, a parity bit
and an ACK bit indicating a parity of the slave address,
a control field indicating an attribute of the informa-
5 tion message, a parity bit indicating a parity of the
control field, and a data field indicating transmission
information. The parity bit is used for parity check.
The ACK bit informs to the transmitter whether the
receiver has normally received the data or not. If the
10 receiver normally receives, it sends back an acknowledge
(ACK) signal, and if it incorrectly receives, it sends
back a non-acknowledge (NACK) signal.

A communication method in the above system is
explained. When an information message is to be sent
15 from the communication control unit 102 to the communi-
cation control unit 103 in Fig. 8, the communication
control unit 102 first send the start bit, and then
send a unit address of the communication control unit
102 as the master address, the parity bit thereof, a
20 unit address of the communication control unit 103 as
the slave address, and the parity bit thereof. The unit
addresses of the communication control units 102 and 103
are uniquely present on the information transmission line
101. When the communication control unit 103 detects the
25 start bit, it starts to receive the information message
to receive the master address, the parity bit thereof,
the slave address and the parity bit thereof. If the
information message is normally received and the slave

1 address coincides with the unit address of the communication control unit 103, the communication control unit 103 determines that the information message is addressed to its own unit and sends back the ACK bit. If it does not
5 correctly receive the information message by asynchronization or parity error during the receiving operation, or if the slave address does not coincide with the unit address of its own, it sends back the NACK bit. If the communication control unit 103 is not connected to the
10 information transmission line 1, the ACK bit is not sent and no response is sent. The communication control unit 102 determines it as if it received the NACK bit. When the communication control unit 102 receives the NACK bit, it stops to send the information message.
15 When the communication control unit 102 receives the ACK bit, it further sends the control field and the parity bit thereof. When the communication control unit 103 correctly receives the control field and the parity bit thereof, or when it is able to execute the
20 operation designated by the control field in the receiving station, it sends back the ACK signal. If it does not correctly receive the control field and the parity bit thereof because of asynchronization or parity error during the receiving operation, or if it cannot
25 execute the operation designated by the received control field, it sends back the NACK signal to the communication control unit 102. When the communication control unit 102 receives the NACK signal, it stops to send the

1 information messate. When it receives the ACK signal,
it further transmits the data field to the communication
control unit 103.

Collective collection of information by one of
5 the communication control units connected to the infor-
mation transmission line is now considered. In a bus type
communication network shown in Fig. 12 in which a plurali-
ty of communication control units are interconnected
through an information transmission line, let us assume
10 that a communication control unit 105 receives information
① of a communication control unit 106 and information ②
of a communication control unit 107 through an information
transmission line 104. Numerals in < > in the respective
communication control units represent unit addresses on the
15 information transmission line assigned to the respective
communication control units. A communication message and a
communication sequence therefor are shown in Figs. 13 and
14, respectively. The communication control unit 105
designates an address of a memory, in which the informa-
20 tion to be read from the communication control unit 106 is
stored, by a communication message shown in Fig. 13a,
in which MA denotes a master address which is a source
address, and SA denotes a slave address which is a
destination address. The unit address <200> of the
25 communication control unit 105 and the unit address <210>
of the communication control unit 106 are designated. CF
denotes a control field which represents an attribute of
the message. Specifically, it has a code which indicates

1 the attribute of the memory address designation. In
the following data field, an address of the memory in
which the information to be read is stored is written.
The communication control unit 105 then reads the
5 information from a memory 108 of the communication
control unit 106 by a message shown in Fig. 13b, in which
MA contains the unit address <200> of the communication
control unit 105, AS contains the unit address <210> of
the communication control unit 106, and CF contains a
10 code indicating the read-out of the data. When the
communication control unit 106 receives the code, it
detects the data read-out code and sends back the informa-
tion ① stored at the address designated by the memory
address designation message of Fig. 13a, as a data field
15 of the data read-out message of Fig. 13b. When the
communication control unit 105 reads the information ②
from the information memory 109 of the communication
control unit 107, it reads the information by a memory
address designation message of Fig. 13c and a data
20 read-out message of Fig. 13d. Fig. 14 shows a communica-
tion sequence in reading the data by the messages of
Fig. 13a, 13b, 13c and 13d.

In the prior art communication control method
mentioned above, when one communication control unit
25 communicates the same information with a plurality of
communication control units, it has to repeatedly
communicate the same information message to the plurality
of communication control units. Thus, a procedure is

1 very complex.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a communication control method and an information
5 transmission system for collectively transmitting and collecting information without individually sending the information of the same content to a plurality of communication control units when the same information is to be collectively sent to or collected by the
10 plurality of communication control units. The collective transmission of the same information is first explained. In order to achieve the above object, the information transmission system of the present invention comprises a bus type communication network which has an informa-
15 tion transmission path for transmitting control information and at least two communication control units which communicate with each other through the information transmission path. The communication control unit comprises a communication controller, a controller for
20 generating, decoding and processing information transmitted through the communication controller, and a memory containing the information at memory addresses assigned to respective information classes. When information data is to be simultaneously transmitted or
25 broadcasted from an optional one of the communication control units to one or more other communication control unit, the broadcasting communication control unit sends

1 a collective information transmission message including
predetermined destination addresses, which indicates
information transmission from the broadcasting communi-
cation control unit to the plurality of information
5 receiving communication control units. The information
receiving communication control units connected to the
information transmission path receive the collective
information transmission message only to the extent of the
destination addresses therein, and compare their own
10 addresses with the destination addresses to determine
whether they should receive and process the collective
information transmission message or not. If it is the
message is to be processed, the communication control
unit receives the succeedingly transmitted collective
15 information transmission message.

The collective collection of the same informa-
tion is next explained. In order to achieve the above
object, an optional communication control unit which is
to collect information sends to the information trans-
20 mission path a collective information transmission
message containing, in its data field, memory addresses
of the information to be collectively collected. The
memory address designation message is received by one
or more other communication control units which recognize
25 the memory addresses of the information to be collected.
The communication control units which collect the
information send to the information transmission path
the information collection message. A data field of

1 the information collection message is composed of a
plurality of sets each of which sets has an address
data field and a send-back information field which
indicates the information to be sent back. When other
5 communication control units receive the information
collection message, they send their own addresses to
the address data field of the information collection
message to take part in a competition control. Each of
the communication control units, which have won in the
10 competition control, enters its own address in the
address data field and also enters in the send-back
information field the send-back information designated
by the memory address designation message. Then, the
preferential communication control units sequentially
15 send the entered address data fields and send-back
information fields to the information transmission
path. Thus, as the original communication control unit,
which has sent the information collection message,
receives the address data fields and the send-back
20 information fields, it can collectively collect the
information by using a single message. Further, if the
data field of the information collection message
comprises the address data field, a byte count field,
which indicates the number of bytes of information to
25 be sent back, and the send-back information field which
contains the information to be sent back, and the com-
munication control units, from which the information
is to be collected, simultaneously send the numbers of

1 data bytes of the information to be sent back, then
plural byte data can be collected in a lump. In
accordance with the present invention, an optional communication control unit can effect collective transmission or collection of information to or from any
5 other optional communication control units connected to each other through the information transmission path. Thus, the information transmission efficiency via an information transmission path is improved.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1 and 3 show formats of address codes in one embodiment of an information transmission system of the present invention.

Fig. 2 shows a block diagram of the information
15 transmission system.

Fig. 4 illustrates transmission of a common message.

Fig. 5 shows a flow chart of an operation of a controller of a receiving communication control unit
20 in the information transmission system.

Fig. 6 shows a format of an address in another embodiment of the information transmission system of the present invention.

Fig. 7 shows a format of first one-byte data
25 of a data field in the information transmission system.

Fig. 8 shows a block diagram of a prior art information transmission system.

1 Fig. 9 shows a format of an information message
used in the prior art and present information transmission
systems.

 Figs. 10 and 11 show message formats in other
5 embodiment of the communication control method of the
present invention.

 Fig. 12 shows a configuration of a communica-
tion network and a communication control unit to which
the present communication control method is applied.

10 Fig. 13 shows a format of a message for
collecting information in a prior art method.

 Fig. 14 shows a communication sequence when
a conventional message is used.

 Fig. 15 shows a format of a message for
15 collecting information in the present invention.

 Fig. 16 shows a communication sequence when
the message of Fig. 15 is used.

 Fig. 17 shows a format of a message for
collecting information in the present invention shown
20 in Fig. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

 Firstly, an embodiment of the present invention
for collectively transmitting information is now explained
with reference to the drawings.

25 Fig. 2 shows a block diagram of one embodiment
of the information transmission system of the present
invention. A communication control unit 1 of the

1 information transmission system of the present embodiment
comprises a communication controller 10 for transmitting
an information message to an information transmission
path including an information transmission line 4 and
5 receiving an information message from the information
transmission path including the information transmission
line 4, a memory 11 for storing an address of a message
to be received by the communication control unit, and
a controller 12 for controlling those elements. Communi-
10 cation control units 2 and 3 have the same construction
as the communication control unit 1. Numerals 20 and
30 denote communication controllers, numerals 21 and 31
denote memories, and numerals 22 and 32 denote control-
lers. The communication control units 1, 2 and 3 have
15 unique unit addresses assigned thereto. Fig. 1 shows
a content of an address code. The eleventh bit b11
indicates whether broadcasting is involved or not.
(Here, the term "broadcasting" is used to denote multi-
address calling, multi-address communication, or collective
20 communication.) When it is "1", it indicates an address
for broadcasting, and when it is "0", it indicates an
individual (normal) address. The tenth to eighth bits
represent a service code. For example, when they are
"000", they indicate a gate, and when they are "001",
25 they indicate audio/video equipment. The seventh to
third bits indicate a device name. Table 1 shows device
names of the audio/video equipment and corresponding
device codes.

