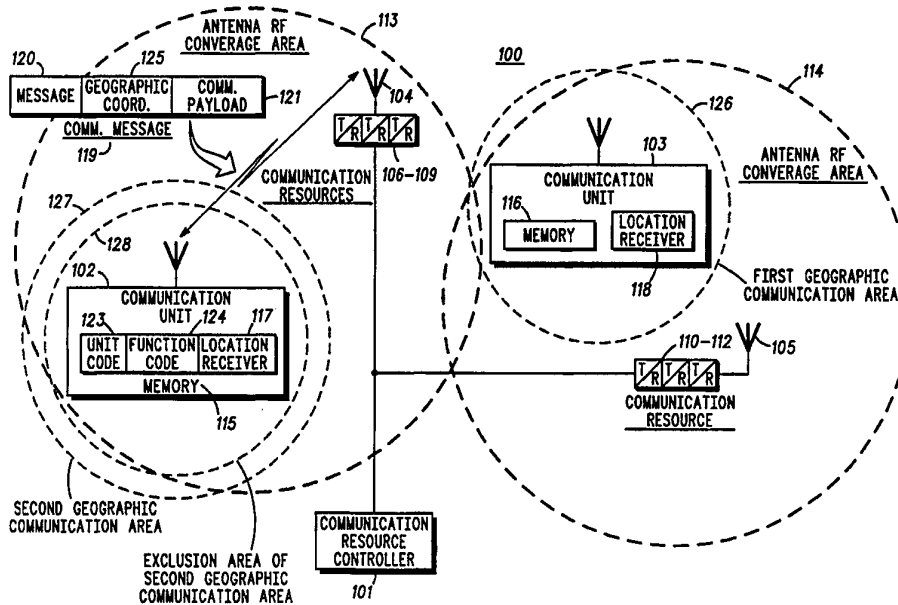




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<p>(21) International Application Number: PCT/US95/01368 (22) International Filing Date: 2 February 1995 (02.02.95) (30) Priority Data: 08/209,328 10 March 1994 (10.03.94) US (71) Applicant: MOTOROLA INC. [US/US]; 1303 East Algonquin Road, Schaumburg, IL 60196 (US). (72) Inventors: GRUBE, Gary, W.; 157 Cedarwood Court, Palatine, IL 60067 (US). NADDELL, Marc, C.; 1126 E. Algonquin 3J, Schaumburg, IL 60173 (US). SHAUGHNESSY, Mark, L.; 1242 Victoria Court, Algonquin, IL 60102 (US). (74) Agents: EGAN, Wayne, J. et al.; Motorola Inc., Intellectual Property Dept., 1303 East Algonquin Road, Schaumburg, IL 60196 (US).</p>		<p>(81) Designated States: CN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). <b>Published</b> <i>With international search report.</i></p>

(54) Title: METHOD FOR PROVIDING COMMUNICATIONS WITHIN A GEOGRAPHIC REGION



(57) Abstract

Communications may be established based on geographic location when a communication resource controller (101) transmits a communication message (119), which includes a message ID (120) a communication payload (121), and a set of geographic coordinates to a plurality of communication units (102, 103). Each communication units (102, 103) upon receiving the communication message (119), compares its identification code (122) with the message ID (120). If a match occurs, the communication unit (102, 103) then determines its geographic location. Having obtained the geographic location, the unit determines whether its present location is within the area defined by the set of geographic coordinates and, if so, adjust its receiver to receive the communication payload (121).

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5 METHOD FOR PROVIDING COMMUNICATIONS WITHIN  
A GEOGRAPHIC REGION

Field of the Invention

10 This invention relates generally to communication systems and, in particular, to geographic location based communications.

Background of the Invention

15 Communication systems are known to include a communication resource controller, a plurality of communication units, and antennas that transceive a limited number of communication resources. In such communication  
20 systems, the communication units communicate with each other via the communication resources, where a communication resource may be an RF channel, a pair of RF channels, a TDM slot, or any medium for carrying RF signals.

