PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 :		(11) International Publication Number:
H04J 3/16, H04L 12/413	A1	WO 00/42726
		(43) International Publication Date: 20 July 2000 (20.07.00)

(21) International Application Number: PCT/US99/29900

(22) International Filing Date: 15 December 1999 (15.12.99)

(30) Priority Data:
09/231,179 14 January 1999 (14.01.99) US

(71) Applicant: MOTOROLA INC. [US/US]; 1303 East Algonquin Road, Schaumburg, IL 60196 (US).

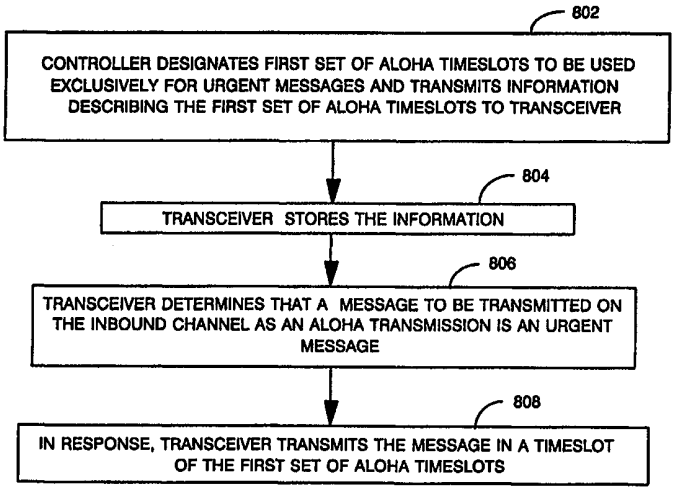
(72) Inventors: GIPSON, Jack, Anthony; 4021 Hemlock, Fort Worth, TX 76137 (US). DORENBOSCH, Jheroen, Pieter; Route 1, Box 79F, Paradise, TX 76073 (US).

(74) Agents: BETHARDS, Charles, W. et al.; Motorola Inc., Intellectual Property Department, 5401 North Beach Street, MS–E230, Fort Worth, TX 76137 (US).

(81) Designated States: CN, JP, KR, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: METHOD AND APPARATUS IN A WIRELESS COMMUNICATION SYSTEM FOR TRANSMITTING MESSAGES IN AN ALOHA TRANSMISSION



800

(57) Abstract

A first set of ALOHA timeslots (514, 516) is designated (802) to be used exclusively for urgent messages. It is determined (806) that a message to be transmitted in an ALOHA transmission is an urgent message, and, in response, the message is transmitted (808) in a timeslot (514) of the first set of ALOHA timeslots.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

METHOD AND APPARATUS IN A WIRELESS COMMUNICATION SYSTEM FOR TRANSMITTING MESSAGES IN AN ALOHA TRANSMISSION

Field of the Invention

This invention relates in general to wireless communication systems, and more specifically to a method and apparatus in a wireless communication system for transmitting messages in an ALOHA transmission.

Background of the Invention

The advent of two-way messaging systems has brought about the capability to generate inbound messages from portable transceivers to base station receivers in the fixed portion of a messaging system. Some of the inbound messages are the result of a request from the fixed portion of the system. Such inbound messages are called "scheduled messages", because each portable transceiver is told which of a plurality of timeslots should be used on an inbound channel for the response. Other inbound messages are referred to as "unscheduled messages", because they originate without a request from the fixed portion and cannot be scheduled by the fixed portion.

Unscheduled messages have utilized a slotted ALOHA technique to maximize throughput. The slotted ALOHA technique is a synchronous technique that requires each transmission to begin at the start of one of a plurality of well-defined timeslots. The specific one of the timeslots is determined independently by the portable transceiver through a random process.

The ALOHA process does not utilize the channel very efficiently, because it cannot guarantee that every timeslot will be utilized, and further because collisions can and do occur, necessitating retries. During busy times, the inefficiency of the ALOHA process can cause high latency on the inbound channel. In the case of an urgent message, high latency is intolerable. Thus, a solution is needed to provide low latency for an urgent ALOHA message that is originated by a transceiver on the inbound channel. In addition, it is desirable to improve the transmission reliability of urgent messages to ensure their reception.

Summary of the Invention

An aspect of the present invention is a method in a wireless communication system for transmitting messages in an ALOHA transmission. The method comprises the steps of designating a first set of ALOHA timeslots to be used exclusively for urgent messages; determining that a message to be transmitted in the ALOHA transmission is an urgent message; and transmitting the message in a timeslot of the first set of ALOHA timeslots, in response to determining that the message is urgent.

Another aspect of the present invention is a transceiver in a wireless communication system for transmitting messages in an ALOHA transmission. The transceiver comprises a receiver for receiving information designating a first set of ALOHA timeslots to be used exclusively for urgent messages, and a processing system coupled to the receiver for processing the information and for determining that a message to be transmitted in the ALOHA transmission is an urgent message. The transceiver further comprises a transmitter coupled to the processing system for transmitting the message. The processing system is programmed to control the transmitter to transmit the message in a timeslot of the first set of ALOHA timeslots, in response to determining that the message is urgent.

Another aspect of the present invention is a controller in a wireless communication system for controlling a transceiver to transmit an urgent message in an ALOHA transmission. The controller comprises a base station interface for controlling a base station to communicate with the transceiver, and a processing system coupled to the base station interface for controlling the base station interface. The processing system is programmed to designate for the transceiver a first set of ALOHA timeslots to be used exclusively for urgent messages.

Brief Description of the Drawings

FIG. 1 is an electrical block diagram of an exemplary wireless communication system in accordance with the present invention.

FIG. 2 is an electrical block diagram of an exemplary transceiver in accordance with the present invention.