1 In Table 1, "00000" to "11110" indicate
individual devices, and "11111" indicates collective
broadcasting to the audio/video equipment. The second
to zero-th bits indicate device numbers. Table 1 shows
5 the device numbers from No. 1 to No. 8 for one and the
same device.

Table 1

DEVICE CODE b7 b6 b5 b4 b3					DEVICE NAME
0	0	0	0	0	VIDEO MONITOR (TV)
0	0	0	0	1	AUDIO AMPLIFIER
0	0	0	1	0	VIDEO SOURCE SELECTOR
0	0	0	1	1	AUDIO SOURCE SELECTOR
0	0	1	0	0	VTR
0	0	1	0	1	VIDEO TUNER
0	0	1	1	0	VIDEO PLAYER
0	0	1	1	1	VIDEO CAMERA
0	1	0	0	0	TEXT DECODER
0	1	0	0	1	DISPLAY ON SCREEN
0	1	0	1	0	VIDEO PRINTER
0	1	0	1	1	BROADCAST FAX
0	1	1	0	0	VIDEO EFFECTS DEVICE
0	1	1	0	1	Undefined
0	1	1	1	0	Undefined
0	1	1	1	1	Undefined
1	0	0	0	0	AUDIO TUNER
1	0	0	0	1	AUDIO RECORDER
1	0	0	1	0	CD PLAYER
1	0	0	1	1	ANALOGUE AUDIO DISC PLAYER
1	0	1	0	0	AUDIO EFFECTOR
1	0	1	0	1	Undefined
1	0	1	1	0	Undefined
1	0	1	1	1	Undefined
1	1	0	0	0	A/V PERSONAL COMPUTER
1	1	0	0	1	A/V CONTROLLER
1	1	0	1	0	CD ROM
1	1	0	1	1	Undefined
1	1	1	0	0	TIMER
1	1	1	0	1	Undefined
1	1	1	1	0	Undefined
1	1	1	1	1	Collective broadcasting

1 In accordance with the address code configura-
tion described above, the unit address of the communi-
cation control unit 1 is set to "1EO (HEX)", the unit
address of the communication control unit 2 is set to
5 "120 (HEX)", and the unit address of the communication
control unit 3 is set to "1CO (HEX)". The format of the
information message is the same as that shown in Fig. 9.
In the present embodiment, in the one-to-one communication
mode, the broadcasting bit b11 in Fig. 1 is set to "0",
10 and the information message is transmitted in the same
manner as in the prior art system. In a one-to-plural
communication mode, that is, in the broadcasting mode,
the bit b11 in Fig. 1 is set to "1". There are three
types in the broadcasting mode, that is, collective
15 broadcasting to all communication control units connected
to the information transmission line 4, service group
broadcasting to the communication control units belonging
to a service group designated by the service code, and
device group broadcasting to the communication control
20 units belonging to a device group designated by the
service code and the device name. Fig. 3a shows an
address code for the collective broadcasting. It is
"FFF (HEX)". Fig. 3b shows an address code for the
service group broadcasting. All bits other than the
25 service code are set to "1". Fig. 3c shows an address
code for the device group broadcasting. The bit b11 is
set to "1" and the bits b2 to b0 are set to "1".

The communication method in the information

1 transmission system thus constructed is explained.

The one-to-one communication mode is the same as that of the prior art communication method, and the explanation thereof is omitted. The transmission of the

5 information message from the communication control unit 1 to all other communication control units 2 and 3 through the information transmission line 4 is explained.

The communication control units 1, 2 and 3 store the slave addresses to be received and processed
10 in the memories 11, 21 and 31, respectively. For example, the communication control unit 1 stores the individual address "LEO (HEX)", collective broadcasting address "FFF (HEX)", service group broadcasting address "9FF (HEX)" and device group broadcasting address "9E7 (HEX)"
15 in the memory, the communication control unit 2 stores the individual address "120 (HEX)", collective broadcasting address "FFF (HEX)", service group broadcasting address "9FF (HEX)" and device group broadcasting address "927 (HEX)" in the memory, and the communication
20 control unit 3 stores the individual address "1CO (HEX)", collective broadcasting address "FFF (HEX)", service group broadcasting address "9FF (HEX)" and device group broadcasting address "9C7 (HEX)" in the memory.

When the communication control unit 1 is to
25 broadcast to the communication control units 2 and 3 having the same service group address, the communication control unit 1 generates the information message having the codes of the master address "LEO (HEX)" and the

1 slave address "9FF (HEX)" by the controller 12, and
sends the start bit, master address, parity bit thereof,
slave address and parity bit thereof from the communica-
tion controller 10 to the communication control units
5 2 and 3 through the information transmission line 4,
as shown in Fig. 4. When the communication control
units 2 and 3 detect the start bit, the communication
controllers 20 and 30 thereof start the receiving
operations. The communication control unit 2 receives
10 the master address, parity bit thereof, slave address
and parity bit thereof through the communication control-
ler 20. If they are correctly received without asynchroni-
zation, the controller 22 checks the slave address and
decides whether the information message is to be received
15 or not. Fig. 5 shows the process in the controller 22.

When the controller 22 receives the master
address and the slave address (step A), it determines
whether the received slave address "9FF (HEX)" coincides
with the individual address "120 (HEX)" stored in the
20 memory 21 (step B). Since it does not coincide in this
example, it determines whether the received slave address
"9FF (HEX)" coincides with the collective broadcasting
address "FFF (HEX)" stored in the memory 21 (step C).
Since it also does not coincide, it determines whether the
25 received slave address "9FF (HEX)" coincides with the
device group broadcasting address "927 (HEX)" stored in the
memory 21 (step D). Since it also does not coincide, it
determines whether the received slave address "9FF (HEX)"

1 coincides with the service group broadcasting address
"9FF (HEX)" stored in the memory 21 (step E). Since
it coincides, the message reception is processed (step
F). The ACK signal for the master address and the
5 slave address is not sent at this time, but the process
is delayed for that period. When the communication
control unit 1 has conducted broadcasting communication,
it does not confirm the ACK signal for the slave address
but sends the control field and the parity bit thereof
10 without performing the confirmation of the ACK signal,
and then sends the data field. The communication control
unit 2 receives those messages. The communication control
unit 3 also receives the messages in the same way as the
communication control unit 2 does, and receives the
15 information message of the service group broadcasting
having the slave address "9FF (HEX)".

In this manner, one information message sent
from the communication control unit 1 can be simultaneous-
ly received by the communication control units 2 and 3.

20 Another embodiment of the present invention
is explained. The configuration of the information
transmission system is the same as that shown in Fig. 2.
Fig. 6 shows a content of an address code. The eleventh
to eighth bits represent a service code. When they
25 are "0000", they indicate a gateway, and when they are
"0001", they indicate an audio/video equipment.
The seventh to third bits and the second to 0-th bits
represent the device name and the device number,

1 respectively, as they are in the previous embodiment.
When the eleventh to 0-th bit are all "1", they represent
the address for the collective broadcasting to all
communication control units connected to the information
5 transmission line 4. The format of the information message
is the same as that shown in Fig. 9. In the present
embodiment, in the one-to-one communication mode, the
slave address contains the individual address of the
destination as it does in the prior art system. In the
10 one-to-plural communication mode, that is, in the
broadcasting mode, the slave address, which indicates the
collective broadcasting address, is used. When the
collective broadcasting address is used as the slave
address, the first one byte of the data field indicates
15 the broadcasting group. The individual address is
divided into eight groups, groups 0 to 7, and when the
bit for one group is "1", the message is broadcasted
to that group, and when it is "0", the broadcasting is
not effected. In the present embodiment, the communica-
20 tion control units 1, 2 and 3 of Fig. 2 are assigned to
group 0.

The communication method in the information
transmission system thus constructed is explained.
The communication method in the one-to-one communication
25 mode is the same as that of the prior art system and the
explanation thereof is omitted. The transmission of the
information message from the communication control unit
1 to the communication control units 2 and 3 connected

1 to the information transmission line 4 is explained.

