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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

Asst. Commissioner for Patents
Box Provisional Application
Washington, DC 20231

Sir:

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

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TITLE OF THE INVENTION:

LOCATION BASED COMMUNICATIONS SYSTEM

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ENCLOSED APPLICATION PARTS:

- ☒ Specification 41 pages. ☐ CD's, Number _____.
☒ Drawings, 12 sheets. ☐ Other _____.
☒ Appln. Data Sheet (see 37 CFR 1.76).

METHOD OF PAYMENT OF FILING FEES

- ☒ Applicant claims small entity status (see 37 CFR 1.27).
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☐ Payment by credit card. Form PTO-2038 is attached.

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- ☒ No
☐ Yes. The name of agency and contract number are _____

Respectfully submitted,

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Telephone: (352) 341-4803 Docket No: 6190
Date: March 19, 2001

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**PROVISIONAL
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DATA SHEET**

Docket No. 6190

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PROVISIONAL APPLICATION

for

LOCATION BASED COMMUNICATIONS SYSTEM

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LOCATION BASED COMMUNICATIONS SYSTEM

FIELD OF THE INVENTION

5 The present invention relates generally to communications systems. More particularly, the invention pertains to apparatus and methods for enhanced local and wide-area communications between stationary and/or roving telephone units on land, at sea, and in the air.

BACKGROUND OF THE INVENTION

10 A variety of wireless communications systems are used to provide voice and data transmission to and from subscriber telephonic units within a prescribed geographic area. Analog cellular systems such as those designated as AMPS, ETACS, MMT-450 and MMT-900 have been deployed
15 throughout the world. Subsequently, digital cellular systems have become common, and include the so-called personal communications system (PCS) including those denoted as IS-95m OCS-1900, PACS, DCS-1800, DECT, PHS and other
20 names. PCS systems generally utilize a radio frequency band of about 2 gigahertz (Ghz) for both voice and data transmission.

25 In a conventional terrestrial wireless communication system, wireless mobile terminals, i.e. cellular phones may communicate with a plurality of cells served by base stations and a mobile telephone switching office. Communication is enabled between mobile telephones and

between a mobile telephone and a land line terminal, e.g. conventional telephone or computer.

5 Celestial wireless communications systems are known, and comprise typically a plurality of earth satellites that serve as transponders or relays for radio communications between earth stations and wireless satellite mobile terminals. Such cellular systems may utilize a single antenna beam covering the entire area served by the system, or alternatively, the system may produce multiple beams
10 (with minimal overlap), each beam serving a distinct geographic coverage area within the service region. Thus, a satellite and coverage area serve the same purpose as a base station and a cell of a non-satellite cellular communications system.

15 Various systems for locating one's earth position are in place including the well-known Global Positioning System (GPS). In this application, electronic position locating systems will be referred to generically as physical location systems (PLS).

20 Various methods and apparatus for integrating a physical location system (PLS) such as a global position satellite system (GPS) with a satellite communications system are described in the patent literature, as noted below.

25 In U.S. Patent No. 5,448,623 of Wiedeman et al., a satellite communications system is disclosed having a network of gateways which interface with a terrestrial communications system.

U.S. Patent No. 5,946,618 of Agre et al., describes a mobile telephone system employing a fleet of communications satellites and a set of gateway ground stations arranged around the globe for handling communications to and from mobile subscriber units. The location of a mobile unit is determined using a GPS satellite system, and the mobile unit transmits the location to a gateway. The disclosure presents methods for selecting which service provider will handle a call made by a mobile unit, and ways for directing emergency calls to the proper authorities. In addition, methods for handling a mobile unit call to a nearby phone which is far distant from the calling unit's home area are disclosed, wherein the call is handled as a local call irrespective of whether a long distance area code or trans-country prefix is dialed.

U.S. Patent No. 5,995,041 of Bradley et al. discloses a satellite phone for direct communication with a communications satellite system. The phone may be stationary or mobile, and generates a highly directed antenna beam which is continuously controlled regardless of the position of the phone, using GPS determined coordinates of both the phone and a communications satellite.

In U.S. Patent No. 6,028,514 of Lemelson et al., a system is described for monitoring a person's location. A few standardized warning messages may be transmitted to the person, and a few emergency messages may be transmitted from the person's unit to a command center. The person's location is calculated from GPS signals, and the

communications are transmitted via a terrestrial cellular system or via communication satellites.

U.S. Patent No. 6,041,222 of Horton et al. describes a wireless mobile terminal having a communication transceiver and a GPS transceiver. The two transceivers share a common frequency reference signal which is used for signal demodulation and processing. The reference indicates utility in an advanced "911" system whereby an emergency call by e.g. an accident victim would include the GPS location of the victim. It is also indicated that radio communications from a communications satellite could be highly directed (in "pencil beams") if the mobile terminal's location is accurately known. This would save considerable transmission energy.

In U.S. Patent No. 6,064,336 of Krasner, a GPS receiver having a communications link is described. A precision carrier frequency is used to calibrate the local oscillator such that its output is modified by a reference signal generated from the precision carrier frequency signal. More particularly, satellite almanac data are transmitted to a remote GPS receiver unit from a base station. The remote GPS receiver unit uses the almanac data to determine approximate Doppler data for the satellite in the "view" of the receiver unit.

As described in U.S. Patent No. 6,061,561 of Alanara et al., a mobile station within the geographic limits of a "cell" receives a signal from the cellular base station indicating the location of the base station. The location

data are stored in the mobile station and transmitted in calls made therefrom.

In U.S. Patent No. 6,002,363 of Krasner, a cellular mobile unit is disclosed which has a GPS receiver for
5 determination of the unit's location. The circuitry for GPS receiving/calculating operations and cellular communications operations are shared, requiring that both operations cannot be used simultaneously.

U.S. Patent No. 5,890,092 of Kato et al. describes a
10 navigation system for vehicles wherein direction of movement (heading) is calculated using a geomagnetic sensor, steering sensor, gyro, or the like. The heading data is combined with GPS position data to determine the route and velocity of a vehicle.

As disclosed in U.S. Patent No. 6,044,257 of Boling et al., a "panic button" cell phone may be activated to receive
15 GPS signals and calculate its position. The phone may be used to call to an emergency response center (ERC) which is given the phone's position. In addition to a sound alarm, a
20 low-range radio may be used to activate a household alarm system.

A cellular communications device is described in U.S. Patent No. 6,067,082 of Enmei in which its position is calculated from GPS signals, and transmitted in
25 communications (voice, facsimile and data) made from the device.

In the current state of the art, each cellular telephone unit has a unique identification code. Radio signals (initiated by other units) which present that code

will initiate a response from the called unit, as long as the called unit is "switched ON" and is within radio range to receive the radio signals. Cellular telephone communication with ships at sea is non-existent unless the ship is in port or near land having a nearby cellular tower.

Currently, radio communications at sea require a person to maintain a radio ON and listen to various parties communicating on the same channel. In proper use, the radio must be kept ON and audible. Because it is tiresome to continuously listen to conversation which is not specific to the listener's vessel, radios are generally ignored, and often are turned OFF. Thus, a call from another vessel is unsuccessful. Often, SOS transmissions from nearby ships or boats are missed, and the vessel passes the troubled ship without any knowledge of the situation. Plans are underway to abandon the present maritime communications system in the near future because of these and other inherent problems.

SUMMARY OF THE INVENTION

The present invention comprises a communication system which may be integrated with current telephonic systems, e.g. hard-wired or cellular, or may be used as a partial or complete replacement for current methods of initiating and maintaining telephonic (voice, facsimile, data, e-mail, etc.) communications between parties.

The invention requires (1) a system for identifying the geographic location of a telephonic unit, e.g. a physical position location system (PLS) and (2) a system for message transmission. While various systems of each type may be

used, the invention will be illustrated and exemplified herein by use of a PLS system such as uses global position satellites (GPS), and radio-telephone transmission through a network of communications satellites (CS).

5 In this location-based communications system, a phone is located and called by its geographic location, or a limited area or space having boundaries which enclose the specific geographic location of the called phone. This is contrary to the current system using a conventionally
10 assigned telephone number for example having at least some of a country code, an area code, a local prefix and a plural-digit number (four digits in the United States) which identify the particular telephone unit.

In a location-based communications system of the invention, each mobile unit has apparatus for determining
15 its earth location in at least two dimensions, e.g. latitude and longitude, and preferably including a third dimension, i.e. altitude. To initiate a call from a first telephone unit to a second telephone unit, the geographic earth
20 location (called G# herein) of the second telephone unit (more precisely, the PLS antenna of the unit) may be identified in the call initiating process. Of course, the PLS antenna of a telephone unit may be located remotely from the unit.

25 Preferably, the initiating call from the first telephone unit is directed (e.g. through a communications transceiver on a satellite or cellular system) to include a two-dimensional area or a three-dimensional space having boundaries within which the G# (i.e. location) of the second

telephone unit is located. This area or space is called herein a Geographic Zone Number or GZ# for short. The call-initiating telephone unit may be conventionally hard-wired or wireless, and the location based communications system may include ground lines between individual telephone units, satellite gateways and cellular gateways.

An initiating telephone call will preferably include the G# of the calling telephone unit, a billing number, e.g. a conventional telephone number, and a definition of the area within which a desired called telephone unit is located, e.g. a GZ#. The initiating call is transmitted to a communications satellite or cellular system, and rebroadcast to an area which, at minimum, encloses the G# of the desired called telephone unit. The called telephone unit receives the initiating call, compares the called geographic definition with its own location. If there is agreement, the called telephone unit will signal that it has received a call, and an ANSWER command may be entered by its user to begin communication.

The location G#s of existing stationary telephone units (or the building entry boxes therefor) are currently known, or may be readily determined. Since a telephone unit is identified by its location, stationary telephone units will have permanent G#s in the system's memory. On the other hand, the G# of a mobile telephone unit will vary as the location of the unit changes. The current location of a mobile telephone may be determined using any available method which may be incorporated into a practical mobile phone, but preferably uses global position signals from a

PLS satellite(s). A preferred embodiment will be capable of receiving position signals from an orbiting PLS satellite system, as well as voice, data and/or facsimile signals and the like to/from an orbiting communications satellite system. Any type of digital or analog-coded message which is capable of transmission may be used in this invention.

The invention also encompasses methods and apparatus for operating the location based communication system, particularly in marine communications and the like. Methods and apparatus for calling a sighted (but unidentified) ship(s) in a marine emergency are disclosed. Methods for discriminating between a plurality of telephone units within a called GZ# are presented. Also, methods for issuing telephonic warnings or other messages to all persons with telephone units in a specified area or space of any definable size e.g. a building, city block, city, county, specified airspace, etc. are described.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a figurative illustration of an exemplary location-based communications system which is constructed and operated in accordance with the present invention.

FIG. 2 is a block diagram of the components of an exemplary telephone unit in accordance with the present invention.

