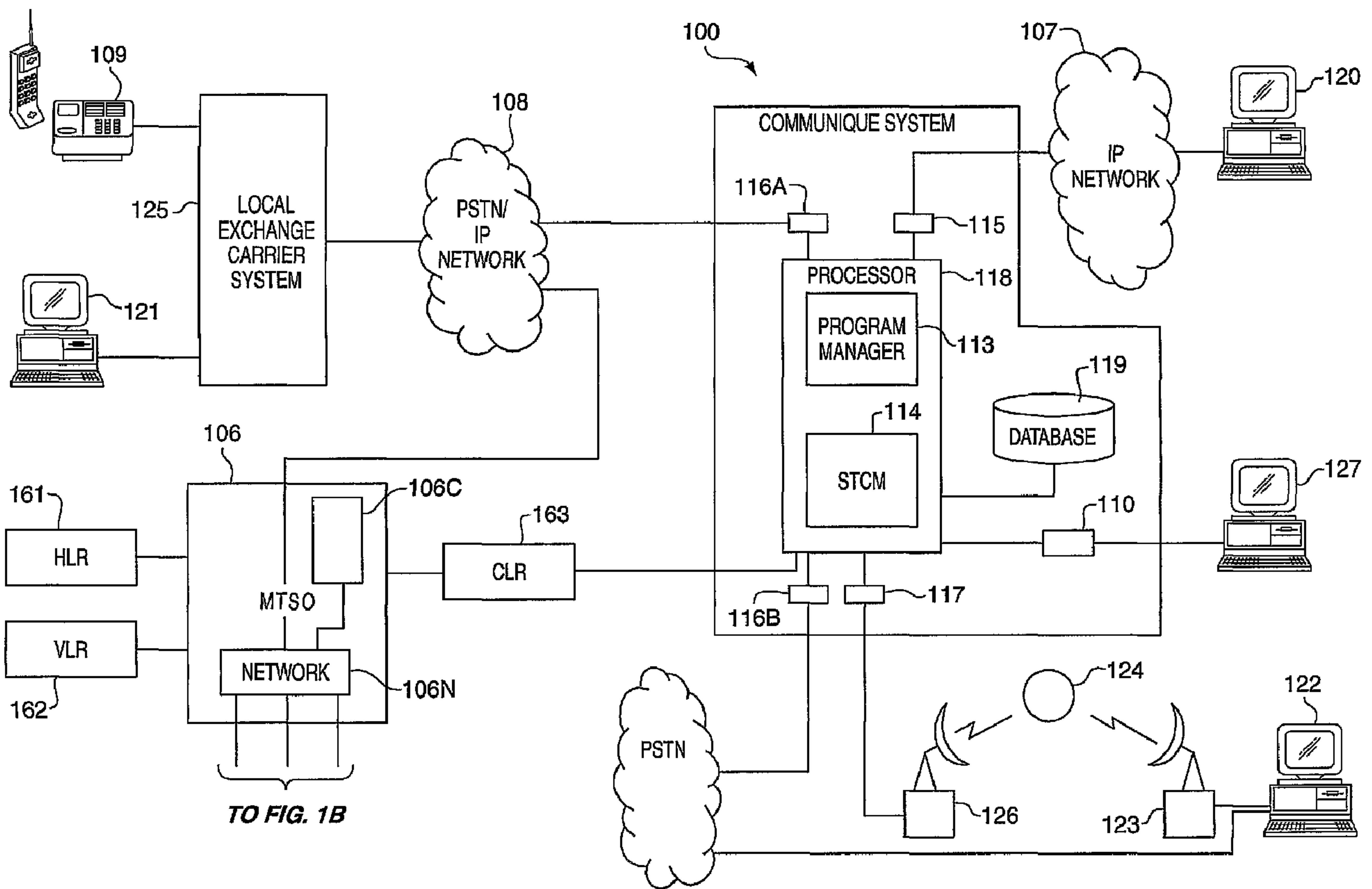




(86) Date de dépôt PCT/PCT Filing Date: 2001/08/13
 (87) Date publication PCT/PCT Publication Date: 2002/02/21
 (45) Date de délivrance/Issue Date: 2008/10/07
 (85) Entrée phase nationale/National Entry: 2003/02/12
 (86) N° demande PCT/PCT Application No.: US 2001/025325
 (87) N° publication PCT/PCT Publication No.: 2002/015606
 (30) Priorités/Priorities: 2000/08/14 (US09/638,744);
 2001/07/11 (US09/902,887)

(51) Cl.Int./Int.Cl. *H04Q 7/22* (2006.01),
H04L 12/28 (2006.01), *H04L 12/56* (2006.01),
H04Q 7/38 (2006.01)
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(54) Titre : TRANSFERT D'ABONNE A UN SERVICE DE COMMUNIQUE ENTRE UN RESEAU DE COMMUNICATION CELLULAIRE A DIFFUSION RESTREINTE ET UN RESEAU DE COMMUNICATION CELLULAIRE POINT A POINT
 (54) Title: HANDOFF BETWEEN A NARROWCAST CELLULAR COMMUNICATION NETWORK AND A POINT-TO-POINT CELLULAR COMMUNICATION NETWORK



(57) Abrégé/Abstract:

The communicate system for cellular communication networks operates with existing cellular communication networks to provide communicate communication services to subscribers. The Communicate transmission to an individual subscriber can be managed

(57) **Abrégé(suite)/Abstract(continued):**

using the hand off capability of the cellular communication network. Thus, if the subscriber roams out of the narrowcast coverage area, the communique transmission to the subscriber is extended from the narrowcast coverage area via an "umbilical" connection on a point-to-point basis using the existing capabilities of the cellular communication network. This enables uninterrupted service for the subscriber even if the subscriber does not continue to remain within the narrowcast coverage area.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
21 February 2002 (21.02.2002)

PCT

(10) International Publication Number
WO 02/015606 A3

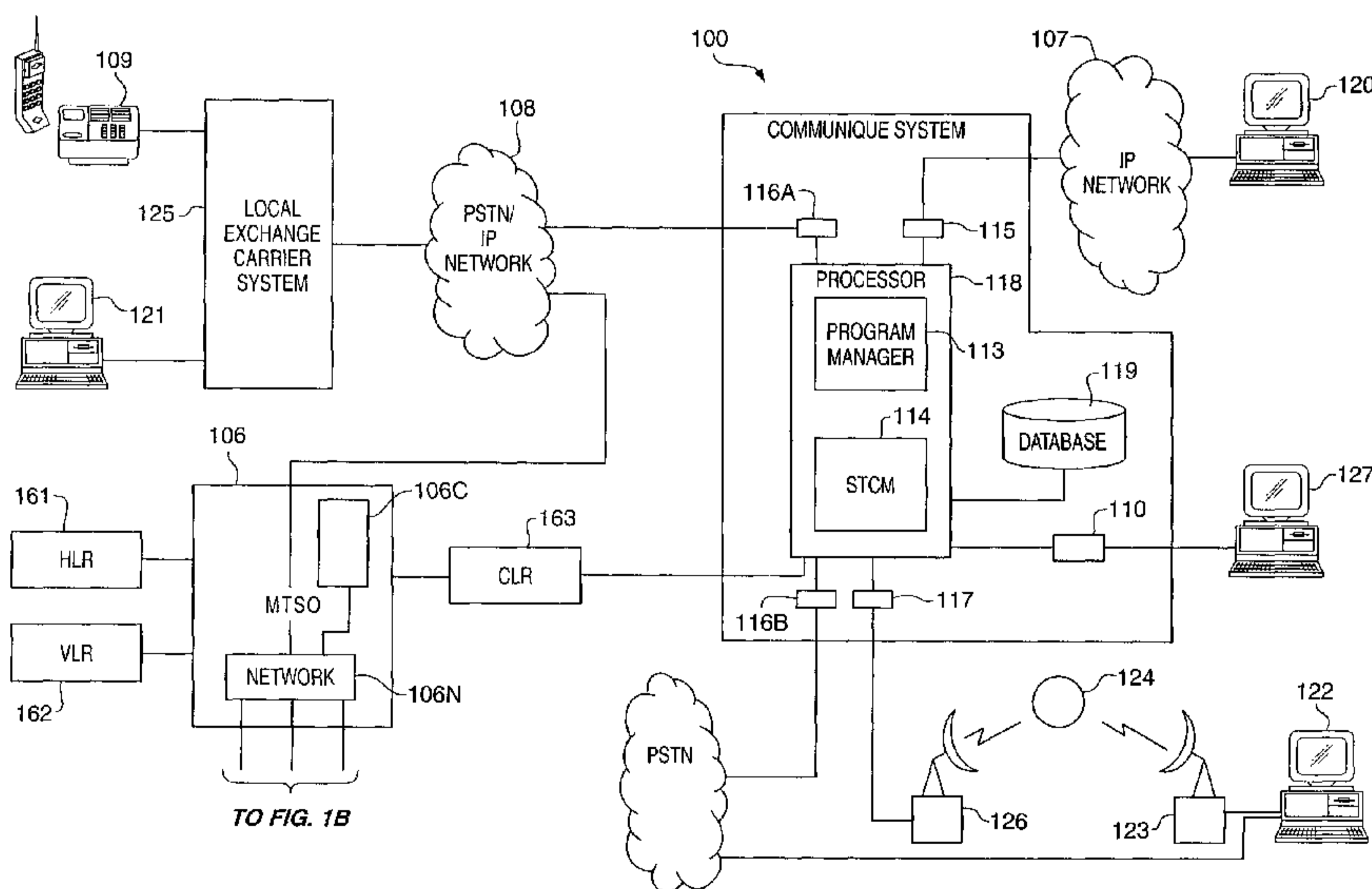
- (51) International Patent Classification⁷: H04Q 7/22, H04L 12/28, 12/18, 29/06, 29/08
- (21) International Application Number: PCT/US01/25325
- (22) International Filing Date: 13 August 2001 (13.08.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
09/638,744 14 August 2000 (14.08.2000) US
09/902,887 11 July 2001 (11.07.2001) US
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- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for all designations
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations

[Continued on next page]

(54) Title: HANDOFF BETWEEN A NARROWCAST CELLULAR COMMUNICATION NETWORK AND A POINT-TO-POINT CELLULAR COMMUNICATION NETWORK



(57) Abstract: The communicate system for cellular communication networks operates with existing cellular communication networks to provide communicate communication services to subscribers. The Communicate transmission to an individual subscriber can be managed using the hand off capability of the cellular communication network. Thus, if the subscriber roams out of the narrowcast coverage area, the communicate transmission to the subscriber is extended from the narrowcast coverage area via an "umbilical" connection on a point-to-point basis using the existing capabilities of the cellular communication network. This enables uninterrupted service for the subscriber even if the subscriber does not continue to remain within the narrowcast coverage area.

WO 02/015606 A3



Published:

— *with international search report*

(88) Date of publication of the international search report:

12 September 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

74769-941

**HANDOFF BETWEEN A NARROWCAST CELLULAR COMMUNICATION NETWORK
AND A POINT-TO-POINT CELLULAR COMMUNICATION NETWORK**

Field of the Invention

This invention relates to cellular communication
5 networks and to a communication system that makes use of the
bandwidth capacity in existing point-to-point cellular
communication networks to provide subscribers with access to
a plurality of broadcast and narrowcast based services.

Problem

10 It is a problem in cellular communication networks
that the network topology is exclusively point-to-point in
nature. This paradigm represents the historical view of
cellular communications as a wireless equivalent of
traditional wire-line telephone communication networks,
15 which serve to interconnect a calling party with a called
party. An additional problem in cellular communication
networks is that the need to concurrently serve many voice
subscribers with the limited bandwidth available in cellular
communication networks has prevented the provision of wide
20 bandwidth communication services, such as data, to these
subscribers.

The third generation (3G) wireless communication
systems, as specified by the ITU/IMT-2000 requirements for
cellular communications, represent a step toward solving the
25 above-noted problems. The third generation wireless
communication systems support the provision of advanced
packet data services. In 3G/IMT-2000 systems, dynamic
Internet Protocol address assignment is required in addition
to static Internet Protocol (IP) address assignment. With
30 static IP address assignment, the wireless subscriber
station's static IP address is fixed and assigned by the

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home wireless network. When the wireless subscriber station is away from its home wireless network (roaming), a special data communications link (Wireless IP tunnel) needs to be established between the visited wireless network and the home wireless network. In this case, IP packets destined to the wireless subscriber station's IP address of the home wireless network are routed to the home wireless network according to standard IP routing. A Wireless IP tunnel is used in the home wireless network to redirect the IP packets that are destined to the wireless subscriber station's static IP address to the visited wireless network where the roaming wireless subscriber station is located and being served. When a wireless subscriber station moves from one wireless network coverage area to another, Wireless IP mobility binding updates are performed between the wireless subscriber station and its Home Agent (HA) in the home wireless network. Since both the wireless station's IP address and its Home Agent IP address are static or fixed, a shared secret between the wireless subscriber station and the Home Agent can be preprogrammed into the wireless station and its Home Agent so that the Home Agent can authenticate Wireless IP registrations requested by the wireless subscriber station and perform mobility binding updates in a secure manner.

25 However, even with advances in bandwidth utilization and the provision of packet data services, the cellular communication networks still operate on a point-to-point paradigm, with the networks being unable to concurrently communicate data to a plurality of subscribers, which is the fundamental concept of broadcast communications, especially in the case of a dynamically changing audience for the broadcasts.

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Solution

The above-described problems are solved and a technical advance achieved by the communique system for cellular communication networks that operates with existing cellular communication networks to provide communique communication services to subscribers. The Communique can be unidirectional (broadcast) or bidirectional (interactive) in nature and the extent of the Communique can be network-wide broadcast or narrowcast, where cells and/or cell sectors are grouped to cover a predetermined geographic area or demographic population or subscriber interest group to transmit information to subscribers who populate the target audience for the narrowcast transmissions. The grouping of cells to form the communique coverage area for the narrowcast transmissions need not be contiguous and can comprise dynamic combinations of contiguous and non-contiguous cells as well as combinations of in-building wireless coverage areas, standard terrestrial cells, non-terrestrial cells, orchestrated in a hierarchical manner. In addition, the communique transmission to an individual subscriber can be managed using the hand off capability of the cellular communication network. Thus, if the subscriber roams out of the narrowcast coverage area, the communique transmission to the subscriber is extended from the narrowcast coverage area via an "umbilical" connection on a point-to-point basis using the existing capabilities of the cellular communication network. This enables uninterrupted service for the subscriber even if the subscriber does not continue to remain within the narrowcast coverage are.

The content of these communique transmissions can be multi-media in nature and comprise a combination of various forms of media: audio, video, graphics, text, data and the like. The subscriber terminal devices used to

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communicate with the communique system for cellular communication networks are typically full function communication devices that include: WAP enabled cellular telephones, personal digital assistants, Palm Pilots, 5 personal computers, other types of cellular telephones and the like or special communique only communication devices that are specific to communique reception; or MP3 audio players (essentially a radio receiver or communique radio); or an MPEG4 video receiver (communique TV); or other such 10 specialized communication device. The subscriber terminal devices can either be mobile wireless communication devices in the traditional mobile subscriber paradigm, or the fixed wireless communication devices in the more recent wireless product offerings. Furthermore, these communique 15 communication services can be free services, subscription based services, or toll based services, while the data propagation can be based on push, pull and combinations of push/pull information distribution modes.

According to one aspect the invention provides a 20 communique system for providing a plurality of communiques, wherein each communique of the plurality of communiques constitutes program content concurrently delivered to a plurality of subscribers, who are equipped with wireless subscriber devices, via a cellular communication network 25 that includes a plurality of cell sites, wherein said plurality of cell sites provides a plurality of cells, wherein each cell site provides a plurality of wireless communication channels in cells that cover a predetermined volume of space around a cell site transmitting antenna, 30 comprising: processor means for selecting at least one of said plurality of cells to provide one of the plurality of communiques to a plurality of subscribers who are authorized to receive said one of the plurality of communiques and who

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are served by said selected at least one of the plurality of cells, wherein said plurality of subscribers authorized to receive are receiving said one of the plurality of communiques independent of the presence of subscribers who are authorized to receive said one of the plurality of communiques and who are served by other cells of said cellular communication network; router means for routing data, constituting said one of the plurality of communiques, from a selected program source to cell sites associated with said selected at least one of the plurality of cells for concurrent transmission to wireless subscriber devices of subscribers who are authorized to receive said one of the plurality of communiques and who are served by said selected at least one of the plurality of cells, in at least one of said selected at least one of the plurality of cells, said transmission to said plurality of wireless subscriber devices being effected concurrently to more than one of said plurality of wireless subscriber devices via a one of said plurality of wireless communication channels; and cellular communication means, responsive to a one of said plurality of wireless subscriber devices roaming outside of a coverage area of said selected at least one of the plurality of cells, for extending said one of the plurality of communiques to said one wireless subscriber device via a one-to-one communication connection through at least one of said plurality of cells other than said selected at least one of the plurality of cells.

According to another aspect the invention provides a method of operating a communique system for providing a plurality of communiques, wherein each communique of the plurality of communiques constitutes program content concurrently delivered to a plurality of subscribers, who are equipped with wireless subscriber devices, via a

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cellular communication network that includes a plurality of cell sites, wherein said plurality of cell sites provides a plurality of cells, wherein each cell site provides a plurality of wireless communication channels in said cells

5 that cover a predetermined volume of space around a cell site transmitting antenna, comprising: selecting at least one of said plurality of cells to provide one of the plurality of communiques to a plurality of subscribers who are authorized to receive said one of the plurality of

10 communiques and who are served by said selected at least one of the plurality of cells, wherein said plurality of subscribers authorized to receive are receiving said one of the plurality of communiques independent of the presence of subscribers who are authorized to receive said one of the

15 plurality of communiques and who are served by other cells of said cellular communication network; routing data, constituting said one of the plurality of communiques, from a selected program source to cell sites associated with said selected at least one of the plurality of cells for

20 concurrent transmission to wireless subscriber devices of subscribers who are authorized to receive said one of the plurality of communiques and who are served by said selected at least one of the plurality of cells, in at least one of said selected at least one of the plurality of cells, said

25 transmission to said plurality of wireless subscriber devices being effected concurrently to more than one of said plurality of wireless subscriber devices via a one of said plurality of wireless communication channels; and extending, in response to a one of said plurality of wireless

30 subscriber devices roaming outside of a coverage area of said selected at least one of the plurality of cells, said one of the plurality of communiques to said one wireless subscriber device via a one-to-one communication connection

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through at least one of said plurality of cells other than said selected at least one of the plurality of cells.

Brief Description of the Drawing

5 Figures 1A & 1B illustrate in block diagram form the overall architecture of a typical cellular communication network that is equipped with the present communique system for cellular communication networks;

10 Figure 2 illustrates in flow diagram form the operation of a typical cellular communication system in implementing an idle handoff mode of operation;

Figure 3 illustrates in block diagram form a typical configuration of the base to end user forward CDMA channel used in cellular communication networks;

15 Figure 4 illustrates in block diagram form a typical assignment of cells in a cellular communication network for a unidirectional transmission without subscriber registration mode of operation of the present communique system for cellular communication networks;

20 Figure 5 illustrates in block diagram form a typical configuration of the base to end user forward CDMA channel used in cellular communication networks;

Figure 6 illustrates in block diagram form a typical assignment of cells in a cellular communication network as an example of the operation of the present communique system for cellular communication networks;

5 Figure 7 illustrates in block diagram form a typical assignment of cells in a cellular communication network for a non-interactive bidirectional transmission with subscriber registration mode of operation of the present communique system for cellular communication networks;

Figure 8 illustrates in block diagram form a typical signaling protocol for a Traffic channel for use in the present communique system for cellular communication networks;

10 Figures 9 & 10 illustrate typical dynamic coverage areas for various types of communique transmissions;

Figure 11 illustrates in flow diagram form the operation of the Spatial-Temporal Content Manager;

Figure 12 illustrates a typical program coverage pattern;

15 Figure 13 illustrates a typical program stream for a plurality of communication channels;

Figure 14 illustrates in tabular form a typical definition of a plurality of narrowcasts applicable to the program streams of Figure 13 as applied to the typical dynamic coverage areas of Figures 9 & 10;

20 Figure 15 illustrates in street map form a typical communique coverage area for a cellular communication network that is equipped with the present communique system for cellular communication networks;

Figure 16 illustrates a typical hierarchical communique architecture;

25 Figure 17 illustrates in flow diagram form the operation of the present communique system for cellular communication networks to manage a communique coverage area that includes non-contiguous cells;

Figure 18 illustrates in flow diagram form a typical execution of the Hand-Out process that extends a Communique to a subscriber who roams from a narrowcast coverage area to a point-to-point service area; and

30 Figure 19 illustrates in flow diagram form a typical execution of the Hand-In process that extends a Communique to a subscriber who roams from a point-to-point service area to a narrowcast coverage area.