At the start-up of the system, the communication control units 1, 2 and 3 store the collective broadcasting address "FFF (HEX)" which is the slave address of the information message to be received, and the individual address in the memories 11, 21 and 31, respectively. The communication control unit 1 generates in the controller 12 the information message having the unit address "1E0 (HEX)" of the communication control unit 1 as the master address, the slave address "FFF (HEX)" which indicates the collective broadcasting and the first byte code "01 (HEX)" of the data field showing the addressing to the group 0, respectively, and sends the information message from the communication controller 10 to the information transmission line 4. The communication control units 2 and 3 detect the start bit of the information message and start the receiving operations in the communication controllers 20 and 30, respectively. The controller 22 of the communication control unit 2 receives the master address, parity bit thereof, slave address and parity bit thereof through the communication controller 20. If it correctly receives the information message, it compares the slave address "FFF (HEX)" of the information message received by the controller 22 with the address of the message to be received stored in the memory 21, and determines whether to continue the receiving operation or not. The memory 21 contains the slave addresses "120 (HEX)" and "FFF (HEX)" of the

1 information messages to be received. Since the slave
address "FFF (HEX)" coincides, the communication control
unit 2 continues to receive the information message and
temporarily stores the content of the information message
5 in the memory 21. When the data field has been received to
the end, the controller 12 decide the content of the first
one byte of the data field of the received information
message stored in the memory 21 to determine whether the
information message is addressed to the group to which
10 it belongs. Since the code of the first byte of the
data field of the received information message is "01
(HEX)" and $b_0 = 1$, that is, since it is addressed to the
group 0, the controller 12 conducts the process designated
by the content of the data field. The communication
15 control unit 3 also conducts the same process, that is,
it receives the information message for the group 0 sent
from the communication control unit 1.

In this manner, one information message
sent from the communication control unit 1 can be
20 simulataneously received by the communication control
units 2 and 3.

The collective collection of information in
the present invention is next explained.

Fig. 10 shows a message format in an embodi-
25 ment of the present invention. MA denotes a master
address which is a source address, SA denotes a slave
address which is a destination address, and CF denotes
a control field which indicates an attribute of the

1 message. A message shown in Fig. 10a is a memory
address designation message. MA denotes a unit address
of the communication control unit which collects the
information, and SA contains a specific code "FFF".

5 When this code is set, all communication control units
connected to the information transmission line other than
the communication control unit, which collects the
information, receive the message. The collective broad-
casting message explained above is used for this purpose.

10 The service group broadcasting message or device group
broadcasting message may also be used. CF contains the
memory address designation code, and the data field
contains the address of a memory to be read. In the
message shown in Fig. 10b, MA and SA are the same as

15 those of Fig. 10a. CR contains the data read code and
the data field contains a plurality sets of data, each
data set including a unit address of the communication
control unit, to which the information is to be sent
back, and the send-back information. In the bus type

20 communication network shown in Fig. 12, it is assumed
that the communication control unit 105 collects the
information ① stored in the information memory 108 of
the communication control unit 106 and the information
② stored in the information memory 109 of the communi-

25 cation control unit 107. Figs. 15 and 16 show communi-
cation message and communication sequence when the
message format shown in Fig. 10 is used. In Fig. 15a,
the communication control unit 105 for collecting the

1 information sends to the information transmission line
104 the information collection message having the
specific collective broadcasting address code "FFF" in
the field SA and the memory address designation code in
5 the field CF. All communication control units connected
to the information transmission line 104 other than the
communication control unit 105, that is, the communica-
tion control units 106 and 107 receive the message,
recognize it as the memory address designation message,
10 and read the content of the memory having the address
designated by the data field. The contents of the
memory are the information (1) for the communication
control unit 106, and the information (2) for the
communication control unit 107. Then, the information
15 is collected by the information collection message of
Fig. 15b. SA contains the specific collective broad-
casting address "FFF" so that all communication control
units 106 and 107 receive the message. When the
communication control unit receives the message, it
20 detects the data read code in the field CF, and sends
the unit address data of its own communication control
unit while performing competition control at the head
of the data field. The communication control units 106
and 107 concurrently send the unit addresses of their own
25 units and compare the transmitted data with the data
on the information transmission line 104. If a plurality
of communication control units concurrently send data
to the information transmission line 104, the data "0"

1 wins against the data "1" because the communication control units are connected to the information transmission line 104 in a wired-and manner. When the unit address data is concurrently sent to the information transmission line 104, the communication control unit, which has sent a smaller value of unit address, wins in the competition and acquires a right to succeedingly send the data. Since the unit address of the communication control unit 106 is smaller than that of the communication control unit 107, the communication control unit 106 wins, and it sends back to the information transmission line 104 data 1 comprising the unit address "210" and the information (1), which the communication control unit 106 is to send back, in one set. The communication control unit 107, which has lost in the competition, sends the unit address to the information transmission line 104 succeeding to the data 1 to retry the competition. Since there is no other communication control unit which is to send back information to the information transmission line 104, the communication control unit 107 wins and it sends back to the information transmission line 104 data 2 comprising the unit address 220 of its own unit and the information (2) to be sent back, in one set. The communication sequence in the embodiment of the present invention is shown in Fig. 16. The memory address designation message and the data read message are concurrently received by the communication control units

1 106 and 107.

A message format in another embodiment of the present invention is shown in Fig. 11. Fig. 11a shows a message similar to that of Fig. 10a. In Fig. 11b, 5 a data field contains a unit address of the communication control unit which is to send back information, a byte count indicating the number of bytes of the send-back information, and the send-back information. The communication control unit, which has the send-back information 10 in the data field, places the unit address of its own unit and the number of bytes of the send-back information, which it is to send back, ahead of the send-back information to thereby form the data field. The data field comprises send-back data which have been sent back from 15 a plurality of communication control units. In the communication network shown in Fig. 12, it is assumed that the communication control unit 105 collects the information (1) of the communication control unit 106 and the information (2) of the communication control 20 unit 107. A communication message, which complies with the message format of Fig. 11, is shown in Fig. 17. A memory address designation message shown in Fig. 17a is similar to that of Fig. 15a. Succeeding to the use of the message of Fig. 17a, an information collection 25 message of Fig. 17b is used to collect information. When the communication control units receive the message, competition control is effected therebetween in the unit address fields, as they did in Fig. 15b, then, the

1 preferential communication control units designate in
the byte count fields the numbers of bytes of the
send-back information to be sent back, and transmit
the send-back information.

5 In accordance with the present invention, the
information can be collectively transmitted and
collected by using a small number of messages between
an optional communication control unit and other optional
communication control units. In the collective trans-

10 mission mode, the transmission may be designated to a
variety of destinations. In the collective collection
mode, not only a single kind of information but also
many kinds of information may be collected. Further,
the length of information to be sent back may be variable.

15 Thus, the present invention has great advantages in
practical use.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A communication control method in a bus type communication network having a plurality of communication control units connected to an information transmission path in which an optional one of said communication control units collectively transmits broadcasting information by using one message to other plural communication control units through said information transmission path, comprising the steps of:

(a) transmitting one broadcasting message from said optional communication control unit, which transmits the information, to said information transmission path, said broadcasting message having a destination address field containing a code indicating that a plurality of predetermined communication control units are destined;

(b) receiving the broadcasting message only until the destination address field thereof by all said communication control units connected to said information transmission path other than said optional communication control unit which transmits the information; and,

(c) comparing the received destination address with values of a plurality of preassigned receiving addresses, in each of said communication control units which have received the broadcasting message, and continuing the reception, if the broadcasting message is determined to be received, or interrupting the reception, if the broadcasting message is determined not to be



received;

whereby the broadcasting information is broadcasted to said plurality of communication control units.

2. A communication control method in a bus type communication network having a plurality of communication control units connected to an information transmission path in which an optional one of said communication control units collectively transmits broadcasting information by using one message to other plural communication control units through said information transmission path, comprising the steps of:

(a) transmitting one broadcasting message from said optional communication control unit, which transmits the information, to said information transmission path, said broadcasting message having a destination address field containing a code indicating that all said communication control unit connected to said information transmission path are destined, said broadcasting message further having a data field whose head portion contains a code indicating that a plurality of predetermined communication control units are destined;

(b) receiving the broadcasting message only until the destination address field thereof by all said communication control units connected to said information transmission path other than said optional communication control unit which transmits the information; and,

(c) temporarily receiving and storing the

broadcasting message in each of said communication control units which have received said broadcasting message, if the received destination address is a code indicating that all said communication control units connected to said information transmission path are destined; and,

(d) comparing, in each of said communication control units which have received and stored the broadcasting message up to the end thereof, a message destination code at the head of the received data field with a destination code which has been preassigned to be processed, determining whether the broadcasting message is to be received and processed, receiving and processing the broadcasting message, if the broadcasting message is determined to be processed, and interrupting the reception, if the broadcasting message is determined not to be processed;

whereby the broadcasting information is broadcasted to said plurality of communication control units.

3. A communication control unit in a bus type communication network having an information transmission path for transmitting broadcasting information and at least two communication control units, which communicate with each other through said information transmission path, wherein an optional one of said communication control units collectively transmits the broadcasting information by using one message to other plural communication control units through said information transmission path, comprising:

a communication controller and a controller;
said communication controller communicating
with those of other communication control units through
said information transmission path,

said controller generating, decoding and
processing the information transmitted through said
communication controller,

said communication control unit thereby
performing the following operational steps:

(a) transmitting one broadcasting message from
said controller of said optional communication control
unit, which transmits the broadcasting information, to
said information transmission path through said
communication controller, said broadcasting message
having a destination address field containing a code
indicating that a plurality of predetermined
communication control units are destined;

(b) receiving the broadcasting message only
until the destination address field thereof by said
controller through said communication controller in all
said communication control units connected to said
information transmission path other than said optional
communication control unit which transmits the
broadcasting information; and,

(c) comparing the received destination address
with values of a plurality of preassigned receiving
addresses by said controller in each of said
communication



control units which have received the broadcasting message, and continuing the reception, if the broadcasting message is determined to be received, or interrupting the reception, if the broadcasting message is determined not to be received;

whereby the broadcasting information is broadcasted to said plurality of communication control units.