FIG. 3 is an electrical block diagram of an exemplary controller in accordance with the present invention.

FIG. 4 is a diagram depicting a prior art frame of data partitioned into scheduled timeslots and ALOHA timeslots.

FIG. 5 is an exemplary diagram depicting a frame of data partitioned into scheduled timeslots, urgent ALOHA timeslots, and non-urgent ALOHA timeslots in accordance with a first embodiment of the present invention.

FIG. 6 is an exemplary diagram depicting a frame of data partitioned into scheduled timeslots, urgent ALOHA timeslots, and non-urgent ALOHA timeslots in accordance with a second embodiment of the present invention.

FIG. 7 is an exemplary diagram depicting frames of data on multiple channels partitioned into scheduled timeslots, urgent ALOHA timeslots, and non-urgent ALOHA timeslots in accordance with a third embodiment of the present invention.

FIG. 8 is an exemplary flow diagram depicting operation of the wireless communication system in accordance with the present invention.

Detailed Description of the Drawings

Referring to FIG. 1, an electrical block diagram depicts an exemplary wireless communication system in accordance with the present invention, comprising an infrastructure portion 102 including a controller 112 and a plurality of conventional base stations 116, the communication system also including a plurality of transceivers 122. The base stations 116 preferably communicate with the transceivers 122 utilizing conventional radio frequency (RF) techniques, and are coupled by conventional communication links 114 to the controller 112, which controls the base stations 116.

The hardware of the controller 112 is preferably a combination of a Choreographer!® network management device, a Wireless Messaging Gateway (WMG™) Administrator!™ terminal, an RF-Usher!™ multiplexer, and an RF-

Conductor!® message distributor manufactured by Motorola, Inc., and utilizes software modified in accordance with the present invention. The hardware of the base stations 116 is preferably a combination of the RF-Orchestra!™ transmitter and the RF-Audience!® receiver manufactured by Motorola, Inc. The transceivers 122 are preferably similar to PageWriter® 2000 data transceivers, also manufactured by Motorola, Inc., and also utilize software modified in accordance with the present invention. It will be appreciated that other similar hardware can be used as well for the controller 112, the base stations 116, and the transceivers 122.

Each of the base stations 116 transmits RF signals to the transceivers 122 via an antenna 118. The base stations 116 preferably each receive RF signals from the plurality of transceivers 122 via the antenna 118. The RF signals transmitted by the base stations 116 to the transceivers 122 (outbound messages) comprise selective call addresses identifying the transceivers 122, and data messages originated by a message originator, as well as commands originated by the controller 112 for adjusting operating parameters of the radio communication system. The RF signals preferably transmitted by the transceivers 122 to the base stations 116 (inbound messages) comprise responses that include scheduled messages, such as positive acknowledgments (ACKs) and negative acknowledgments (NAKs), and unscheduled messages, such as registration requests and requests for items of information.

The controller 112 preferably is coupled by telephone links 101 to a public switched telephone network (PSTN) 110 for receiving selective call message originations therefrom. Selective call originations comprising data messages from the PSTN 110 can be generated, for example, from a conventional telephone 111 or a conventional computer 117 coupled to the PSTN 110. It will be appreciated that, alternatively, other types of networks, e.g., a local area network (LAN), a wide area network (WAN), and the Internet, to name a few, can be used for receiving selective call originations.

The over-the-air protocol utilized for outbound and inbound messages is preferably selected from Motorola's well-known FLEX™ family of digital selective call signaling protocols. These protocols utilize well-known error detection and error correction techniques and are therefore tolerant to bit errors occurring during transmission, provided that the bit errors are not too numerous. It will be appreciated that other suitable protocols can be used as well. While the preferred embodiment is a two-way wireless communication system, as depicted in FIG. 1, aspects of the present invention also are applicable to a one-way wireless communication system which utilizes ALOHA transmission techniques, as well.

FIG. 2 is an electrical block diagram of the exemplary transceiver 122 in accordance with the present invention. The transceiver 122 comprises an antenna 204 for intercepting an outbound message and for transmitting an inbound message. The antenna 204 is preferably coupled to a conventional receiver 208 for receiving the outbound message and is coupled to a conventional transmitter 209 for transmitting the inbound message. The receiver 208 and transmitter 209 are coupled to a processing system 206 for processing the outbound and inbound messages and for controlling the transceiver 122 in accordance with the present invention. A user interface 214 preferably is also coupled to the processing system 206 for interfacing with a user. The user interface 214 comprises a conventional display 216 for displaying the inbound and outbound messages, a conventional alert element 218 for alerting the user when the outbound message arrives, and a conventional keyboard 220 for generating the inbound message and for controlling the transceiver 122. A conventional clock 207 is also coupled to the processing system 206 for supporting time keeping requirements of the transceiver 122.

The processing system 206 comprises a conventional processor 210 and a conventional memory 212. The memory 212 comprises software elements and data for programming the processing system 206 in accordance with the present invention. The memory 212 preferably includes a selective call address 222 to which the transceiver 122 is responsive. In addition, the memory 212 includes a message processing element 224 for programming the processing system 206 to process messages through well-known techniques. The memory 212 further comprises an urgent ALOHA processing element 226 for programming the processing system 206 to process urgent ALOHA messages in accordance with the present invention. The memory 212 also includes a non-urgent ALOHA processing element 228 for programming the processing system 206 to process non-urgent ALOHA messages in accordance with the present invention. The memory 212 also includes space for storing urgent and non-urgent ALOHA slot designations 230 designating a first set of ALOHA timeslots to be used exclusively for urgent ALOHA messages and a second set of ALOHA timeslots to be used exclusively for non-urgent ALOHA messages. The ALOHA slot designations 230 preferably are received in periodic transmissions of a block information word (BIW) from the fixed portion 102, using a general BIW structure defined by the communication protocol. Alternatively, the ALOHA slot designations 230 can be pre-programmed into the memory 212. The memory 212 further comprises an urgency determination element 232 for programming the processing system 206 to

determine whether an ALOHA message to be transmitted is an urgent message. Operation of the transceiver 122 in accordance with the present invention will be described in detail further below.