Detailed Description

Existing cellular communication networks are designed with a network topology that is exclusively point to point in nature. This paradigm represents the historical view of cellular communications as a wireless equivalent of traditional wire-line telephone communication networks, which serve to interconnect a calling party with a called party. The need to concurrently serve many voice subscribers with the limited bandwidth available in cellular communication networks has also prevented the provision of wide bandwidth communication services to these subscribers. These existing systems are largely static in their operation, with each cell providing point to point communications to a population of subscribers who reside in or roam into the predefined service area of the cell. There is an absence of a capability to provide a communication service to a subscriber population that comprises a dynamically changing coverage area that spans multiple cells. The dynamic convergence of a plurality of subscribers to constitute a target audience for Communiques is a paradigm that is not addressed by existing cellular communication systems, nor is there any functionality suggested in existing cellular communication systems to deal with providing information relevant to this target audience in a real time manner.

Cellular Communication Network Philosophy

Cellular communication networks as shown in block diagram form in Figures 1A & 1B, provide the service of connecting wireless telecommunication customers, each having a wireless subscriber device, to both land-based customers who are served by the common Carrier Public Switched Telephone Network (PSTN) 108 as well as other wireless telecommunication customers. In such a network, all incoming and outgoing calls are routed through Mobile Telephone Switching Offices (MTSO) 106, each of which is connected to a plurality of cell sites (also termed Base Station Subsystems 131-151) which communicate with wireless subscriber devices 101, 101' located in the area covered by the cell sites. The wireless subscriber devices 101, 101' are served by the cell sites, each of which is located in one cell area of a larger service region. Each cell site in the service region is connected by a group of communication links to the Mobile Telephone Switching Office 106. Each cell site contains a group of radio transmitters and receivers (Base Station Transceiver 132, 142, 143, 152) with each transmitter-receiver pair being connected to one communication link. Each transmitter-receiver pair operates on a pair of radio frequencies to create a communication channel:

one frequency to transmit radio signals to the wireless subscriber device and the other frequency to receive radio signals from the wireless subscriber device.

The first stage of a cellular communication connection is set up when a transmitter-receiver pair in a cell site 131, operating on a predetermined pair of radio frequencies, is turned on and a wireless subscriber device 101, located in the cell site 131, is tuned to the same pair of radio frequencies to thereby activate a communication channel between the wireless subscriber device 101 and the cell site 131. The second stage of the communication connection is between the communication link connected to this transmitter-receiver pair and the common carrier Public Switched Telephone Network 108. This second stage of the communication connection is set up in the Mobile Telephone Switching Office 106, which is connected to the common carrier Public Switched Telephone Network 108 by incoming and outgoing trunks.

The Mobile Telephone Switching Office 106 contains a switching network 106N to switch wireless subscriber voice and/or data signals from the communication link to an incoming or outgoing trunk. The Mobile Telephone Switching Office 106 and associated software typically manages the base station controllers 132, 142, 152 and the Base Station Transceiver Transmit/Receive electronics which serve to implement the wireless radio frequency link to the wireless subscriber devices 101. The Mobile Telephone Switching Office 106, in conjunction with the Home Location Register (HLR) 161 and the Visitor Location Register (VLR) 162, manages subscriber registration, subscriber authentication, and the provision of wireless services such as voice mail, call forwarding, roaming validation and so on. The Mobile Telephone Switching Office Controller 106C also controls the actions of the associated base station controllers 132, 142, 152 by generating and interpreting the control messages that are exchanged with the associated base station controllers 132, 142, 152 over data links that interconnect these subsystems. The base station controllers 132, 142, 152 at each cell site 131-151, in response to control messages from the Mobile Telephone Switching Office 106, control the transmitter-receiver pairs at the cell site 131. The control processes at each cell site also control the tuning of the wireless subscriber devices to the selected radio frequencies. In the case of CDMA, the system also selects the PN code word to enhance isolation of the communications with the wireless subscriber devices.

Each cell in the cellular communication network comprises a predetermined volume of space radially arranged around the cell site transmitting antenna with the region of space roughly approximating a cylindrical volume having predetermined height. Since all of the wireless subscriber devices are installed in ground-based units
5 (such as motor vehicles or handheld units) in traditional cellular communication systems, the antenna radiation pattern of the cell site is aligned to be proximate to the ground and the polarization of the signals produced by the cell site antenna is vertical in nature. In order to prevent the radio signals in one cell site from interfering with radio signals in an adjacent cell site, the transmitter frequencies for adjacent cell sites are
10 selected to be different so that there is sufficient frequency separation between adjacent transmitter frequencies to avoid overlapping transmissions among adjacent cell sites. In order to reuse the same frequencies, the cellular telecommunication industry has developed a small but finite number of transmitter frequencies and a cell site allocation pattern that ensures that two adjacent cell sites do not operate on the same frequency.
15 When a ground-based wireless subscriber device initiates a call connection, control signals from the local cell site transmitter cause the frequency agile transponder in the ground-based wireless subscriber device to operate at the frequency of operation designated for that particular cell site. As the ground-based wireless subscriber device moves from one cell site to another, the call connection is handed off to the successive
20 cell sites and the frequency agile transponder in the ground-based wireless subscriber device adjusts its frequency of operation to correspond to the frequency of operation of the transmitter located in the cell site in which the ground-based wireless subscriber device is presently operational.

There are numerous technologies that can be used to implement the cellular
25 communication network and these include both digital and analog paradigms, with the digital apparatus representing the more recent of the two technologies. Furthermore, the frequency spectrum is allocated for different cellular communication systems, with the personal communication system (PCS) systems being located in the 1.9 GHz region of the spectrum while traditional cellular systems are located in the 800 MHz region of
30 the spectrum. The access methods used in cellular communication systems include Code Division Multiple Access (CDMA) that uses orthogonal codes to implement communication channels, Time Division Multiple Access (TDMA) which uses time division multiplexing of a frequency to implement communication channels and

Frequency Division Multiple Access (FDMA) which uses separate frequencies to implement communication channels, as well as combinations of these technologies. These concepts are well known in the field of cellular communications and various ones of these can be used to implement the ubiquitous wireless subscriber device of the present invention. These technologies are not limitations to the system which is described herein, since a novel system concept is disclosed, not a specific technologically limited implementation of an existing system concept.

The traditional CDMA cellular network architecture is designed to carry a wireless call between a wireless subscriber device and a base station, by simultaneously using multiple base stations or antennas to mitigate the effects of signal fading of various types, including, but not limited to: Rayleigh, rician and log-normal. If one cell or one antenna in the CDMA cellular network has a poor signal for a given time frame, another cell or antenna in the CDMA cellular network which had an acceptable signal carries the call. This call management process is called soft or softer hand-off, depending on whether the call is carried between two cells or two antennas at a given cell, respectively.

Cellular Communication Network Architecture

Figure 1 is the block diagram of the architecture of the present communicate system for cellular communication networks 100 and one example of an existing commercial cellular communication network in which it is implemented. In the description of the present communicate system for cellular communication networks, the major entities of the cellular communication network providing communicate services to the wireless subscriber device 101 are the Base Station Subsystems 131-151 that are associated with the Mobile Telephone Switching Office 106. In a typical cellular communications network, there are numerous Mobile Telephone Switching Offices 106, but for the sake of simplicity only a single Mobile Telephone Switching Office is shown.

The typical implementation of an existing Mobile Telephone Switching Office 106 comprises a Mobile Telephone Switching Office Controller 106C which executes call processing associated with the Mobile Telephone Switching Office 106. A switching network 106N provides the telephone connectivity between Base Station Subsystems 131-151. Base Station Subsystems 131-151 communicate with wireless subscriber device 101 using Radio Frequency (RF) channels 111 and 112, respectively. RF channels 111 and 112 convey both command messages as well as digital data, which

may represent voice signals being articulated at the wireless subscriber device 101 and the far-end party. With a CDMA system, the wireless subscriber device 101 communicates with at least One Base Station Subsystem 131. In Figure 1, the wireless subscriber device 101 is simultaneously communicating with two Base Station Subsystems 131, 141, thus constituting a soft handoff. However, a soft handoff is not limited to a maximum of two base stations. Standard EIA/TIA IS-95-B supports a soft handoff with as many as six base stations. When in a soft handoff, the base stations serving a given call must act in concert so that commands issued over RF channels 111 and 112 are consistent with each other. In order to accomplish this consistency, one of the serving base station subsystems may operate as the primary base station subsystem with respect to the other serving base station subsystems. Of course, a wireless subscriber device 101 may communicate with only a single base station subsystem if determined as sufficient by the cellular communication network.

Cellular communication networks provide a plurality of concurrently active communications in the same service area, with the number of concurrently active communication connections exceeding the number of available radio channels. This is accomplished by reusing the channels via the provision of multiple Base Station Subsystems 131-151 in the service area that is served by a single Mobile Telephone Switching Office 106. The overall service area of a Mobile Telephone Switching Office 106 is divided into a plurality of "cells", each of which includes a Base Station Subsystem 131 and associated radio transmission tower 102. The radius of the cell is basically the distance from the base station radio transmission tower 102 to the furthest locus at which good reception between the wireless subscriber device 101 and the radio transmission tower 102 can be effected. The entire service area of a Mobile Telephone Switching Office 106 is therefore covered by a plurality of adjacent cells. There is an industry standard cell pattern in which sets of channels are reused. Within a particular cell, the surrounding cells are grouped in a circle around the first cell and the channels used in these surrounding cells differ from the channels used in the particular cell and from each of the other surrounding cells. Thus, the signals emanating from the radio transmission tower in the particular cell do not interfere with the signals emanating from the radio transmission towers located in each of the surrounding cells because they are at different radio frequencies and have different orthogonal coding. However, in the case of soft handoff, the frequencies must be the same for all cells involved in the soft

or softer handoff process. In addition, the next closest cell using the transmission frequency of the particular cell is far enough away from this cell that there is a significant disparity in signal power and therefore sufficient signal rejection at the receivers to ensure that there is no signal interference. The shape of the cell is determined by the surrounding terrain and is typically not circular, but skewed by irregularities in the terrain, the effect of buildings and vegetation and other signal attenuators present in the cell area. Thus, the cell pattern is simply conceptual in nature and does not reflect the actual physical extent on the various cells, since the implemented cells are not hexagonal in configuration and do not have precisely delimited boundary edges.

10 The control channels that are available in this system are used to setup the communication connections between the subscriber stations 101 and the Base Station Subsystem 131. When a call is initiated, the control channel is used to communicate between the wireless subscriber device 101 involved in the call and the local serving Base Station Subsystem 131. The control messages locate and identify the wireless subscriber device 101, determine the dialed number, and identify an available voice/data communication channel consisting of a pair of radio frequencies and orthogonal coding which is selected by the Base Station Subsystem 131 for the communication connection. The radio unit in the wireless subscriber device 101 re-tunes the transmitter-receiver equipment contained therein to use these designated radio frequencies and orthogonal coding. Once the communication connection is established, the control messages are typically transmitted to adjust transmitter power and/or to change the transmission channel when required to handoff this wireless subscriber device 101 to an adjacent cell, when the subscriber moves from the present cell to one of the adjoining cells. The transmitter power of the wireless subscriber device 101 is regulated since the magnitude of the signal received at the Base Station Subsystem 131 is a function of the subscriber station transmitter power and the distance from the Base Station Subsystem 131. Therefore, by scaling the transmitter power to correspond to the distance from the Base Station Subsystem 131, the received signal magnitude can be maintained within a predetermined range of values to ensure accurate signal reception without interfering with other transmissions in the cell.

The voice communications between wireless subscriber device 101 and other subscriber stations, such as land line based subscriber station 109, is effected by routing the communications received from the wireless subscriber device 101 via

switching network 106N and trunks to the Public Switched Telephone Network (PSTN) 108 where the communications are routed to a Local Exchange Carrier 125 that serves land line based subscriber station 109. There are numerous Mobile Telephone Switching Offices 106 that are connected to the Public Switched Telephone Network (PSTN) 108 to thereby enable subscribers at both land line based subscriber stations and wireless subscriber devices to communicate between selected stations thereof. This architecture represents the present architecture of the wireless and wireline communication networks. The present communique system for cellular communication networks 100 is shown connected to the Public Switched Telephone Network 108, the Mobile Telephone Switching Offices 106, as well as a data communication network such as the Internet 107, although these examples of interconnections are subject to an implementation selected by the purveyor of communique services and some of these connections can be eliminated as unnecessary for some implementations as described below.

15 **Format of the Forward CDMA Channel**

Figure 3 illustrates in block diagram form a typical configuration of the Base Station Subsystem 131 to wireless subscriber device 101 forward CDMA channel used in cellular communication networks. The typical Base Station Subsystem 131 to wireless subscriber device 101 forward CDMA channel comprises a predefined bandwidth centered about a selected carrier frequency. The bandwidth of the selected channel as well as the selected carrier frequency is a function of the technical implementation of the Base Station Subsystem 131 of the cellular communication network and is not discussed further herein. The channel is typically divided into a plurality of segments: Pilot 301, Synchronization (Synch) 302, Paging 303, Traffic 304. The Paging 303 and Traffic 304 segments are further divided into a plurality of channels Ch1-Ch7 and Ch1-Ch55, respectively. Each traffic channel represents a communication space for a selected wireless subscriber device 101. The plurality of paging channels Ch1-Ch7 are available for the base station subsystem 131 to page a selected wireless subscriber device 101 in well known fashion. In order to segregate these channels, each channel is assigned a selected one of the 64 Walsh codes, from $W=0$ to $W=63$. For example, the Pilot channel is assigned a Walsh code of $W=0$, while the Synch channel is assigned a Walsh code of $W=32$. The Paging channels Ch1-Ch7 are assigned Walsh codes of $W=1$ - $W=7$, respectively. The remaining Walsh codes are

assigned to the traffic channels CH1-CH55 as shown in Figure 3. Each Traffic channel consists of data traffic 311 as well as in band signaling 312 transmitted from the base station subsystem 131 to the wireless subscriber device 101.

Idle Handoff of Wireless Subscriber Devices

5 Figure 2 illustrates in flow diagram form the operation of a typical cellular communication system in implementing an idle handoff mode of operation. An idle handoff occurs when a wireless subscriber device 101 has moved from the coverage area of one Base Station Subsystem 131 into the coverage area of another Base Station Subsystem 141 during the Wireless Station Idle State. As shown in Figure 2,
10 at step 201, the wireless subscriber device 101 scans for pilot signals for the base stations that serve the coverage area in which the wireless subscriber device 101 is operational. If the wireless subscriber device 101 detects a Pilot channel signal from another base station subsystem 141, that is sufficiently stronger than that of the present Base Station Subsystem 131, the wireless subscriber device 101 determines that an idle
15 handoff should occur. Pilot channels are identified by their offsets relative to the zero offset pilot PN sequence and typically are the Walsh Code 0 for each channel. Pilot offsets are grouped by the wireless subscriber device 101 at step 202 into sets describing their status with regard to pilot searching. The following sets of pilot offsets are defined for a wireless subscriber device 101 in the Wireless Station Idle State. Each
20 pilot offset is a member of only one set.

Active Set: The pilot offset of the Forward CDMA Channel whose Paging channel is being monitored.

Neighbor Set: The offsets of the Pilot channels that are likely candidates for idle handoff. The members of the Neighbor Set are specified in the Neighbor List Message,
25 Extended Neighbor List Message, and the General Neighbor List Message.

Remaining Set: The set of all possible pilot offsets.

 In the process of Figure 2, the wireless subscriber device 101 at step 203 selects the 3 strongest pilot signals for use in establishing/maintaining the cellular communication connection. In this process, the RAKE receiver in the wireless
30 subscriber device 101 at step 207 continuously looks for the strongest pilot signals to ensure the continuation of the cellular communication connection. The wireless subscriber device 101 at step 204 decodes the pilot signals and locks on to the synch channel of selected forward CDMA channels having the strongest pilot signals.

At step 205, the wireless subscriber device 101 transmits on the Access channel of the end user to base station reverse CDMA channels, corresponding to of the selected forward CDMA channels having the strongest pilot signals, using a random access procedure. Many parameters of the random access procedure are supplied by
5 the Base Station Subsystem 131 in the Access Parameters Message. The entire process of sending one message and receiving (or failing to receive) an acknowledgment for that message is called an access attempt. One access attempt consists of one or more access sub-attempts. Each transmission in the access sub-attempt is called an access probe. Each access probe consists of an Access channel
10 preamble and an Access channel message capsule.

When the wireless subscriber device 101 stops transmitting access probes of an access attempt to one pilot and begins transmitting access probes of an access attempt to another pilot, it is said to perform an access probe handoff. The portion of an access attempt which begins when the wireless subscriber device 101 begins transmitting
15 access probes to one pilot, and ends when the wireless subscriber device 101 either performs an access probe handoff or receives an acknowledgment for that message is called an access sub-attempt. When the access probe handoff is successful, at step 205 the wireless subscriber device 101 switches to idle Traffic channels, one per selected forward CDMA channel and demodulates the signals received therein and at step 206
20 outputs the demodulated multi-media output to the user interface of the wireless subscriber device 101 for use by the subscriber.

As described herein, the overhead required in point to point cellular communications to manage hand-offs between cells within the cellular communication network is considerable and continuous, since many of the wireless subscriber devices
25 served by the cellular communication network are mobile in nature. In the present communique system for cellular communication networks, the need for this overhead in processing call hand-offs is reduced since the wireless subscriber device is not provided with a unique communication link, but shares this link with many other wireless subscriber devices. There are a number of communique implementations that can be
30 overlaid on this standard handoff process.

Within an access sub-attempt, access probes are grouped into access probe sequences. The Access channel used for each access probe sequence is chosen pseudo randomly from among all the Access channels associated with the present

Paging channel. If there is only one Access channel associated with the present paging channel, all access probes within an access probe sequence are transmitted on the same Access channel. If there is more than one access channel associated with the present Paging Channel, all access probes within an access probe sequence may be transmitted on the different Access channels associated with the present Paging channel. Each access probe sequence consists of up to $1 + \text{NUM_STEPs}$ access probes. The first access probe of each access probe sequence is transmitted at a specified power level relative to the nominal open loop power level. Each subsequent access probe is transmitted at a power level that is adjusted by the PWR_STEPs plus the mean input power change plus the interference correction change from the previous access probe. The timing of access probes and access probe sequences is expressed in terms of Access channel slots. The transmission of an access probe begins at the start of an Access channel slot. There are two types of messages sent on the Access channel: a response message (one that is a response to a base station message) or a request message (one that is sent autonomously by the wireless subscriber device).

Different procedures are used for sending a response message and for sending a request message. The timing of the start of each access probe sequence is determined pseudo randomly. Timing between access probes of an access probe sequence is also generated pseudo randomly. After transmitting each access probe, the wireless subscriber device waits a specified period, $\text{TA} = (2 + \text{ACC_TMO}_s) \text{H} 80 \text{ ms}$, from the end of the slot to receive an acknowledgment from the base station. If an acknowledgment is received, the access attempt ends. If no acknowledgment is received and the wireless subscriber device transmits all access probes within an access probe sequence on the same Access channel associated with the current Paging channel, the next access probe is transmitted after an additional back off delay, RT , from 0 to $1 + \text{PROBE_BKOFF}_s$ slots. If no acknowledgment is received and the wireless subscriber device pseudo randomly selects an Access channel from among all Access channels associated with the current Paging channel, the next access probe is transmitted after an additional back off delay, RT , from 0 to PROBE_BKOFF_s slots. The wireless subscriber device shall not begin a new access attempt until the previous access attempt has ended.