4. A communication control unit in a bus type communication network having an information transmission path for transmitting broadcasting information and at least two communication control units, which communicate with each other through said information transmission path, wherein an optional one of said communication control units collectively transmits the broadcasting information by using one message to other plural communication control units through said information transmission path, comprising:

a communication controller and a controller;

said communication controller communicating with those of other communication control units through said information transmission path,

said controller generating, decoding and processing the information transmitted through said communication controller,

said communication control unit thereby performing the following operational steps:

(a) transmitting one broadcasting message from said controller of said optional communication



control unit, which transmits the information, to said information transmission path through said communication controller, said broadcasting message having a destination address field containing a code indicating that all said communication control units connected to said information transmission path are destined, said broadcasting message further having a data field whose head portion contains a code indicating that a plurality of predetermined communication control units are destined;

(b) receiving the broadcasting message only until the destination address field thereof by said controller through said communication controller in all said communication control units connected to said information transmission path ~~but~~ other than said optional communication control unit which transmits the information;

(c) temporarily receiving and storing the broadcasting message by said controller in each of said communication control units which have received said broadcasting message, if the received destination address is a code indicating that all said communication control units connected to said information transmission path are destined; and

(d) comparing, by said controller in each of said communication control units which have received and stored the broadcasting message up to the end thereof, a message ~~object~~^{destination} code at the head of the received data field with an ~~object~~^{destination} code which has been



preassigned to be processed, determining whether the broadcasting message is to be received and processed, receiving and processing the broadcasting message, if the broadcasting message is determined to be processed, and interrupting the reception, if the broadcasting message is determined not to be processed;

whereby the broadcasting information to said plurality of communication control units.

5. A communication control method in a bus type communication network having a plurality of communication control units connected to an information transmission path wherein an optional one of said communication control units collectively collects broadcasting information from other communication control units through said information transmission path, comprising the steps of:

(a) transmitting, from said optional communication control unit which collects the broadcasting information, a memory address designation message to said information transmission path,

said memory address designation message having a destination address in the message, a control field containing a specific code and a data field containing a code indicating a memory address of data to be collected,

said code in said control field indicating an attribute of the message,

said data field containing data to be transmitted;



(b) receiving, by said communication control units other than said optional communication control unit which collects the broadcasting information, said memory address designation message and confirming that send-back information having a memory address designated by said memory address designation message is to be collected;

(c) transmitting from said optional communication control unit, which collects the broadcasting information, an information collection message to said information transmission path,

said information collection message having a destination address in the message, a control field containing a specific code, and a data field containing a plurality of sets each thereof being composed of an address data field and a send-back information field,

said send-back information field containing the information data to be sent back;

(d) transmitting from said communication control units, which have received said information collection message, unit address data of their own communication control units to said address data field in said information collection message to perform competition control, and preparing, in said communication control units which have won in the competition control, said address data field by using the address data of their own communication control units, and preparing said send-back information field by using the send-back information designated by said memory address designation

message, and sequentially transmitting from each of said communication control units a set of said address data field and said send-back information field to said information transmission path; and

(e) receiving by said optional communication control unit, which has transmitted said information collection message, said address data field and said send-back information field so that said optional communication control unit collectively collects the information from said other communication control units by using one message,

whereby the ^{broadcasting} information is collectively collected.

6. A communication control method in a bus type communication network having a plurality of communication control units connected to an information transmission path wherein an optional one of said communication control units collectively collects ^{broadcasting} information from said other communication control units through said information transmission path, comprising the steps of:

(a) transmitting, by said optional communication control unit which collects the ^{broadcasting} information, a memory address designation message to said information transmission path,

said memory address designation message having a destination address in the message, a control field containing a specific code and a data field containing a code indicating a memory address of data to be



collected,

said code in said control field indicating
an attribute of the message,

said data field containing data to be
transmitted;

(b) receiving, by said communication control
units other than said optional communication control
unit which collects the ^{broadcasting} information, said memory address
designation message and confirming that send-back
information having a memory address designated by said
memory address designation message is to be collected;

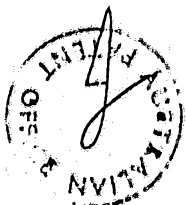
(c) transmitting from said optional communi-
cation control unit, which collects the ^{broadcasting} information, an
information collection message to said information
transmission path,

said information collection message having
a destination address in the message, a control field
containing a specific code, and a data field containing
a plurality of sets each thereof being composed of an
address data field, a byte count field and a send-back
information field,

said byte count field representing the number
of bytes of the information to be sent back,

said send-back information field containing
the information data to be sent back;

(d) transmitting from said communication
control units, which have received said information
collection message, unit address values of their own



communication control units to said address data field in said information collection message to perform competition control, and preparing, in said communication control units which have won in the competition control, said address data field by using the unit address data of their own communication control units, said byte count field by using the numbers of bytes of the send-back information designated by said memory address designation message, and said send-back information field by using the information to be sent back, and sequentially transmitting from each of said communication control units a set of said address data field, said byte count field and said send-back information field to said information transmission path; and

(e) receiving by said optional communication control unit, which has transmitted said information collection message, said address data field, said byte count field and said send-back information field so that said optional communication control unit collectively collects the broadcasting information from said other communication control units by using one message,

whereby the broadcasting information is collectively collected.

7. Communication control units connected to an information transmission path in a bus type communication network wherein an optional one of said communication control units collectively collects broadcasting information from said other communication control units through said

information transmission path, each of said communication control units comprising:

- a communication controller;
- a controller; and,
- a memory,

said communication controller communicating with those of said other communication control units through said information transmission path,

said controller generating, decoding and processing the broadcasting information transmitted through said communication controller,

said memory containing the information at a memory address assigned to each information class,

said communication control units thereby performing the following operational steps:

(a) generating by said controller of said optional communication control unit, which collects the broadcasting information, a memory address designation message and transmitting said message to said communication controller to transmit said message therethrough to said information transmission path,

said memory address designation message having a destination address in the message, a control field containing a specific code, and a data field containing a code indicating a memory address of data to be collected,

said code in said control field indicating an attribute of the message,

said data field containing data to be transmitted;

(b) receiving by said controllers of said plural communication control units other than said optional communication control unit, which collects the ^{broadcasting} information, said memory address designation message through said communication controllers thereof to confirm that send-back information containing the memory address designated in said memory address designation message is to be collected;

(c) transmitting by said optional communication control unit, which collects the ^{broadcasting} information, an information collection message from said controller thereof through said communication controller thereof to said information transmission path,

said information collection message having a destination address in the message, a control field containing a specific code, and a data field containing a plurality of sets each thereof being composed of an address data field and a send-back information field,

said send-back information field containing the information data to be sent back;

(d) transmitting from said controllers of said communication control units, which have received said information collection message, unit address ^{data} values of their own communication control units to said address data field in said information collection message to perform competition control, and preparing,



in said controllers of said communication control units which have won in the competition control, said address data field by using the unit address data of their own communication control units, and preparing said send-back information field by using said information to be sent back, which has been designated by said memory address designation message and read out from said memories by said controllers of said communication control units, and subsequently transmitting from said controller of each of said communication control units, a set of said address data field and said send-back information field through said communication controllers thereof to said information transmission path; and

(e) receiving, by said controller of said optional communication control unit, which has transmitted said information collection message, said address data field and said send-back information field through said communication controller thereof, and deciding the content of each of the received fields so that said optional communication control unit collectively collect the broadcasting information from said other communication control units,

whereby the broadcasting information is collectively collected by using one message.

8. Communication control units connected to an information transmission path in a bus type communication network wherein an optional one of said communication control units collectively collects broadcasting



information from said other communication control units through said information transmission path, each of said communication control units comprising:

a communication controller;

a controller; and

a memory,

said communication controller communicating with those of said other communication control units through said information transmission path,

said controller generating, decoding and processing the broadcasting information transmitted through said communication controller,

said memory containing the information at a memory address assigned to each information class,

said communication control units thereby performing the following operational steps:

(a) generating, by said controller of said optional communication control unit, which collects the broadcasting information, a memory address designation message and transferring said message to said communication controller to transmit said message therethrough to said information transmission path,

said memory address designation message having a destination address in the message, a control field containing a specific code, and a data field containing a code indicating a memory address of data to be collected,



said code in said control field indicating an attribute of the message,

said data field containing data to be transmitted;

(b) receiving by said controllers of said plural communication control units other than said optional communication control unit, which collects the ^{broadcasting} information, said ~~memory~~^{memory} address designation message through said communication controllers thereof to confirm that send-back information containing the memory address designated in said memory address designation message is to be collected;

(c) transmitting, by said optional communication control unit, which collects the ^{broadcasting} information, an information collection message from said controller thereof through said communication controller thereof to said information transmission path,

said information collection message having a destination address in the message, a control field containing a specific code, and a data field containing a plurality of sets each thereof being composed of an address data field, byte count field and a send-back information field,

said byte count field representing the number of bytes of the information to be sent back,

said send-back information field containing the information data to be sent back;

(d) transmitting from said controllers of



said communication control units, which have received said information collection message, unit address ^{data} ~~values~~ of their own communication control units to said address data field in said information collection message to perform competition control, and preparing, in said controllers of said communication control units which have won in the competition control, said address data field by using the unit address ^{data} ~~values~~ of their own communication control units, and preparing said send-back information field and said byte count field, respectively, by reading out from said memories the information to be sent back, which information has been designated by said memory address designation message, and by using the information to be sent back and the number of bytes thereof, and sequentially transmitting from said controller of each of said communication control units, a set of said address data field, said byte count field and said send-back information field through said communication controllers thereof to said information transmission path; and

(e) receiving, by said controller of said optional communication control unit, which has transmitted said information collection message, said sets of said address data field, said byte count field and said send-back information field through said communication controller thereof, and deciding the content of each of the received fields so that said optional communication control unit collectively collects the ^{broadcasting} ~~information~~ from said



other communication control units,

whereby the broadcasting information is collectively collected by using one message.