FIG. 3 is an electrical block diagram depicting an exemplary controller 112 in accordance with the present invention. The controller 112 comprises a network interface 318 for receiving a message from a message originator via the telephone links 101. The network interface 318 is coupled to a processing system 310 for controlling and communicating with the network interface 318. The processing system is coupled to a base station interface 304 for controlling and communicating with the base stations 116 via the communication links 114. The processing system 310 is also coupled to a conventional clock 336 for providing a timing signal to the processing system 310. The processing system 310 comprises a conventional computer 312 and a conventional mass medium 314, e.g., a magnetic disk drive, programmed with information and operating software in accordance with the present invention. The mass medium 314 comprises a conventional subscriber database 320 for storing profiles defining service for subscribers using the system. The mass medium 314 further comprises a message processing element 322 for processing messages through well-known techniques.

The mass medium 314 also includes an ALOHA slot designation element 324 for programming the processing system 310 to designate a first set of ALOHA timeslots to be used exclusively for urgent messages and a second set of ALOHA timeslots to be used exclusively for non-urgent messages. The processing system 310 preferably accomplishes this by cooperating with the base station interface 304 to control the base stations 116 to periodically transmit a block information word (BIW) to inform the transceivers 122 about the first and second sets of ALOHA timeslots. In an alternative embodiment, the transceivers 122 are pre-programmed with information defining the first and second sets of ALOHA timeslots, and the ALOHA slot designation element 324 can be omitted. Operation of the controller 112 in accordance with the present invention will be described further below.

FIG. 4 is a diagram 400 depicting a prior art partial frame of data for the inbound channel, the data partitioned into scheduled timeslots and ALOHA timeslots. An ALOHA boundary 402 separates the timeslots that have been scheduled by the fixed portion 102, from those that are ALOHA random access timeslots. The timeslots to the left of the ALOHA boundary 402 are for scheduled messages. The timeslots containing the letter "S", such as the timeslot 404, are timeslots that actually contain a scheduled message, in this example. Note that all of the scheduled timeslots are used. This is possible because the messages are

scheduled by a single entity of the fixed portion, e.g., the controller 112; and because the transceivers 122 are kept synchronized with the fixed portion 102, through well-known techniques, by the synchronous communication protocol transmitted on the outbound channel.

The timeslots to the right of the ALOHA boundary 402 are ALOHA timeslots. The timeslots containing the letter "A", such as the timeslot 406, contain ALOHA messages. Note that some of the ALOHA timeslots are empty, such as the timeslot 410. Note also that the timeslot 408 contains "A A" indicating that two ALOHA messages have collided in the timeslot 408. The reason for collisions and the reason for the empty timeslots is that in the ALOHA process, the transceivers 122 independently and randomly schedule which of the ALOHA timeslots they will use. The ALOHA process thus does not utilize the channel very efficiently. The ALOHA process is, however, necessary for communications originated by the transceivers 122 without a request and schedule from the fixed portion 102. As discussed briefly in the Background of the Invention, the inefficiency of the ALOHA process can cause high latency on the inbound channel. In the case of an urgent message, high latency is intolerable. Thus, a solution is needed to provide low latency for an urgent message that is originated by one of the transceivers 122, on the inbound channel.

FIG. 5 is an exemplary diagram 500 depicting a partial frame of data partitioned into scheduled timeslots 506, urgent ALOHA timeslots 514, 516, and non-urgent ALOHA timeslots 508 in accordance with a first embodiment of the present invention. In the diagram 500 the scheduled timeslots 506 are to the left of an urgent ALOHA boundary 504. The urgent ALOHA timeslots 514, 516 are to the right of the urgent ALOHA boundary 504 up to a non-urgent ALOHA boundary 502. The non-urgent ALOHA timeslots 508 are to the right of the non-urgent ALOHA boundary 502. Preferably, the urgent ALOHA boundary 504 and the non-urgent ALOHA boundary 502 are positioned such that the collision probability and the latency are both very low for the expected amount of urgent message traffic, thereby allowing fast and reliable delivery of urgent messages. This inherently means that, in comparison with the non-urgent timeslots 508, more of the urgent timeslots will be empty, as depicted by the timeslot 516, while fewer timeslots will actually carry a message, as depicted by the "U" in timeslot 514. Thus, some channel efficiency is traded to obtain low latency and higher reliability for urgent messages. It will be appreciated that incentives, e.g., a cost penalty for excessive urgent messages, can be instituted to ensure that the amount of urgent

ALOHA traffic is kept sufficiently small to minimize the detrimental effects on channel efficiency.

FIG. 6 is an exemplary diagram 600 depicting a partial frame of data partitioned into scheduled timeslots, urgent ALOHA timeslots, and non-urgent ALOHA timeslots in accordance with a second embodiment of the present invention. In the second embodiment, the urgent ALOHA timeslots are scattered amongst the scheduled timeslots, as depicted in the diagram 600. This arrangement reduces latency for urgent ALOHA messages that are initiated during the first portion of the frame. On the other hand, the arrangement makes the scheduling of long inbound messages somewhat more difficult and less efficient.