FIG. 3 is an elevational view of a mobile telephone unit operable in accordance with the present invention.

FIG. 4 is a top view of a calling telephone unit and a called telephone unit, the latter having a geographical zone

surrounding the telephone unit and useful for initiating a call to the called telephone unit in accordance with the invention.

5 FIG. 5 is a top view of another geographical zone having a different shape, in accordance with the invention.

FIG. 6 is a top view of a further geographical zone having another shape, in accordance with the invention.

10 FIG. 7 is a top view of a user defined geographical zone for calling a telephone unit estimated to be within the geographical zone, in accordance with the invention.

FIG. 8 is an elevational view of a mobile telephone unit operable in accordance with another embodiment of the invention.

15 FIG. 9 is a figurative illustration of the earth's surface within the service area of a communications satellite, and depicting a method of calling for assistance in accordance with an embodiment of the invention.

20 FIG. 10 is a flowchart of exemplary preliminary steps for initiating a telephone call in accordance with the methods and apparatus of the invention.

FIG. 11 is a flowchart of exemplary secondary steps for completing a telephone call in accordance with one embodiment of the invention.

25 FIG. 12 is a flowchart of exemplary secondary steps for completing a telephone call in accordance with another embodiment of the invention.

FIG. 13 is a flowchart of exemplary secondary steps for completing a telephone call in the event of an emergency, in accordance with a further embodiment of the invention.

FIG. 14 is a flowchart of exemplary steps taken by a location based communications system in response to an emergency call in accordance with an embodiment of the invention.

5 FIG. 15 is an illustration of typical parts of a call origination message of the invention.

10 FIG. 16 is a top view of a user-defined expandable geographical zone for calling a distant telephone unit without knowing its position, in accordance with the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which examples and preferred embodiments of the invention are shown. However, this invention may be embodied in many different forms and should not be construed as limited to the exemplary embodiments set forth herein. Rather, these
20 embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like or equivalent elements throughout.

25 In this application, the term "physical location system" or "PLS" is used in a generic sense to denote any method for rapid determination of the earth position of a telephone unit. The PLS may comprise a satellite or fleet of satellites which emit radio signals usable by a receiving unit to determine its position, i.e. latitude and longitude and preferably altitude as well. A PLS satellite is denoted

in FIG. 1 by the numeral 9. The system known as Global Positioning Satellite System (GPS) is a particular PLS system in wide use by U.S. customers and the U.S. military.

5 The term "communications satellite" or "CS" denotes one or more earth satellites which act as transceivers to relay telephone calls between individual telephone units or between a telephone unit and a gateway station or another satellite by "handing-off". A communications satellite CS will be identified herein by the numeral 7. It should be
10 noted that for at least land-based communications, a cellular system may be used in lieu of communications satellites CS.

The term "telephone unit" is used to describe a terminal apparatus by which a user may access a
15 communications system, and may transmit and receive voice, data, e-mail, facsimile information and the like. Prior art telephone units will be identified herein by the numeral 11 for stationary phones and 13 for mobile wireless cellular phones. A telephone unit of this invention is generally
20 identified herein by the numeral 10 with suffixes thereto representing specific telephone units. The numeral 10 with alphabetic suffixes such as 10A, 10B, 10C, etc. will denote different telephone units or units being operated in a particular way. A telephone unit may be configured as a
25 desk or wall-mounted "hand-set", a mobile unit, vehicle mounted telephone unit, a computer terminal or other apparatus.

The term "gateway station" identified by the numeral 12 refers to a communications station which handles the

transfer of communications between a communications
satellite 7 and a telephone unit on earth. Typically, a
large number of earthbound telephone units 10A may be
linked, typically hard-wired, within a telephone system
5 having a gateway station 12 for accessing a satellite
communications system.

The invention may be broadly summarized as comprising
methods and apparatus for connecting telephone units 10 for
bidirectional communication on the basis of the earth
10 location of the calling and/or called telephone units,
rather than on the basis of a conventional assigned
telephone number.

An exemplary system of the present invention is
depicted generally in FIG. 1, and relates to a wireless
communications system 50 using communications satellites 7
and PLS satellites 9 or their equivalents. A portion of the
earth's surface 25 is depicted and shows land area 27
separated from water area 29 by coastline 26. Each
telephone unit, generically denoted as 10, will have at any
time a specific earth location noted herein as a geographic
number or G#. The telephone units initiate and receive
wireless calls through communications satellites 7. In
addition, mobile telephone units 10 receive PLS signals 32,
typically from a plurality of PLS satellites 9. Signals 32
25 enable each unit 10 to determine its own earth location i.e.
G# to less than several meters, and preferably less than
several feet using current GPS technology. PLS systems
under development promise to provide even greater precision
in G#. The G# may be used in any format which defines an

earth position. A format of latitude and longitude may be used, and preferably includes altitude, either above mean sea level or above the earth's surface, or even below water surface. For the sake of clarity, differing locations G# of telephone units 10 will be denoted by the numeral 30 followed by a suffix.

For example, a particular location in the Pecos River drainage area of New Mexico, U.S.A. is approximately 90 miles East of Albuquerque, and may be defined as N35°30'30.71"-W105°30'30.27"-A1905. In this example, latitude is represented by a N or S coordinate, and longitude is represented by an E or W coordinate. The altitude is shown as 1905 meters above mean sea level. For ease of computation and radio transmission, the location (in either 2 or 3 dimensions) may be collated, stored and transmitted in alpha-numeric or numeric decimal form such as, for example N35.50853056-W105.50840833-A1905 which represents the above location. In this example, the latitude and longitude are presented in degrees and fractions of degrees only.

More preferably, the latitude and longitude may be entirely decimal in form, e.g. wherein 360° is equivalent to a singular number 1.0. Thus, all locations in latitude or longitude will fall between zero and 1.0. The location G# 30 will have the desired number of decimal places to obtain the desired precision.

In FIG. 1, the telephone units 10 may include stationary units which are typically installed in buildings, telephone booths, etc., as well as mobile units which may be

personally hand carried or mounted in vehicles such as an automobile 16, boat 18 or airplane 22, for example. Where the text specifically refers to one of a stationary or mobile unit, stationary telephone units will be identified by the numeral 10A, and mobile units by 10B.

As is well known, each satellite 7, 7A, etc. of a communications satellite fleet has a service area 24 on the earth's surface 25. In actuality, the service area 24 may be three dimensional, including a vertical component extending above the earth's surface 25 and downwardly to below water level. When a telephone call is made from a telephone unit 10 in one service area 24 to a telephone unit in another service area, the call 60 is "handed off" in call handoff 28 between the appropriate associated satellites 7 and 7A. The wireless communication system 50 of this invention is not dependent upon other hard-wired, cellular or satellite systems, but access between the systems may be provided.

The location based communications system 50 of the invention may be universal in scope in which all telephone units 10 are equipped for communication to other units by specifying the unit's earth location. Alternatively, it may be integrated with other systems currently used or proposed for use. For example, conventional (e.g. hard- or optical-wired as at 52) telephone units 11 may be accessed from the satellite communications system through gateway radio communication 58 with gateway stations 12, as known in the art. Likewise, a cell gateway tower 54 may be accessed from a communications satellite 7 to provide cellular/satellite

service to conventional mobile phone units 13 within the cell 56.

Turning now to FIGS. 2 and 3, an example of a wireless telephone unit 10 of the invention is illustrated. FIG. 3 depicts a mobile version 10B of telephone unit, such as a personal or vehicle-installed radiotelephone, and is used herein to illustrate one embodiment of the unit. The unit 10 is illustrated as using radio frequency RF signals 60 to/from communications satellites 7. As shown, the telephone unit 10 includes an antenna 62 for transmitting radio frequency (RF) signals 60 to and receiving radio frequency (RF) signals 60 (or other type of transmission) from a transceiver of a communications satellite (CS) 7. Alternatively, the antenna 62 may send/receive signals to/from a cellular tower or other system.

In the particular example shown in FIG. 2, the telephone unit 10B includes a modulator 64, a RF transmitter 66, a RF receiver 68, a demodulator 72, and a controller 70 that processes signals from the receiver 68 and signals to the transmitter 66.

The telephone unit 10B also includes a location determination device 80 which may comprise a computer which determines the specific location i.e. G# of the telephone unit 10B based on wireless signals 32 from a physical location system satellite (PLS) or satellites 9 received by PLS signal antenna 84. The location data may be stored in memory 82 as a latitude number 34 and a longitude number 36, and preferably with an altitude number 38, the combination together indicating the location or G# 30 of the telephone

unit 10 on the earth's surface 25 or in three dimensions including altitude e.g. above sea level, or alternatively above ground level. As already indicated, the location may be configured and stored in memory 82 as a numeric or alpha-
5 numeric string indicative of the 2-dimensional or 3-dimensional position. Note that in the embodiment of telephone unit 10B in FIG. 3, the PLS signal antenna 84 is combined with the communications satellite signal antenna 62.

10 The telephone unit 10B includes a power supply 74, which typically includes a rechargeable battery (e.g. for a hand-held mobile unit 10B, and accessible through door 98 in the case 99) or conventional AC or DC power (e.g. for a stationary unit 10A or vehicle-mounted mobile unit.)

15 Also included in telephone unit 10B are a speaker 76 for audio e.g. voice output 78 and a microphone 83 for audio input 86. A display screen 88 provides visual indications of control messages, the unit's own G# 30A, the G# 30B and/or geographic zone GZ# 20 (see FIG. 4) of a currently
20 called telephone unit, transmitted data messages, etc. A user input device 90 with computer interface connections, typically a keypad with multiple keys, enables a user to operate the telephone unit 10B. As shown in FIG. 3, a user
25 input device 90 may include not only a conventional telephone alphanumeric keyboard 94 with keys 92A, but additional command keys 92B for operation of the various devices and functions of the telephone unit 10, and an ON-OFF switch 92C. As shown, each of the devices associated

with the telephone unit 10 is connected to the controller 70 for coordination and control thereof.

In general, a stationary version of the telephone unit 10 may have the same components as a mobile version, i.e. CS antenna 62, transmitter 66, modulator 64, receiver 68, demodulator 72, controller 70, power supply 74, speaker 76, microphone 84, location determination device 80, display 88, user input device 90 and memory 82 as well as memory in the controller and other devices of the unit.

In one embodiment of the telephone unit 10, the unit also includes apparatus for determining the compass direction from the telephone unit 10B to another telephone unit. Several types of direction-finding devices 100 with direction memory 102 (see FIG. 2) are described, *infra*, together with the purpose and use thereof.