9. An information transmission system including an information transmission path for transmitting broadcasting information therethrough and at least two communication control units for communicating with each other through said information transmission path wherein an optional one of said communication control units collectively collects the broadcasting information from one or more other communication control units.

each of said communication control units comprising a communication controller, a controller and a memory,

said communication control units through said information transmission path,

said controller generating, decoding and processing the information transmitted through said communication controller,

said memory containing the information at a memory address assigned to each information class,

said information transmission system performing the following operations:

(a) transmitting from said optional communication control unit, which collected the broadcasting information, a memory address designation message to said information transmission path,



said memory address designation message having a destination address in the message, a control field containing a specific code, and a data field containing a code indicating a memory address of data to be collected,

said code in said control field indicating an attribute of the message,

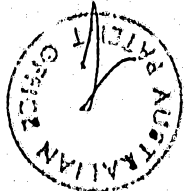
said data field containing data to be transmitted;

(b) receiving by said communication control units other than said optional communication control unit, which collects the ^{broadcasting} information, said memory address designation message through said communication controllers thereof to confirm by said controllers thereof that said-back information containing the memory address designated in said memory address designation message is to be collected;

(c) transmitting from said controller of said optional communication control unit, which collects the ^{broadcasting} information, an information collection message through said communication controller thereof to said information transmission path,

said information collection message having a destination address in the message, a control field containing a specific code, and a data field containing a plurality of sets each thereof being composed of an address data field and a send-back information field,

said send-back information field containing



the information data to be sent back;

(d) transmitting from said controllers of said communication control units, which have received said information collection message, unit address ^{data} ~~values~~ of their own communication control units to said address data field in said information collection message to perform competition control, and preparing, in said controllers of said communication control unit, which have won in the competition control, said address data field by using the unit address ^{data} ~~values~~ of their own communication control units, and preparing said send-back information field by using said information to be sent back, which has been designated by said memory address designation message and read out from said memories by said controllers of said communication control units, and sequentially transmitting from said controller of each of said communication control units, a set of said address data field and said send-back information field through said communication controllers thereof to said information transmission path; and

(e) receiving, by said controller of said optional communication control unit, which has transmitted said information collection message, said sets of said address data field and said send-back information field through said communication controller thereof, and deciding the content of each of the received fields so that said optional communication control unit collectively collects the information from said other communication control



units,

whereby the broadcasting information is collectively collected by using one message.

10. An information transmission system including an information transmission path for transmitting broadcasting information therethrough and at least two communication control units for communicating with each other through said information transmission path wherein an optional one of said communication control units collectively collects the broadcasting information from one or more other communication control units,

each of said communication control units comprising a communication controller, a controller and a memory,

said communication controller communicating with those of said other communication control units through said information transmission path,

said controller generating, decoding and processing the information transmitted through said communication controller,

said memory containing the information at a memory address assigned to each information class,

said information transmission system performing the following operation:

(a) transmitting from said optional communication control unit, which collected the broadcasting information, a memory address designation message to said information transmission path,



said memory address designation message having a destination address in the message, a control field containing a specific code, and a data field containing a code indicating a memory address of data to be collected,

said code in said control field indicating an attribute of the message,

said data field containing data to be transmitted;

(b) receiving by said communication control units other than said optional communication control unit, which collects the ^{broadcasting} information, said memory address designation message through said communication controllers thereof to confirm by said controllers thereof that send-back information containing the memory address designated in said memory address designation message is to be collected;

(c) transmitting from said controller of said optional communication control unit, which collects the ^{broadcasting} information, an information collection message through said communication controller thereof to said information transmission path,

said information collection message having a destination address in the message, a control field containing a specific code, and a data field containing a plurality of sets each thereof being composed of an address data field, a byte count field and a send-back ^{broadcasting} information field,



said byte count field representing the number of bytes of the information to be sent back,

said send-back information field containing the information data to be sent back;

(d) transmitting from said controllers of said communication control units, which have received said information collection message, unit address ^{data} values of their own communication control units to said address data field in said information collection message to perform competition control, and preparing, in said controllers of said communication control units which have won in the competition control, said address data field by using the unit address ^{data} values of their own communication control units, and preparing said send-back information field and said byte count field, respectively, by reading out from said memories the information to be sent back, which information has been designated by said memory address designation message, and by using the information to be sent back and the number of bytes thereof, and sequentially transmitting from said controller of each of said communication control units, a set of said address data field, said byte count field and said send-back information field through said communication controllers thereof to said information transmission path; and

(e) receiving, by said controller of said optional communication control unit, which has transmitted said information collection message, said sets of said



address data field, said byte count field and said send-back information field through said communication controller thereof, and deciding the content of each of the received fields so that said optional communication control unit collectively collects the broadcasting information from said other communication control units,

whereby the broadcasting information is collectively collected by using one message.

11. A communication control method substantially as herein described with reference to and as illustrated in Figs. 1 - 7 and 9 -17 of the accompanying drawings.

12. A communication control unit substantially as herein described with reference to and as illustrated in Figs. 1 - 7 and 9 -17 of the accompanying drawings.

13. An information transmission system substantially as herein described with reference to and as illustrated in Figs. 1 - 7 and 9 -17 of the accompanying drawings.

Dated this 2nd day of February 1990

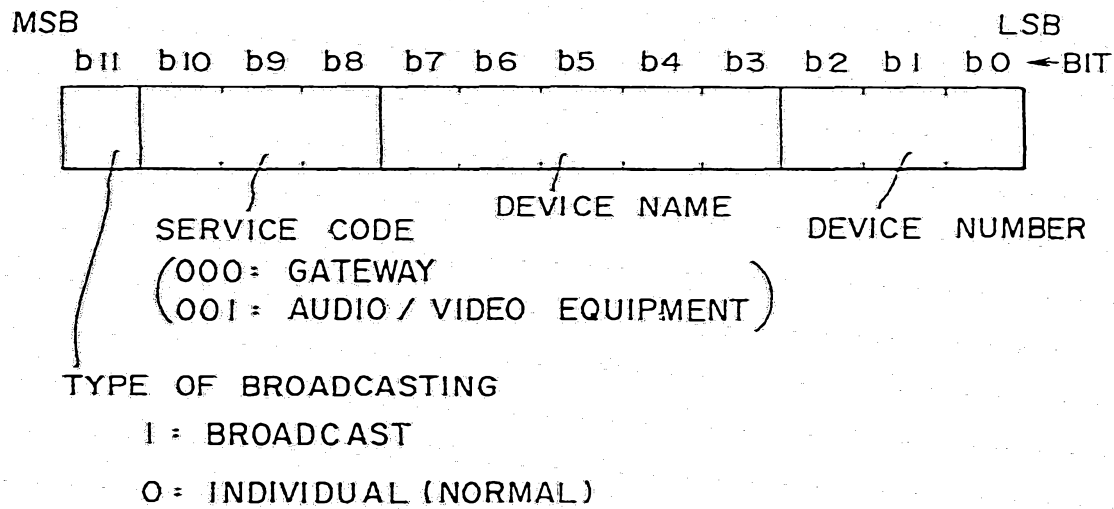
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Fellows Institute of Patent
Attorneys of Australia.