Access Handoff

The wireless subscriber device 101 is permitted to perform an access handoff to use the Paging channel with the best pilot strength and an associated Access channel.

The wireless subscriber device 101 is permitted to perform an access handoff when waiting for a response from the Base Station Subsystem 131 or before sending a
5 response to the Base Station Subsystem 131. An access handoff is permitted after an access attempt while the wireless subscriber device 101 is in the Page Response Subrate or the Wireless Station Origination Attempt Subrate. When the wireless subscriber device 101 declares a loss of the Paging channel, the wireless subscriber device 101 shall perform an access handoff while waiting for a response from the Base
10 Station Subsystem 131 in the System Access State if the wireless subscriber device 101 is not performing an access attempt and all of the following conditions hold:

The new base station is in the list ACCESS_HO_LIST,
ACCESS_HOs is equal to $>1=$, and

The wireless subscriber device is in the Page Response Subrate or the Wireless
15 Station Origination Attempt Subrate.

When the wireless subscriber device 101 declares a loss of the Paging channel, the wireless subscriber device 101 shall perform an access handoff after receiving a message and before responding to that message while in the System Access State if the wireless subscriber device 101 is not performing an access attempt and all of the
20 following conditions hold:

The new base station is in the list ACCESS_HO_LIST,
ACCESS_HOs is equal to $>1=$,
ACCESS_HO_MSG_RSPs is equal to $>1=$, and

The wireless subscriber device is in the Page Response Subrate or the Wireless
25 Station Origination Attempt Subrate.

When the wireless subscriber device 101 declares an insufficiency of the Paging channel, the wireless subscriber device 101 may perform an access handoff while waiting for a response from the Base Station Subsystem 131 in the System Access State if the wireless subscriber device 101 is not performing an access attempt and all
30 of the following conditions hold:

The new base station is in the list ACCESS_HO_LIST,
ACCESS_HOs is equal to $>1=$, and

The wireless subscriber device is in the Page Response Subrate or the Wireless

Station Origination Attempt Subrate.

When the wireless subscriber device 101 declares an insufficiency of the Paging channel, the wireless subscriber device 101 may perform an access handoff after receiving a message and before responding to that message while in the System
5 Access State if the wireless subscriber device 101 is not performing an access attempt and all of the following conditions hold:

The new base station is in the list ACCESS_HO_LIST,
ACCESS_HOs is equal to $>1=$,
ACCESS_HO_MSG_RSPs is equal to $>1=$, and

10 The wireless subscriber device is in the Page Response Subrate or the Wireless Station Origination Attempt Subrate.

Before the wireless subscriber device 101 transmits an access probe to the new Base Station Subsystem 141, the wireless subscriber device 101 shall update the parameters based on the System Parameters Message, the Access Parameters
15 Message and the Extended System Parameters Message on the associated new Paging channel and process the parameters from the messages. The wireless subscriber device 101 shall update the parameters based on the Neighbor List Message, Extended Neighbor List Message or the General Neighbor List Message on the associated new Paging channel and process the parameters from the message. If
20 the wireless subscriber device 101 receives a Global Service Redirection Message which directs the wireless subscriber device 101 away from the new Base Station Subsystem 141, the wireless subscriber device 101 shall not access the new Base Station Subsystem 141. The wireless subscriber device 101 shall process these messages only once after each access handoff. If ACCESS_PROBE_HOs is equal to
25 $>0=$ and ACCESS_HOs is equal to $>1=$, the wireless station may monitor other Paging Channels which are in ACCESS_HO_LIST for T_{42m} seconds after the wireless subscriber device 101 declares a loss of the original Paging channel during an access attempt.

Access Probe Handoff

30 The wireless subscriber device 101 is permitted to perform an access probe handoff when the wireless subscriber device 101 is in the Page Response Subrate or the Wireless Station Origination Attempt Subrate. The wireless subscriber device 101

may perform an access probe handoff during an access attempt to a pilot in ACCESS_HO_LIST when the message being sent is the Origination Message or the Page Response Message if all of the following conditions hold:

ACCESS_PROBE_HOs is equal to $>1=$,

5 The wireless subscriber device is in the Page Response Subrate or the Wireless Station Origination Attempt Subrate, and

The wireless subscriber device has performed fewer than (MAX_NUM_PROBE_HOs +1) access probe hand-offs during the current access attempt.

10 The wireless subscriber device 101 may also perform an access probe handoff during an access attempt to a pilot in ACCESS_HO_LIST when the message being sent is a message other than the Origination Message or the Page Response Message if all of the preceding conditions hold and ACC_PROBE_HO_OTHER_MSGs is equal to $>1=$. The wireless subscriber device 101 may also perform an access probe handoff
15 during an access attempt to a pilot not in ACCESS_HO_LIST when the message being sent is the Origination Message or the Page Response Message if all of the following conditions hold:

ACC_HO_LIST_UPDs is equal to $>1=$,

ACCESS_PROBE_HOs is equal to $>1=$,

20 The new pilot is stronger than any pilot in ACCESS_HO_LIST,

The new pilot has the corresponding ACCESS_HO_ALLOWED field in the NGHBR_REC equal to $>1=$,

Inclusion of the new pilot in ACCESS_HO_LIST does not cause the Access channel message to exceed the maximum capsule size,

25 Inclusion of the new pilot in ACCESS_HO_LIST does not cause the number of members to exceed N_{13m} ,

The wireless subscriber device is in the Page Response Subrate or the Wireless Station Origination Attempt Subrate, and

30 The wireless subscriber device has performed fewer than (MAX_NUM_PROBE_HOs +1) access probe hand-offs during the current access attempt.

The wireless subscriber device 101 may also perform an access probe handoff during an access attempt to a pilot in ACCESS_HO_LIST, when the message being sent

is a message other than the Origination Message or the Page Response Message if all of the preceding conditions hold and ACC_PROBE_HO_OTHER_MSGs is equal to >1=. If the above conditions are met, the wireless subscriber device 101 may perform an access probe handoff when the wireless subscriber device 101 declares a loss of the
5 Paging channel; the wireless subscriber device 101 may also perform an access probe handoff after the TA timer expires and the wireless subscriber device 101 declares an insufficiency of the Paging channel.

Before the wireless subscriber device 101 transmits an access probe to the new base station 104, the wireless subscriber device 101 shall update the parameters based
10 on the System Parameters Message, the Access Parameters Message and the Extended System Parameters Message on the associated new Paging channel and process the parameters from the message. The wireless subscriber device 101 shall update the parameters based on the Neighbor List Message, Extended Neighbor List Message, or the General Neighbor List Message on the associated new Paging channel
15 and process the parameters from the message. If the wireless subscriber device 101 receives a Global Service Redirection Message which directs the wireless subscriber device 101 away from the new Base Station Subsystem 141, the wireless subscriber device 101 shall not access the New Base Station Subsystem 141. The wireless subscriber device 101 shall process these messages only once per access sub-attempt
20 during an access attempt.

If the wireless subscriber device 101 performs an access probe handoff, the wireless subscriber device 101 shall restart the access attempt probe sequence number on the new pilot, starting with the first probe of the first probe sequence of the access sub-attempt. The wireless subscriber device 101 shall not reset its access probe
25 handoff count until the access attempt ends. The wireless subscriber device 101 shall abort the access attempt if the length of the message to be sent exceeds MAX_CAP_SIZE of the new base station. The wireless subscriber device 101 may monitor other Paging channels which are in ACCESS_HO_LIST for T_{42m} seconds.

Philosophy of the Communique System

30 The terms "cell site" and "cell" are sometimes loosely used in the literature, and the term "cell site" generally denotes the locus, such as Base Station Subsystem 131, at which the radio frequency transmitter and receiver apparatus (Base Station Transceiver 133, 143, 144, 153) is located, while the term "cell" generally denotes the

region of space which is served by a particular radio frequency transmitter-receiver pair which is installed in Base Station Transceiver 133 at Base Station Subsystem 131, and includes sectors of a particular cell where the cell comprises a plurality of sectors. The cells can also be the coverage area that is created by in-building wireless communication systems, private wireless networks, as well as dynamically configured wireless communication networks as described below. The particular technology used to implement the communications between wireless subscriber devices and the radio frequency transmitter-receiver pairs as well as the nature of the data transferred there between, be it voice, video, telemetry, computer data, and the like, are not limitations to the communication system for cellular communication networks 100 which is described herein, since a novel system concept is disclosed, not a specific technologically limited implementation of an existing system concept. Therefore, the term "cellular" as it is used herein denotes a communication system which operates on the basis of dividing space into a plurality of volumetric sections or cells, and managing communications between wireless subscriber devices located in the cells and the associated radio frequency transmitter-receiver pairs located at the cell site for each of these cells. In addition, the term "telecommunications cell" is used in the general sense and includes a traditional cell generated by a cell site as well as a sector of a cell, as well as a cell elevation sector, regardless of size and shape. The wireless subscriber device, as noted above, can be any of a number of full function communication devices that include: WAP enabled cellular telephones, personal digital assistants, Palm Pilots, personal computers, other cellular telephone, and the like or special communication devices that are specific to communication reception; or MP3 audio players (essentially a radio receiver or communication radio); or an MPEG4 video receiver (communication TV); or other such specialized communication device. The subscriber terminal devices can either be mobile wireless communication devices in the traditional mobile subscriber paradigm, or the fixed wireless communication devices in the more recent wireless product offerings.

The communication system for cellular communication networks operates with existing cellular communication networks, as described above, to provide other than strictly point to point communication services, which are collectively termed "communication services" herein, to subscribers. The Communication can be unidirectional (broadcast) or bidirectional (interactive) in nature and the extent of the Communication can

be network-wide or narrowcast, where one or more cells and/or cell sectors are grouped to cover a predetermined geographic area or demographic population or subscriber interest group to transmit information to subscribers who populate the target audience for the narrowcast transmissions. For instance, the coverage region can be implemented in the radio frequency domain by using frequency assignments, code assignments or dynamically shaped antenna patterns. Pattern shaping is done now to manage capacity constraint issues (e.g. a cell size would be shaped/shrunk at busy hour with adjacent cells helping to carry a particular region's traffic). The communicate system for cellular communication networks can use pattern shaping to create a narrowcast region for instance.

The communicate system for cellular communication networks creates broadcast and/or narrowcast regions in a "virtual" manner. With this concept, the RF configuration is separable, in that it can be static in its architecture OR it could be configured as described above in a dynamic manner. The "virtual" architecture is achieved in the content domain - a very powerful and flexible concept. By selectively enabling and disabling specific content on a cell-by-cell basis, a shaped broadcast or narrowcast can be realized from the subscriber=s perspective even though the RF configuration may have remained static or unchanged. This is a powerful narrowcast tool since it is relatively simple to dynamically change the specific content being transmitted at a given cell. The combinatorial effect is spatial and temporal in its extent even though the RF architecture may have been unchanged. The methods available to achieve this effect are similar to the zip code advertising systems used in cable TV transmissions wherein regional servers select, parse and reassemble content for a particular geographic region. The content management can also be done on a centralized basis.

The basic functionality of the communicate system for cellular communication networks 100 comprises an information distribution management functionality that concurrently propagates information to a plurality of wireless subscriber devices, using push, pull and combinations of push/pull data propagation modes. The need for information dissemination is identified: in response to external events, in response to predetermined temporal/spatial stimuli; as a function of subscriber inquiries/requests; and the like. The communicate system for cellular communication networks 100, in response to an identified information dissemination event, identifies a plurality of cells

in the cellular communication network as well as available communication channels in each of these cells to carry the information that is to be transmitted to a plurality of wireless subscriber devices extant in the locales served by the selected cells. The communication channels can be dedicated to communique services or can be selected
5 from the pool of available communication channels. The subscribers access the Communiques by selecting the communication channel on their wireless subscriber device that carries the Communique. The subscriber can be alerted to the presence of the Communique in many ways or can activate their wireless subscriber device to retrieve the Communique absent any alert being transmitted to the wireless subscriber
10 device. The Communique retrieved by the subscriber is not subscriber-unique, in that the Communique is transmitted to many subscribers, with a plurality of subscribers concurrently accessing the Communique being a typical mode of operation. In addition, the bandwidth required for communique services can be variable, with unused channels of the existing cellular communication network being allocated on an as needed basis
15 to communique services. Furthermore, the routine point to point cellular communication traffic can be load balanced with the communique services, with routine cellular traffic being preferentially served by cells that have unused capacity to thereby free up channels in other cells for communique services. In addition, the communique system for cellular communication networks 100 identifies the appropriate source of information
20 available from a program source that is to be used to constitute the communique service. The information can be a predetermined continuous feed, or can be comprised of a plurality of segments that can be interspersed with advertisements, other information segments and the like.

Communique Services in Cellular Communication Networks

25 As can be seen from the above description, the wireless subscriber device 101 listens for the strongest pilot signal in one of the available communication channels and uses this pilot signal to derive a time/frequency reference. The wireless subscriber device 101 then demodulates the synch signal for this communication channel to precisely align the clock of the wireless subscriber device 101 with that contained in the
30 Base Station Subsystem 131. For a broadcast mode of operation, the wireless subscriber device 101 must be given information that identifies which PN codes are broadcast/narrowcast signals for this communication channel. This can be accomplished by transmitting directory information to the wireless subscriber device 101

in the pilot or synch signals or by using a predefined PN code for selected broadcast signals.

Since the cellular communication network continuously transmits the Communique signals from various cell sites, there is no statistical reduction of self-interference. Therefore, proper selection of frequencies for transmission and PN codes is necessary to reduce interference. Each PN code space can contain either a single

transmission or can be used in a multiplex mode where multiple signals are transmitted. In the latter mode, time slotted base band data is streamed on a single CDMA waveform by the creation of multiple subchannels in each frame of the transmission. In this manner, lower data rate signals can share a single transmission.

The Mobile Telephone Switching Office 106, in conjunction with the VLR and HLR, helps to manage the registration process that includes subscriber authorization.

The Visitor Location Register 161 and the Home Location Register 162 are essentially sophisticated databases that are hooked to the Mobile Telephone Switching Office 106.

The VLR and HLR are sometimes the same device with logical functional partitions although VLRs can stand alone and can be distributed in their deployment while HLRs are typically more centralized. The Communique Location Register (CLR) 163, is the apparatus in the communique system for cellular communication networks 100 where all of the systems information for subscribers' authorization and service plans reside.

This has substantial merit in terms of practical implementation since it can be a wholly separate device that connects to the Mobile Telephone Switching Office 106 or as an integral part of the communique system for cellular communication networks 100. The Communique Location Register 163 is attached to the Mobile Telephone Switching Office 106 in a manner similar to the HLR/VLR.

In order to describe the various services that are available from the communique system for cellular communication networks 100, the terms used to describe the processes operational in the recognition of a subscriber and provision of service to a subscriber must be defined. "Acquisition" is the process where the wireless subscriber device scans for pilots, locks onto synch channels and has all system based knowledge necessary to know where and how to receive Communiques. "Registration" is the process that entails the interchange of information between the wireless subscriber device and the cellular communication network wherein the cellular communication network becomes aware of and knows which subscribers are receiving Communiques

and where they are receiving them. "Authorization" is the process where the
communicate system for cellular communication networks 100 grants subscriber access
to broadcast or narrowcast content to one or many subscribers in a general or specific
location. Thus, a "free" communicate service has the ACQUISITION process but does
5 not have REGISTRATION or AUTHORIZATION processes. "Subscription"
communicate services have all three processes. "Pre-pay" communicate services have
a modified ACQUISITION process but do not include REGISTRATION or
AUTHORIZATION processes. Therefore, the term "autonomous" can be used to
describe the "free" broadcast architecture, since the cellular communication network
10 does not know who is listening or where they are listening. This is the equivalent of
today=s broadcast radio and TV with the exception that the content can be specialized
into "free" narrowcasts that have a limited spatial extent which can be dynamically
managed. The wireless subscriber device used for such a communicate service can be
a one-way receive only (ultra-low cost) wireless subscriber device. For a communicate
15 service that includes free broadcasts and subscription services, the wireless subscriber
device is not content interactive, meaning communicate services such as request-reply
are not available. The wireless subscriber device is two-way in terms of its
communication capability with the network for registration and authorization purposes.
A Pre-pay Subscription communicate service is conceptually similar to the digital TV
20 recorders that have a one-time-only pre-pay subscription fee. This concept uses a
modified forward paging channel to provide initialization information for traffic channels
and then uses in-band signaling on the forward traffic channel to convey systems
information.

Unidirectional Transmission Without Subscriber Registration

25 There are numerous possible architectures that can be used to transmit
information to the wireless subscriber devices with the architecture selected having an
impact on the types of transmissions.

Figure 4 illustrates in block diagram form a typical assignment of cells in a cellular
communication network for a unidirectional transmission without subscriber registration
30 mode of operation of the communiqué system for private virtual narrowcasts 100,
where a plurality of cells are transmitting Communiqué signals, with each cell using the
same frequency and the same Walsh (PN) code for a selected Communiqué. There is
a K=3 cell repeat pattern, although alternatively, the cells can be subdivided into three

sectors for the same effect. In this manner, the communiqué wireless subscriber device MS does not have to search for the desired Communiqué, since the location is uniform throughout the cellular communication network. The communiqué wireless subscriber device MS is always in soft handoff mode and in the example of Figure 4, the PN code varies by cell according to the $K=3$ repeat pattern, so the communiqué wireless subscriber device MS maintains a soft handoff mode with the three PN codes, regardless of the location of the communiqué wireless subscriber device MS in the cellular communication network. Existing wireless subscriber devices are equipped with three receivers in the rake receiver system that enables operation in this mode.

Alternatively, adjacent cells (or cell sectors) can transmit the Communiqué signals on different frequencies, but this requires additional complexity in the wireless subscriber device, since the handoff must occur with both frequency and PN code making it a hard handoff. In addition, the lack of uniformity in the transmission frequency requires the wireless subscriber device to receive information from the base station to identify the location of the desired Communiqué in order to enable the wireless subscriber device to lock on to the appropriate combination of frequency and PN code for each cell. One way of avoiding the complexity is illustrated in Figure 6 where there is a grouping of $K=3$ for the cells and the Walsh code assignment is static, using a specific Walsh code for each of the $K=3$ cells, such as Traffic channel 8 (Walsh code $W=8$) for the cell $K=1$ and Traffic channel Ch9 (Walsh code $W=9$) for the cell $K=2$ and Traffic channel Ch10 (Walsh code $W=10$) for cell $K=3$. Therefore, the subscriber does not need additional information from the cellular communication network to receive the broadcast information, since the communiqué wireless subscriber device MS has 3 RAKE receivers, which can each be locked on to one of the three Walsh codes $W=8$ - $W=10$ used in the $K=3$ repeat scenario. The communiqué wireless subscriber device MS can always be in a soft handoff mode to ensure that continual reception of the transmission takes place as the communiqué wireless subscriber device MS receives signals from the three predetermined Traffic channels.

For the "Receive Only" type of communiqué wireless subscriber device, the following Figure 2 describes the preferred registration algorithm although others are certainly possible (IS95 architecture adaptation). This is described as an Autonomous Registration since the network is unaware of the communiqué wireless subscriber device activity and the communiqué wireless subscriber device is incapable of

communicating with the network.

Figure 2 illustrates in flow diagram form the operation of a typical cellular communication system in implementing an idle handoff mode of operation. An idle handoff occurs when a communiqué wireless subscriber device MS has moved from the coverage area of one Base Station Subsystem 131 into the coverage area of another Base Station Subsystem 141 during the Wireless Station Idle State. As shown in Figure 2, at step 201, the communiqué wireless subscriber device MS scans for pilot signals for the base stations that serve the coverage area in which the communiqué wireless subscriber device MS is operational. If the communiqué wireless subscriber device MS detects a Pilot channel signal from another Base Station Subsystem 141, that is sufficiently stronger than that of the present Base Station Subsystem 131, the communiqué wireless subscriber device MS determines that an idle handoff should occur. Pilot channels are identified by their offsets relative to the zero offset pilot PN sequence and typically are the Walsh Code 0 for each channel. The communiqué wireless subscriber device MS at step 202 groups pilot offsets into sets describing their status with regard to pilot searching. The following sets of pilot offsets are defined for a communiqué wireless subscriber device MS in the Wireless Station Idle State. Each pilot offset is a member of only one set.