As already indicated, an exact location on the earth's surface 25 or in the space about the earth's surface 25 or even below sea level may be defined in two "dimensions" or three "dimensions", respectively. If the exact location G# 30 of a to-be-called telephone unit 10C is known, a telephone call to that G# from another telephone unit will result in a communication connection. However, there are obvious sources of error which make use of an "exact" G# 30 difficult to use in practice. For example, under certain conditions, some current PLS systems are incapable of defining a location on the earth's surface 25 closer than to within about one meter. Furthermore, if a G# is defined as a 6 inch by 6 inch square, moving a telephone unit 10 a few inches will remove it from the exact G#. In addition, if

one or both of the calling and called telephone units 10 is moving, there will be a delay in transmitting/receiving PLS signals and calculating G#'s therefrom. Even current PLS receiving units at stationary locations experience a slight delay in determination of location. Newer GPS units are expected to greatly reduce the delays in location determination. However, to obviate these difficulties as well as errors in a person's estimate of distance and direction, a useful Geographical Zone number i.e. GZ# 20 is created which defines an area or space surrounding and quickly "capturing" the G# 30D of the called telephone unit 10D in spite of PLS time delays and known sources of error including simultaneous movement of both telephone units. A two-dimensional GZ# 20 with boundaries 21 is shown in FIG. 4, enabling telephone unit 10C at G# location 30C to complete a call to telephone unit 10D at G# location 30D by specifying the GZ# 20 rather than the G# 30D. It is noted that the direction and distance of G# 30D from G# 30C are defined along line 96 on the earth's surface. An example of a two dimensional GZ# 20 denoting an area on the earth's surface is N-0.7784221-0.7784226*W-0.2232880-0.2232885, where N refers to boundaries along two spaced-apart latitudes, and W refers to boundaries along two spaced-apart longitudes. The geographic area bounded by these latitudes and longitudes comprises the GZ# 20. A three dimensional GZ# 20 includes altitude boundaries; an example is S-0.1444372-0.1444380*E-0.6667529-0.6667537*A-500-3000, in which the specified altitude is between 500 meters and 3000 meters. When a three dimensional GZ# 20 is used, the

computer 70 within each telephone unit 10B may be set at a default elevation which considers extant ground elevation as 0.000, regardless of its elevation above sea level. Current PLS satellite systems 9A use such a program factor, and the telephone unit 10B of this invention may utilize the current PLS system to define a default elevation value. Sub-terrainian elevation values such as of underground railways, mines, etc. and even underwater elevation values, may be determined and used in this location-based communications system. Actual elevations above mean sea level may optionally be used in the GZ# 20, especially for calls to/from an airborne telephone unit(s) 10B. In a further embodiment, a data base comprising actual land surface elevations i.e. a terrestrial map may be incorporated into the telephone unit's memory, or in the memory of the PLS satellite system 9. The data-base elevations may comprise default elevations.

The size of a GZ# 20 which will consistently capture a telephone unit 10D is dictated by the expected errors, known time delays in the PLS system 9A, and the desired degree of confidence in the G# 30 being enclosed within the GZ#. As the specified size of the GZ# 20 is increased, the degree of statistical confidence in connectivity will increase. In practice, it is desired to provide 100 percent (or nearly 100 percent) confidence in connectivity. However, use of an overly large GZ# 20 may result in the area encompassing more telephone units 10 than the single unit 10D to which communication is directed. Discrimination procedures are

then required for a caller at telephone unit 10C to reach the desired telephone unit 10D.

5 In the communications system 50 of this invention, one method by which telephone unit 10C may call telephone unit 10D is by specifying the G# 30D of unit 10D. As already discussed, this method is currently limited by lack of dimensional discrimination and time delays in PLS systems 9A.

10 In another method, a minimal GZ# 20 is defined which includes the G# 30D. This is useful where the called telephone unit 10D is a stationary phone with an unchanging i.e. permanent G# 30D. A minimal GZ# 20 may have dimensions of only 5 meters by 5 meters, for example, depending upon the dimensional discrimination of the PLS system 9A. In a
15 communications system 50, all telephone units 10 called by specifying the exact location G# 30 are automatically assigned a minimal GZ# 20 about the G#. A GZ# may have any regular or non-regular shape 48, including two-dimensional shapes such as a circle, oval, square, rectangle or other
20 polygon, and any three-dimensional shape including spherical, cylindrical, conical and polygonal for example. FIG. 5 depicts an oval GZ# 20 surrounding a called telephone unit 10D. Likewise, FIG. 6 depicts a rectangular GZ# in which a called telephone unit 10D is captured. The use of a
25 GZ# 20 has many other advantages which will be described, infra.

A telephone call may be made from telephone unit 10C at G# 30C to telephone unit 10D at G# 30D in several ways.

The initial steps in placing a telephone call from a telephone unit 10B are shown in FIG. 10, and include turning the ON-OFF switch 92C to an ON position. The unit 10B may then make status checks including circuitry, battery and software integrity. Various data may be displayed on the display screen 88, including for example battery charge level, current G# 30 of the calling unit 10B, billing number of the unit (which may be optionally configured as currently used telephone numbers), and any error messages.

The telephone unit 10B may provide for recall of messages received while the unit was turned off or the user absent. The messages may be viewed on the display screen 88 or heard, depending upon the type of message. The messages are erasable.

Upon activation of the call function, a G# 30 or GZ# 20 must be entered defining the location of the telephone unit 10B which is to be called. The particular method used depends upon several factors.

Dial Method 1: If the G# 30 or GZ# 20 of the called telephone unit 10 is known, it may be keyed in, i.e. entered by hand or from the unit's memory. The method is illustrated in FIG. 11. A priority code 114 or extension number 114A may be added to the origination string 40 to limit the call to a phone unit having a priority clearance, or one having an extension where more than one phone unit is connected to a single receiver 68. Call transmission is then initiated to a communications satellite 7, cell gateway station 54, or telephone wire grid 52 to locate the called telephone unit and complete the call.

As depicted in FIG. 11, if the location G# 30D of the to-be-called telephone unit 10D is known, the call may be made using the known G# 30D. The system 50 may be set up to apply a small but inclusive default GZ# 20 about any specified G# 30 which is called. Thus, a minimally sized G Zone GZ# 20 may be applied by telephone unit 10C or by the transceiver controller of a communications satellite 7, or by other communication hardware, not shown, to enable a very high probability of reaching the called telephone unit 10D. The caller may wish to apply a priority code to the G#, where there may be more than one telephone unit 10 within the called G# or GZ#. For example, the captain of a ship would normally be assigned a primary priority code; other telephone units 10 on the ship may have assigned secondary priority codes. A call made to the ship will ring the telephone unit 10 having the highest priority code, unless a particular secondary code is specified by the caller. Calls placed without a priority code would ring the highest priority unit 10 first. If the captain does not have a telephone unit, and there is no high priority phone on board, any call encompassing the GZ# 20 of the ship will activate any phone having a secondary priority, or all phones 10 on the ship. A plurality of priority levels may be established.

In other situations, such as an office with multiple telephone units 10, calls to/from all units may be funneled through a single radio antenna. Each individual telephone unit 10 may be assigned a priority code number 144 or an

extension number 144A which may be specified in the call origination alpha-numeric or numeric string 40.

5 As shown in FIG. 15, the alpha-numeric or numeric call origination string 40 which denotes the routing may include for example, (a) satellite contact code 136 which includes a normal string to achieve contact and instructions for the communications satellite 7; (b) the current location G# 138 of the calling telephone unit 10; (c) a billing number 140 or unit identification code by which a periodic bill may be assembled for the user; and (d) the called G# or GZ# 142 together with priority code number 144 or extension number 144A. The call origination string 40 may include codes for other factors as well, including user-specified factors.

Dial Method 2:

15 A unique feature of the location based communications system 50 may be used to provide communication with an unknown party or telephone unit 10 at an unknown (but roughly estimatable by sight, sound, etc.) location G# 30. In this method, illustrated in FIG. 12 and using the system shown in FIG. 7, a telephone call is placed to a user-defined GZ# 20. As depicted in FIG. 7, for example, a distant telephone unit 10D at location G# 30D is sighted by an operator of telephone unit 10C at location G# 30C. The call initiation message string 40 will include numeric or alphanumeric coded (a) location G# 30C of the calling unit 10C as well as codes indicating (b) estimated direction 44 of the telephone unit 10D from telephone unit 10C, (c) estimated distance 42 to unit 10D, and (d) the size 46 and shape 48 of a GZ# 20 which will include the G# 30D. The

direction 44 may be determined using a compass, calculation from PLS transmission data, or by other methods. One or more standard size/shape configurations may be stored in memory for instant recall and use. As in Dial Method 1, a
5 priority code 114 may be entered into the GZ# 20.

In one embodiment of the location-based communications system 50, a telephone unit 10 (hard-wired, cellular or satellite based) with a conventional telephone number, may be called from telephone unit 10C by simple use of the
10 phone's conventional phone number. The message will be transferred, for example, from a communications satellite 7 through a satellite gateway station 12 or cellular gateway station 54 to the hard-wired, cellular or satellite system, respectively.

15 An exemplary application of a user-defined GZ# may be illustrated by reference to FIG. 7. Assume that a sailor on a boat on an ocean has a mobile telephone unit 10C having an earth location G# 30C. Because of an emergency, the sailor wishes to contact the nearest other watercraft; a ship 19
20 which appears to be a cruise liner is visible at an estimated distance 42 of 3.5-4 miles. The sailor may place a telephone call to the sighted ship 19 which has a telephone unit 10D.

25 Using features of a telephone unit 10C of the invention, the compass direction 44 of the cruise liner 19 (with telephone unit 10D) from the sailor is estimated and stored in memory. The sailor may place a telephone call to a telephone unit 10D on the cruise liner 19 by creating the location and boundary limitations of a GZ# 20 enclosing the

telephone unit 10D, i.e. enclosing the cruise liner 19. The GZ# 20 is based on (a) the known G# 30C of the sailor's telephone unit 10C, (b) the estimated direction to ship 19, (c) the estimated distance 42 to ship 19, and (d) the size 46 and shape 48 of the GZ# 20. In this example, the GZ# 20 is shown as an arcuately truncated angular (conic section) projection with an axial central point 104 at the selected estimated distance 42 of 4 miles. The sailor has selected the near and far end boundaries 21A and 21B, respectively of GZ# 20 to be $\pm 25\%$ of the selected distance 42, whereby the GZ# 20 extends from 3 to 5 miles from the calling unit 10C. The end boundaries 21J, 21K may be preprogrammed based on the selected estimated distance.

The size factor 46 which in this case is the angular width of the GZ# 20 is selected by the sailor to be that between lines 5° relative to a line 96 between the two telephone units 10C and 10D. This creates a relatively small GZ# 20D with a total 10° spread between side boundaries 21D. Optionally, other widths or "spreads" may be selected, depending upon the sailors inherent confidence of accuracy in determining the direction 44. For example, spreads of $\pm 10^\circ$ and $\pm 15^\circ$ are shown by boundary lines 21E and 21F, respectively. The selected spread is preferably variable to allow for a user's accuracy in estimating direction and/or distance by sight or sound under the particular weather conditions.