12 00 1987

FIG. 1



13 12 8 3337

FIG. 2

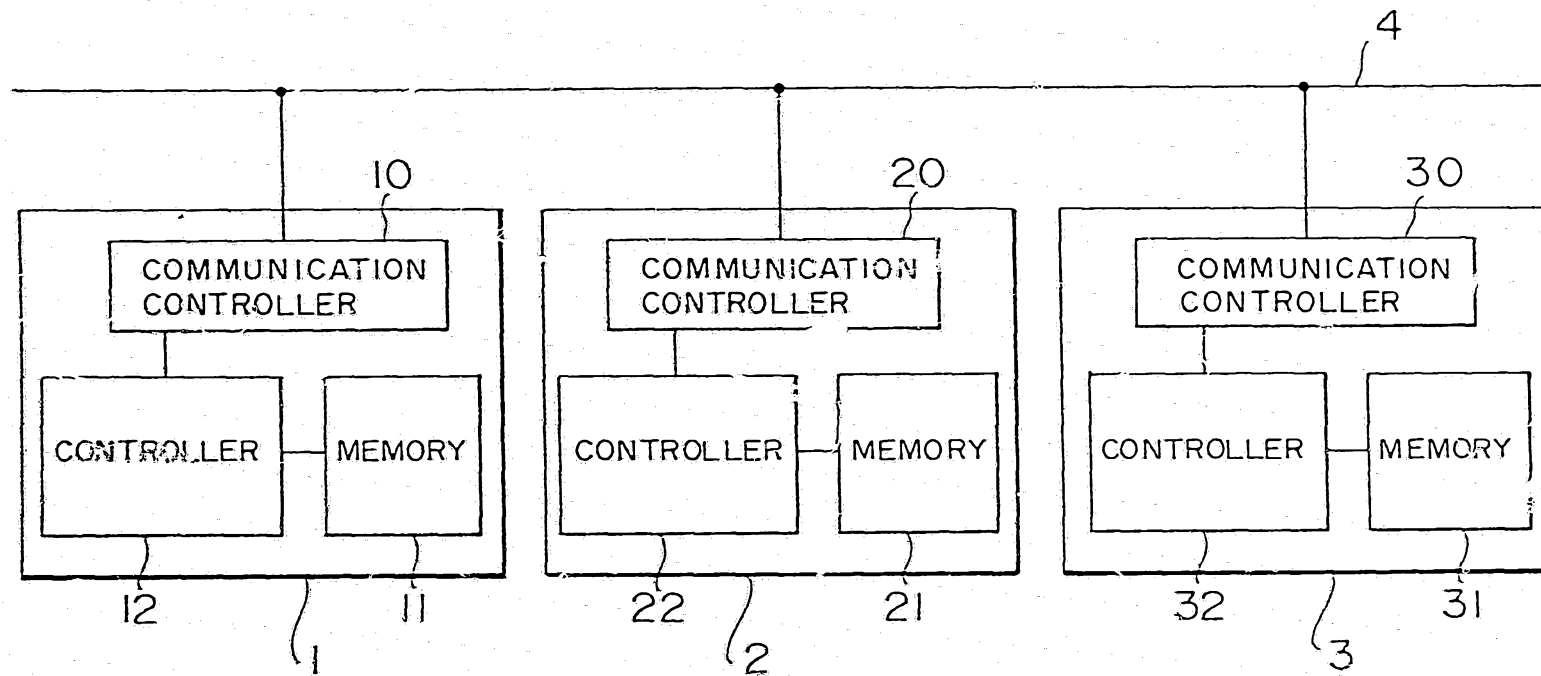


FIG. 3a

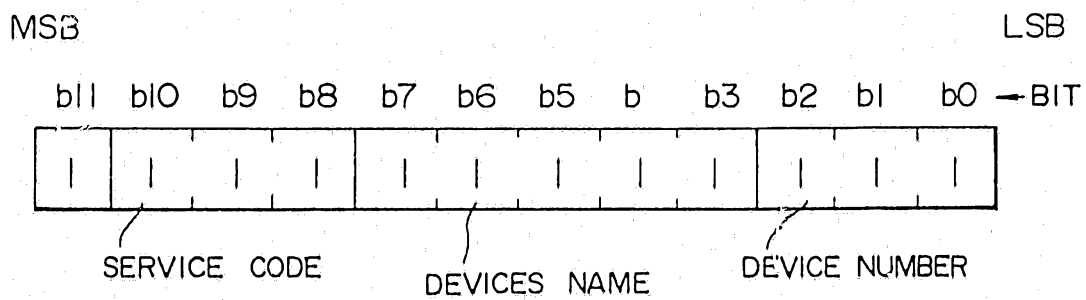


FIG. 3b

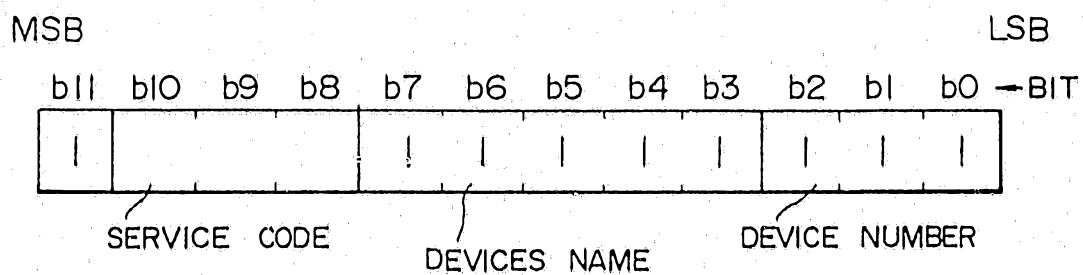


FIG. 3c

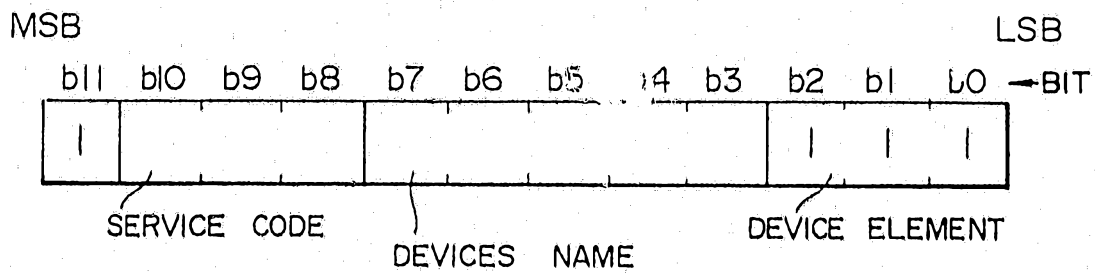


FIG. 4

COMMUNICATION CONTROL UNIT 1 COMMUNICATION CONTROL UNIT 2 COMMUNICATION CONTROL UNIT 3

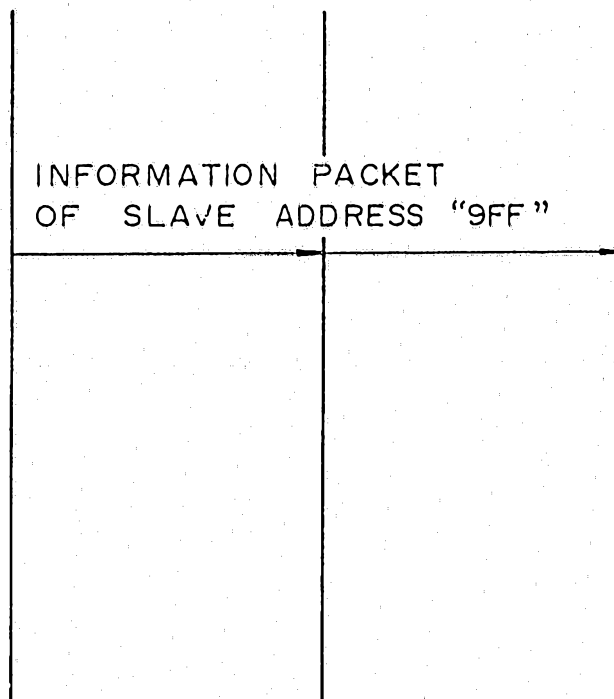


FIG. 5

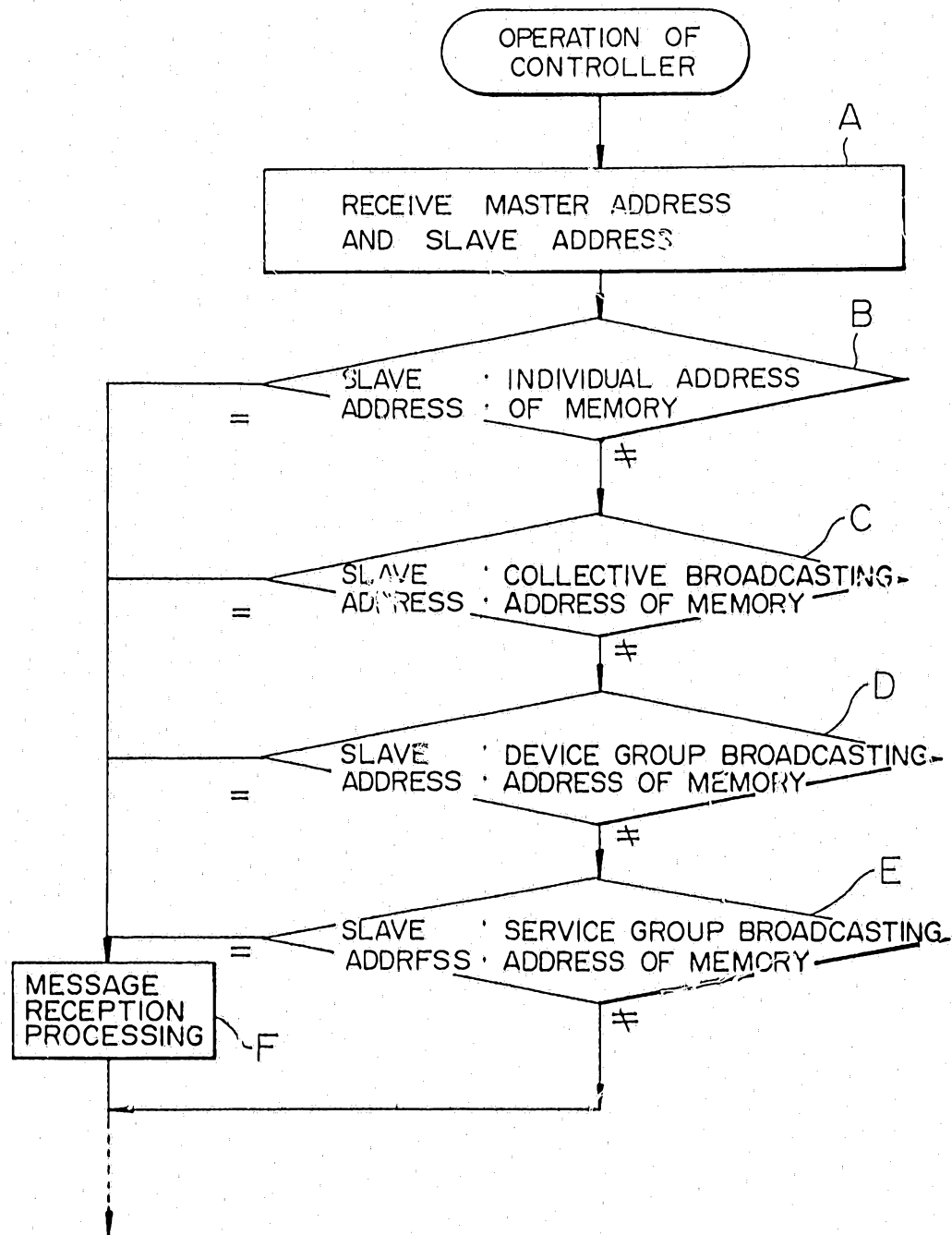


FIG. 6

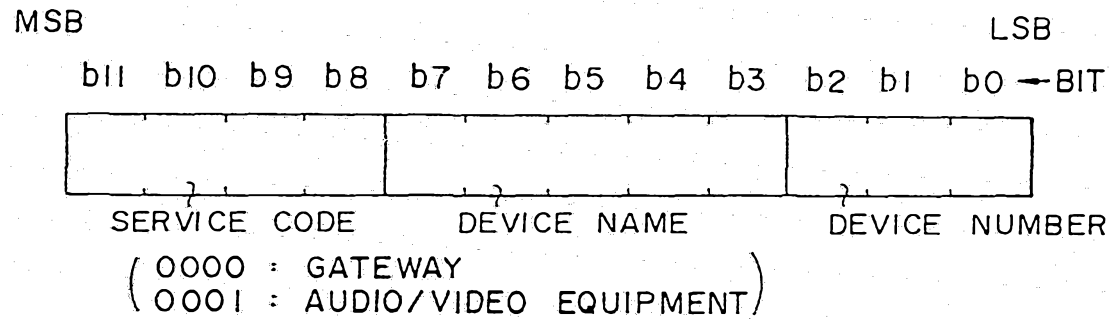
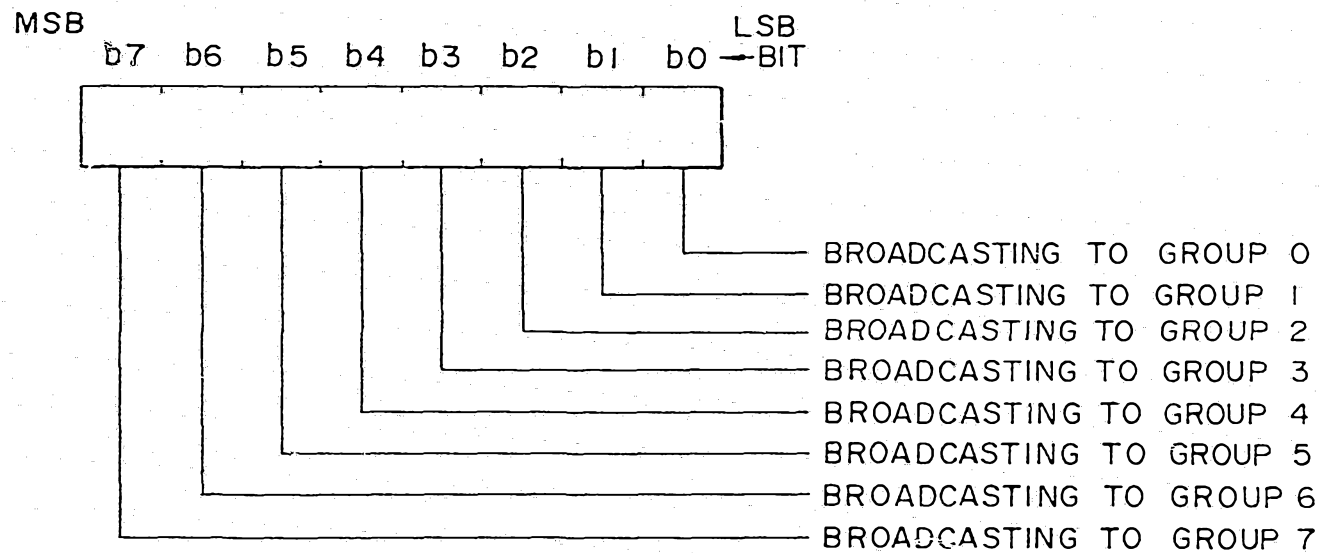


FIG. 7