FIG. 7 is an exemplary diagram 700 depicting partial frames of data on multiple channels partitioned into scheduled timeslots, urgent ALOHA timeslots, and non-urgent ALOHA timeslots in accordance with a third embodiment of the present invention. In the diagram 700, two non-urgent ALOHA channels 706 carry only non-urgent messages to the right of a non-urgent ALOHA boundary 702, while an urgent ALOHA channel 708 carries only urgent messages to the right of an urgent ALOHA boundary 704. Note that the urgent ALOHA boundary can be positioned independent of the position of the non-urgent ALOHA boundaries 702. Moreover, a system can even move the urgent ALOHA boundary 704 to the left to make most or all slots available for urgent ALOHA messages, thereby further reducing latency. In addition, the urgent ALOHA channel 708 can be operated at a different transmission speed, if desired, to obtain higher reliability for the urgent messages.

FIG. 8 is an exemplary flow diagram 800 depicting operation of the wireless communication system in accordance with the present invention. The diagram 800 begins when the controller 112 designates 802 a first set of ALOHA timeslots to be used exclusively for urgent messages, and transmits information describing the first set of ALOHA timeslots to the transceivers 122. In the first and second embodiments as depicted in the diagrams 500 and 600, the controller 112 designates the first set of ALOHA timeslots to be on a channel utilized by the wireless communication system for transmitting non-urgent messages in a second set of ALOHA timeslots. Also in the second embodiment, the controller 112 designates the first set of ALOHA timeslots to be scattered amongst a plurality of timeslots utilized by the wireless communication system for scheduled transmissions. In the third embodiment as depicted in the diagram 700, the controller designates the first set of ALOHA timeslots to be on a channel different from that utilized by the wireless communication system for transmitting non-

urgent messages in a second set of ALOHA timeslots. Also in the third embodiment, the controller 112 can designate a transmission speed to be utilized for urgent messages, the transmission speed being different from that utilized for non-urgent messages.

The transceivers 122 then store 804 the information in the locations of the memory 212 set aside for the ALOHA slot designations 230. An inbound ALOHA message is then originated by one of the transceivers 122, which determines 806 that the message is urgent. The urgency of the message is preferably indicated by a user input through the keyboard 220. A special key sequence such as 9-1-1, for example, can be used to identify that the message is urgent. Alternatively, an urgent message can be specified through well-known menu selection techniques, e.g., by selecting "send urgent". As a further alternative, when the transceiver is a special type intended for emergency use only, every transmission can be flagged as urgent.

In response to determining that the ALOHA message is urgent, the transceiver 122 transmits the message in a timeslot of the first set of ALOHA timeslots. The transceiver 122 preferably repeats the urgent message a predetermined number of times, e.g., three times, without waiting for feedback from an intended receiver of the base stations 116. In addition, the transceiver 122 transmits a retry sooner, e.g., in one-half the normal time, for the urgent message than a predetermined retry time used for a non-urgent message, in response to failing to receive an acknowledgment. In another embodiment, the transceiver 122 transmits the urgent message at a power level higher, e.g., six dB higher, than a predetermined power level utilized for transmitting a non-urgent message. In systems in which the controller 112 designates a different transmission speed to be utilized for urgent messages, the transceiver 122 additionally transmits the urgent message at the transmission speed designated for urgent messages. These transmission techniques advantageously can improve the transmission reliability for urgent ALOHA messages.

When the controller 112 receives the urgent message (as determined by the use of one of the first set of ALOHA timeslots), the controller preferably processes the urgent message before processing unprocessed non-urgent ALOHA messages, even though the non-urgent ALOHA messages may have been received before the urgent message. In addition, the controller 112 preferably marks the urgent message for prioritized processing by another component of the wireless communication system, e.g., a server (not shown). The controller 112 can mark

the urgent message with, for example, a predetermined character string, prefixed or appended to the message.

Thus, it should be clear from the preceding disclosure that the present invention advantageously provides a method and apparatus in a wireless communication system for providing low latency and high reliability for an urgent ALOHA message originated by a transceiver on an inbound channel.

Many modifications and variations of the present invention are possible in light of the above teachings. Thus, it is to be understood that, within the scope of the appended claims, the invention can be practiced other than as specifically described herein above.

What is claimed is:

CLAIMS

1. A method in a wireless communication system for transmitting messages in an ALOHA transmission, the method comprising the steps of:

designating a first set of ALOHA timeslots to be used exclusively for urgent messages;

determining that a message to be transmitted in the ALOHA transmission is an urgent message; and

transmitting the message in a timeslot of the first set of ALOHA timeslots, in response to determining that the message is urgent.

2. The method of claim 1, wherein the designating step comprises the step of

designating the first set of ALOHA timeslots to be on a channel utilized by the wireless communication system for transmitting non-urgent messages in a second set of ALOHA timeslots.

3. The method of claim 1, wherein the designating step comprises the step of

designating the first set of ALOHA timeslots to be on a channel different from that utilized by the wireless communication system for transmitting non-urgent messages in a second set of ALOHA timeslots.

4. The method of claim 1, wherein the designating step comprises the step of

designating the first set of ALOHA timeslots to be scattered amongst a plurality of timeslots utilized by the wireless communication system for scheduled transmissions.

5. The method of claim 1, wherein the transmitting step comprises the step of repeating the urgent message a predetermined number of times without waiting for feedback from an intended receiver.

6. The method of claim 1, wherein the transmitting step comprises the step of transmitting a retry sooner for the urgent message than for a non-urgent message, in response to failing to receive an acknowledgment.

7. The method of claim 1, wherein the transmitting step comprises the step of transmitting the urgent message at a power level higher than that utilized for transmitting a non-urgent message.

8. The method of claim 1,

wherein the designating step comprises the step of designating a transmission speed to be utilized for urgent messages, the transmission speed being different from that utilized for non-urgent messages, and

wherein the transmitting step comprises the step of transmitting the urgent message at the transmission speed.