For the sake of simplicity, a telephone unit 10 of the invention may be configured with predetermined values of distance 42 and GZ# size 46, enabling one-button entry.

In more sophisticated embodiments, various GZ# shapes 48 and sizes 46 may be selectable when making a call. Such selection may be useful to maximize the chances of "capturing" the G# 30 of the desired party while eliminating or minimizing the chances of having other telephone units 10 within the GZ#.

In another embodiment, a conical or other shape GZ# 20 may be defined, either distantly truncated or non-truncated, and the telephone unit 10 set to detect and call the telephone unit within the GZ# which is nearest the calling telephone unit 10. In this embodiment, each telephone unit 10 within the GZ# indicates its location to a computer which automatically selects and calls the unit nearest the calling telephone unit 10. Optionally, emergency calls may automatically be assigned a priority code to eliminate calls to persons incapable or non-authorized to assist. The priority code criteria may be sequentially "down-graded" from a top priority to a lowest priority. If there is no response from a telephone unit 10 in the GZ# 20, the search is widened, using a larger GZ# 20. This "selective reception" method enables caller-controlled discrimination to ensure contact with a desired party.

In a further embodiment, a time-expanding GZ# 20 may be initiated, in which an initial small GZ# is continuously or sequentially expanded to a larger GZ# until a responsive telephone unit is located and identified. The GZ# 20 may also be moved as well as increased in size. This method acts to discriminate between plural telephone units 10 within a given area, and is also useful in expediting an

emergency call to the nearest phone unit. The expanding GZ# may be centered about the calling telephone unit 10 or about a distant point. The expansion may of course be in any direction in three dimensions.

5 FIG. 2 indicates a telephone unit 10 with a direction finder device 100 such as for example, a computer accepting signals from a PLS satellite 9. The 2-dimensional or 3-dimensional direction 44 from a caller telephone unit 10C to a desired callee telephone unit 10D may be determined by a
10 direction finder device 100 in several ways. As shown in the embodiment of FIG. 8, a user sights through a viewfinder 106 and aligns a reticle or reticles 108 with the person or item associated with the telephone unit 10D. The user may press a button or key 110 to compare the direction with a
15 magnetic compass 59, for example, and store the result in memory. A computer program may be stored in controller memory or memory 102 to correct the magnetic compass 59 direction value for natural variations over the surface of the earth. The telephone unit 10C is constructed to
20 minimize stray current leakage, both ambient and inherent, which will affect the magnetic compass 59. In another embodiment, a close approximated value for direction 44 may be obtained by aligning the telephone unit 10C with the to-be-called telephone unit 10D and determining the compass
25 alignment of the unit from PLS signals transmitted by the PLS satellites 9. Data required to calculate compass alignment is the same data which is transmitted in the PLS signals for location determination, as long as it provides the positions of the PLS satellites 9 or directions thereto

relative to a grid of earth coordinates. For example, movement between two PLS positions could be used to calculate compass alignment.

5 It will be recognized that the viewfinder 106 may be modified to also include a rangefinder device 112 therewith, whereby an estimated direction value 44 and an estimated distance value 42 may be obtained at the same time. Such an apparatus will reduce the errors in those estimations, and permit the use of a GZ# 20 of smaller size.

10 In another embodiment, the direction finding device 100 may comprise a computer program in memory 102 which is activated through use of a key 92B. A user then moves the telephone unit 10C in the direction of telephone unit 10D. As the unit 10C traverses through a number of G#s, the
15 direction is calculated from the change in G#. The distance which must be traversed to obtain a proper estimate of direction is a function of the discrimination of the PLS satellite system; PLS systems being developed will enable adequately precise direction determination by moving the
20 telephone unit 10C less than a few feet, for example.

As shown in FIG. 16, a person on a first boat 18A having telephone unit 10A intends to call a second boat 18B (presumably having a telephone unit 10B) which is on the distant horizon. Using a direction finder 100 on telephone
25 unit 10A to denote a direction along the line-of-sight 158, a call is made through a communications satellite 7 specifying a GZ# 20H having an oval shape 48, specific size 46 and centered at an estimated distance 152 from the calling boat position 150, toward the second boat 18B.

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There will be no response from telephone unit 10B on the second boat 18B because in this first calling attempt, boat 18B is outside of the GZ# 20H. A feature of this particular unit 10A is a computer program which changes the GZ# after receiving no response within a set time period. The program varies the GZ# 20 by (a) expanding its size (particularly width 156) in a direction in two or three dimensions and (b) moving the GZ# in a specific direction. In the example of FIG. 16, a GZ# 20J is entered and called, without receiving a response in the preset time. Additional GZ# 20K and 20L are then called in turn, without response. A further GZ# 20M is called, which activated telephone unit 10B on boat 18B, located at position 148. The preset time for GZ# change is sufficient to permit telephone unit 10B to receive the call origination message 40, compare it with its own G# 30, and send a confirmation message to the communications satellite 7 which processes and relays the confirmation to phone unit 10A. Although this system may be configured in many different ways, it may be simplified to a single shape 48, a single direction of movement away from the user, and a single increase in the size 46 of the GZ#. The system may be preset to use this location method automatically.

In one embodiment of the invention, telephone units 10 are programmed so that, upon sensing a telephone call origination message from a communications satellite 7 (or other location based communications system) which agrees with its own G# 30, the unit's controller 70 turns on a ringer to signal the user, and in addition, transmits a short return acknowledgement message to the communications

satellite 7 indicating the unit's G# and identification or
billing number. In this mode, a record of the unit's
location G# 30 is maintained, even if the user does not
immediately respond to the call. In a further embodiment,
5 this feature is programmable to bypass the unit's ON-OFF
switch and respond with its G# and identification number to
every call it senses which is in agreement with its
location, even when the unit is turned OFF.

10 Dial Method 3: The communication system 50 of the
invention enhances quick responses to emergency situations.

In this method, illustrated in FIG. 9 as applied to a
maritime emergency, an EMERGENCY system may be incorporated
in the controller 70 of a telephone unit 10 (FIG. 2). The
method is also shown in FIGS. 13 and 14, and this discussion
15 will make reference to all of these figures. Upon
activation of a designated EMERGENCY key 92D (FIGS. 3 and 8)
by the user e.g. a sailor on a boat 122 at sea 29 or by a
signal from an emergency sensor on the boat, an emergency
message 116 is transmitted from the boat's telephone unit 10
20 to communications satellite 7. This message 116 may be
monitored by the Coast Guard or other organization which
will interact with rescue activities. The message 116 may
simply indicate an emergency, or a preprogrammed detail
indicating the type of emergency may also be included e.g.
25 by using pre-installed messages in memory, or using
keystrokes to write a message. The message 116 will
include vital information, e.g. the satellite contact code,
the unit's location G# 30X and identification number
(billing number), a description of the vessel, number of

crew, and safety equipment on board, as well as an indication of the type of emergency. Other information may be included as helpful in the situation. Upon receipt of the emergency message 116, the satellite transceiver controller 120 initiates a program to find the nearest available source of assistance for the boat 122 having an emergency. In addition, a message may be returned to the caller G# 30X indicating "call receipt", i.e. confirmation of receipt of the emergency call by the communications satellite 7. Thus, the caller knows whether to repeat the emergency call. Upon confirmation from the satellite 7, the caller may simply hang up and wait for rescue or calls from assistance. At sea 29, the sources of assistance are primarily other boats or ships at sea, but may be aircraft 130 as well, or a land-based station 132.

The communications satellite 7 (or other location based communications system) then originates a telephone call 124 specifying a GZ# 20X which surrounds the boat 122 in trouble. The GZ# 20X may be circular about the boat 122, as shown, or may be of another shape. An example of a GZ# 20X may have a radius of 10 miles about the boat's location G# 30X. If there is no response to the call, i.e. no other telephone units 10 respond to the call specifying GZ# 20X with a 10 mile radius 126A, the radius of GZ# 20X may be expanded (to a radius 126B of 30 miles, for example) to form a larger GZ# 20Y, and a new call 128 originated.

When a source of assistance such as ship 118 at G# 30Y answers the call, for example, several alternative programs may be performed. The message 134 which reaches a

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responding ship 118 may contain the location of the boat 122 in trouble, any other information concerning the emergency which was transmitted to the satellite 7, and a query concerning possible assistance. The message 128 is preferably in digital form for viewing, but may also be in voice or other form. The vessel's captain answers the call with a call 134 with an indication of whether the vessel 118 will assist boat 122. If desired, voice or other communication between the boat and the ship may be maintained. All during the rescue period, a record of the position G# 30X of the beleaguered boat 122 is maintained by the satellite 7. In a preferred embodiment of the invention, all vessels could have a coded listing of factors which may effect their ability to respond to an emergency. Such listing may be transmitted to the satellite 7 in responding to the query. Furthermore, the programmed controller 120 of the satellite 7 may be enabled to distinguish, in a file based on identification number, which source of assistance may respond to the emergency more quickly or be better equipped for the task. Safety organizations such as the Coast Guard may have their telephone units 10 set to intercept and record all calls denoted by the emergency activation of a telephone unit, such as from a boat at sea.

Thus far, various embodiments of the location based communications system 50 have been illustrated in terms of marine or marine-to-shore use, using communications satellites and PLS satellites. However, use of the system 50 is also advantageous for use in land-to-land, land-to-

air, and air-to-air communications, using satellites, cellular systems and/or wired/optical connections.

For example, use of the invention in aircraft enables communication between airplanes or between an airplane and a control tower which automatically supplies all information about the airplane, including its present position, heading, speed, and elevation. Furthermore, this information may be automatically received for all planes and integrated into visual and electronic outputs which enable air traffic controllers to be aware of (and direct) all air traffic without the use of radar at all. Pilots will be made aware of all surrounding aircraft; pilots of small planes can identify other aircraft without visually seeing identification numbers.

In another scenario, a disabled aircraft must make an emergency landing at sea. By identifying all vessels in the area, as well as their recovery and emergency equipment and personnel, etc., the best vessel for recovery can be selected. The initial response from the vessel's telephone unit 10 may automatically provide the necessary information and not involve any personnel. In addition, the aircraft pilot may communicate directly with the recovery vessel's personnel concerning weather conditions, wave height, etc. to determine the optimal approach direction.

The location based communications system 50 has great potential for public safety issues. Medical personnel, police, firemen and hazardous team members may each have a specific prefix or suffix added to their G# 30, so that calls for help may be specifically directed to the

appropriate party. In the most useful form, an area map and navigation program is integrated with the communications system 50 by which any G# 30 is identified.

5 In an example, the system 50 may be used by a policeman to immediately identify and call a speeding motor vehicle if it has a phone unit 10. To make verbal contact with the vehicle's driver, the policeman's telephone unit 10 may be pointed at the vehicle and a distance estimate entered.

10 Also, computer analysis of the changing G# of the vehicle's path enables vectoring calculation of the vehicle's velocity, without using a radar gun.