Active Set: The pilot offset of the Forward CDMA Channel whose Paging channel is being monitored.

Neighbor Set: The offsets of the Pilot channels that are likely candidates for idle handoff. The members of the Neighbor Set are specified in the Neighbor List Message, Extended Neighbor List Message, and the General Neighbor List Message.

Remaining Set: The set of all possible pilot offsets.

In the process of Figure 2, the communiqué wireless subscriber device MS at step 203 selects the 3 strongest pilot signals for use in establishing/maintaining the cellular communication connection. In this process, the RAKE receiver in the communiqué wireless subscriber device MS at step 207 continuously looks for the strongest pilot signals to ensure the continuation of the cellular communication connection. The communiqué wireless subscriber device MS at step 204 decodes the pilot signals and locks on to the synch channel of selected forward CDMA channels having the strongest pilot signals.

At step 205, the communiqué wireless subscriber device MS switches to selected Traffic channels, one per selected forward CDMA channel as determined by a communiqué identifier stored in the profile memory PS and demodulates the signals received therein and at step 206 outputs the demodulated multi-media output to the appropriate devices of the user interface NTR of the communiqué wireless subscriber device MS for use by the subscriber.

As described herein, the overhead required in point to point cellular communications to manage hand-offs between cells within the cellular communication network is considerable and continuous, since many of the wireless subscriber devices served by the cellular communication network are mobile in nature. In the communiqué system for cellular communication networks, the need for this overhead in processing call hand-offs is reduced since the wireless subscriber device is not provided with a unique communication link, but shares this link with many other wireless subscriber devices. There are a number of communiqué implementations that can be overlaid on this standard handoff process.

Specific attributes of the Autonomous Registration Cycle for the "Receive Only" communiqué wireless subscriber device include:

1. Adjacent cell pilots are $W=0$ (Walsh Code zero) but have unique sequence offsets to identify a particular base station from other base stations.
2. The synchronization or synch channels have the same offset as the pilot.
3. The static traffic channels conveying the narrowcasted content are always fixed within the network deployment using a $K=3$ algorithm. The communiqué wireless subscriber devices are pre-programmed to know which code sequence to look for (a priori knowledge of where the narrowcast resides).
4. Communiqué wireless subscriber devices are in continual soft or softer handoff.
5. All Walsh code assignments are static.
6. $K=3$ can be an omni cell grouping or a sector grouping.
7. Forward Paging Channels are not used.
8. Traffic Channel carries content and network overhead (as an in-band signaling protocol).

Non-Interactive Bi-Directional Transmission With Subscriber Registration

Figure 7 illustrates in block diagram form a typical assignment of cells in a cellular

communication network for a non-interactive bi-directional transmission with subscriber registration mode of operation of the communiqué system for private virtual narrowcasts 100, where a plurality of cells are transmitting Communiqué signals, with each cell using any frequency and any Walsh (PN) code for a selected Communiqué.

5 This mode of operation enables the cellular communication system to select any repeat pattern of cells, any assignment of Walsh codes for a transmission to thereby enable communiqué services. The communiqué wireless subscriber device MS communicates with the Base Station Subsystem 131 for channel assignment spoofed registration purposes to receive free communiqué services. Thus, the communiqué wireless
10 subscriber device MS does not require a unique MIN for this free communiqué services mode of operation, since billing or authorization is not required. This mode of operation can also be described as a receive-only mode of content delivery, with a bi-directional communication channel administration capability.

However, for subscription services, as shown in Figure 7, at step 701, the
15 communiqué wireless subscriber device MS scans for pilot signals from the Base Station Subsystems that serve the coverage area in which the communiqué wireless subscriber device MS is operational. If the communiqué wireless subscriber device MS detects a Pilot Channel signal from another Base Station Subsystem 141, that is sufficiently stronger than that of the present Base Station Subsystem 131, the
20 communiqué wireless subscriber device MS determines that an idle handoff should occur. Pilot Channels are identified by their offsets relative to the zero offset pilot PN sequence and typically are the Walsh Code 0 for each channel. The communiqué wireless subscriber device MS at step 702 groups pilot offsets into sets describing their status with regard to pilot searching. The communiqué wireless subscriber device MS
25 at step 703 selects the 3 strongest pilot signals for use in establishing/maintaining the cellular communication connection. In this process, the RAKE receiver in the communiqué wireless subscriber device MS at step 710 continuously looks for the strongest pilot signals to ensure the continuation of the cellular communication connection. The communiqué wireless subscriber device MS at step 704 decodes the
30 pilot signals and locks on to the synch channel of the 3 selected forward CDMA channels having the strongest pilot signals.

At step 705, the communiqué wireless subscriber device MS registers with the Base Station Subsystem 131 using their unique ESN and SSD, but a common MIN that

is used for communiqué purposes to spoof the base station subsystem 131 into recognizing the communiqué wireless subscriber device MS without requiring a unique identity for the communiqué wireless subscriber device MS. In addition, the fraud prevention system (software) in the Mobile Telephone Switching Office 106 is disabled
5 for Communiqués since the fraud system rejects multiple simultaneous MINs at different geographic locations. This feature is designed to prevent cloning fraud (more of an artifact for analog versus digital) although multi-MIN fraud detection is used in digital systems as well. The Base Station Subsystem 131 verifies the authorization of this communiqué wireless subscriber device MS to receive the requested service, identifies
10 the inbound call to the communiqué wireless subscriber device MS (shared by potentially many wireless subscriber devices) at step 706 via the Paging channel used by the communiqué wireless subscriber device MS to request this service and, in response to control signals received by the communiqué wireless subscriber device MS from the Base Station Subsystem 131, the communiqué wireless subscriber device MS
15 at step 707 changes to the identified traffic channel that carries the selected Communiqué. The communiqué wireless subscriber device MS at step 709 remains in a soft handoff mode to ensure uninterrupted reception of the Communiqué and also at step 708 outputs the received multi-media data to the user.

In this scenario, the issue of "push/pull" transmissions was not mentioned. The
20 subscriber at communiqué wireless subscriber device MS can receive "push" data transmissions from a source which are directed to all subscribers of this service by the base station flood paging the MIN associated with this Communiqué. Thus, the communiqué wireless subscriber device MS would potentially have multiple MINs, with one for point to point traditional cellular communications and one for each of the
25 communiqué services to which the subscriber enrolls. Alternatively, the communiqué wireless subscriber device MS can have a single MIN that includes a Communiqué address embedded in the application layer of the application software of the communiqué wireless subscriber device MS that filters the content received by the communiqué wireless subscriber device MS. This filter function distributes the
30 Communiqué access control to the communiqué wireless subscriber device MS to thereby allow the subscriber to access only portions of the MIN enabled received content. Thus, when the communiqué wireless subscriber device MS is active in the service area, the flood page of one of the subscriber's MINs on the paging channel

alerts the subscriber of the presence of a Communiqué transmission. The subscriber can activate communiqué wireless subscriber device MS to receive this transmission or can reject the transmission by operating appropriate buttons on the communiqué wireless subscriber device MS. The reverse path on this communiqué channel is disabled, since there are many subscribers simultaneously registering for the Communiqué.

The Mobile Telephone Switching Office 106, Base Station Controller (BSC) 132, 142, 152 and Base Station Transceiver (BST) 133, 143, 144, 153 need appropriate software and control revisions to not alarm or error when no reverse path transmission on the traffic channel is received from the communiqué device (mobile or fixed). For the provision of subscription or toll services via the non-interactive bi-directional transmission with subscriber registration mode of operation of the communiqué system for private virtual narrowcasts 100, a plurality of cells transmit Communiqué signals, with each cell using any frequency and any Walsh (PN) code for a selected Communiqué.

This mode of operation enables the cellular communication system to select any repeat pattern of cells, any assignment of Walsh codes for a transmission to thereby enable not only free communiqué services but also subscription services. The communiqué wireless subscriber device MS communicates with the base station 102 for registration purposes, but does not enter an interactive mode once registration is accomplished.

Thus, the communiqué wireless subscriber device MS does not require a unique MIN for this mode of operation, since the subscription billing and authorization can be implemented using the ESN and/or SSD of the communiqué wireless subscriber device MS or other such unique identifier.

The difference with this process compared to that of Figure 2 is that the registration process of step 705 consists of the communiqué wireless subscriber device MS transmitting the spoofing MIN as well as the SSD and/or ESN to the Base Station Subsystem 131 in a brief data exchange on the reverse CDMA paging channel to log the subscriber in to the selected subscription or toll services. If required, the subscriber can use the biometric device MU to authenticate the purchase of services, since the immutable physical characteristic measured by the biometric device BU guarantees the identity of the subscriber. The forward page to the communiqué wireless subscriber device MS can include the Traffic channel identification of the subscribed services and the communiqué wireless subscriber device MS responds on the reverse CDMA

channel with the subscriber registration information. Much of the communications to effect soft handoff and registration can be carried in-band on the reverse CDMA channel.

To summarize, some of the attributes of this particular embodiment include:

- 5 1. Walsh assignments can be dynamic. This provides flexibility in planning and deploying the network.
2. Not constrained to K=3 architectures. This enables improved management of self-interference.
3. The system manages handoffs: soft, softer and hard.
- 10 4. Enables subscription types of narrowcast services.
5. Supports free narrowcasts.
6. Does not support interactive narrowcasts.
7. Can do a hard handoff if necessary.

The following are architectural features of this topology:

- 15 1. All communiqué wireless subscriber devices have the same MIN.
2. Subscription billing/authorization is done through means other than the MIN by using other unique identifiers such as the ESN (Electronic Serial Number) or SSD (Shared Secret Data). Alternatively, a NID (Narrowcast ID) could be created however this doesn't exist today.
- 20 3. Base Station Subsystems (BSS) are "spoofed" into thinking a call (inbound to the communiqué wireless subscriber device) is always in place and needs to always be added whenever requested.
4. Fraud prevention software needs to be "spoofed" also. Disable fraud software for a given MIN.
- 25 5. Minimize reverse access channel paging congestion by priority assignment less than circuit switched voice traffic.
6. "Continuous" flood page to a specified MIN on the forward paging channel. Flood page has lower priority than circuit switched call pages.
7. Overall objective is to minimize forward paging channel congestion.
- 30 8. Disable reverse path traffic channel on communiqué wireless subscriber device and error/loss measurement of carrier software at BTS/BSC. The reverse path traffic channel is disabled because the system is incapable of supporting of very large numbers of simultaneously transmitting communiqué wireless subscriber devices on

one reverse traffic channel.

Interactive Bi-Directional Transmission With Subscriber Registration

This type of communiqué wireless subscriber device has the highest level of functionality and complexity. It adds two-way communiqué capability to the "Receive
5 Only, Two-Way Admin Overhead" communiqué wireless subscriber device described above. This capability can be termed "Two Way Narrowcast Reception/Transmission, Capable of Bi-Directional Administrative Systems Overhead" to emphasize the fact that the content transmission as well as the administrative information transmissions are bi-directional. The registration process for this communiqué wireless subscriber device
10 MS is identical for that described above in Figure 7 for the non-interactive transmission with subscriber registration, but the communiqué wireless subscriber device MS also has the capability to transmit data in the reverse direction, to the Base station Subsystem.

In essence, this communiqué wireless subscriber device MS is a fully functional
15 cellular phone capable of receiving one-way communiqués in a blind radio like fashion (not transmit capable). It is also capable of receiving one-way communiqués with bi-directional administrative overhead capability for registration and channel assignment. And the final functionality is reverse path (mobile to base) communiqué capability. This reverse path communiqué capability can be implemented in a packet or circuit switched
20 manner and can be coordinated or uncoordinated with respect to the one-way communiqué being transmitted from the base station. In practice, the preferred method is to architect this channel in a packet switched mode enabling multiple subscribers access on a demand basis using a variety of protocols such as aloha or slotted aloha. While it is possible to have the reverse communiqué channel be circuit switched, this
25 architecture is not designed for thin route types of data transfer from large numbers of subscribers.

In summary, the "Transmit/Receive, Two-way Admin Overhead" communiqué wireless subscriber device MS is a full function device capable of three modes of operation with the highest functionality being the mode wherein the device is capable
30 of reverse path communiqués. The reverse path communiqué can have the same registered subscribers as the coincident forward path communiqué or the reverse path communiqué could have a unique narrowcast group. The communiqué group for reverse path (mobile to base) communiqués does not have to coincide with the

communiqué assignments on the forward path (base-to-mobile). Of importance, each communiqué wireless subscriber device MS now becomes a content source in a peer-to-peer architecture where each communiqué wireless subscriber device has the ability to send information to other users in its reverse path communiqué group.

5 **Content Delivery**

The content of the Communiques can vary widely and include but are not limited to: free information, subscription based information, toll based information, and the like, as noted above. The content can be locally generated or remotely generated, with the propagation of the information to the various cell sites being implemented in a number of ways. Figures 1 A & 1B illustrate in block diagram form the overall architecture of a typical content delivery network for the present communique system for cellular communication networks 100. In particular, there is a Program Manager 113 that functions to receive the program source information from multiple sources and migrate information to selected cell sites for transmission to the subscribers served by these cell sites. The Spatial-Temporal Content Manager 114 defines the geographic area or demographic population or subscriber interest group that are the metrics used to transmit information to subscribers who populate the target audience for narrowcast transmissions. The Spatial-Temporal Content Manager 114 also can include the selection of frequencies and PN codes that are used by each cell site to transmit the Communiques to subscribers. The basic content delivery network is independent of the existing radio frequency cellular communication network, but is cooperatively operative with the cellular communication network. Thus, it is expected that part of the functionality described herein for the content delivery network can be part of or integrated with the cellular communication network, as a matter of expediency. The degree to which the content delivery network is incorporated into the cellular communication network or even into the communique system for cellular communication networks 100 varies and does not diminish the applicability of the concepts embodied in the communique system for cellular communication networks 100.

As shown in block diagram form in Figures 1A & 1B, the sources of data for the communique system for cellular communication networks 100 can be varied, and a few typical content sources are shown here to illustrate the concepts of the communique system for cellular communication networks 100. In particular, the communique system for cellular communication networks 100 is connected to a plurality of content sources.

The sources can be a remotely located program source for providing for example network news, such as a national network station 122 that is connected via a satellite uplink 123 and satellite 124 to a satellite downlink 126 and forwarded to satellite interface 117 that is part of the communique system for cellular communication networks 100 or can use the Public Switched Telephone Network and trunk interface 116B. Alternatively, the program source can be a local program source 120 for local news and information, that is connected via a data communication medium, such as the Internet 107, to an Internet server interface 115 of the communique system for cellular communication networks 100. In addition, a program source, such as local program source 121 is connected via the Public Switched Telephone Network 108 to a trunk interface 116A of the communique system for cellular communication networks 100.

In addition, a local terminal device 127 can be connected via interface 110 to the communique system for cellular communication networks 100 for inputting information.

The various program sources provide information of various types, including but not limited to: news, advertisements, traffic, weather, travel information, and the like.

The communique system for cellular communication networks 100 also includes a local mass storage memory 119 for storing control instructions for use by processor 118 as well as program material received from the various program sources identified above. The communique system for cellular communication networks 100 is controlled by a processor complex that includes Spatial-Temporal Content Manager 114 to manage the definition of the cells to which a particular Communique is transmitted. Furthermore, communique system for cellular communication networks 100 includes Program Manager 113 to integrate information received from the various program sources into Communiques that are transmitted over selected Traffic channels of the forward CDMA channel within one or more cells as identified by the Spatial-Temporal Content Manager 114. The Communiques generated by the Program Manager 113 are transmitted to the various Base Station Subsystems 131-151 identified by the Spatial-Temporal Content Manager 114 either directly or via the associated Mobile Telephone Switching Office 106. The Program Manager 113 functions to assemble program streams as described below, and transmits the program streams containing the Communiques via a selected communication medium, such as the Public Switched Telephone Network 108, using network interface 116A, or some other communication medium, such as an IP network.

Content Domain Narrowcast

An alternative to the use of centralized, predetermined Communiques that are formatted at the communique system for cellular communication networks 100 and transmitted via the Base Station Subsystems 132, 142, 152 to the wireless subscriber devices, the delivery of information can be effected by using the content domain as a distribution format. The content domain enables the communique system for cellular communication networks 100 to achieve a dynamic, changeable broadcast/narrowcast without modifying or reconfiguring the RF network domain.

In particular, a broadband program stream containing all information for all cells can be created by the Spatial-Temporal Content Manager 114. This information, such as that described below with respect to Figure 8, is delivered to the Mobile Telephone Switching Office 106 for distribution to all relevant Base Station Subsystems 132, 142, 152. The Base Station Subsystems 132, 142, 152 can either parse the information contained in the frame into a plurality of Communiques for transmission in their cells, such as the plurality of cells included in coverage areas A-C shown on Figure 12. Alternatively, the information can be passed directly to the wireless subscriber devices for parsing therein. However, it is expected that the bandwidth limitations in the communication link from the Base Station Subsystems 132, 142, 152 to the wireless subscriber devices render the former parsing scheme preferable to parsing at the wireless subscriber device. Yet another alternative is the hierarchical parsing of the information, where the Base Station Subsystems 132, 142, 152 parse the received information frame into a plurality of subframes of similar format and reduced content for transmission to the wireless subscriber devices for further parsing of the subframes into the individual Communiques. This process utilizes the available bandwidth to provide the wireless subscriber devices with the information necessary to produce a number of Communiques, thereby eliminating the need for the Base Station Subsystems 132, 142, 152 to communicate with the wireless subscriber devices to switch channels to access other Communiques. This distributed switching and hierarchical information delivery architecture thereby reduces the Paging channel traffic for the Base Station Subsystems 132, 142, 152.

The Spatial-Temporal Content Manager 114 controls the actual information that is transmitted from each cell site by sending program stream parsing control signals to routers contained in the Base Station Controllers 132, 142, 152 at each cell site which

then, on a distributed basis, re-assemble the broadband program stream containing all information for all cells into a data stream that is only relevant for that particular cell. By grouping cells as shown on Figure 12 into "content similar blocks" or more specifically coverage areas A-C, the Spatial-Temporal Content Manager 114 has commanded the
5 routers at the cell sites to parse the broadband program stream identically for the grouped cells (as predefined by the systems programming or a content programming operator), the effect of a narrowcast can be achieved without modifying the RF network architecture. From the subscriber's perspective, he is only receiving narrowcast information when in the grouped cells' transmission range. As the subscriber moves
10 from one region to another, the broadcast/narrowcast Communique received may be different depending on the spatial programming of the Spatial-Temporal Content Manager 114. Also, over time, a given narrowcast region may change in its physical shape or disappear altogether.

The operation of this Spatial-Temporal Content Manager 114 is illustrated in flow
15 diagram form in Figure 11 where at step 1101 each cell in the cellular communication network the is served by the communique system for cellular communication networks 100 is assigned a unique address, using a selected protocol, such as TCP/IP. At step 1102, the cells are grouped into collections comprising coverage areas. The program content in the form of Communiques are selected at step 1103 and assigned to
20 destinations, using the cell addresses assigned at step 1101. At step 1104, the Communique schedule is defined in terms of time of transmission, duration of transmission, duration of narrowcast region, temporal and/or spatial characteristics of narrowcast region, and the like. Finally, at step 1105, the identified Communiques are transmitted to the selected cells using the assigned cell addresses. The transmission
25 can occur on a real time basis where the Communiques are provided to the cells at the time they are to be broadcast, or the Communiques can be distributed in advance of transmission and stored for future transmission. The process of Figure 11 then returns to either step 1101 where address information is updated as needed or step 1102 where the cell groupings are modified and the process cycles through the above-noted steps
30 as required.

One disadvantage of this particular distributed re-assembly approach is with a CDMA architecture designed to operate in soft or softer handoff (this limitation is not present in an analog or TDMA architecture since they do not operate in soft handoff).