To initiate a communication, a communication unit  
25 transmits a communication request to the communication resource controller via a communication resource dedicated for control information (control channel). The communication request includes a request for a particular service, such as allocation of a communication resource and  
30 identity of a target communication unit(s). For example, the request may be for a group call which identifies all of the communication units in the same group as the initiating communication unit.

Upon receiving this communication request, the  
35 communication resource determines whether the

communication unit is authorized to access the system and, if so, grants the request. Having granted the request, the communication resource controller allocates a communication resource to the initiating communication unit and the target communication units and then transmits a communication resource allocation message on the control channel. All communication units within the coverage area of the control channel antenna receives the allocation message. However, only the communication units identified in the message, i.e., the initiating and target communication units, will access the allocated communication resource and subsequently partake in the communication.

This method of communication resource allocation works very well in many trunking communication system applications, however, because the coverage area of an antenna can be quite large (typically having a 10 to 30 mile radius), this method has its limitations. For example, assume that the antenna is centrally located in metropolitan area and the antenna is used by the metropolitan's police force. Further assume that the police force is divided into districts, where each district has its own communication group. With this basic structure, when a police officer initiates a group call for his or her district, all other police officers from that district will receive the group call provided they are within the coverage area of the antenna. If one or more of the receiving police officers are outside of the district, it is impractical for them to receive the call because they are physically unable to respond due to their geographic location, or they may be out of the initiator's jurisdiction. (With the 30 mile coverage radius, a police officer may be up to 60 miles away from the district, making it impossible for him or her to physically respond.) In addition to being unable to physically respond, the police officer's radio is tied up with a communication that he or she can do little about, thus preventing that radio from receiving another call. A call

which the officer may be able to respond to based on his or her physical location.

Therefore, a need exists for a method that allows communications to be established based on geographic  
5 locations.

### Brief Description of the Drawings

FIG. 1 illustrates a communication system that  
10 incorporates the present invention.

FIG. 2 illustrates a logic diagram that may be used to implement the present invention.

15 FIG. 3 illustrates a logic diagram that may be used to implement an alternate embodiment of the present invention.

### Description of a Preferred Embodiment

20 Generally, the present invention provides a method that establishes communications based on geographic locations. This is accomplished when a communication resource controller transmits a communication message and a set of geographic coordinates to the communication units. Upon  
25 receiving the communication message, each communication unit determines whether the identification code contained within the message matches an individual identification code of the communication unit. If the codes match, the communication unit then determines its geographic location and compares its location with the set of geographic  
30 coordinates. If the communication unit is within the area defined by the geographic coordinates, unit processes the communication payload. With such a method, communication units only participate in communications if they are within a  
35 predefined geographic area, thus eliminating communication

units that are physically too far away from the geographic area.

The present invention can be more fully described with reference to FIGS. 1 - 3. FIG. 1 illustrates a communication system (100) that includes a communication resource controller (101), a plurality of communication units (102 and 103), a plurality of antennas (104 and 105) and a limited number of communication resources (106-112). Each of the antennas (104 and 105), which may be coupled to a base station such as Motorola QUANTAR™, has an RF coverage area (113 and 114). Each of the communication units (102 and 103), includes memory (115 and 116), and a location receiver (117 and 118). The memory (115 and 116), which may be RAM, ROM, or any other digital storage element, includes a unit code field (123) and a function code field (124), wherein the unit code and the function code comprise a communication unit identification code. The location receiver (117, 118) may be a Global Positioning Satellite (GPS) receiver that is coupled to a communication processor (not shown).

Within the communication system (100), any of the communication units (102, 103) may initiate a communication by transmitting a request to the communication resource controller (101). The communication resource controller (101), which may be a Motorola trunking central controller, processes the request and prepares a communication message (119) based on the request. For example, if the request was for a group call, the communication message (119) would include a target message ID code (120) which identifies a particular group for which the group call was requested, a communication payload (121), and a set of geographic coordinates (125). The communication payload (121) may be voice messages, data messages, graphical images, files, or a request for information. In addition, the message ID code (120) may include a function code that instructs the receiving

communication unit to respond. For example, the function code may request an acknowledgment signal, an action to be performed, or send location.