15 Occasionally, it is necessary for an ambulance or other public safety vehicle to meet a vehicle carrying a person requiring medical assistance. Using the continuously known location of the vehicle, the ambulance can direct the vehicle to a most expeditious location for meeting.

20 In another example, when a city block, or an apartment building, or any area, needs to be warned, or evacuated, or otherwise informed of something of importance, a public safety officer may use a single GZ# 20 encompassing the area to immediately reach all phones in the area; the message may be prerecorded, and is transmitted to all phones in the GZ# 20.

25 In another concept useful for modern communication, each telephone unit 10 may be assigned a specific default language, e.g. English, German, Spanish, etc. by the owner/primary user. This default setting may be associated with the phone's billing number. Any message which is to be used by fire departments, police, etc. may be prerecorded in

multiple languages. When any telephone unit 10 is activated to receive a particular message, it receives the message prerecorded in the default language preset for that telephone unit. Thus, a person responding to a message will receive it in his own tongue. A user may over-ride the default language and select another language, if desired. This feature is especially useful in multi-ethnic areas of any country, especially when warnings and evacuation orders are issued in the event of storms, fire, criminal activity, etc. In addition, airplane pilots and navigators, as well as seagoing vessel personnel, may be able to select a language enabling clear understanding of emergency messages and the like.

In a further example, an emergency vehicle travelling on a particular route may have a location based telephone unit 10 in which the desired route is designated. The unit 10 includes a program by which traffic ahead of the emergency vehicle may be warned by an emergency siren built into their own telephone units 10, indicating approach of an emergency vehicle. This forward progression GZ# system may be fine-tuned so that for example, only traffic moving in the same direction is warned, or the warning may include side traffic approaching the route. The program may include vector progression along the route in advance of the emergency vehicle.

In another embodiment, clubs or event personnel could communicate to all members, or any portion of their members, simultaneously. For example, in a cross-country bicycle race, all racers could be assigned a given GZ# prefix,

suffix or other identifier enabling simultaneous communication to all or a certain number of the group. Optionally, for example, racers nearing the finish line will receive a special message. Team-mates will be enabled to communicate with each other. In this embodiment, persons of any group of people who wish to hold simultaneous conversation, or receive a common message, may all be assigned a particular identifying number. In another example, members of a fishing club may be assigned a specific identifier. When fishing in the ocean, a member may locate any or all other members fishing in any defined area, i.e. GZ# 20.

At this point, it should be noted that the telephone units 10 may include the option of self-answering, in which the unit is programmed to not only signal when it is called, but to answer the call. For example, a bicycle racer receiving a call need not physically touch the telephone unit 10, but merely listens to messages through an earphone, or optionally talks into an attached miniature microphone.

It should be noted that general messages relating to weather forecasts, storm warnings, road closings, traffic, or any other message of public importance may be accessed by a user. As already noted, a governmental safety office may specifically activate all phones 10 within a specific area or region with a warning. The activation program may include means for establishing an "interruption priority" enabling interruption of existing conversations.

For example, all phones 10 within a 100 mile-long expected path of a tornado or hurricane, or along a river subjected to a flash flood, may be activated with a warning.

Use of a GZ# prefix/suffix would also be useful in tracking and surveillance. For example, animals fitted with telephone units 10 may be accessed by dialling a particular number to determine its exact location. The telephone unit 10 may receive information from any measurement device to relay for example pulse rate, body temperature, and the like. An automatic dialer, either on the roaming unit 10 or on the base station unit, may be set to gather information at any desired time or time interval.

Such a system could also be placed in a vehicle, by which its location could be determined at any time.

Use of this system 50 is indicated in any situation where knowledge of persons is important, such as in forest fire control.

In another embodiment of the invention, each telephone unit 10 is provided with a "serial number" specific to that unit. In the event a unit is stolen, the exact location of the unit may be determined from another phone unit by initiating a call to a very large GZ# 20 and including the "serial number".

Whether the location based system 50 uses communications satellites, cellular towers or wire/optic signals, the system 50 transmits a call and records the G# 30 when a telephone unit having the particular serial number responds. The program of the unit as originally constructed may be set up

to receive the call and respond without any indication of the call to a person present at the location.

5 In another advantage of the invention, it is noted that if a phone unit 10 is misplaced or lost by its user in an area not likely to have other phone units, it may be located by calling, from another phone, a GZ# 20 sufficiently large to encompass the area and activate the lost unit. The lost unit then responds by indicating its exact location G# 30.

10 It is also evident that the location of a lost/stolen telephone unit 10 may be determined simply by calling the billing number of the unit.

15 In another use, a delivery company may use a G# 30 to indicate a receiving address. An electronic map on the vehicle will indicate the location, as well as the street address and G# 30.

20 As in the current "Yellow Pages" of Bell Telephone affiliates, the location based communication system 50 enable placement of advertising/informational information available to anyone with a telephone unit 10. In one embodiment, each type of business will be assigned a particular "Yellow Pages" code identifier. To exemplify, a travelling person in need of a motel may call a GZ# encompassing the next 15 miles of the highway, and including the identifier number for lodging. He will receive a message indicating the particular lodging sites in the next 25 15 miles together with information such as price, availability of rooms, distance off the road, etc.

In another example, using a different identifier number, the nearest or next gasoline station(s) on the

traveler's route may be identified for a vehicle in need of fuel.

5 In the communications system of the invention, a telephone unit may communicate with another telephone anywhere on the earth or in airspace above the earth's surface 25 via a communications satellite transceiver, without the need for an intermediate gateway. In a hybrid system, however, large numbers of stationary telephone units may continue to use gateways. In addition, mobile cellular 10 telephone units may also continue to use cellular base stations along with satellite gateway stations to gain access to the location based communications system.

15 Many other modifications and embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the invention is not limited to the specific embodiments disclosed, and that other modifications and embodiments are intended to be included within the scope of the invention.

ABSTRACT

A location based communications system uses a physical location system (PLS) to determine a telephone unit's location in two or three dimensions, and is configured for radiotelephonic calls through intermediary communications satellite systems, cellular systems or other mobile systems, based on the location G# of the called telephone or on a caller-defined estimated area or space termed a G zone number GZ# surrounding the desired callee. The system is particularly advantageous for mobile communications, and may be interfaced with conventional stationary telephones, cellular phones and other communications devices. Multiple telephone units may be simultaneously contacted with messages in user-defined languages. An emergency SOS feature enables the location based communication system to locate and notify the nearest and/or best equipped party for assistance in the event of an emergency.