Since the data streams must be identical for the wireless subscriber device to operate in soft handoff, as a subscriber transitions from the boundary of one narrowcast region to another, the number of cell sites available to be in soft handoff is varying and could be zero. One method for solving this limited shortcoming is to broadcast the broadband content stream from all sites all the time and put the router function within the wireless subscriber device itself. Commands on how to re-assemble the content is based on a subscriber's physical location and the signaling is done on an in-band basis (i.e. the data parsing commands are contained within the traffic channel in a TDM fashion). This reduces the effective available bandwidth for a narrowcast since much of the broadband content is not for a given subscriber and is thrown away by a given subscriber. It also places higher computing power at the wireless subscriber device in order to parse the data. Again, if soft handoff is not required for reliable CDMA operation, the aforementioned limitation is not a concern and parsing can be done at the cell site. And, in either parsing scheme, distributed at the cell site or distributed at the wireless subscriber device, if the content is overlaid on an analog or TDMA network, the soft handoff limitation is not an issue.

Management of Spatial-Temporal Control of Distributed Content

Conceptually, the programming of the broadcast/narrowcast regions for management by the Program Manager 113 is done initially by content operators (people) who pre-program the system for content distribution. As a general principle, the content can be classified into groups such as:

Diurnal Narrowcasts	(e.g. AM/PM traffic reports along highways)
Special Narrowcasts	(e.g. football game, art-in-the-park)
Campuses	(e.g. schools, work complexes)
General	(e.g. news weather sports)
Other	

Much of the programming is repetitive and only needs to be done once i.e. a diurnal narrowcast. One-time only events can be programmed in advance, and say for a football game, can retain all of the programming features such as its spatial coverage extent, and only need to be recalled and given a new narrowcast execution time window. From a user interface perspective, imagine a GUI that displays all of the cells available for a broadcast/narrowcast wherein an operator can select given cells to form a narrowcast region. This region is then saved as a narrowcast group. Next, the

operator goes to another GUI screen that contains all available broadcast information and selects which content files are appropriate for the narrowcast group just previously designed. Last, the operator defines the time window for the narrowcast. By repeating this process and building a database of spatial, temporal and content information, all
 5 requisite knowledge is programmed into the system for a 24 hour, 7 day a week operation in the Spatial-Temporal Content Manager.

The database, at a minimum, has the following fields:

Start Time

Stop Time

10 Narrowcast Cell Grouping

Broadcast Cell Grouping

Narrowcast Content Stream

Broadcast Content Stream

Other

15 **Format of the Forward CDMA Channel for Communique Architectures**

Figure 5 illustrates in block diagram form a typical configuration of the Base Station Subsystem 131 to wireless subscriber device 101 forward CDMA channel used for Communique transmissions in cellular communication networks. As noted above, the typical Base Station Subsystem 131 to wireless subscriber device 101 forward
 20 CDMA channel comprises a predefined bandwidth centered about a selected carrier frequency. The bandwidth of the selected channel as well as the selected carrier frequency is a function of the technical implementation of the base station of the cellular network and is not discussed further herein. The communication space for Communique transmissions is typically divided into a plurality of segments: Pilot 501,
 25 Synchronization (Synch) 502, Traffic 503. The Traffic 503 segment is further divided into a plurality of channels Ch1-Ch62. Each traffic channel represents a communication space for a selected wireless subscriber device 101. The plurality of traffic channels CH1-CH62 as shown in Figure 5 are assigned the remaining Walsh codes. Each Traffic channel consists of data traffic as well as in band signaling transmitted from the Base
 30 Station Subsystem 131 to the wireless subscriber device 101, as noted above.

Typical Content Transmission Format

Figure 8 illustrates in block diagram form a typical signaling protocol for use in the present communique system for cellular communication networks 100. A frame 800

can be used to transmit both content as well as control information and a broadcast guide. The frame 800 is shown in one typical form, although the particulars of the frame 800 can vary as a function of the use of this element. In particular as noted above, a broadband program stream containing all information for all cells can be created by the
5 Spatial-Temporal Content Manager 114. This information is delivered to the Mobile Telephone Switching Office 106 via a communication medium, such as the Public Switched Telephone Network 108, for distribution to all relevant Base Station Subsystems 132, 142, 152. The Base Station Subsystems 132, 142, 152 can either parse the information contained in the frame into a plurality of Communiques for
10 transmission in their cells, such as the plurality of cells included in coverage areas A-C shown on Figure 12. Alternatively, the information can be passed directly to the wireless subscriber devices for parsing therein. Yet another alternative is the hierarchical parsing of the information, where the Base Station Subsystems 132, 142, 152 parse the received information frame into a plurality of subframes of similar format
15 and reduced content for transmission to the wireless subscriber devices for further parsing of the subframes into the individual Communiques.

The frame 800 has a plurality of constituent parts, including a Header 801, Administration 802, Data 803 and Trailer 804. The Header 801 and Trailer 804 are used to identify the beginning and end of the Frame 800 and can include error check
20 bits to ensure proper transmission of the data. The Administration 802 is used to convey various control information to the Base Station Subsystem and to the wireless subscriber device. The Administration 802 can include a Radio Frequency Configuration segment 811 which defines the Traffic channel on which the frame is to be broadcast. The remaining segments of the Administration 802 consist of a "Program
25 Guide" 812 which includes a schedule segment 821 to define the time at which the frame is to be transmitted and the information parsing data, content definition segment 822 the defines the content of the data section 803 of the frame 800 (and optionally the information parsing data), Authorization segment 823 which defines the type of service associated with the content of the data section 803 of the frame 800. Advertisements
30 824 can also be included in the Program Guide 812, along with optional special services 825, such as traffic reports 841, public service announcements 842 and the like 843. Other segments 826 can optionally be included. In the content segment 822, the content definitions describe the information that is available, and a plurality of such

elements is shown to illustrate this concept, including but not limited to: music 831, 832, sports 833 and other programs 834. It is evident that this example of a format is simply an illustration and it is expected that numerous variations can be implemented that fall within the scope of the concept taught herein. In particular, in the case of hierarchical parsing, the frame that is transmitted to the wireless subscriber device would be a reduced content version of frame 800, since the content would be reduced to match the bandwidth capabilities of the communication link from the Base Station Subsystems 132, 142, 152 to the wireless subscriber devices.

Examples of Narrowcast Dynamic Coverage Areas

Figures 9-10 illustrate typical dynamic coverage areas for various types of Communique transmissions. As an example of the capabilities of the communique system for cellular communication networks 100, Figures 9 and 10 illustrate a typical operating environment for this system under dynamically changing conditions. For example, there can be an entertainment complex or sports stadium 912 located proximate two major arterial roads, such as North-South oriented highway 910 and East-West oriented highway 911. There are typically a plurality of cells that provide cellular communication services in the area encompassed by the elements shown in Figure 9. For example, cells 901-904 provide cellular communication services for subscribers who are traveling on North-South oriented highway 910 while cells 905-908 provide cellular communication services for subscribers who are traveling on East-West oriented highway 911. A cell 909 provides cellular communication services for subscribers who are located at or around entertainment complex 912 and when the entertainment complex 912 is not in use, the cellular communication traffic in cell 909 is minimal. The other cells also are subject to varying traffic and, for example, during a morning rush hour traffic the cells 901-904 can be collected into a narrowcast coverage area 921 while the cells 905-908 can be collected into a narrowcast coverage area 922. Thus, subscribers traveling on North-South oriented highway 910 can receive traffic status information via narrowcast coverage area 921 and subscribers traveling on East-West oriented highway 911 can receive traffic status information via narrowcast coverage area 922. Later in the day, when people are leaving the entertainment complex 912 and entering both the North-South oriented highway 910 and East-West oriented highway 911, then the communique system for cellular communication networks 100 can reconfigure the narrowcast coverage areas to encompass cells 903,

907-909 into a narrowcast coverage area 923 to provide traffic status information relating to the outflow of traffic from the entertainment complex 912. As the traffic propagates outward from the entertainment complex 912, the communique system for cellular communication networks 100 can reconfigure the narrowcast coverage areas to also encompass cells 902, 904, 906. The communique system for cellular communication networks 100 can dynamically adapt the extent of narrowcast coverage area 923 in response to the dispersion of the traffic and, for example, once the entertainment complex 912 is emptied, cell 909 can be dropped from the extent of narrowcast coverage area 923.

10 The dynamic adaptation of the narrowcast coverage areas and the selection of information transmitted to subscribers located in these narrowcast coverage areas is accomplished by the communique system for cellular communication networks 100, operating in cooperation with the Mobile Telephone Switching Office 106. The Program Manager 113 and the Spatial-Temporal Communique Manager 114 operate to
15 determine: the presence of subscribers in a particular cell, the presence of external events, the movement of the subscribers from cell to cell, the available programs that are to be transmitted to the subscribers, and then process this information to create the Communiques and the narrowcast coverage areas. This is accomplished in part by the communication between the communique system for cellular communication networks
20 100, operating in cooperation with the Mobile Telephone Switching Office 106 in which the above-noted information is exchanged. In addition, the communique system for cellular communication networks 100 maintains data in memory 119 that defines the call coverage area of the cells so that the external events can be mapped to locales and their associated serving cells.

25 **Dynamically Configured Wireless Local Area Networks**

There is presently an effort to manufacture wireless subscriber devices that are interoperable, via short range, low power communications. These wireless subscriber devices are formed into a small wireless network on an ad hoc basis. The wireless subscriber device seeks out and configures itself with a resident server device, which
30 can be a permanent access point that is interconnected for example with the communique system for cellular communication networks 100.

An example of such a philosophy is presently embodied in the Bluetooth Special Interest Group which uses a wireless paradigm for interoperability of devices using a

carrier frequency of between 2,400 MHz and 2,483.5 MHz to support a plurality of data transfer channels, which are either asymmetric or symmetric, as a function of the application that is enabled. The wireless subscriber device includes a radio frequency (RF) transceiver, a baseband link control unit, associated link management control software and an antenna system. The transmitter mixes the baseband information with the frequency hopping local oscillator to generate a frequency modulated carrier. The receiver down converts and demodulates the RF signal using the same oscillator in the adjacent time slot. The transceiver supports both point-to-point and point-to-multi-point connections. A plurality of wireless subscriber devices so enabled can dynamically configure themselves into a "piconet", with one wireless subscriber device designated as the master and the remaining units as slaves. The piconet is distinguished from other similar piconets in the vicinity by the frequency hopping sequence. The baseband protocol can be used for both circuit and packet switched transmissions. Synchronous links can be established for voice connections, using reserved time slots, while asynchronous links are dedicated for data transmissions.

Non-Contiguous Cells for Narrowcast Dynamic Coverage Areas

In addition to the use of a plurality of contiguous cells to form the communicate coverage area in the communicate system for cellular communication networks 100, non-contiguous cells can be included in the communicate coverage area such that the communicate coverage area comprises either all non-contiguous cells or a combination of contiguous and non-contiguous cells, as an alternative to the contiguous cell example above. These cells can be standard public cellular communication network cells as well as in-building cells formed by in-building wireless communication systems, private wireless networks, and dynamically configured wireless local area networks that serve a local collection of wireless subscriber devices. In that regard, the cellular communication network operated by the communicate system for cellular communication networks 100 can be dynamically configured to comprise a collection of the above-identified elements, which can be configured in a hierarchical manner, as described below, to interconnect operationally independent ones of these cells with the portion of the cellular communication network that operates synchronously.

Figure 15 illustrates in street map form a typical communicate coverage area for a cellular communication network that is equipped with the present communicate system for cellular communication networks 100. This street map illustrates the downtown area

of San Francisco, California with street names listed adjacent the streets, arrows indicating one-way streets, and other typical map legends. In this area, there are a number of buildings highlighted as rectangular symbols 1501-1509. An example of the use of a communique coverage area formed by the communique system for cellular communication networks 100 with the use of non-contiguous cells is in the case of a

5 conference or conference, where the conference participants receive Communiques while located in the conference center 1501, but may reside in any number of outlying hotels 1502, 1503, 1504, rather than at a hotel(s) 1505 adjacent to the conference center 1501 and may dine at restaurants 1506, 1507 not in the conference center 1501.

10 In this example, the conference center 1501 and adjoining hotel(s) 1505 can be served by contiguous cell(s), using a conventional cellular network MTSO and associated cells 1511 and/or in-building wireless communication systems 1521, 1525 while the outlying hotels 1502, 1503, 1504 used by the conference organizers to house guests can each be served by either a cell in the standard cellular communication network 1511 or by

15 their in-building wireless communication system 1522, 1523, 1524, each of which comprises a cell in the communique coverage area of the cellular communication network. Thus, as the conference center programs change and the participating hotels change, the communique system for cellular communication networks 100 can modify the communique coverage area via operation of the Spatial Temporal Communique

20 Manager 114 as data is received from the associated communique generation apparatus 1512 managed by the conference center 1501. The conference center 1501 can be equipped with a variety of equipment to be a source of Communiques, as described above for the various program sources illustrated in Figures 1A & 1B. In addition, multiple events may be staged at the conference center 1501, with each

25 having their own list of participating hotels. The various conference events therefore have communiqué coverage areas that are specific for their participant population and yet have significant overlap in their communique coverage areas, as the conference center 1501 (along with adjoining hotel(s) 1505) may be served by a single in-building wireless communication system or two operationally coupled in-building wireless

30 communication systems 1521, 1525.

Furthermore, there can be numerous restaurants 1506, 1507 that cater to the conference participants and who are themselves included in the communique coverage area via other existing cells (such as 1511), in-building cells for the restaurant 1506,

1507, or other mode of communique coverage. The Communiques can be advisories relating to events and meeting times at the conference center 1501, discount options at participating restaurants 1506, 1507, tours for accompanying persons, revisions to any previously advertised conference activity, paging for conference participants, 5 messages for conference participants, or financial transactions involving conference participants.

Hierarchical Communique Coverage for Narrowcast Dynamic Coverage Areas

Figure 17 illustrates in flow diagram form the operation of the present communique system for cellular communication networks to manage a narrowcast 10 coverage area that includes non-contiguous cells. The above-noted example of a conference center 1501 can encompass the hierarchical organization of Communiques and narrowcast coverage areas as illustrated in Figure 16. In particular, at the highest level of the hierarchy, the conference center 1501 can originate Communiques that are directed to a narrowcast coverage area/group 1601 comprising all participants of all 15 conferences presently hosted at the conference center 1501. At a second layer, the conference center 1501 can originate communiques that are directed to narrowcast conference coverage areas/groups 1611, 1612 comprising specific conferences that are simultaneously hosted by the conference center 1501. At a third level, the conference center 1501 can originate Communiques that are directed to narrowcast conference 20 sub-group coverage areas/groups 1621, 1622 and 1623, 1624, comprising specific groups of participants in the above-noted specific conferences, respectively, that are simultaneously hosted by the conference center 1501. Communiques can be simultaneously generated and transmitted in multiple ones of the above-noted narrowcast coverage areas/groups, with the number and extent of the layers of this 25 hierarchy being statically and/or dynamically architected as a function of the population served by the communique system for cellular communication networks 100.

The operation of the communique system for cellular communication networks 100 in the hierarchical and/or non-contiguous mode(s) can be managed as a function of the target population as described above. Thus, the various narrowcast coverage 30 areas/groups can be selected as a function of the number of customers who are present in each of the narrowcast coverage areas of each of the cells managed by the communique system for cellular communication networks 100, an example of which is described below.

Dynamic Configuration of Narrowcast Dynamic Coverage Areas With In-Building Wireless Communication Systems

The communique system for cellular communication networks 100 can dynamically configure a narrowcast coverage area, such as the narrowcast coverage areas described above. Figure 17 illustrates in flow diagram form the operation of the communique system for cellular communication networks 100, including the communique generation apparatus 1512 managed by the conference center 1501, to manage a narrowcast coverage area that includes non-contiguous cells. At step 1701, the communique generation apparatus 1512 managed by the conference center 1501 registers a plurality of users by using the self-registration process for the wireless subscriber communication devices as described above. For example, an in-building wireless system 1521 communicates with the wireless subscriber communication device to uniquely identify the wireless subscriber communication device and optionally assign a common MIN to the wireless subscriber communication device, or a plurality of common MINs as a function of the subscriber populations served by the narrowcast coverage areas. The communique generation apparatus 1512 enables an administrator, at step 1702, to associate each registered wireless subscriber communication device with a user profile that defines the user, conference attended, associated coverage areas/groups - including the common MIN(s) associated therewith, billing information, activities information, discounts that are available, and the like.

The communique generation apparatus 1512 managed by the conference center 1501 can define a preliminary narrowcast coverage area that defines a plurality of groups, and coverage areas. This function can be effected either prior to the subscriber registration and group assignment, simultaneously with the subscriber registration and group assignment, or after the subscriber registration and group assignment. For the purpose of this description, it is shown that the processes can be implemented substantially independent of each other and substantially concurrently. For example, at step 1703, the communique generation apparatus 1512 determines whether a narrowcast coverage area is to be defined by generating and displaying a query to the system administrator. If the system administrator indicates that a narrowcast coverage area is to be defined, processing advances to step 1704 where the communique generation apparatus 1512 requests the system administrator to define the group for which the narrowcast is directed (such as Conference A Participants 1611), typically by

using the common MIN associated with this narrowcast coverage group, which common MIN is input into the wireless subscriber communication devices of these group members at step 1702, or, alternatively, uniquely identifying the individual members of this narrowcast coverage group by their wireless subscriber communication devices.

5 Once the narrowcast coverage group, Conference A Participants 1611, is defined, processing advances to step 1705 where the system administrator can optionally define a spatial extent of the narrowcast coverage area by selecting a plurality of cells to form a narrowcast coverage area group, such as the public wireless communication system 1511 and the in-building wireless communication systems that include the base stations
10 in the hotels 1521-1525. These in-building wireless communication systems 1521-1525 comprise a plurality of non-contiguous cells, since each of the cells formed by these systems have an extent that is constrained to an in-building coverage area. Alternatively, the spatial extent of a narrowcast coverage area group can be dynamically established by the presence of users in the coverage area of various ones of the cells,
15 as described above. The processing then advances to step 1706 where the system administrator can optionally assign a content stream to this narrowcast coverage area, if there is a continuous content stream, or can assign a content identifier where the content is not continuous, such as bursty communique transmissions (news flashes, messages, and the like). Processing then returns to step 1703 where the communique
20 generation apparatus 1512 determines whether another narrowcast coverage area is to be defined.

The steps 1704-1706 are repeated for the next successive narrowcast coverage area that is defined. The narrowcast coverage areas can be spatially and content hierarchical, overlapping in coverage or not, in addition to optionally containing non-
25 contiguous cells, as described above. Thus, at step 1704 in this iteration of narrowcast coverage area definition, the system administrator can select a narrowcast coverage area defined as Group A2 Participants 1622, whose members are the individuals participating in Conference "A" at the conference center 1501 and are also simultaneously members in a particular sub-grouping "A2" that typically denotes a
30 subject matter specific grouping of conference participants. The members of this group are also the members of the hierarchically senior narrowcast coverage area defined as Conference A Participants 1611. At step 1705, the spatial area definition of this narrowcast coverage area can be of same or lesser extent than that area assigned to

Conference A Participants and the narrowcast coverage area group of cells may just include the participating hotels 1501-1505, since the conference participants may be located exclusively in those locations. Thus, the definitions for various narrowcast coverage areas can be customized as the system administrator proceeds through steps 5 1703-1706 for each narrowcast coverage area. The narrowcast coverage area for Group A2 Participants overlaps with the narrowcast coverage area of Conference A Participants and members of the Group A2 Participants are also members of Conference A Participants.

Once all of the narrowcast coverage areas are defined by associating cells for 10 each narrowcast coverage area group, as determined at step 1703, processing advances to step 1707 where the data comprising the above-described definitions, are transmitted to the communique system for cellular communication networks 100 for use by the Spatial-Temporal Content Manager 114 in managing the delivery of narrowcasts, as described herein. At step 1708, the communique generation apparatus 1512 15 transmits program content, tagged to identify the associated narrowcast coverage area group(s) to the communique system for cellular communication networks 100 for transmission at step 1709 to the cells that comprise each of the narrowcast coverage area groups that have been defined as described above. A Communique can be simultaneously routed to multiple narrowcast coverage area groups and subscribers can 20 receive Communiques from multiple narrowcast coverage area groups, which may not be hierarchically at the same level. Thus, a Communique may be transmitted to Conference A Participants as well as Group A2 Participants, especially if the spatial extent of the associated narrowcast coverage areas are not identical. Finally, at step 1710, the Communiques are transmitted to the wireless subscriber communication 25 devices that are members of the associated narrowcast coverage areas.