13 12 00 2007

FIG. 8

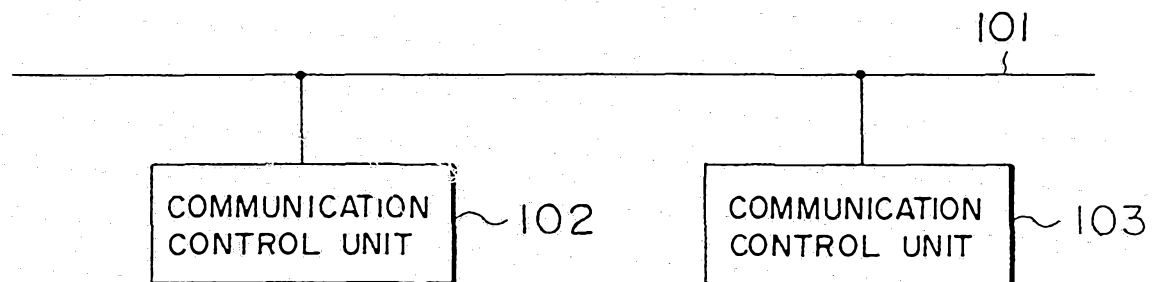


FIG. 9

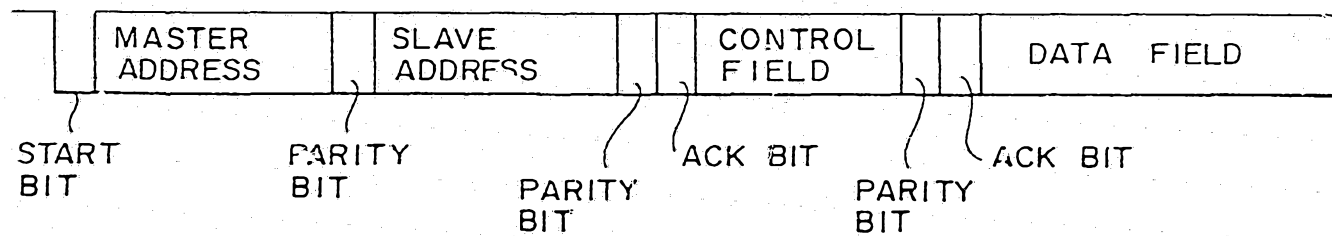


FIG. 10a

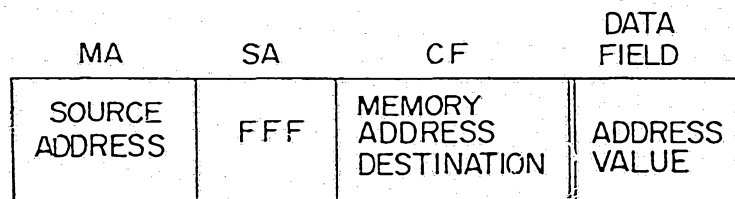
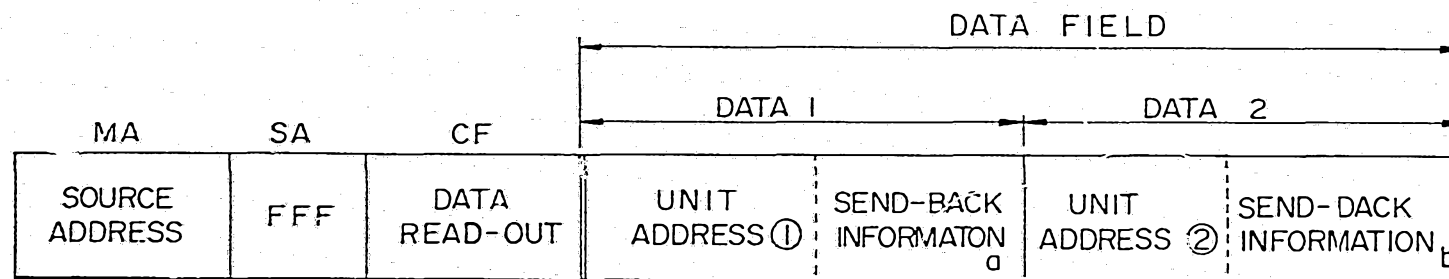


FIG. 10b



13 10 00 0000

FIG. 11a

MA	SA	CF	DATA FIELD
SOURCE ADDRESS	FFF	MEMORY ADDRESS DESIGNATION	ADDRESS VALUE

b FIG. 11b

			DATA FIELD					
			DATA 1			DATA 2		
MA	SA	CF	UNIT ADDRESS ①	BYTE COUNT a	SEND - BACK INFORMATION a	UNIT ADDRESS ②	BYTE COUNT b	SEND-BACK INFORMATION b
SOURCE ADDRESS	FFF	DATA READ-OUT						