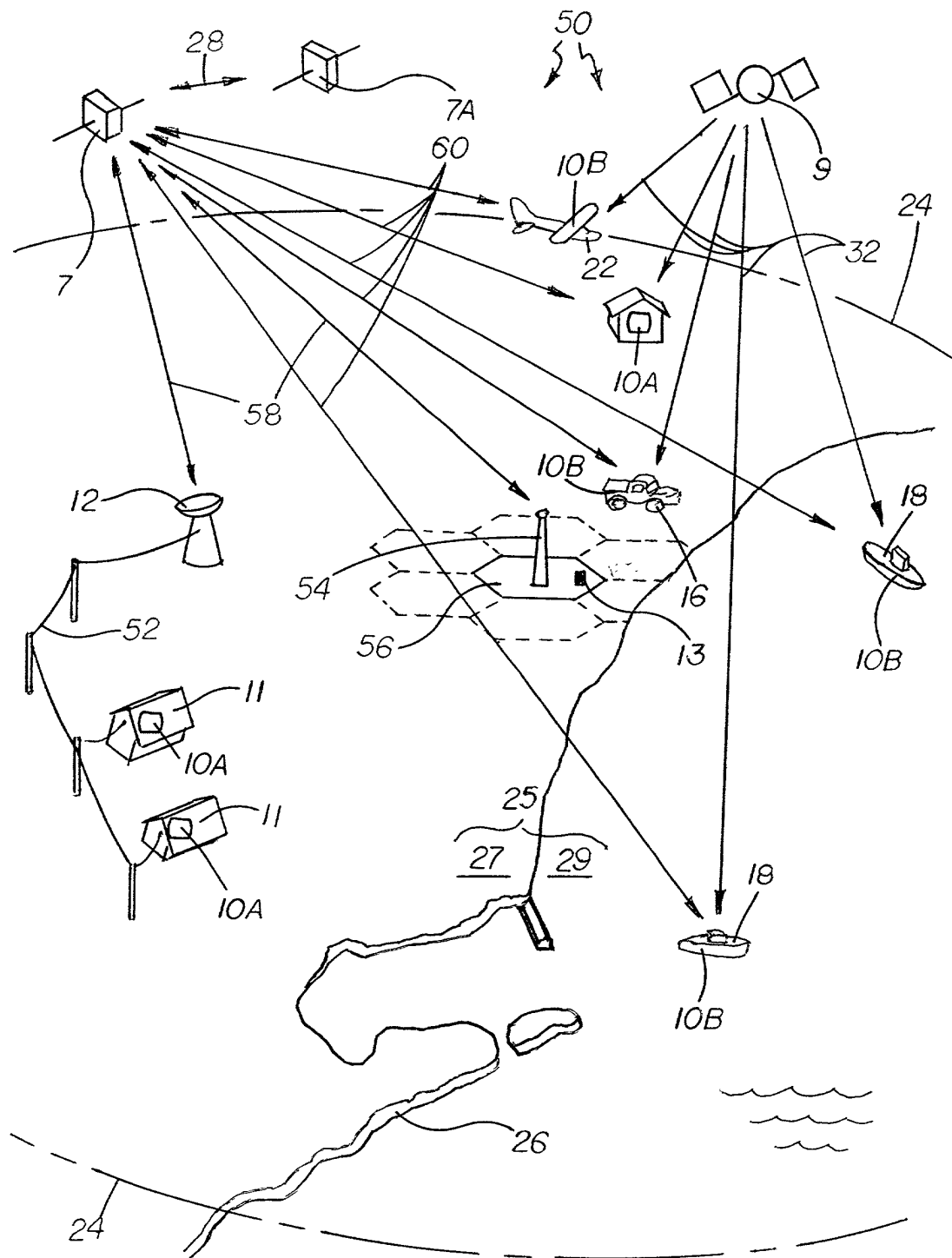


FIG. 1

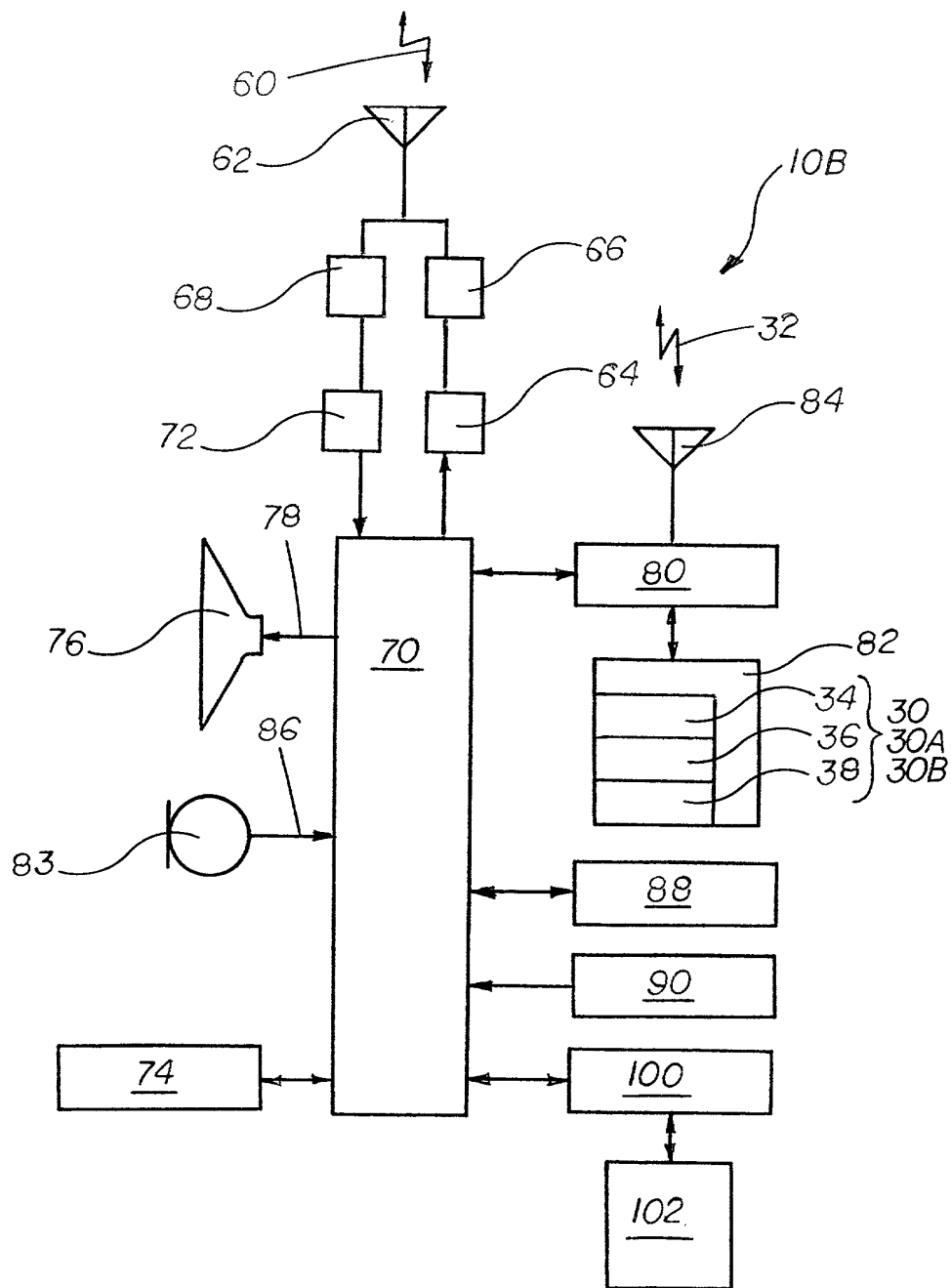


FIG. 2

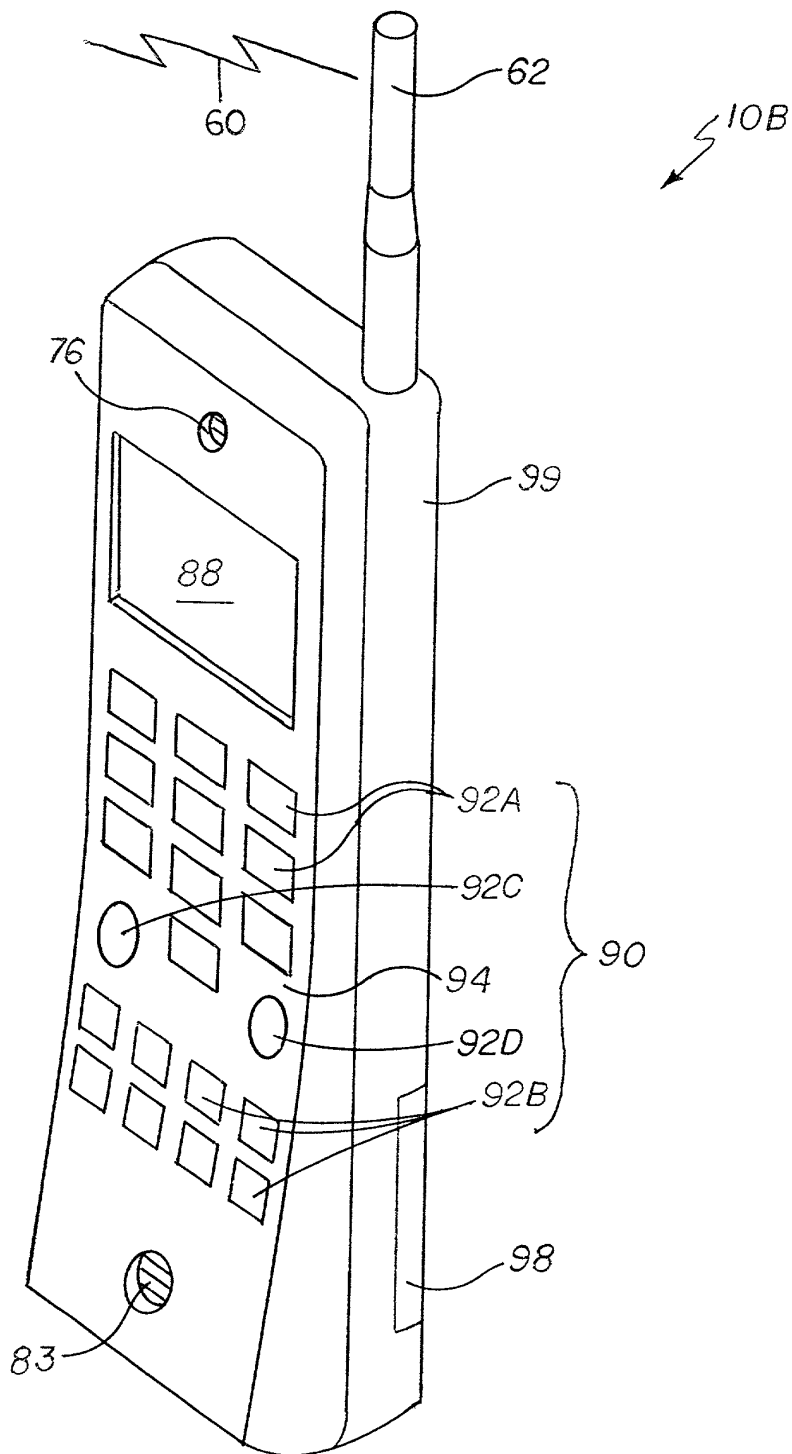


FIG. 3

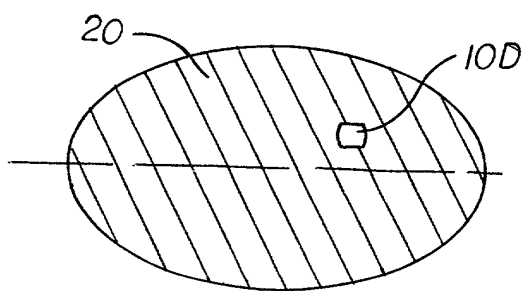
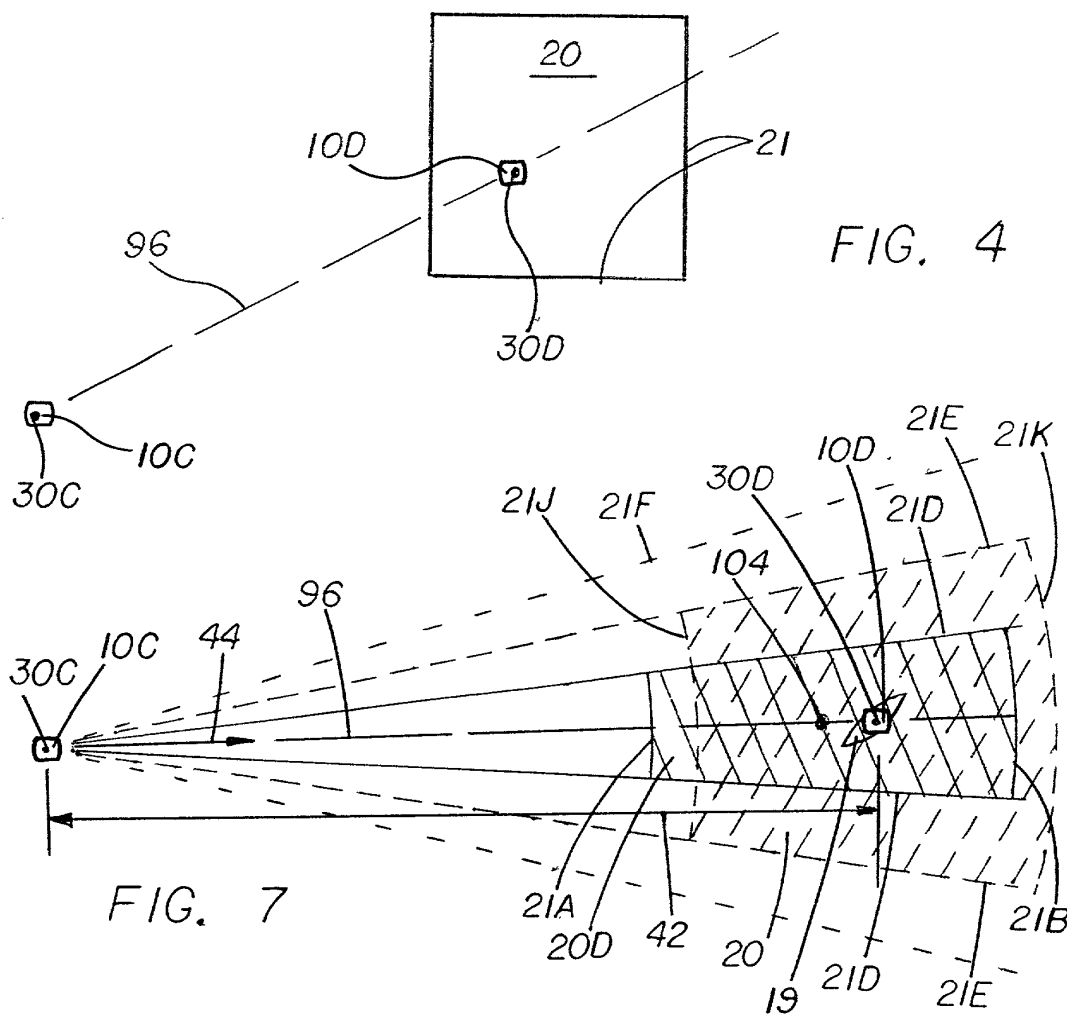