Regardless of the content of the communication message  
5 (119), the message is transmitted via the antenna (104, 105).  
If a communication unit (102, 103) is within the antenna RF  
coverage area (113, 114)), it will receive the communication  
message (119). Upon receiving the communication message  
10 (119), the unit determines whether the target code and  
function code of the message code (120) matches the  
communication units group code or individual code (123) and  
the function code (124). If a match occurs, the  
communication unit then determines its location and if the unit  
is located within the area (126 or 127) defined by the set of  
15 geographic coordinates. If the communication unit is within  
the geographic communication area (126), the unit then  
adjusts it receiver to receive the communication payload.

The first geographic communication area (126) is pre-  
established based on desired coverage area of a particular  
20 communication and is independent of the coverage areas (113,  
114) of the antennas (104, 105). Thus, the geographic  
communication area (126) may be as large or as small as  
needed by the users, may extend across the coverage areas of  
several antennas and be centered about the communication unit  
25 that initiated the group call. Alternatively, the second  
geographic coverage area (127) includes an exclusion area  
(128), which may be centered about the initiating  
communication unit. While the first and second areas (126,  
127) are shown to be circular, any geometric shape can be  
30 defined by the set of geographic coordinates, however, a  
center point and a radius require the least amount of  
bandwidth to transmit. To illustrate this consider the logic  
diagram of FIG. 2.

FIG. 2 illustrates a logic diagram that may be used to  
35 implement the present invention. At step 200, the

communication resource controller transmits a communication message and a set of geographic coordinates via a control channel. As mentioned above, the communication message includes a message ID code and a communication payload. A  
5 communication unit that is located within the antenna RF coverage area (113, 114) receives the communication message and the set of geographic coordinates (201) and determines whether its identification code matches the message  
10 identification code (202). If a match does not occur (202) the communication unit determines that this particular message is not for the unit (203).

If, however, a match does occur (202), the communication unit determines its location via the location receiver (204). Having obtained this information, the  
15 communication unit compares its present geographic location with the area defined by the set of geographic coordinates (205). The communication unit then determines whether it is within the area defined by the set of geographic coordinates (206). If the communication unit is not within the area (206),  
20 the communication unit ignores the communication payload (207).

When the communication unit is located within the geographic communication area (206), the communication unit receives the communication payload (208). Upon  
25 receiving the communication payload, the communication unit determines whether a response is required (209), wherein the response request would be included as part of the function code (see above). If so, the communication unit responds to that request (210). If no response is required (209) the  
30 process ends (211).

FIG. 3 illustrates a logic diagram that a communication unit may use to incorporate the present invention. At step  
35 300, the unit determines geographic coordinates of a geographic communication area. This determination is based on the area in which the communication unit desires its



audience to be located in. Having determined this information, the communication unit then determines the message ID code (301). As mentioned above, the message ID code includes the identification code of either a target  
5 communication group or an individual target communication unit. In addition to determining the message ID code, the communication unit also determines a communication message payload (302). As discussed above, the communication message payload may be voice speech messages, graphic  
10 images, data, files, etc. With this information defined, the communication unit then constructs a communication message (303). Subsequently, the communication unit transmits the communication message (304) and the geographic coordinates (305). Upon receipt of this information, the target  
15 communication unit(s) will follow steps 201 - 211 in the above described process of FIG. 2.

The present invention provides a method that allows communications to be established based on geographic areas. With such a method, communication units located within a  
20 geographic communication area can participate in the communication, while units not within the area, even though they are part of the communication group, will not participate. This focuses group calls to units that are physically close together and thus more likely to be able to  
25 help each other than a unit that is too far away. In addition, units that are not within the communication area are free to receive other calls in which they may be able to provide assistance.