The communique generation apparatus 1512 described above can process the data as described prior to transmission to the communique system for cellular communication networks 100 or it can be an integral part of the communique system for cellular communication networks 100, where the data entry and processing 30 operations are executed as a seamless process. The communique system for cellular communication networks 100 is shown as directly connected to the various components of the cellular communication network, which in the above-noted example consists of a plurality of in-building wireless communication systems 1521-1525, 1528 as well as

a public cell site 1511. Alternatively, all of these components may be controlled by the MTSO in conventional fashion, as described above with respect to Figure 1. In addition, the interconnection of these various elements need not be on a wired basis as shown in Figure 15, since the communiques for some narrowcast coverage areas may be

5 bursty in nature and can be managed via the use of a data file transfer over a data communication network, such as the Internet, or a dial-up telephone line, as described above with respect to Figure 1. The narrowcast coverage areas for the various groups that are served by this system can be combinations of contiguous cells, non-contiguous cells, hierarchical cells, all of which are allocated on a fixed and/or dynamic basis.

10 **Program Stream Management**

Figure 13 illustrates a typical stream for a plurality of communication channels and Figure 14 illustrates in tabular form a typical definition of a plurality of narrowcasts applicable to the program streams of Figure 13 as applied to the typical dynamic coverage areas of Figures 9 & 10. Communiques are formed by the Program Manager,

15 113, and the Spatial Temporal Communique Manager 114, and delivered to the cellular system via the Public Switched Telephone Network 108, which is comprised of a grouping of various architectures (circuit, packet switched (e.g. TCP/IP), ATM, frame relay, satellite and so on) to convey the information from the Communique System 100, to the Mobile Telephone Switching Office 106, to Base Station Subsystem 131,141,151

20 and ultimately to Base Station Transceiver 133,143,144,153 for transmission as a broadcast/narrowcast Communique to the various wireless subscriber devices. The Communiques can be labeled in any manner appropriate for composite system operation, and for this example, the Communiques are given alpha designators (A, B, C and so on). A given Communique may have spatial relevance and could be delivery

25 targeted by the Spatial Temporal Communique Manager 114, to a specific region as described in Figures 9 & 10.

As shown in Figure 13, the example Communique A comprises programming from sources:

30 National Source 122, content residing at key media nodes (in a centralized manner);

Regional Source 120, content residing at a plurality of media nodes attached to the Internet (in a centralized/decentralized manner);

Local Source 121, content residing at a plurality of media nodes connected via

the Local Exchange Carrier (in a decentralized manner);

Local Source 127, content residing at subscriber nodes (in a decentralized manner).

The content from Regional Source 120 is diverse in its substance and embodies
 5 the plethora of media available on the Internet (data, stock quotes, music, video, email, special interest, sports, news and so on). The content from National Source 122 comprises more general information that is applicable to many Communiques such as news, weather and sports. The content from Local Source 127 is information gathered and conveyed by the subscriber in an active or passive mode. An example of Active
 10 information is identifying that a particular lane on a particular highway is blocked. Passive information may be reporting of outside air temperature.

To generate Communique A as shown in Figure 13, the Program Manager 113, collects and collates all available content from sources 120, 122 and 127 from the universe of All Content Sources and forms/creates/parses 120, 122 and 127 to the
 15 desired, predetermined information stream thereby creating Communique A. In this example, it is desired to deliver Communique A to narrowcast region 910. This is the responsibility of the Spatial Temporal Communique Manager 114.

Communique A contains the following content in this example:

From Regional Source 120:

20 stock quotes (free to the subscriber)
 music (channelized) (free/subscription to the subscriber)
 composite traffic flow map (subscription to the subscriber)
 other

From National Source 122:

25 news (free to the end user)
 weather (free to the end user)
 sports (free to the end user)
 other

From Local Source 127:

30 subscriber traffic data (free to the network)
 subscriber temperature data (free to the network)
 other

Each individual content stream can also contain advertising (typical for a free

service). Typical subscription services would not contain advertising.

The Spatial Temporal Content Manager (STCM) 114, receives all Communiques from the Program Manager 113, and assigns the communiques for a given period of time to given cells to form narrowcast regions in the time domain. As described in
5 Figure 14, Communique A, which is the data payload for 803 delivered to narrowcast region 910, is but one of many CommuniquecNarrowcastcTime pairings that occurs in the Spatial Temporal Communique Manager 114. In addition to Communique A, Figure 14 describes:

Communique B is a diurnal narrowcast covering region 922.

10 Communique C is a special event narrowcast in region 909 for entertainment complex 912.

In this example, Communiques A & B are repeated daily. Observe that cells 903, 906, 902, 907 are transmitting both Communiques A & B. For these overlapping narrowcast regions, data payload 803 contains both Communiques A & B.

15 At a time different than given for Figure 9, Figure 10 describes new narrowcast regions formed by the Spatial Temporal Communique Manager 114. These narrowcast regions are served with information contained in communiques M & N which is the payload 803 for narrowcast regions 923 and 909, respectively.

20 The Spatial Temporal Communique Manager 114, through repetitive programming, ensures that all cells, whether stand-alone or grouped into a narrowcast region, have content available 24 hours per day 7 days per week.

The programming described herein is deterministic meaning the content contained within a Communique, where a Communique is transmitted and how long a communiqué is transmitted is pre-programmed by the network operator. Another
25 embodiment concerns dynamic active feedback from subscribers within a given narrowcast region to Ainform@ the Spatial Temporal Communique Manager 114, whether or not they are within the narrowcast region. For instance, let=s say that the Spatial Temporal Communique Manager 114, learns that all subscribers have left the entertainment complex located in region 909 delivering Communique C because the
30 baseball game ended earlier than scheduled. The Spatial Temporal Communique Manager 114, can be embodied with a form of artificial intelligence to not only change the narrowcast region earlier than scheduled but also change the content, or Communique within the new region. An example would be to expand the Communique

region along highway arterials leaving the stadium, change the Communique content and insert advertising for restaurants for hungry ball game spectators.

Communique Transfers Between Narrowcast and Point-to-Point

5 There are two general types of Communique transfers that take place with traditional one-to-one based cellular communication systems, also termed "point-to-point service" herein: Hand-Outs of a communiqué wireless subscriber device from a narrowcast coverage area to a point-to-point service area and Hand-Ins of a communiqué wireless subscriber device from a point-to-point service area to a narrowcast coverage area.

10 Transferring a communiqué wireless subscriber device call connection out of a narrowcast coverage area to a point-to-point service area maintains delivery of the original narrowcast content (Communique) to the subscriber when the subscriber is no longer in the narrowcast coverage area. During the handout process, the Communique, consisting of a narrowcast "call," is extended outside of the narrowcast coverage area
15 via an "umbilical" connection. This is accomplished by transforming the call connection (or at least the portion that extends outside of the narrowcast coverage area) into a one-to-one circuit or packet switched call with the Communique content as its delivered information. The original Communique could be a circuit switched data stream, i.e. continuously in place, or it could be subdivided in the time domain as in a TDMA
20 architecture with only a portion of the composite data stream comprising the given Communique.

Transferring a communiqué wireless subscriber device call connection in to a narrowcast coverage area from a point-to-point service area allows the existing circuit or packet switched call to retain the Communique content but at a much reduced
25 delivery cost (due to the multi-user architecture of the narrowcast spreading the delivery cost amongst many subscribers). This hand-in of the communiqué wireless subscriber device call connection assumes that the subscriber was already "receiving" the narrowcast content (Communique) albeit in a one-to-one circuit or packet switched format. This one-to-one call connection either was placed in a determinative manner
30 from the communiqué wireless subscriber device by the subscriber to access the Communique service, or the communiqué wireless subscriber device was previously transferred out of a narrowcast coverage area, as described above, and is returning to the same or another narrowcast coverage area that supports the Communique service.

Because the hand-in/hand-out process is one in which different subscriber costs are present, the subscriber would typically “enable” their communiqué wireless subscriber device for this feature, although some subscribers may not wish to “pay” for per minute airtime and they can opt out of this feature.

5 From a topology perspective, there are two (2) types of Hand-Ins and two (2) types of Hand-Outs:

Hand-Ins:

1. Circuit switched call to Narrowcast
2. Packet switched call to Narrowcast

10 Hand-Outs:

1. Narrowcast to circuit switched call
2. Narrowcast to packet switched call

The circuit switched calls can comprise the following forms:

Code Division Multiple Access (CDMA)

15 Frequency Division Multiple Access (FDMA) (FM modulated (analog)

Time Division Multiple Access (TDMA)

GSM- a variant of TDMA and FDMA

In comparison, a pure packet switched call architecture, such as TCP/IP or GPRS (TCP/IP is more common in a wired architecture with GPRS common in a wireless
20 cellular environment in Europe), has a connection path that is in the packet domain with no dedicated over-air channel for any given communiqué wireless subscriber device.

Rather, contention sharing schemes are used to deliver content to many communiqué wireless subscriber devices simultaneously. A call connection in a packet architecture has the attribute of “always being on”.

25 Figure 18 illustrates in flow diagram form a typical execution of the Hand-Out process that extends a Communique service to a subscriber who roams from a narrowcast coverage area to a point-to-point service area. From a mobile call switching perspective, a Hand-Out from a narrowcast coverage area to a circuit switched call is relatively straightforward. As an example, a CDMA based narrowcast with MAHO
30 (Mobile Assisted Hand Off) would execute a Hand-Out as follows.

During a call connection, both the switch and the communiqué wireless subscriber device keep track of FER and BER (Frame Error Rate and Bit Error Rate) on both the Forward (cell to communiqué wireless subscriber device) and Reverse

Paths (communiqué wireless subscriber device to cell). The communiqué wireless subscriber device, particularly on the Forward Path, by measuring the FER/BER at the communiqué wireless subscriber device itself, keeps track of the Narrowcast composite FER/BER at step 1801. When this error rate exceeds a predetermined threshold at step 5 1802, the communiqué wireless subscriber device sends a request to the switch for a hand-off. At step 1803, the cellular communication network determines that the communiqué wireless subscriber device is leaving the spatial extent of the narrowcast coverage area that is transmitting the Communique presently being received by the communiqué wireless subscriber device. The subscriber at step 1804 then authorizes 10 (or has pre-authorized as part of the cellular service subscription) their communiqué wireless subscriber device to accept a Hand-Out of a Communique in place of a hand-off within the narrowcast coverage area if the communiqué wireless subscriber device roams outside of the narrowcast coverage area. At step 1805, the cellular communication system compares the Communique identification and the identity of the 15 communiqué wireless subscriber device with the previously stored authorization data stored in the Communique Location Register. If there is a match that indicates a Hand-Out is permitted, then the transfer process advances to step 1806, where the communiqué wireless subscriber device registers with the switch that it is a candidate for Hand-Out. The switch then determines at step 1807, based on reported candidate 20 cells from the communiqué wireless subscriber device (determined by the communiqué wireless subscriber device by keeping a continual candidate list based on FER/BER as was described above), which are the target cell(s) for the communiqué wireless subscriber device Hand-Out. During this process, the subscriber management process must go from the Narrowcast management algorithm to a standard circuit switched call 25 algorithm well known in the art. As the Hand-Out occurs, the switch at step 1808 transfers the communiqué wireless subscriber device from STCM/CLR management to HLR/VLR/MTSO management. As a part of this Hand-Out, the switch connects the streamed Communique content to the circuit switched call at step 1809.

From here on, the communiqué wireless subscriber device is managed by the 30 switch in a traditional manner. The content is now streamed from the Narrowcast content source to the communiqué wireless subscriber device on a one-to-one basis. The communiqué wireless subscriber device hands-off to new cells/sectors as the subscriber's mobility dictates. The subscriber is now paying for the used minutes per

the subscribers' subscription plan. The "umbilical" narrowcast continues until deterministically terminated by the subscriber. The switching of the Communique can be managed using any of a number of network management techniques. For example, the Communique can be switched from the MTSO that last served the communiqué
5 wireless subscriber device to the new cell(s) that now serve the communiqué wireless subscriber device so that the Communique is simply extended over this newly established one-to-one link. Alternatively, the network can extend the Communique from another source over a path that is less highly utilized than the paths available from the MTSO that last served the communiqué wireless subscriber device. As the
10 communiqué wireless subscriber device roams further from the original narrowcast coverage area, the network can execute an optional network management process to limit the extent of the "umbilical" connection that ties the communiqué wireless subscriber device to the Communique.

The Hand-Out process, from a data streaming perspective, is perfectly
15 synchronized with no loss of data- video, audio and so on. The candidate cells are time synched with the narrowcast coverage area's data stream thereby enabling a "lossless" Hand-Out.

Figure 19 illustrates in flow diagram form a typical execution of the Hand-In process that extends a Communique to a subscriber who roams from a point-to-point
20 service area to a narrowcast coverage area. The alternate path, the Hand-In from a subscriber placed circuit switched call to a narrowcast coverage area, is more complex and requires new algorithms. This is because the communiqué wireless subscriber device is effectively handing into a call connection that is already in place (the Narrowcast). This is something that is presently not available or contemplated by
25 present day cellular communication network architectures. In essence, the Hand-In call is being "conferenced" into the Narrowcast that is already in-place. This process, while technologically straightforward, is not provided for in present cellular switching architectures. One preferred embodiment of the narrowcast Hand-In algorithm is presented herein.

30 The Hand-In process results from a subscriber being engaged in an existing call connection to receive a Communique service. This occurs either when the subscriber has previously initiated a circuit switched call connection on a one-to-one basis to a destination where the subscriber can access a selected Communique or the subscriber

was located in a narrowcast coverage area, receiving the Communique service, then roamed outside the spatial extent of this narrowcast coverage area but maintained the call connection via the Hand-Out process as described above. In the first of these options, the call connection is a standard call, provided for in present cellular communication networks, that has been placed to a Narrowcast content source, either
5 a local MTSO or a system that is upstream of the MTSO as shown in Figures 1A & 1B.

In order to minimize the cost of the one-to-one delivered Communique service, delivered in a circuit switched manner, it is desirable to, whenever possible, Hand-In to a Narrowcast coverage area carrying the same, identical Communique service. This
10 removes the per minute billing to the subscriber while retaining access to the desired narrowcasted content. This is accomplished at step 1901 when the switch, knowing the location and likely direction of a communiqué wireless subscriber device through various means, GPS location or other location determination means, together with the communiqué wireless subscriber device, which can determine when it is near a
15 narrowcast coverage area by determining it is a "candidate", prepares the communiqué wireless subscriber device for a Hand-In. The communiqué wireless subscriber device, can by "sniffing" the data stream at the candidate narrowcast coverage area, determine through various means if the narrowcast coverage area in question is streaming the same content as the circuit switched narrowcast call at step 1902. If so, it becomes a
20 Hand-In candidate at step 1903.

One issue that must be addressed in the Hand-In process is "perfect" on-the-air bit synchronization during the Hand-In process. The problem is that the circuit switched call, prior to Hand-In, is not architecturally designed to be synchronized with the concurrently active narrowcast that provides the identical Communique service in the
25 narrowcast coverage area. One solution to this problem is to incorporate digital base-band buffers in the communiqué wireless subscriber device so it can compensate for the unsynchronized bit streams during the Hand-In. From an architectural perspective, this means that whenever an "umbilical" narrowcast is created by a subscriber, the Communique content source needs to advance the bit stream that is transmitted over
30 the point-to-point connection by some pre-determined amount (likely in the millisecond range) so that when a Hand-In occurs, and time difference in the transmissions results in the Narrowcast coverage area's bit timing being at or behind that of the communiqué wireless subscriber device which is Handing-In. Then, when the communiqué wireless

subscriber device hands in to the Narrowcast coverage area, the digital buffer compensates for the timing differences by delivering to the communiqué wireless subscriber device an "apparent" seamless data stream at step 1904. This buffering process is then continuous as long as the Handed-In communiqué wireless subscriber
5 device remains a subscriber within the narrowcast coverage area. Alternatively, the buffering can be terminated when the communiqué wireless subscriber device is a subscriber within the narrowcast coverage area, even though this causes a minor discontinuity in the Communique received by the communiqué wireless subscriber device, there is no loss of content.

10 For the switching process itself, the circuit switched call is handed-in without setting up a "new" call in the candidate cell or sector (because the Narrowcast "call" is already up). So, from an infrastructure perspective, nothing happens. Rather, the entire Hand-In process is done at the communiqué wireless subscriber device but managed/instructed by the switch through communications to the communiqué wireless
15 subscriber device over either the control channel or in-band signaling on the traffic channel at step 1905. For the actual Hand-In, the switch merely tells the communiqué wireless subscriber device to, if a CDMA platform, change to a new code word at step 1906 and assume a "narrowcast" call management profile at step 1907. The communiqué wireless subscriber device then automatically receives the Communique
20 service via the narrowcast coverage area at step 1908.

Summary

The communique system for cellular communication networks groups cells and/or cell sectors to cover a predetermined geographic area^{*} or demographic population or subscriber interest group to transmit information to subscribers who populate the target audience for the narrowcast transmissions. The grouping of cells to form the communique coverage area for the narrowcast transmissions need not be contiguous and can comprise dynamic combinations of contiguous and non-contiguous cells. In addition, the Communique transmission to an individual subscriber can be managed using the hand off capability of the cellular communication network. Thus, if the subscriber roams out of the narrowcast coverage area, the Communique transmission to the subscriber is managed on a point to point basis using the existing capabilities of the cellular communication network.

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CLAIMS:

1. A communique system for providing a plurality of
communiques, wherein each communique of the plurality of
communiques constitutes program content concurrently
5 delivered to a plurality of subscribers, who are equipped
with wireless subscriber devices, via a cellular
communication network that includes a plurality of cell
sites, wherein said plurality of cell sites provides a
plurality of cells, wherein each cell site provides a
10 plurality of wireless communication channels in cells that
cover a predetermined volume of space around a cell site
transmitting antenna, comprising:

processor means for selecting at least one of said
plurality of cells to provide one of the plurality of
15 communiques to a plurality of subscribers who are authorized
to receive said one of the plurality of communiques and who
are served by said selected at least one of the plurality of
cells, wherein said plurality of subscribers authorized to
receive are receiving said one of the plurality of
20 communiques independent of the presence of subscribers who
are authorized to receive said one of the plurality of
communiques and who are served by other cells of said
cellular communication network;

router means for routing data, constituting said
25 one of the plurality of communiques, from a selected program
source to cell sites associated with said selected at least
one of the plurality of cells for concurrent transmission to
wireless subscriber devices of subscribers who are
authorized to receive said one of the plurality of
30 communiques and who are served by said selected at least one
of the plurality of cells, in at least one of said selected
at least one of the plurality of cells, said transmission to

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said plurality of wireless subscriber devices being effected concurrently to more than one of said plurality of wireless subscriber devices via a one of said plurality of wireless communication channels; and

5 cellular communication means, responsive to a one of said plurality of wireless subscriber devices roaming outside of a coverage area of said selected at least one of the plurality of cells, for extending said one of the plurality of communiques to said one wireless subscriber
10 device via a one-to-one communication connection through at least one of said plurality of cells other than said selected at least one of the plurality of cells.

2. The communique system of claim 1 further comprising:

15 content manager means for identifying a plurality of cell sites adapted to serve said subscribers; and

 content migration means for establishing communication connections from said communique system to said cell sites associated with said selected at least one
20 of the plurality of cells.

3. The communique system of claim 1 wherein said cellular communication means establishes a communication connection from said communique system to at least one of said plurality of cell sites other than said cell sites
25 associated with said selected at least one of the plurality of cells to transmit communiques to said at least one of said plurality of cell sites other than said cell sites associated with said selected at least one of the plurality of cells.

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4. The communique system of claim 3 further comprising:

transmitter means for transmitting information, constituting said one of the plurality of communiques from
5 said at least one of said plurality of cell sites other than said cell sites associated with said selected at least one of the plurality of cells to said one wireless subscriber device via a selected one of a plurality of wireless communication channels in said at least one of said
10 plurality of cell sites.