9. A transceiver in a wireless communication system for transmitting messages in an ALOHA transmission, the transceiver comprising:

a receiver for receiving information designating a first set of ALOHA timeslots to be used exclusively for urgent messages;

a processing system coupled to the receiver for processing the information and for determining that a message to be transmitted in the ALOHA transmission is an urgent message; and

a transmitter coupled to the processing system for transmitting the message,

wherein the processing system is programmed to control the transmitter to transmit the message in a timeslot of the first set of ALOHA timeslots, in response to determining that the message is urgent.

10. The transceiver of claim 9, wherein the processing system is further programmed to repeat the urgent message a predetermined number of times without waiting for feedback from an intended receiver.

11. The transceiver of claim 9, wherein the processing system is further programmed to transmit a retry sooner for the urgent message than for a non-urgent message, in response to failing to receive an acknowledgment.

12. The transceiver of claim 9, wherein the processing system is further programmed to transmit the urgent message at a power level higher than that utilized for transmitting a non-urgent message.

13. The transceiver of claim 9, wherein the processing system is further programmed to transmit the urgent message at a transmission speed designated for urgent messages, the transmission speed being different from that utilized for non-urgent messages.

5

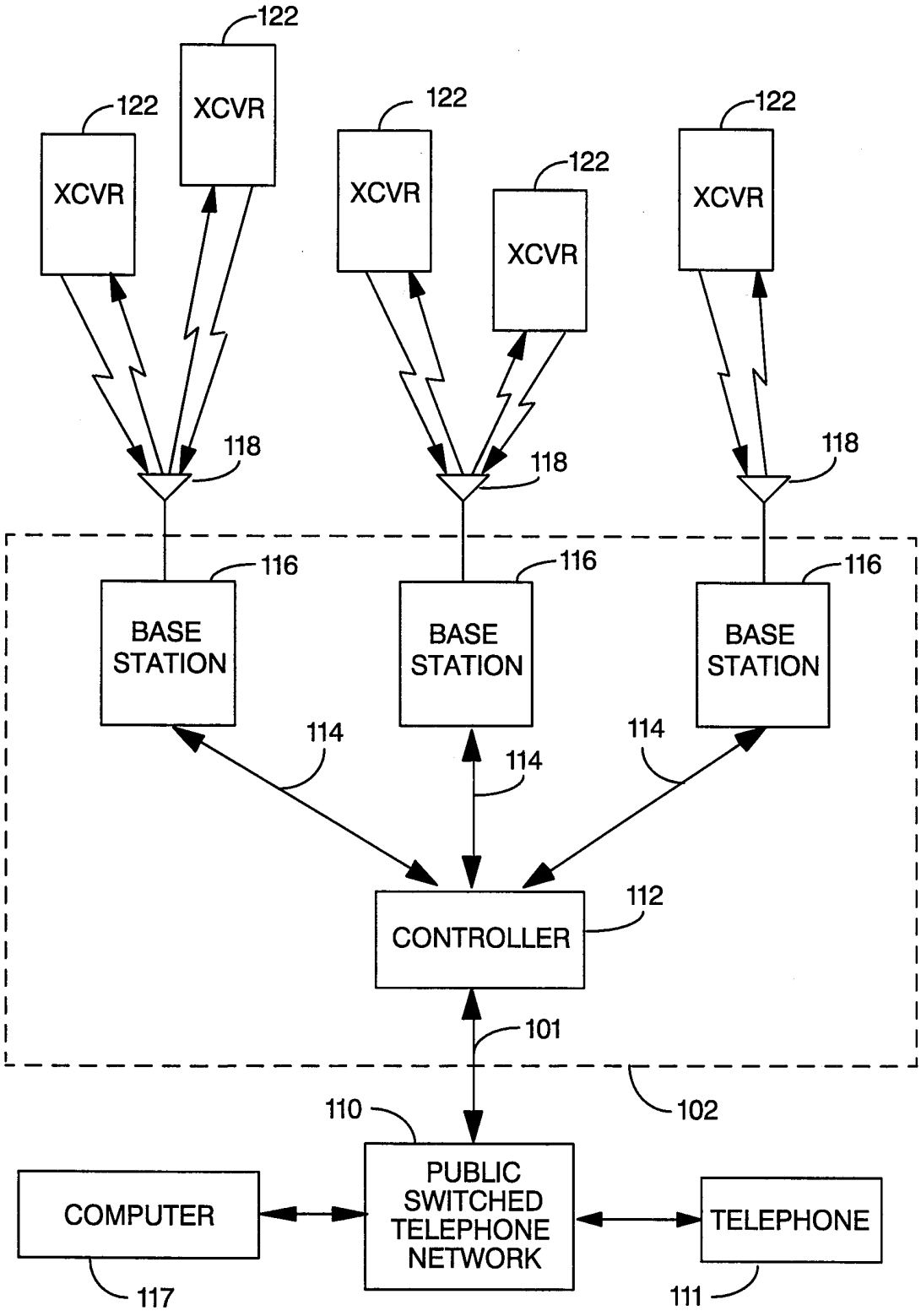

122
XCVR
122
XCVR
122
XCVR
122
XCVR
122
XCVR
118
118
118
116
116
116
BASE STATION
BASE STATION
BASE STATION
114
114
114
112
CONTROLLER
101
102
110
PUBLIC SWITCHED TELEPHONE NETWORK
COMPUTER
TELEPHONE
117
111