### Claims

1. In a communication system that includes a communication resource controller, a limited number of communication resources that are transceived via an antenna,  
5 and a plurality of communication units, a method for providing communications within a geographic region, the method comprises the steps of:
- a) transmitting, by the communication resource  
10 controller, a communication message and a set of geographic coordinates that define a geographic communication area, wherein the communication message includes a message identification code and communication payload and wherein the set of geographic coordinates are independent of radio  
15 frequency coverage area of the antenna;
- b) upon receiving the communication message, determining, by a communication unit of the plurality of communication units, whether the message identification code  
20 substantially matches an identification code of the communication unit;
- c) when the message identification code substantially matches the identification code, determining, by the  
25 communication unit, whether location of the communication unit is within the geographic communication area; and
- d) when the location of the communication unit is within the geographic communication area, receiving, by the  
30 communication unit, the communication payload.

2. The method of claim 1 further comprises, ignoring, by the communication unit, the communication payload when the location of the communication unit is not within the geographic communication area.
- 5 3. In the method of claim 1, step (d) further comprises receiving data as the communication payload.
4. In the method of claim 1, step (d) further comprises  
10 receiving a speech message as the communication payload.
5. In the method of claim 1, step (d) further comprises receiving a graphical image as the communication payload.
- 15 6. In the method of claim 1, step (b) further comprises determining whether a target code of the message identification code substantially matches a unit code of the identification code and whether a function code of the message identification code substantially matches one of a set  
20 of function codes of the identification code.
7. The method of claim 1 further comprises transmitting, by the communication unit, a response to the communication payload.
- 25 8. The method of claim 7 further comprises transmitting, by the communication unit, the location of the communication unit as the response.
- 30 9. In the method of claim 1, step (a) further comprises transmitting as the set of geographic coordinates a geographic point and a first radius that defines a perimeter of the geographic communication area.

10. In the method of claim 1, step (a) further comprises transmitting as the set of geographic coordinates a first set of coordinates that define the geographic communication area and a second set of coordinates that define an exclusion area  
5 within the geographic communication area.