5. The communique system of claim 3 wherein said cellular communication means further comprises:

control means for terminating said communication connection from said communique system to said at least one
15 of said plurality of cell sites other than said cell sites associated with said selected at least one of the plurality of cells upon completion of transmission of communiques.

6. The communique system of claim 1 wherein said cellular communication means comprises:

20 communique location register means for determining whether a communication connection from said communique system to at least one of said cell sites other than said cell sites associated with said selected at least one of the plurality of cells to transmit communiques to said at least
25 one of said plurality of cell sites other than said cell sites associated with said selected at least one of the plurality of cells is authorized for said one wireless subscriber device.

7. The communique system of claim 1 further comprising:
30

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authorization means for enabling each of said plurality of wireless subscriber devices to receive said one of the plurality of communiques via said one of said plurality of wireless communication channels.

5 8. The communique system of claim 7 wherein said authorization means comprises:

subscriber identification means for identifying each of said plurality of wireless subscriber devices via a communique address assigned to said plurality of wireless
10 subscriber devices to enable the cell sites to recognize each of said plurality of wireless subscriber devices, whose communique address constitutes an identity that is common to said plurality of wireless subscriber devices.

9. The communique system of claim 8 wherein said
15 subscriber identification means comprises:

subscriber address means for assigning a common MIN as said communique address assigned to said plurality of wireless subscriber devices to enable the cell sites to recognize each of said plurality of wireless subscriber
20 devices without requiring a unique identity for each of said plurality of wireless subscriber devices.

10. The communique system of claim 7 wherein said authorization means comprises:

registration means for registering at least one of
25 said plurality of wireless subscriber devices to uniquely identify said at least one wireless subscriber device; and

channel assigning means for authorizing said at least one wireless subscriber device to receive a subscriber selected communique.

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11. The communique system of claim 1 further comprising:

transmitter means, responsive to a one of said plurality of wireless subscriber devices roaming into a coverage area of said selected cells and receiving said one of the plurality of communiques via a one to one communication connection through at least one of said plurality of cells other than said selected at least one of the plurality of cells, for transmitting said one of the plurality of communiques to said one of said plurality of wireless subscriber devices via a one of said plurality of wireless communication channels in said selected at least one of said plurality of cells.

12. A method of operating a communique system for providing a plurality of communiques, wherein each communique of the plurality of communiques constitutes program content concurrently delivered to a plurality of subscribers, who are equipped with wireless subscriber devices, via a cellular communication network that includes a plurality of cell sites, wherein said plurality of cell sites provides a plurality of cells, wherein each cell site provides a plurality of wireless communication channels in said cells that cover a predetermined volume of space around a cell site transmitting antenna, comprising:

selecting at least one of said plurality of cells to provide one of the plurality of communiques to a plurality of subscribers who are authorized to receive said one of the plurality of communiques and who are served by said selected at least one of the plurality of cells, wherein said plurality of subscribers authorized to receive are receiving said one of the plurality of communiques independent of the presence of subscribers who are

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authorized to receive said one of the plurality of
communiques and who are served by other cells of said
cellular communication network;

routing data, constituting said one of the
5 plurality of communiques, from a selected program source to
cell sites associated with said selected at least one of the
plurality of cells for concurrent transmission to wireless
subscriber devices of subscribers who are authorized to
receive said one of the plurality of communiques and who are
10 served by said selected at least one of the plurality of
cells, in at least one of said selected at least one of the
plurality of cells, said transmission to said plurality of
wireless subscriber devices being effected concurrently to
more than one of said plurality of wireless subscriber
15 devices via a one of said plurality of wireless
communication channels; and

extending, in response to a one of said plurality
of wireless subscriber devices roaming outside of a coverage
area of said selected at least one of the plurality of
20 cells, said one of the plurality of communiques to said one
wireless subscriber device via a one-to-one communication
connection through at least one of said plurality of cells
other than said selected at least one of the plurality of
cells.

25 13. The method of claim 12 further comprising:

identifying a plurality of cell sites adapted to
serve said subscribers; and

establishing communication connections from said
communique system to said cell sites associated with said
30 selected at least one of the plurality of cells.

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14. The method of claim 12 further comprising:

establishing a communication connection from said
communique system to at least one of said plurality of cell
sites other than said cell sites associated with said
5 selected at least one of the plurality of cells to transmit
communiques to said at least one of said plurality of cell
sites other than said cell sites associated with said
selected at least one of the plurality of cells.

15. The method of claim 14 further comprising:

10 transmitting information, constituting said one of
the plurality of communiques, from said at least one of said
plurality of cell sites other than said cell sites
associated with said selected at least one of the plurality
of cells to said one wireless subscriber device via a
15 selected one of a plurality of wireless communication
channels in said at least one of said plurality of cell
sites other than said cell sites associated with said
selected at least one of the plurality of cells.

16. The method of claim 14 wherein said step of
20 extending said one of the plurality of communiques further
comprises:

terminating said communication connection from
said communique system to said at least one of said
plurality of cell sites other than said cell sites
25 associated with said selected at least one of the plurality
of cells upon completion of transmission of communiques.

17. The method of claim 12 wherein said step of
extending said one of the plurality of communiques
comprises:

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determining whether a communication connection from said communique system to at least one of said cell sites other than said cell sites associated with said selected at least one of the plurality of cells to transmit 5 communiques to said at least one of said plurality of cell sites other than said cell sites associated with said selected at least one of the plurality of cells is authorized for said one wireless subscriber device.

18. The method of claim 12 further comprising the step 10 of:

enabling each of said plurality of wireless subscriber devices to receive said one of the plurality of communiques via said one of said plurality of wireless communication channels.

15 19. The method of claim 18 wherein said step of enabling comprises:

identifying each of said plurality of wireless subscriber devices via a communique address assigned to said plurality of wireless subscriber devices to enable the cell 20 sites to recognize each of said plurality of wireless subscriber devices, whose communique address constitutes an identity that is common to said plurality of wireless subscriber devices.

20. The method of claim 19 wherein said step of 25 identifying comprises:

assigning a common MIN as said communique address assigned to said plurality of wireless subscriber devices to enable the cell sites to recognize each of said plurality of wireless subscriber devices, whose communique address

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constitutes an identity that is common to said plurality of wireless subscriber devices.

21. The method of claim 18 wherein said step of enabling comprises:

5 registering at least one of said plurality of wireless subscriber devices to uniquely identify said at least one wireless subscriber device; and

authorizing said at least one wireless subscriber device to receive a subscriber selected communique.

10 22. The method of claim 12 further comprising the step of:

transmitting, in response to a one of said plurality of wireless subscriber devices roaming into a coverage area of said selected cells and receiving said one
15 of the plurality of communiques via a one to one communication connection through at least one of said plurality of cells other than said selected at least one of the plurality of cells, said one of the plurality of communiques to said one of said plurality of wireless
20 subscriber devices via a one of said plurality of wireless communication channels in said selected at least one of the plurality of cells.

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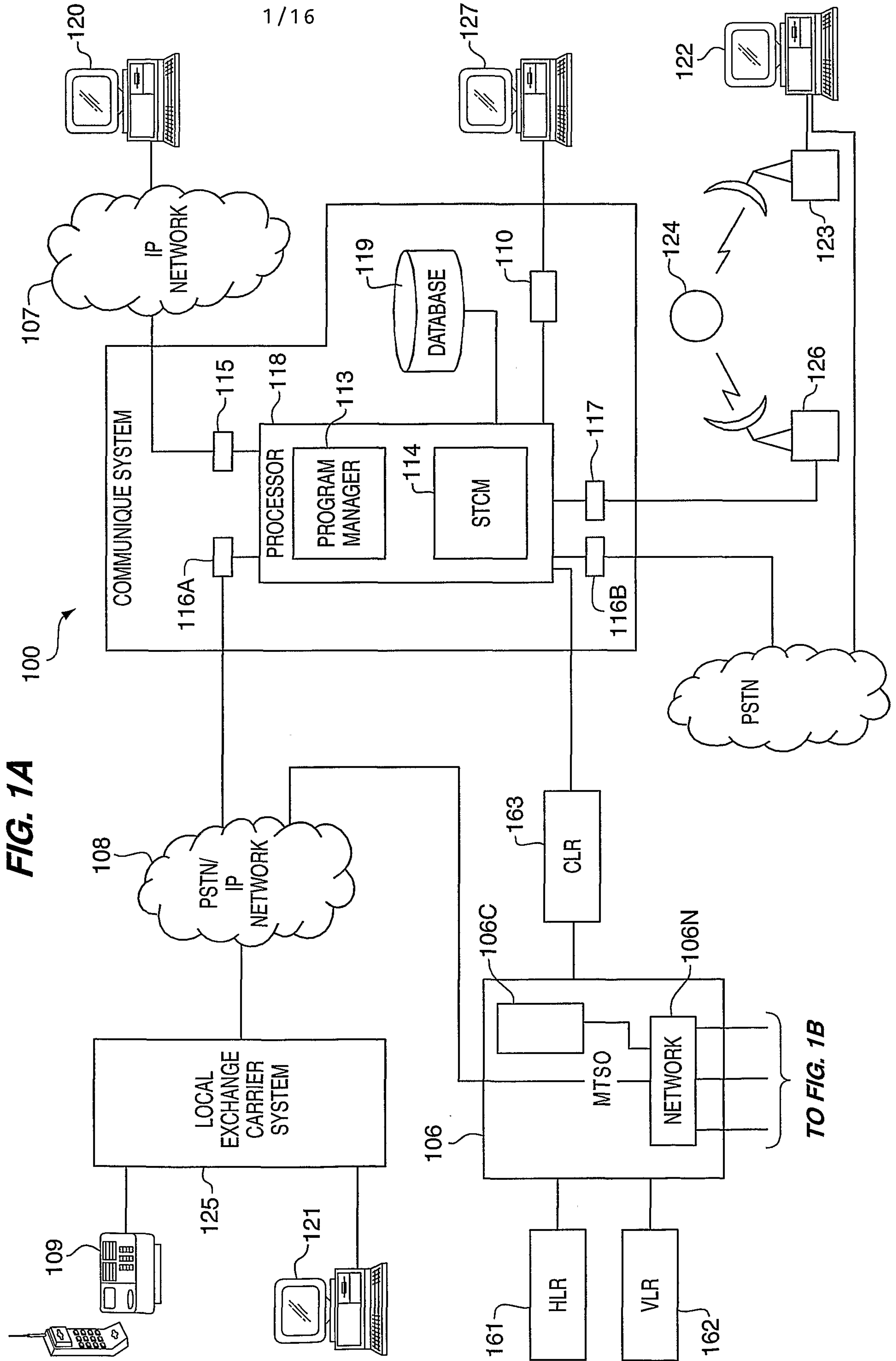


FIG. 1A

TO FIG. 1B

FIG. 1B

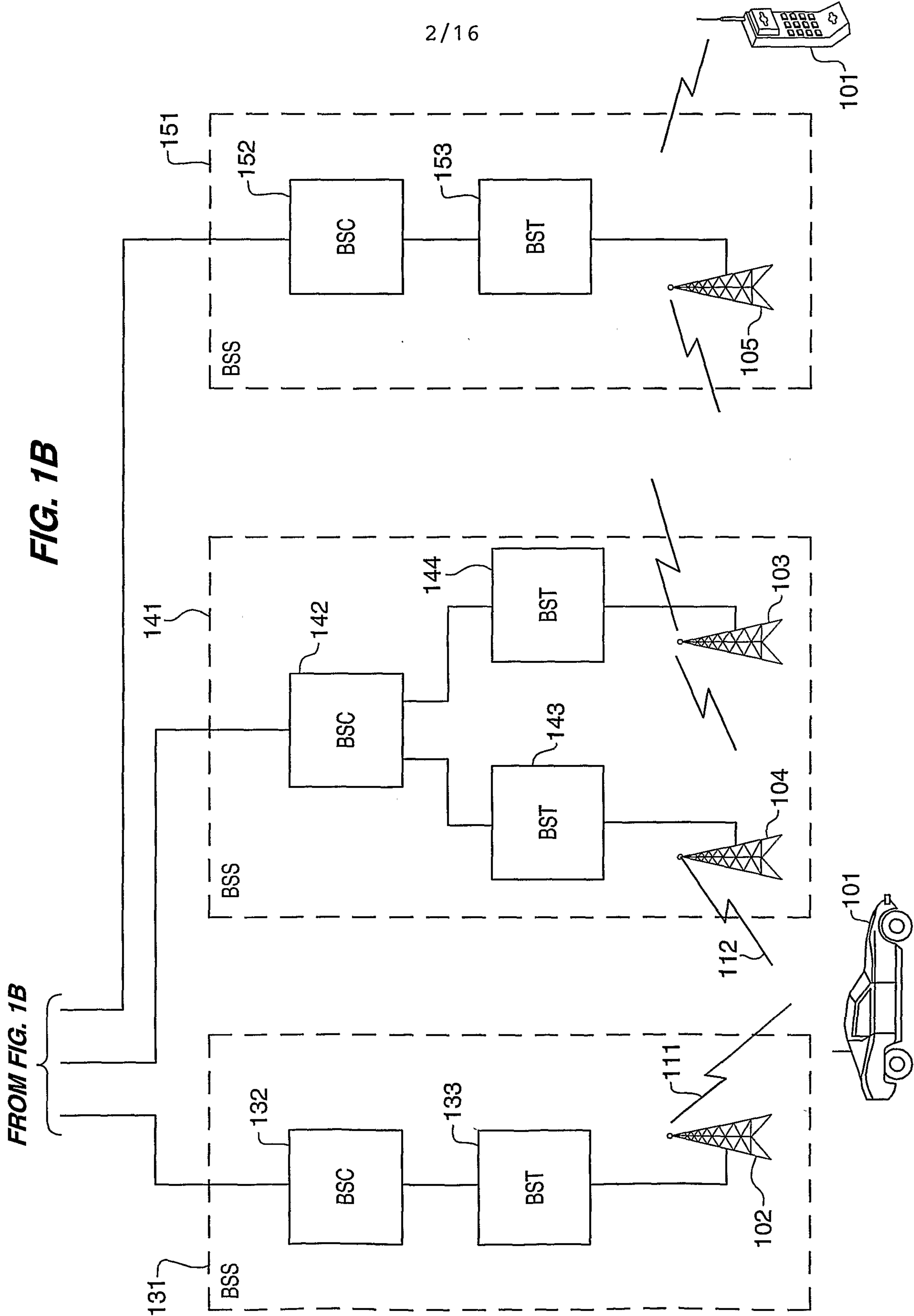
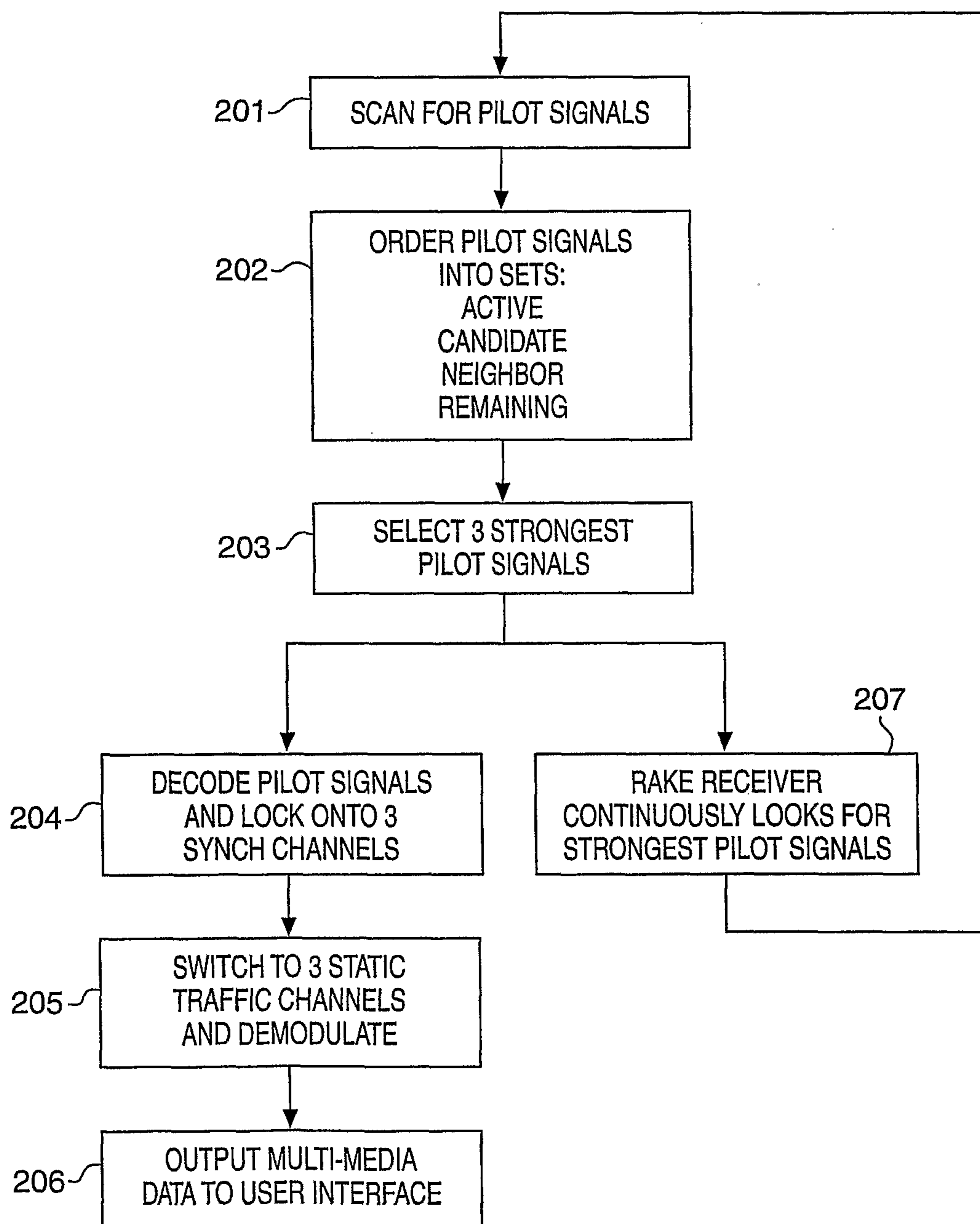