FIG. 1

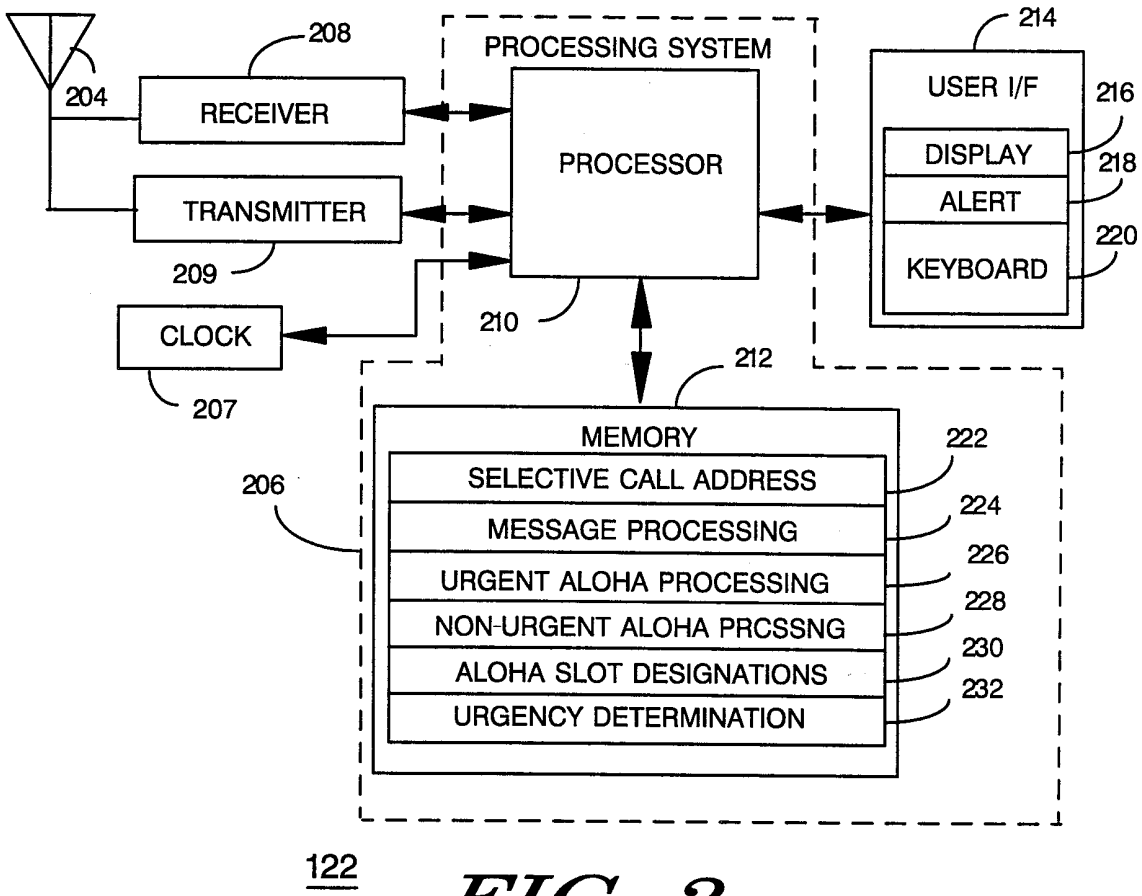

PROCESSING SYSTEM
208
RECEIVER
204
TRANSMITTER
209
CLOCK
207
PROCESSOR
210
214
USER I/F
216
DISPLAY
218
ALERT
220
KEYBOARD
212
MEMORY
222
206
SELECTIVE CALL ADDRESS
224
MESSAGE PROCESSING
226
URGENT ALOHA PROCESSING
228
NON-URGENT ALOHA PRCSSNG
230
ALOHA SLOT DESIGNATIONS
232
URGENCY DETERMINATION
122