FIG. 5

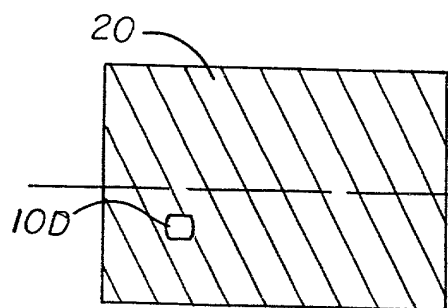


FIG. 6

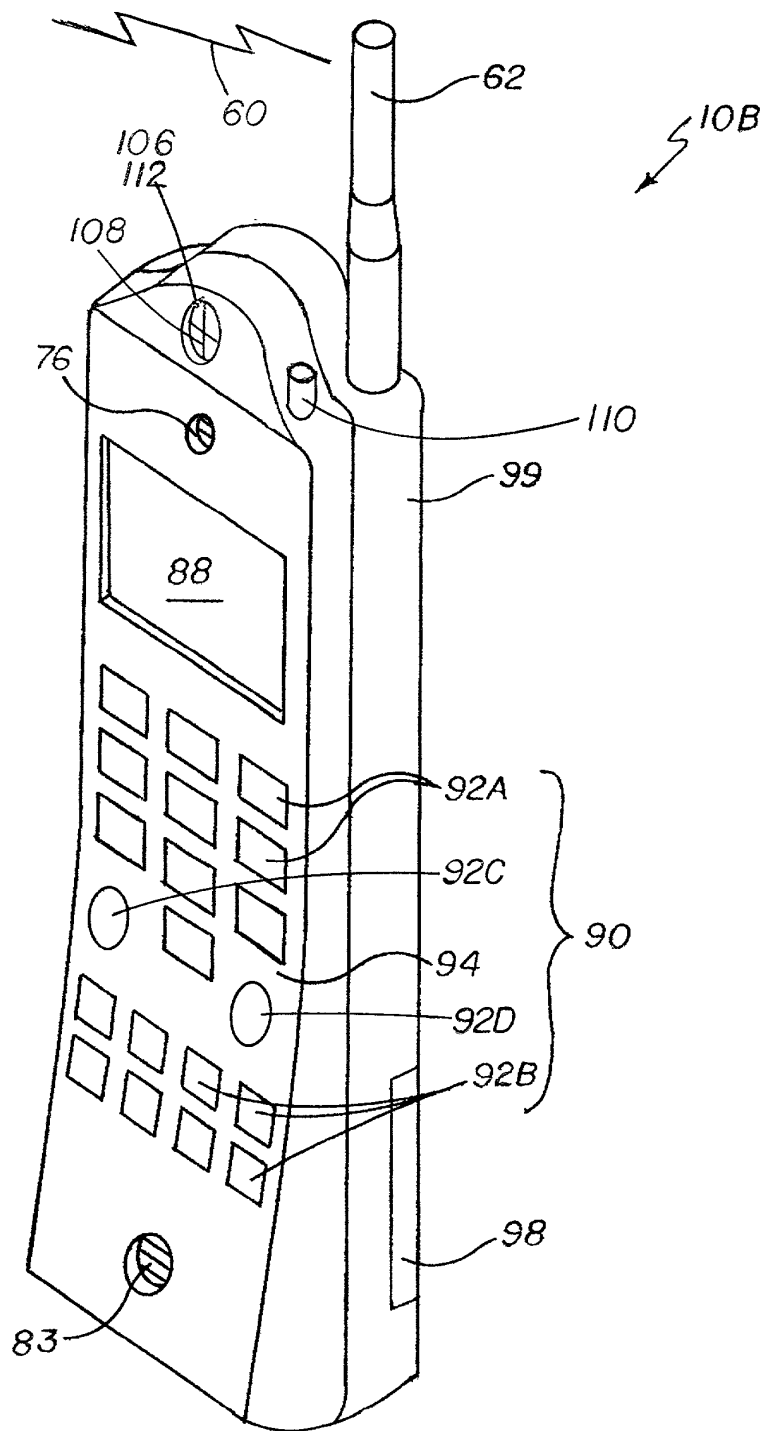


FIG. 8

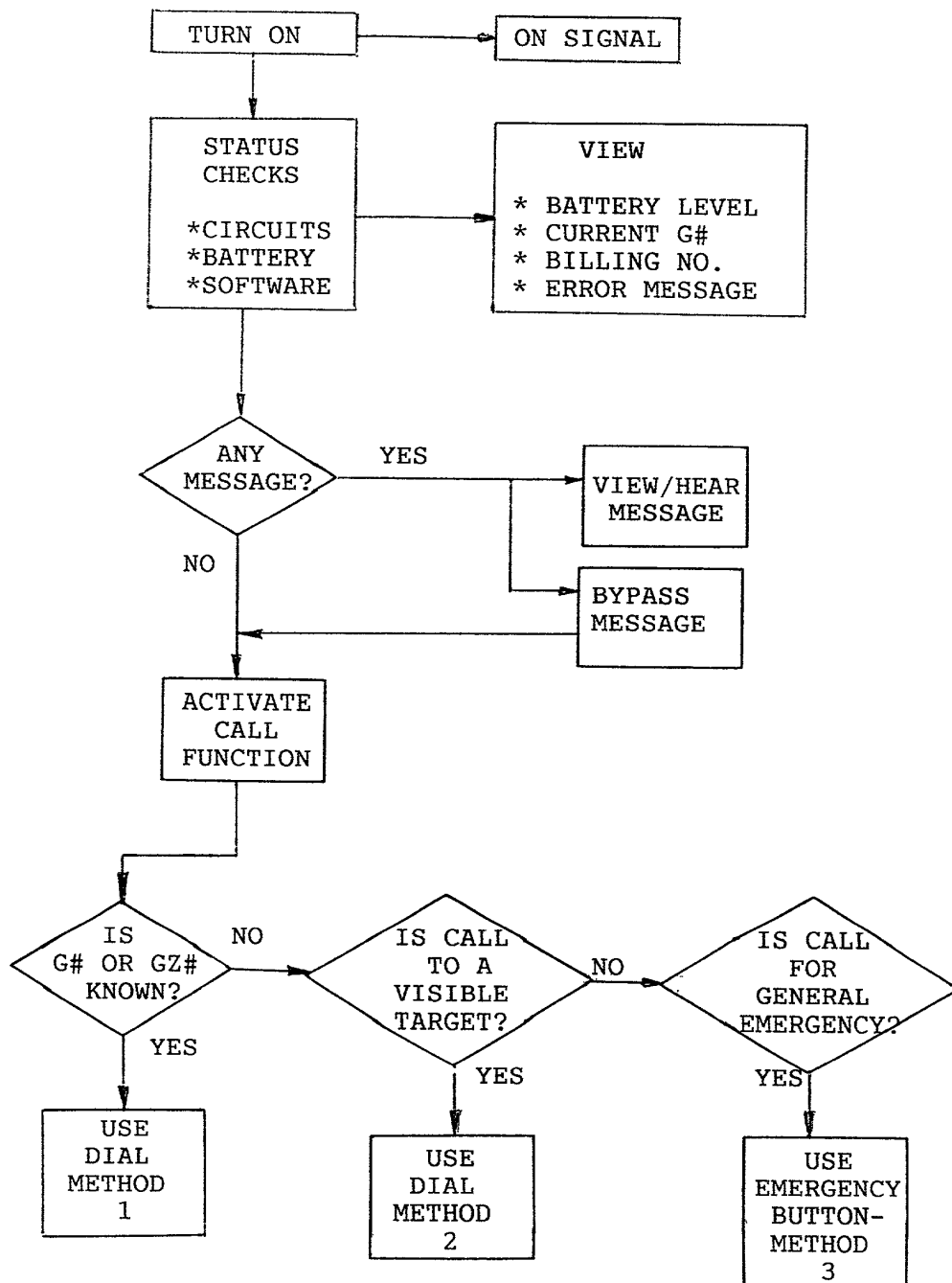


FIG. 10

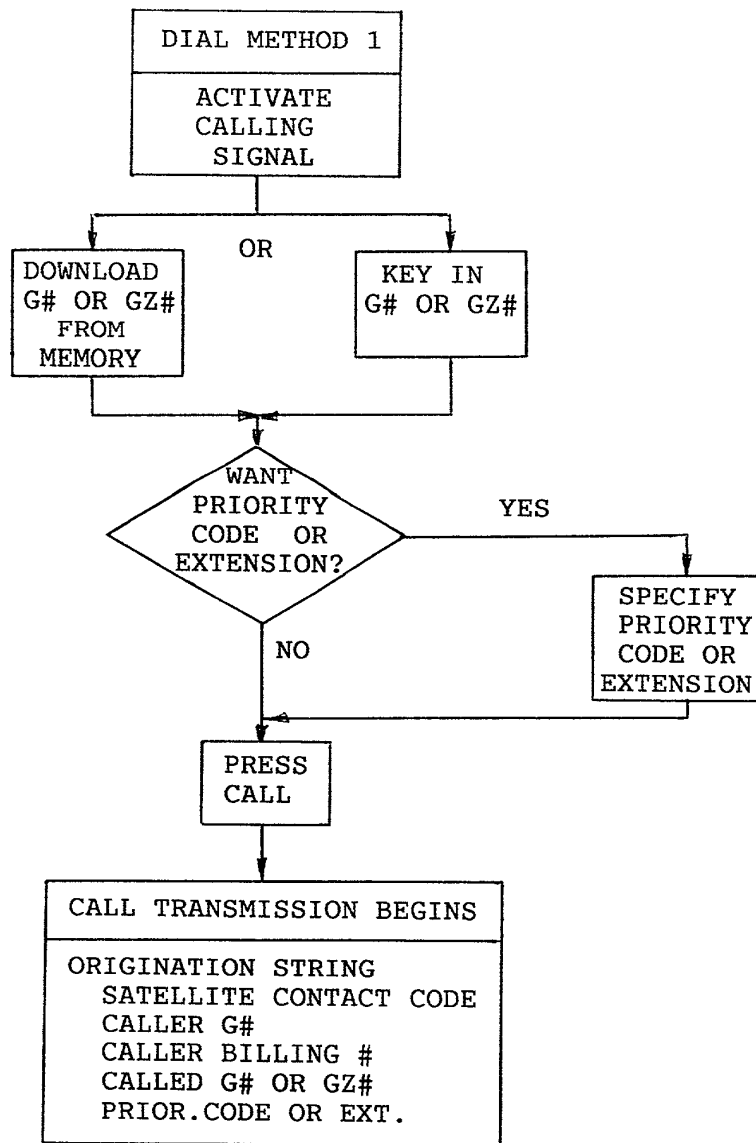


FIG. 11