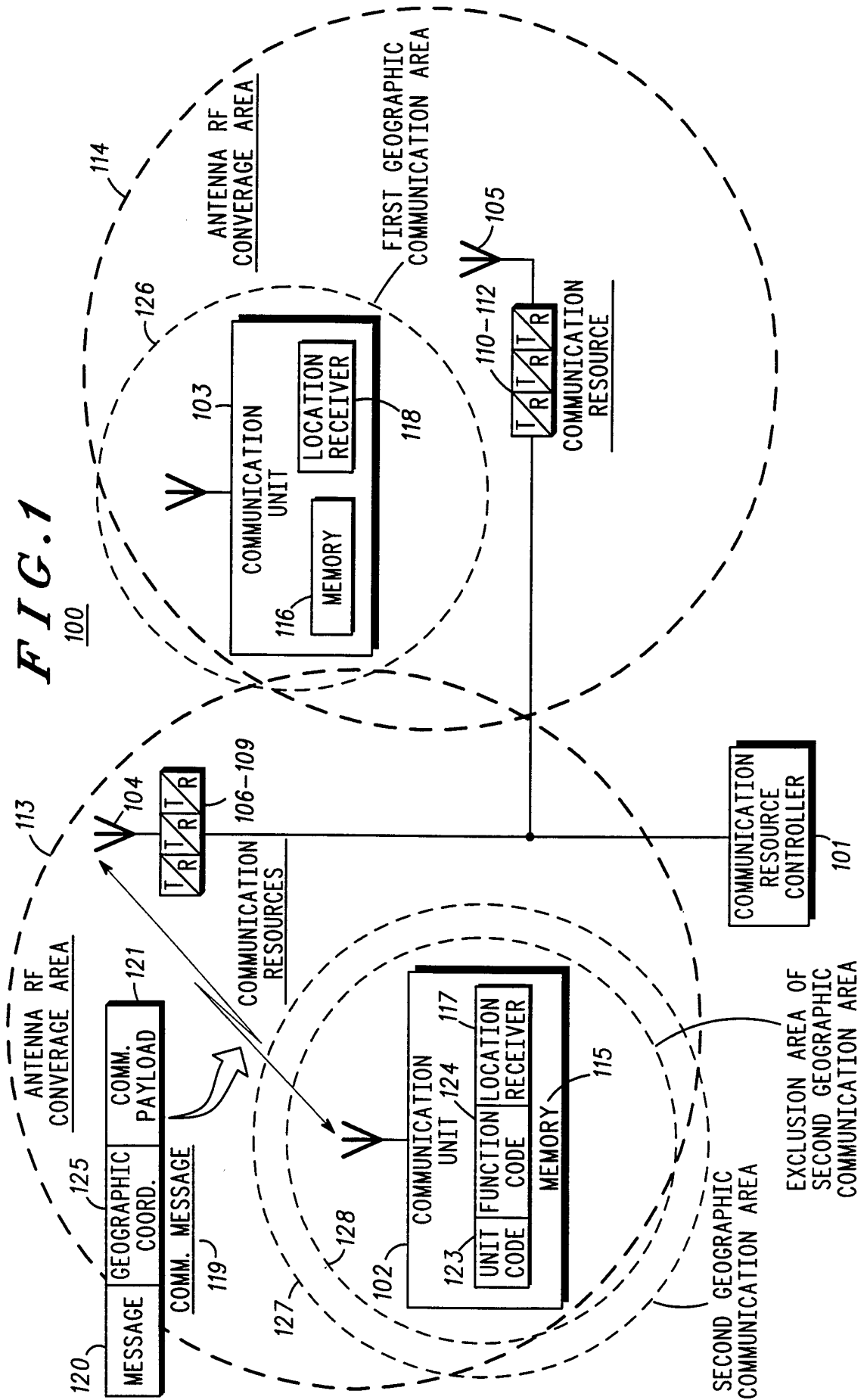


FIG. 2

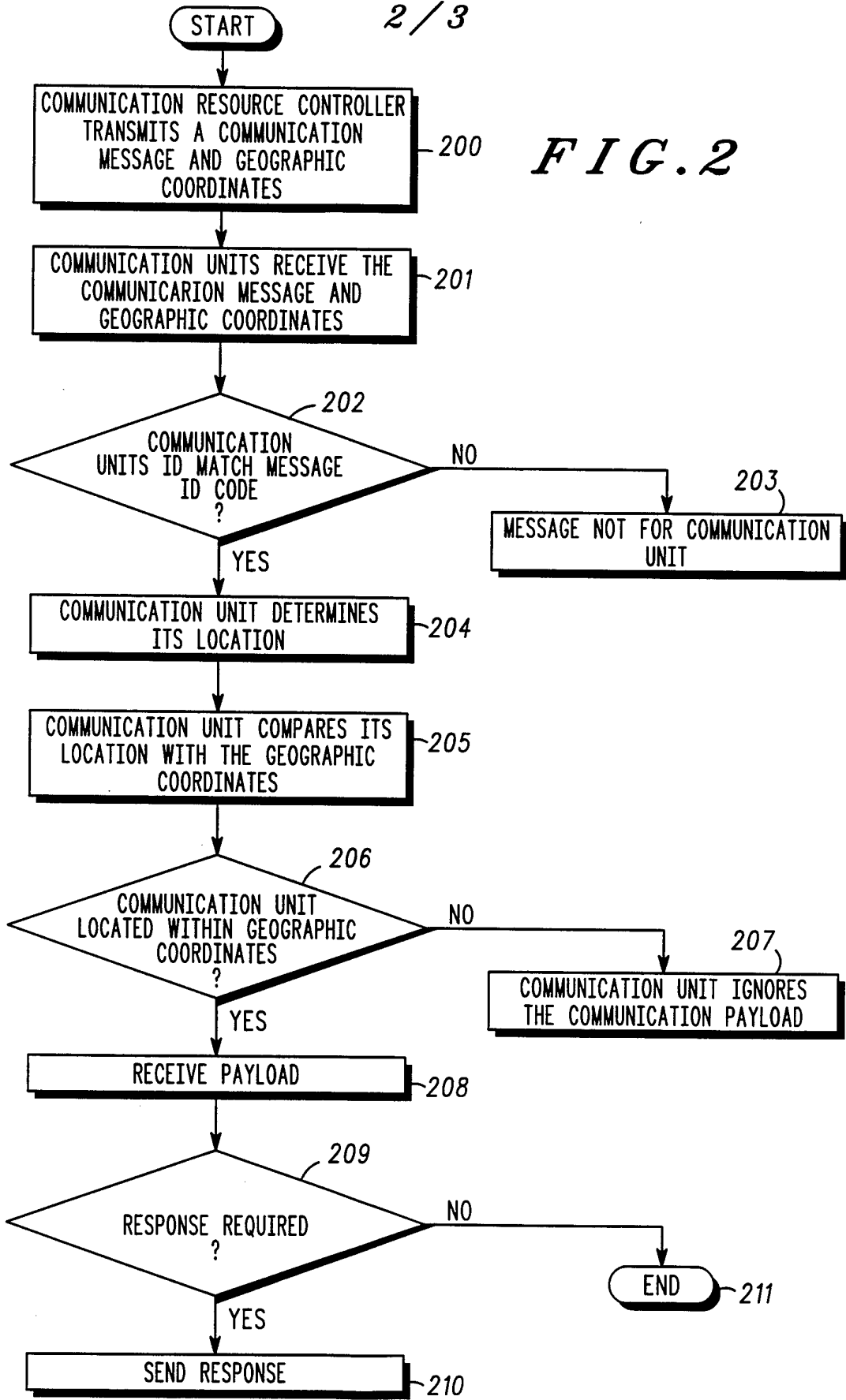
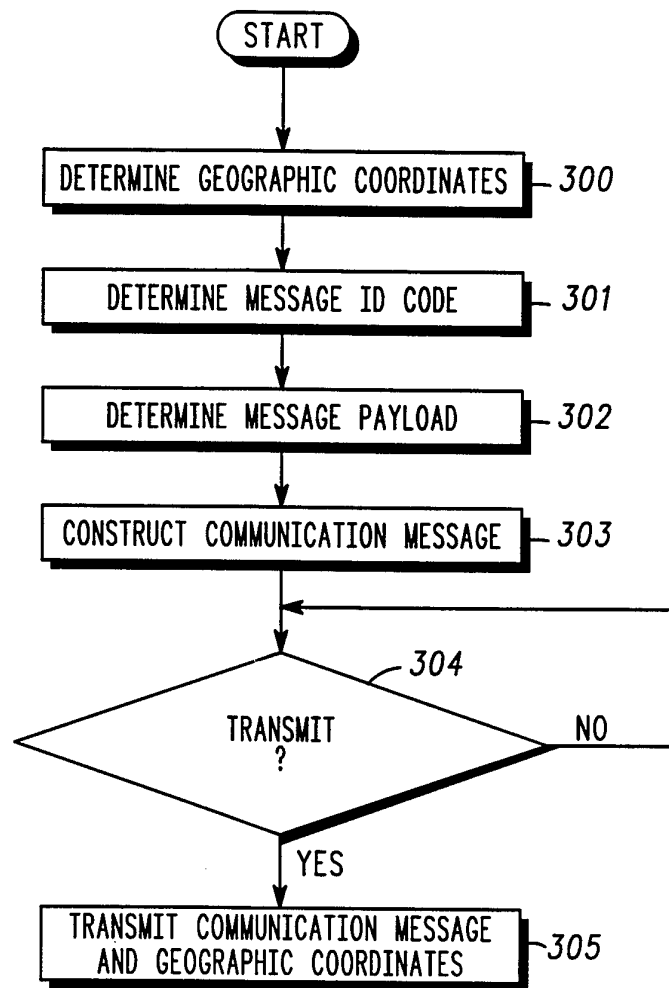


FIG. 3



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US95/01368

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC(6) :HO4Q 7/36 US CL :455/54.1 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) U.S. : 455/54.1,33.1,33.4,53.1,54.1,54.2,56.1,34.1; 379/59,60		
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) NONE		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 5,214,789 (GEORGE) 25 May 1993, col. 5, line 66- col. 7, line 5	1-10
A	US, A, 5,119,504 (DURBORAW, III) 02 June 1992, col. 2, lines 1-20	1-10
Y	US, A, 4,907,290 (CROMPTON) 06 March 1990, col. 2, lines 4-64	1-10
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
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