FIG. 2

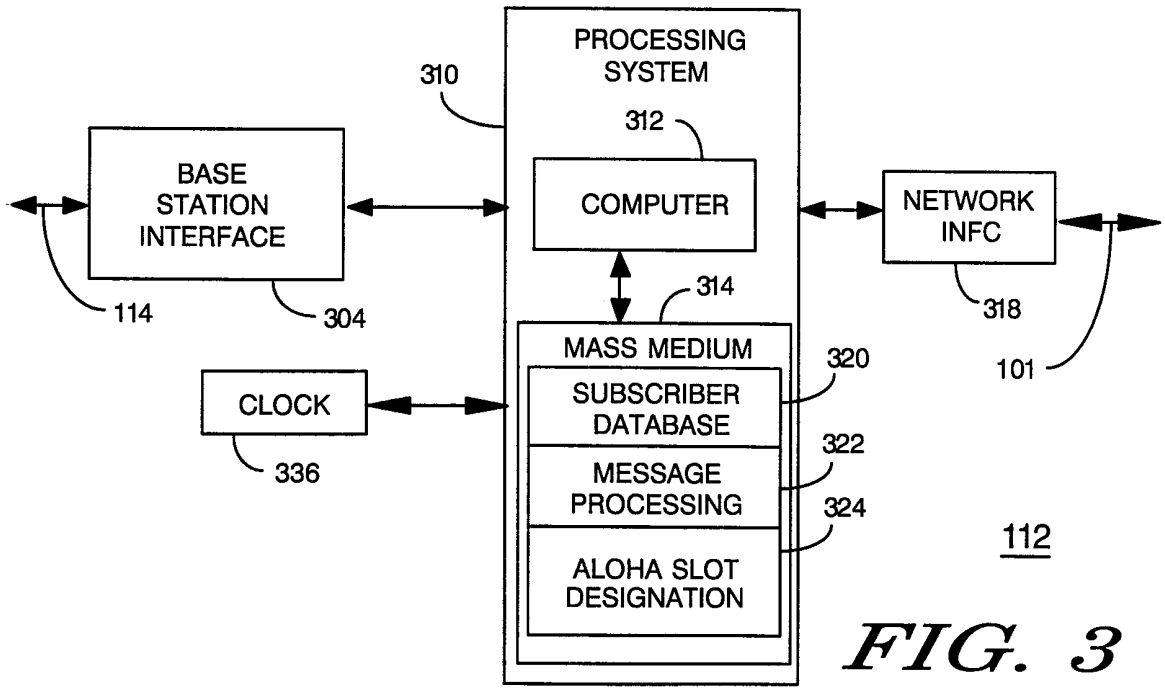

PROCESSING SYSTEM
310
312
BASE STATION INTERFACE
114
304
COMPUTER
NETWORK INFC
318
101
314
MASS MEDIUM
320
CLOCK
336
SUBSCRIBER DATABASE
322
MESSAGE PROCESSING
324
ALOHA SLOT DESIGNATION
112