1 1 2 0 0 2 0 0 7

FIG. 12

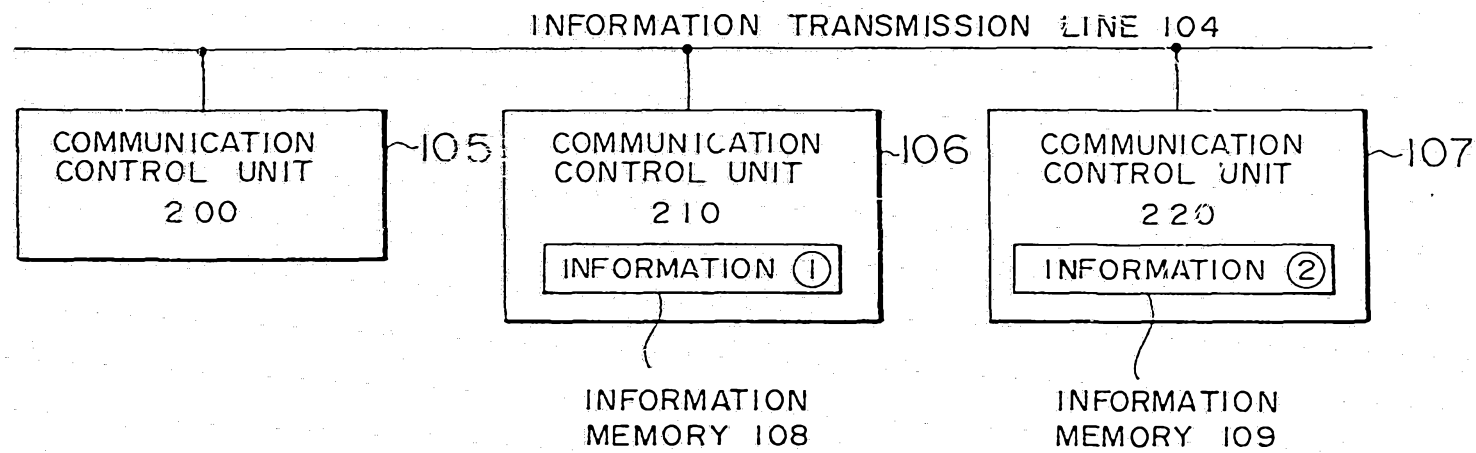


FIG. 13a

FIG. 13b

FIG. 13c

FIG. 13d

FIG. 14

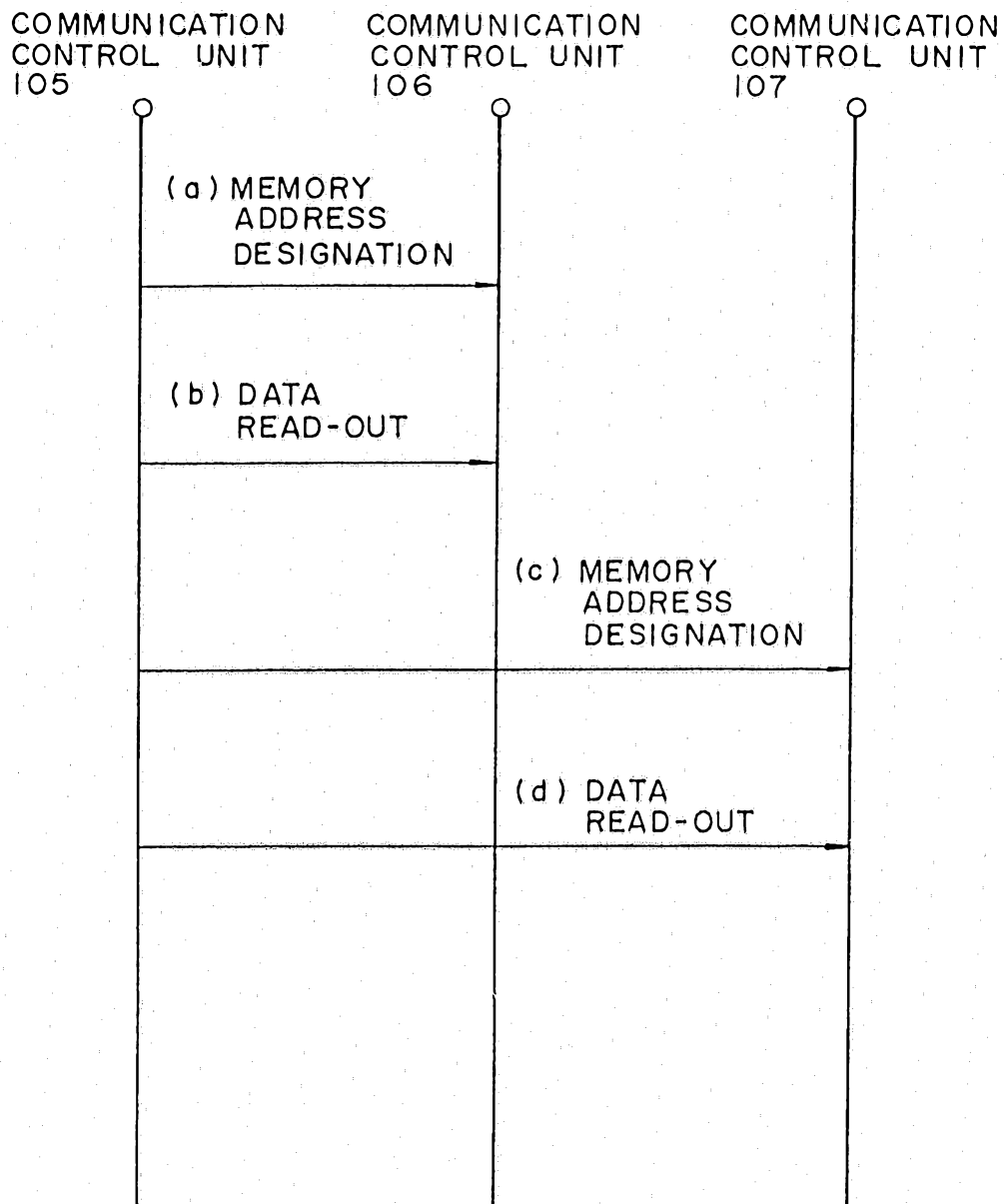


FIG. 15a

MA	SA	CF	DATA FIELD
200	FFF	MEMORY ADDRESS DESIGNATION	ADDRESS VALUE

FIG. 15b

MA	SA	CF	DATA FIELD			
			DATA 1		DATA 2	
200	FFF	DATA READ-OUT	210	INFOR -MATION ①	220	INFOR -MATION ②

FIG. 16

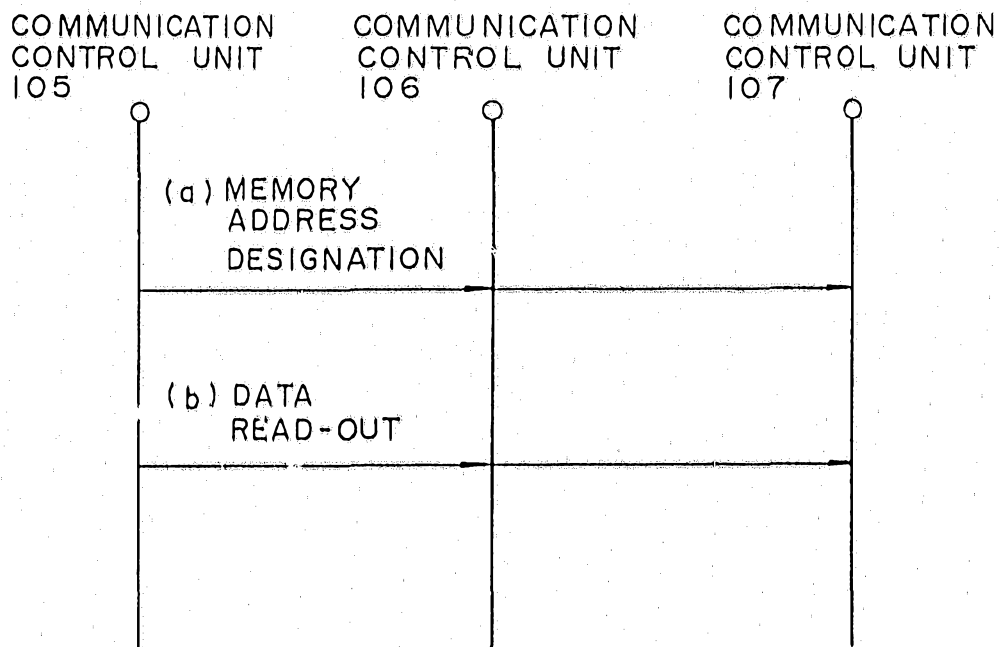


FIG. 17a

MA	SA	CF	DATA FIELD
200	FFF	MEMORY ADDRESS DESIGNATION	ADDRESS

FIG. 17b

MA	SA	CF	DATA FIELD					
			DATA 1			DATA 2		
200	FFF	DATA READ-OUT	210	02	INFOR -MATION ①	220	03	INFOR -MATION ②