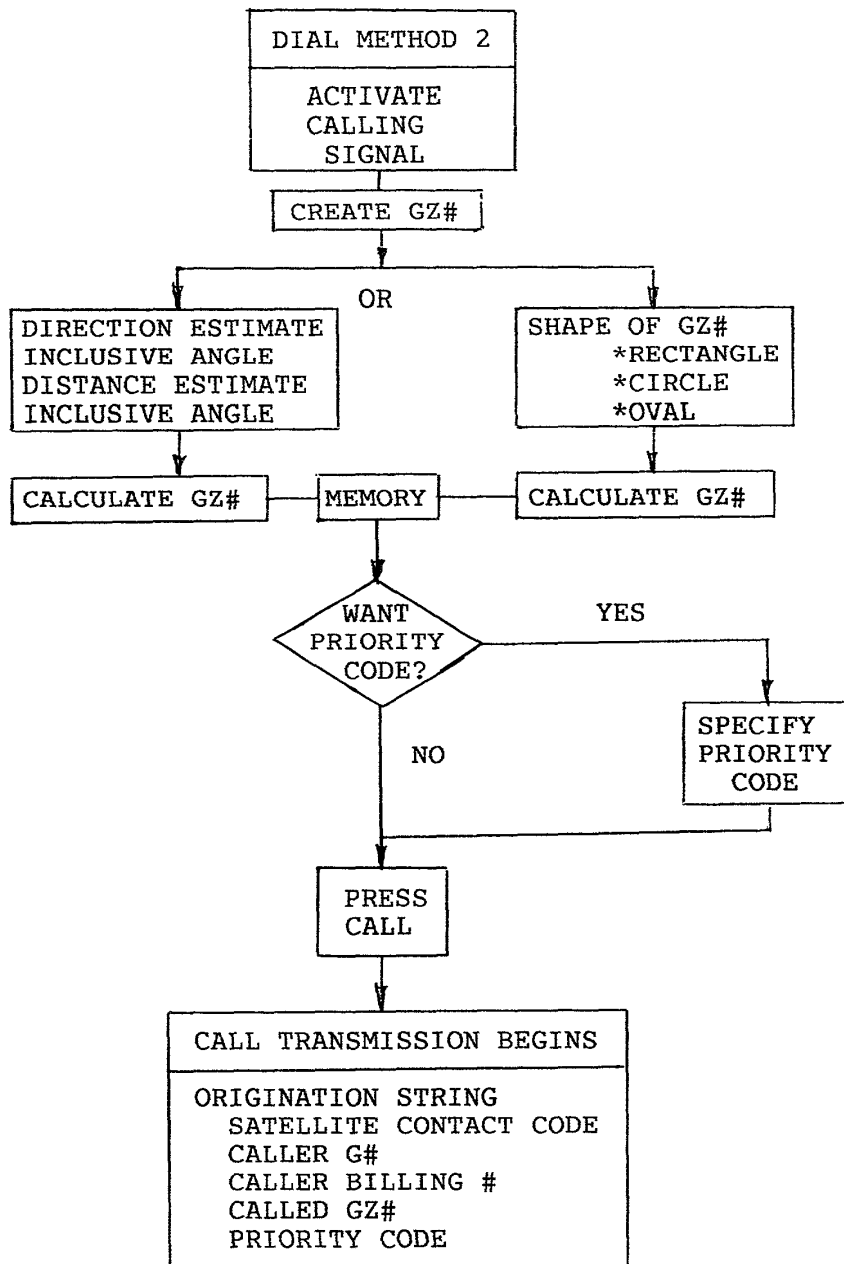


FIG. 12

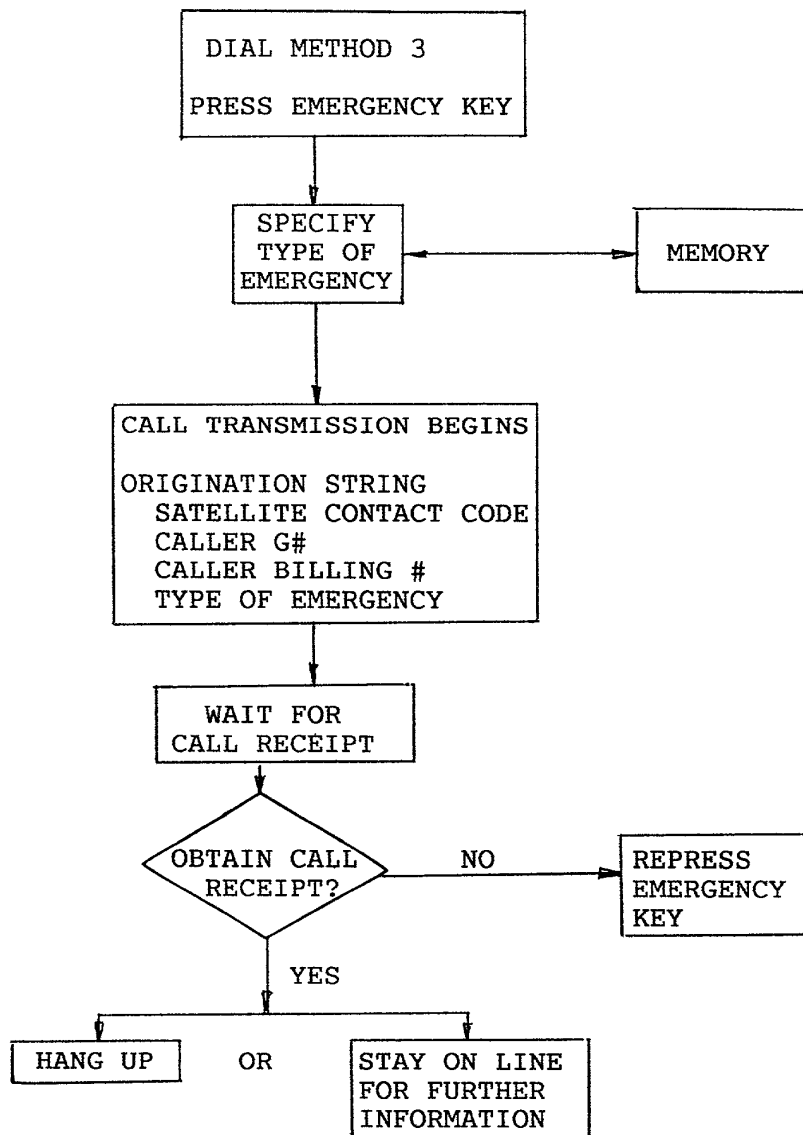


FIG. 13

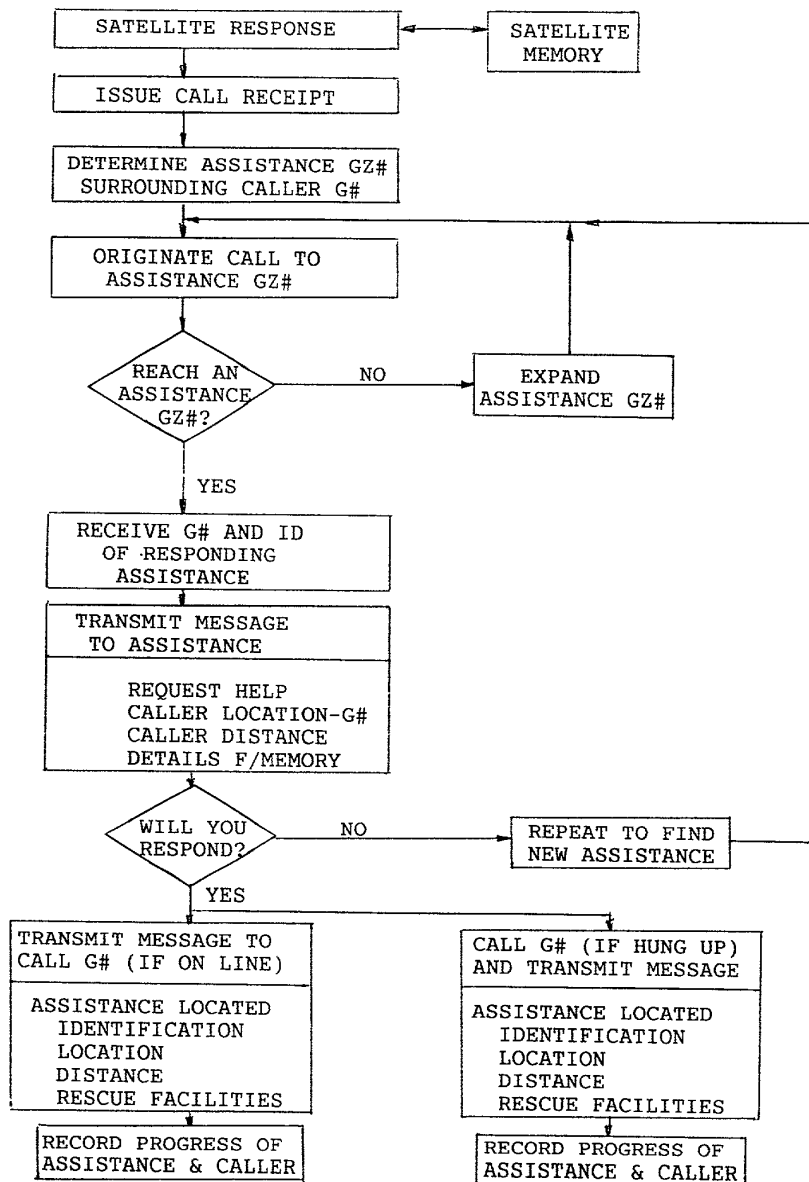


FIG. 14

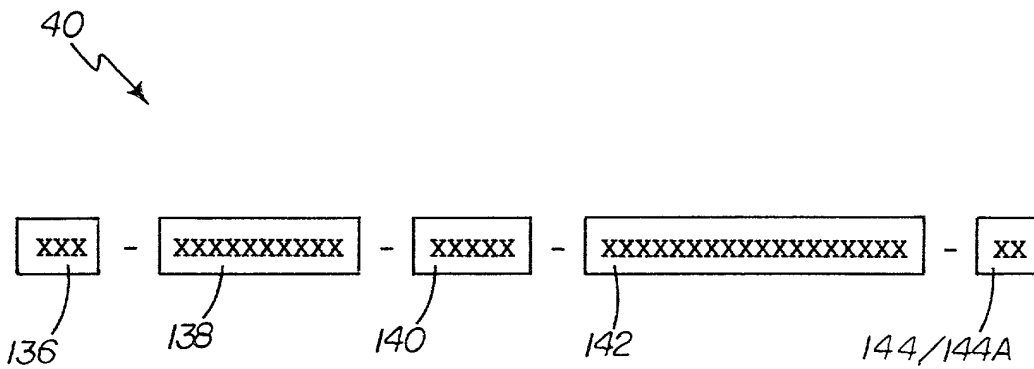


FIG. 15