FIG. 3

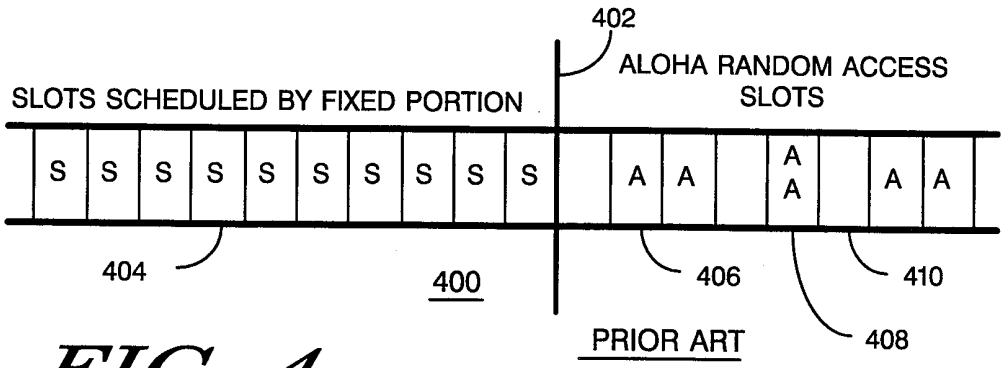


FIG. 4

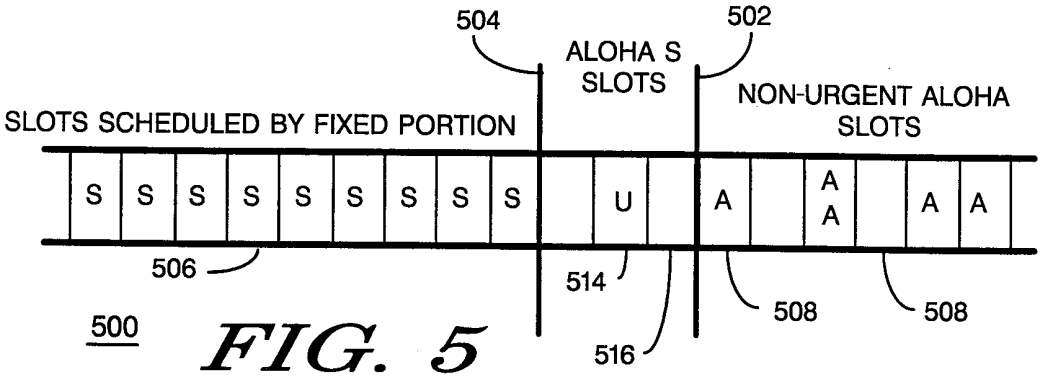


FIG. 5

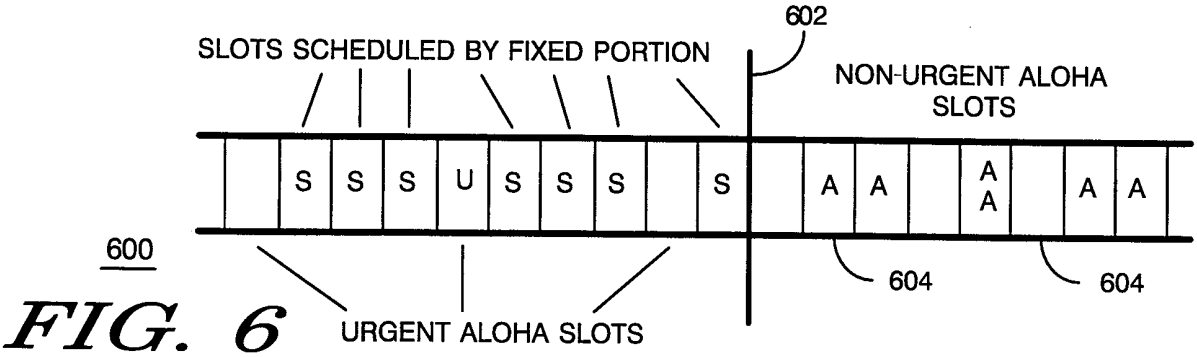


FIG. 6

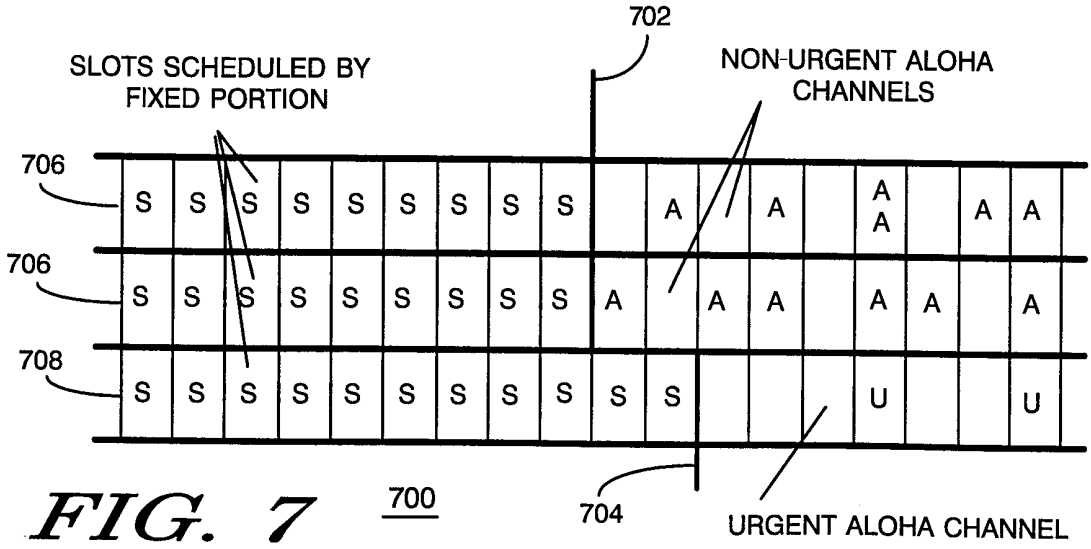
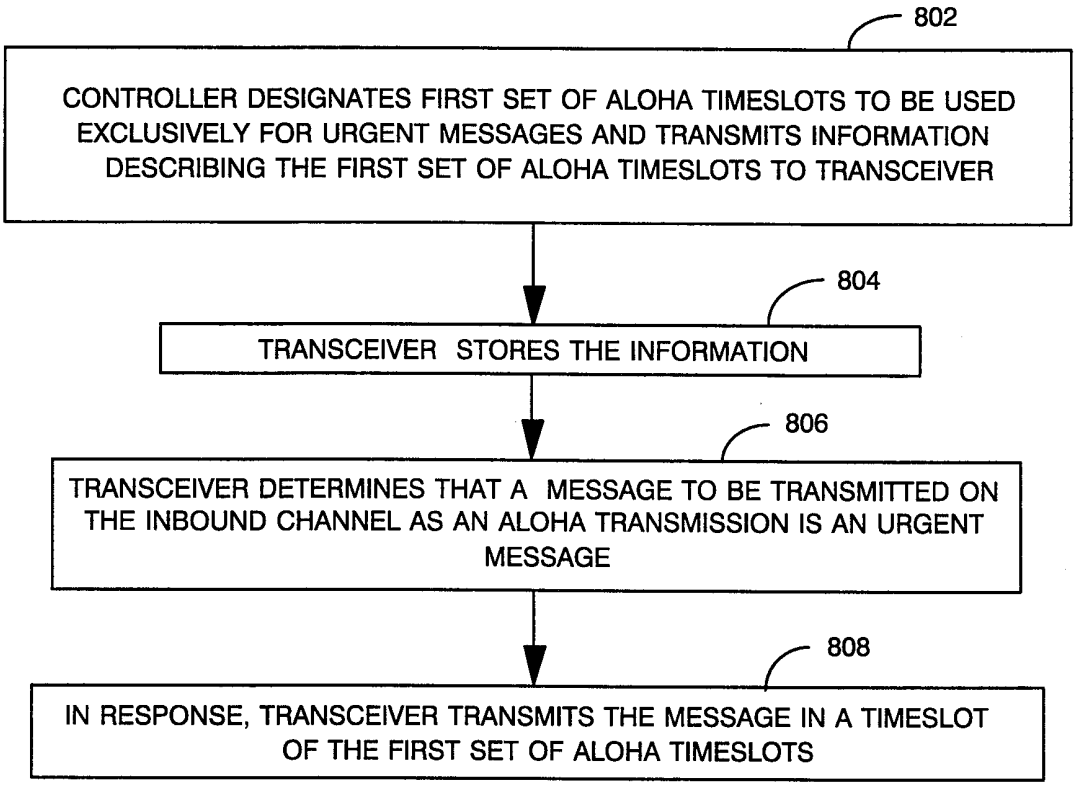


FIG. 7


802
CONTROLLER DESIGNATES FIRST SET OF ALOHA TIMESLOTS TO BE USED EXCLUSIVELY FOR URGENT MESSAGES AND TRANSMITS INFORMATION DESCRIBING THE FIRST SET OF ALOHA TIMESLOTS TO TRANSCEIVER
804
TRANSCEIVER STORES THE INFORMATION
806
TRANSCEIVER DETERMINES THAT A MESSAGE TO BE TRANSMITTED ON THE INBOUND CHANNEL AS AN ALOHA TRANSMISSION IS AN URGENT MESSAGE
808
IN RESPONSE, TRANSCEIVER TRANSMITS THE MESSAGE IN A TIMESLOT OF THE FIRST SET OF ALOHA TIMESLOTS

800

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/29900

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04J 3/16; H04L 12/413
US CL :370/329, 444, 445

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 370/329, 337, 341, 347, 348, 437, 442, 443, 444, 445, 447

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST
search item: ALOHA, reservation, time slots

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---- Y	US 5,841,777 A (COHEN) 24 November 1998, col. 8, line 43-col. 9, line 13.	1-5, 8-10, 13 ------- 5, 6, 11, 12
Y	US 5,784,362 A (TURINA) 21 July 1998, col. 5, line 35-col. 7, line 35.	1-13
Y	US 5,790,551 A (CHAN) 04 August 1998, col. 3, line 21-col. 8, line 46.	1-13

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 04 MAY 2000	Date of mailing of the international search report 30 MAY 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer SOON-DONG HYUN Joni Hill Telephone No. (703) 308-0000

Form PCT/ISA/210 (second sheet) (July 1998)★