FIG. 2

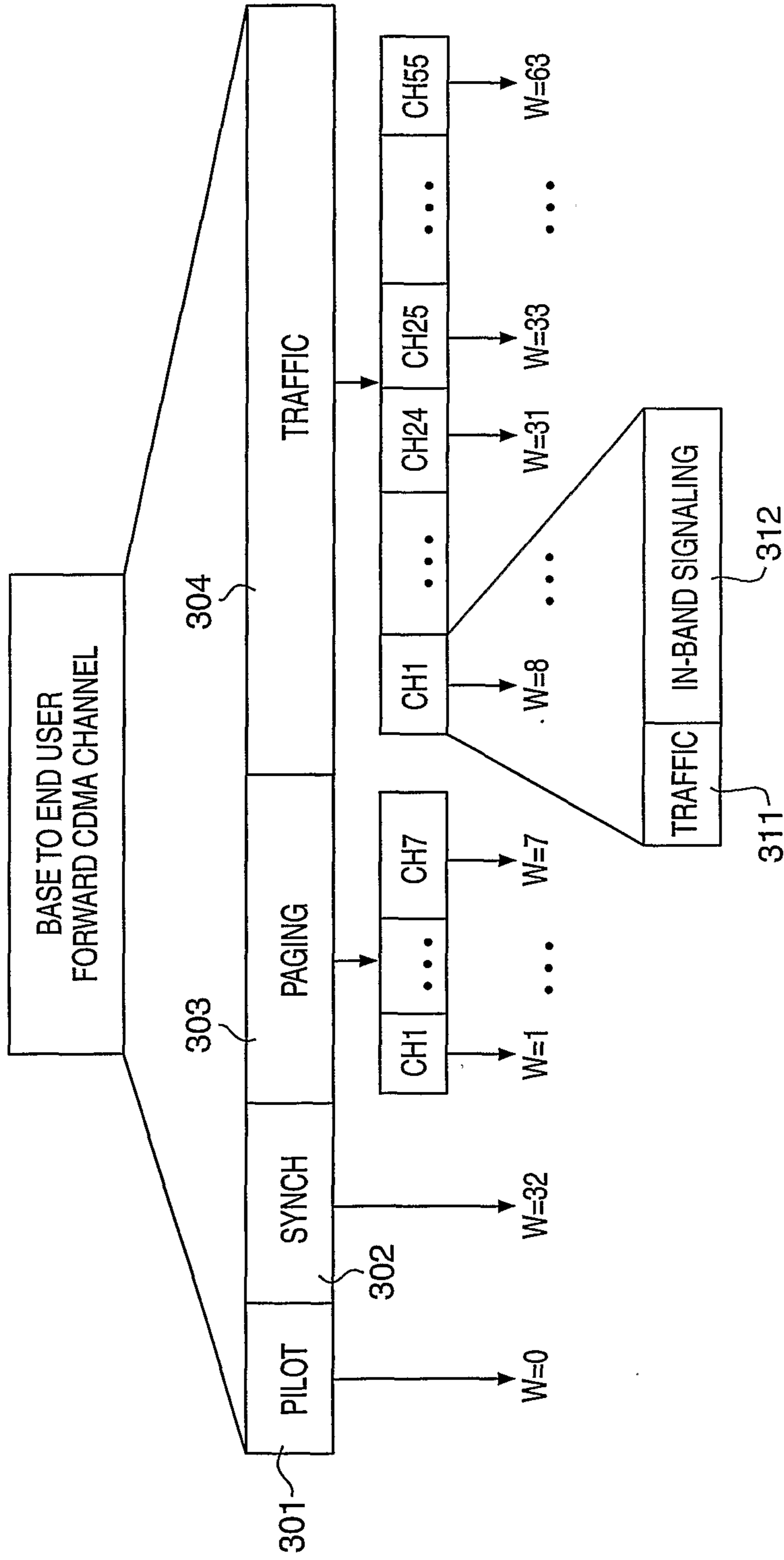


FIG. 3

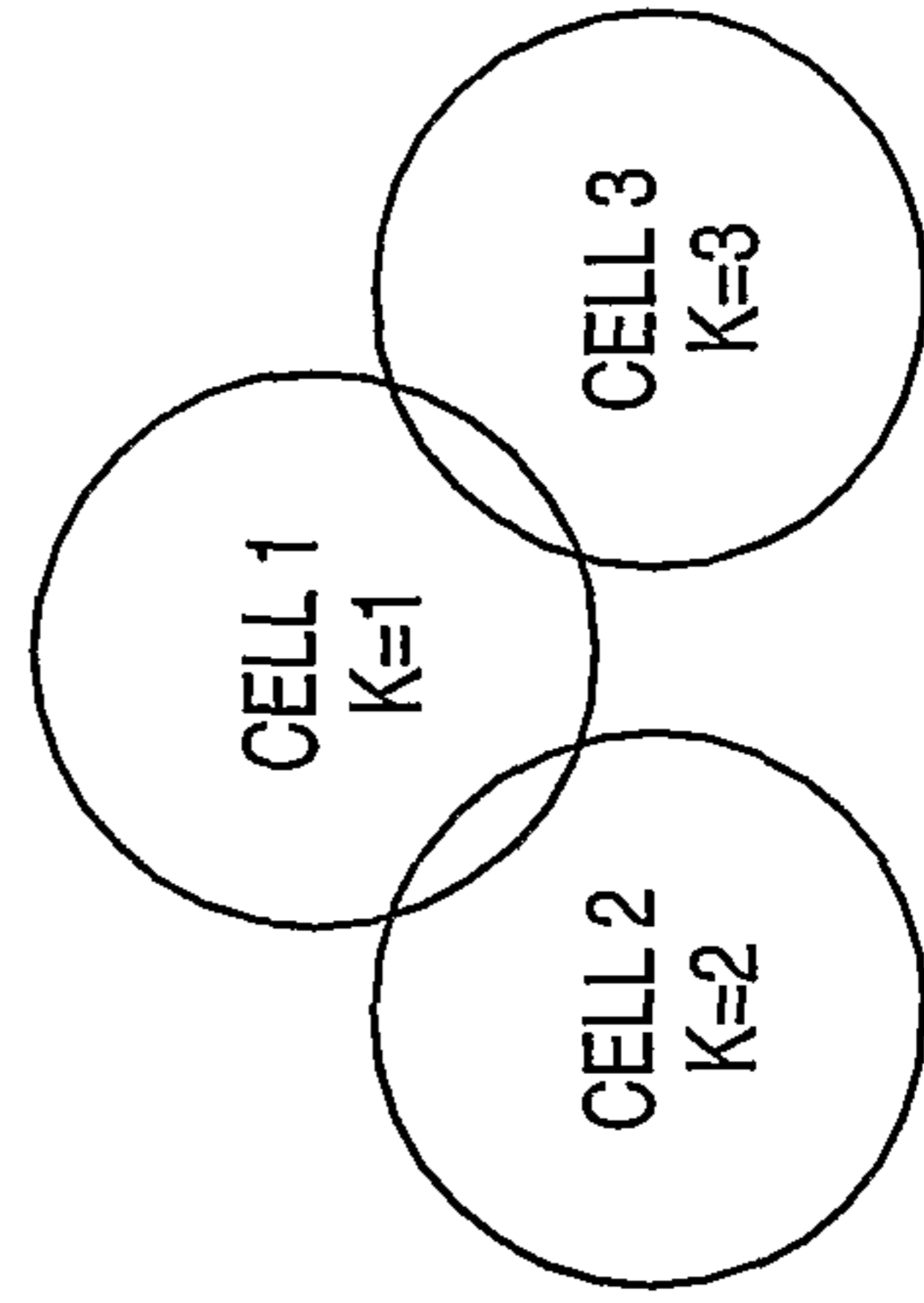


FIG. 4

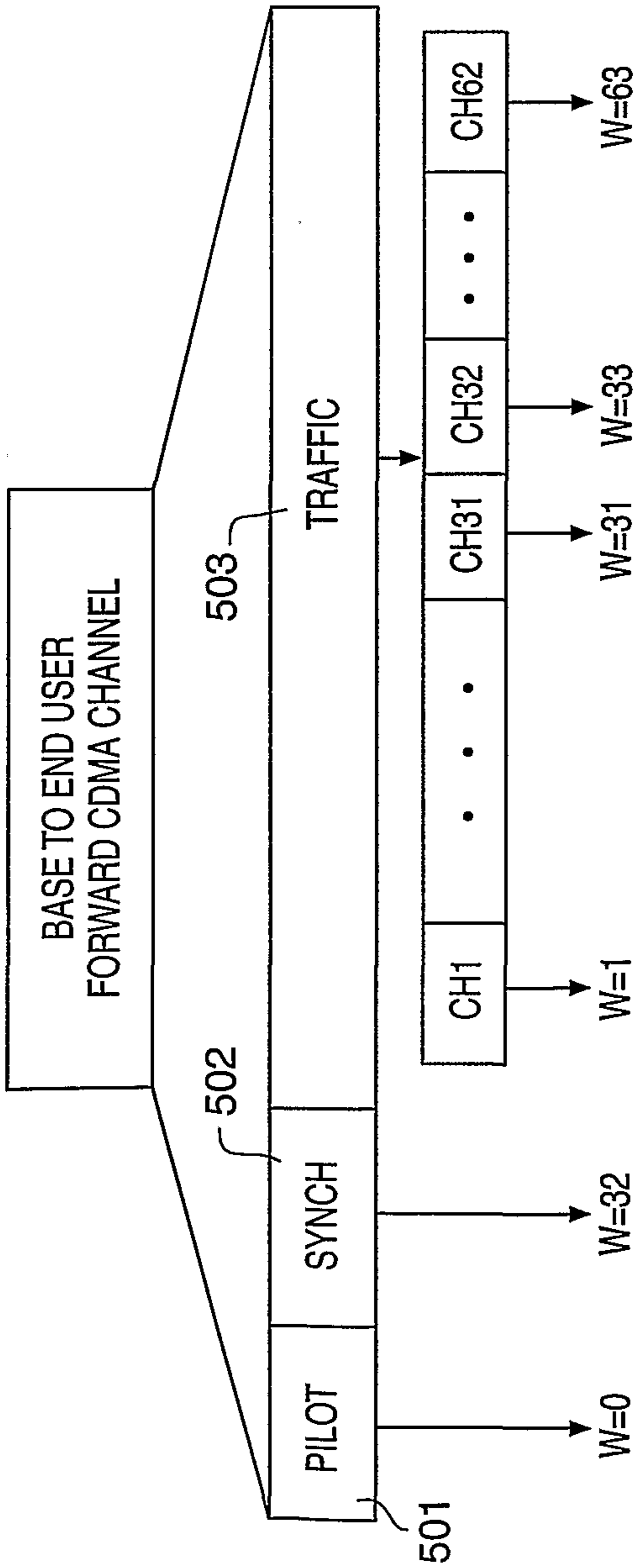


FIG. 5

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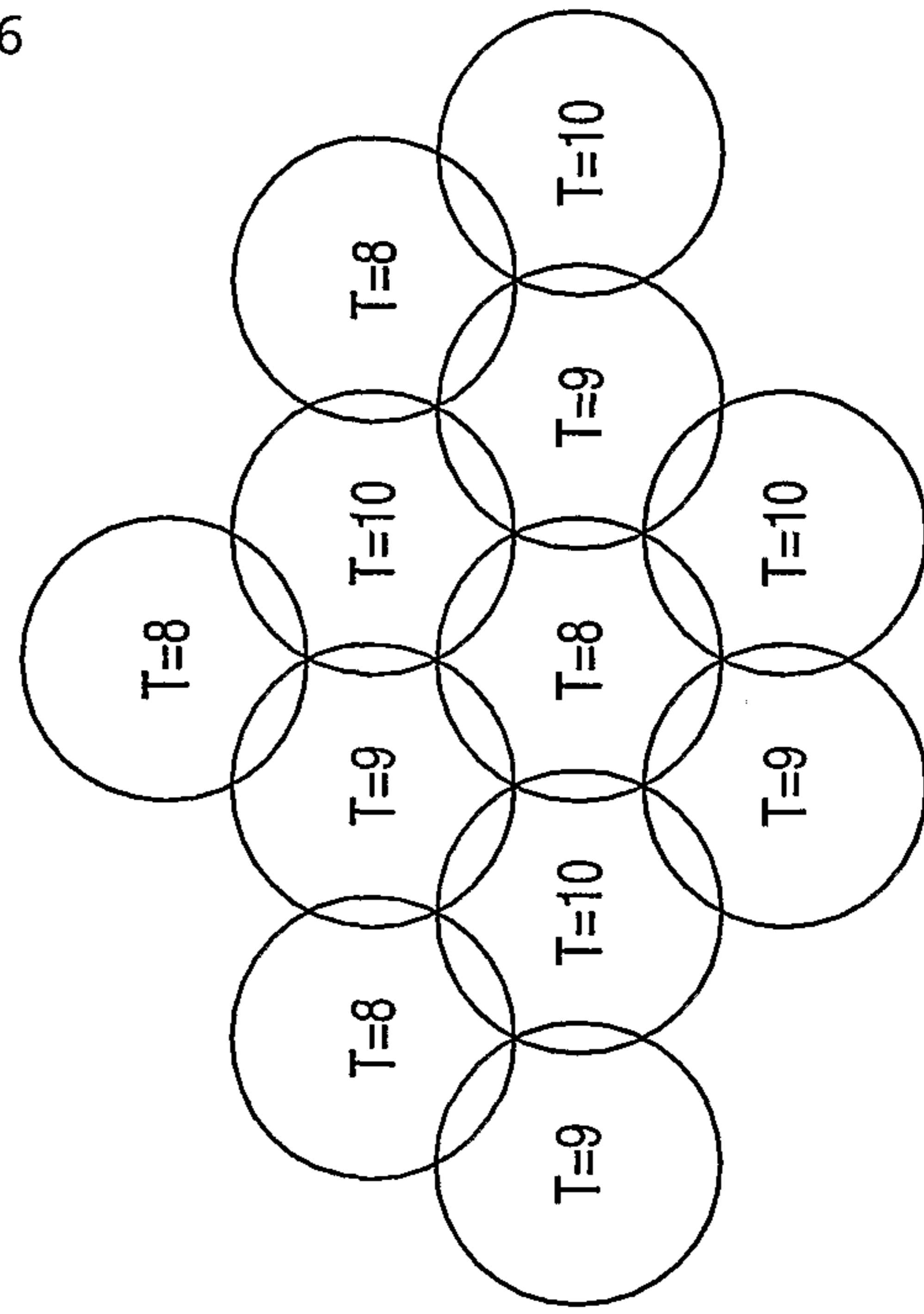
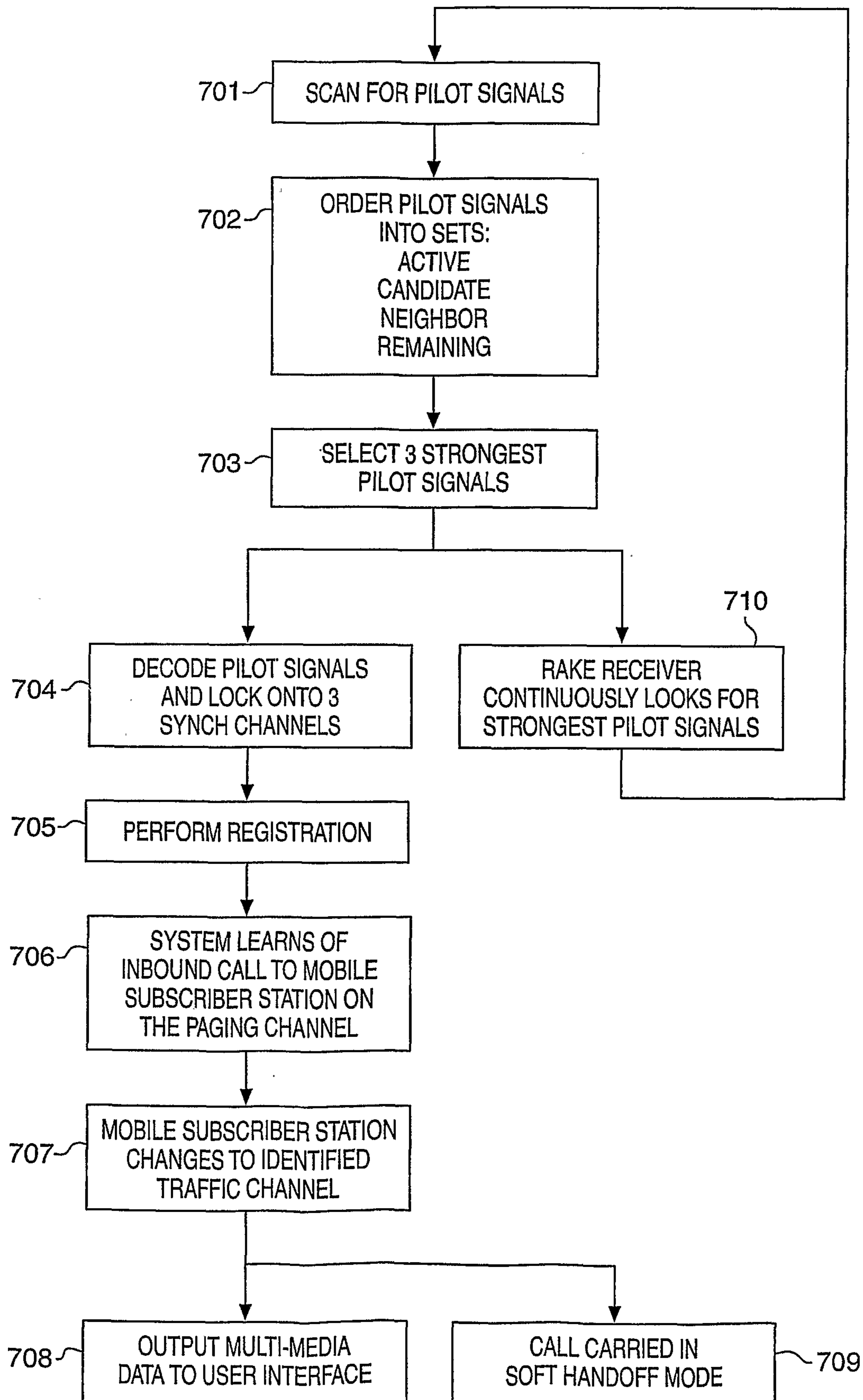


FIG. 6

FIG. 7

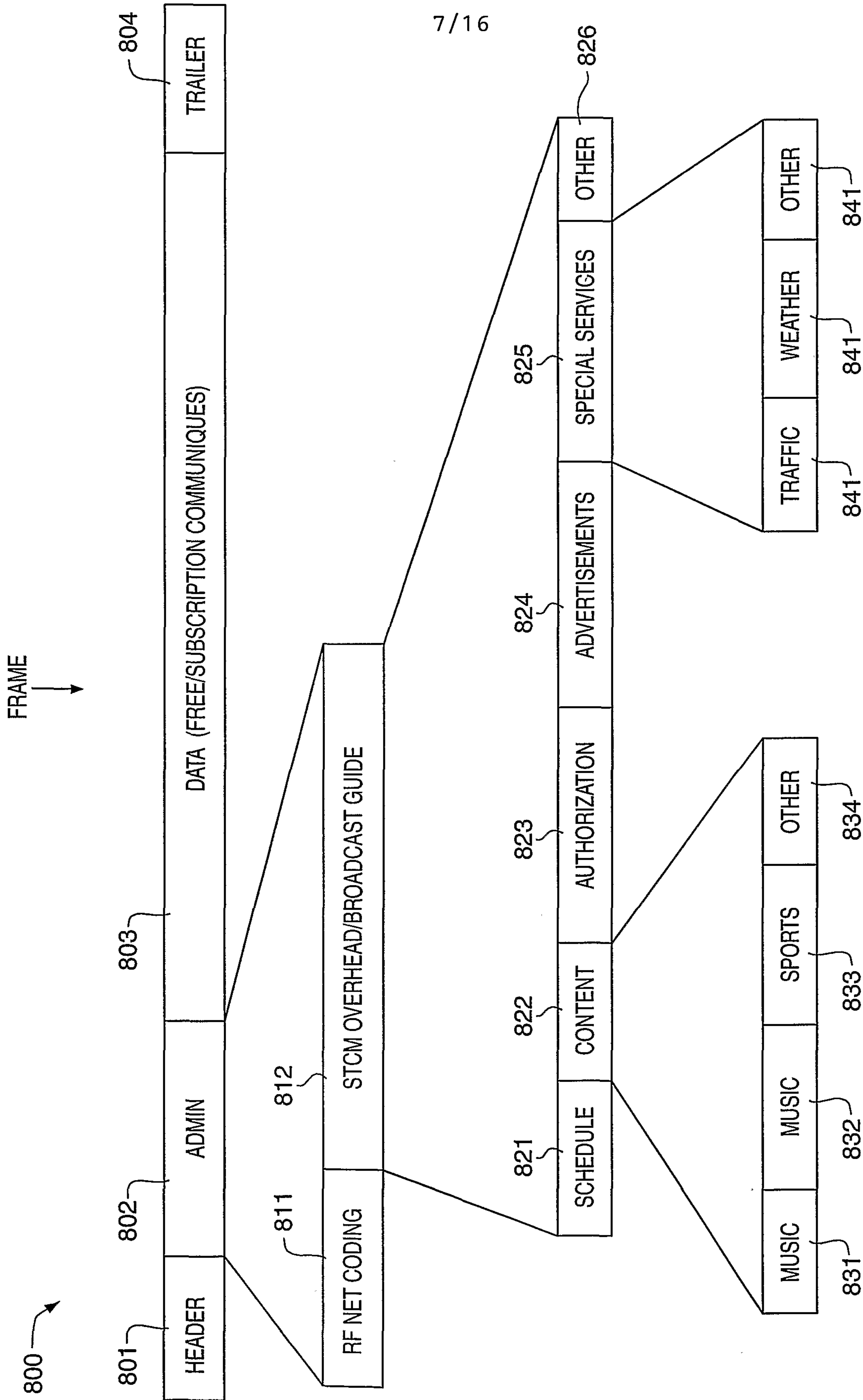


FIG. 8

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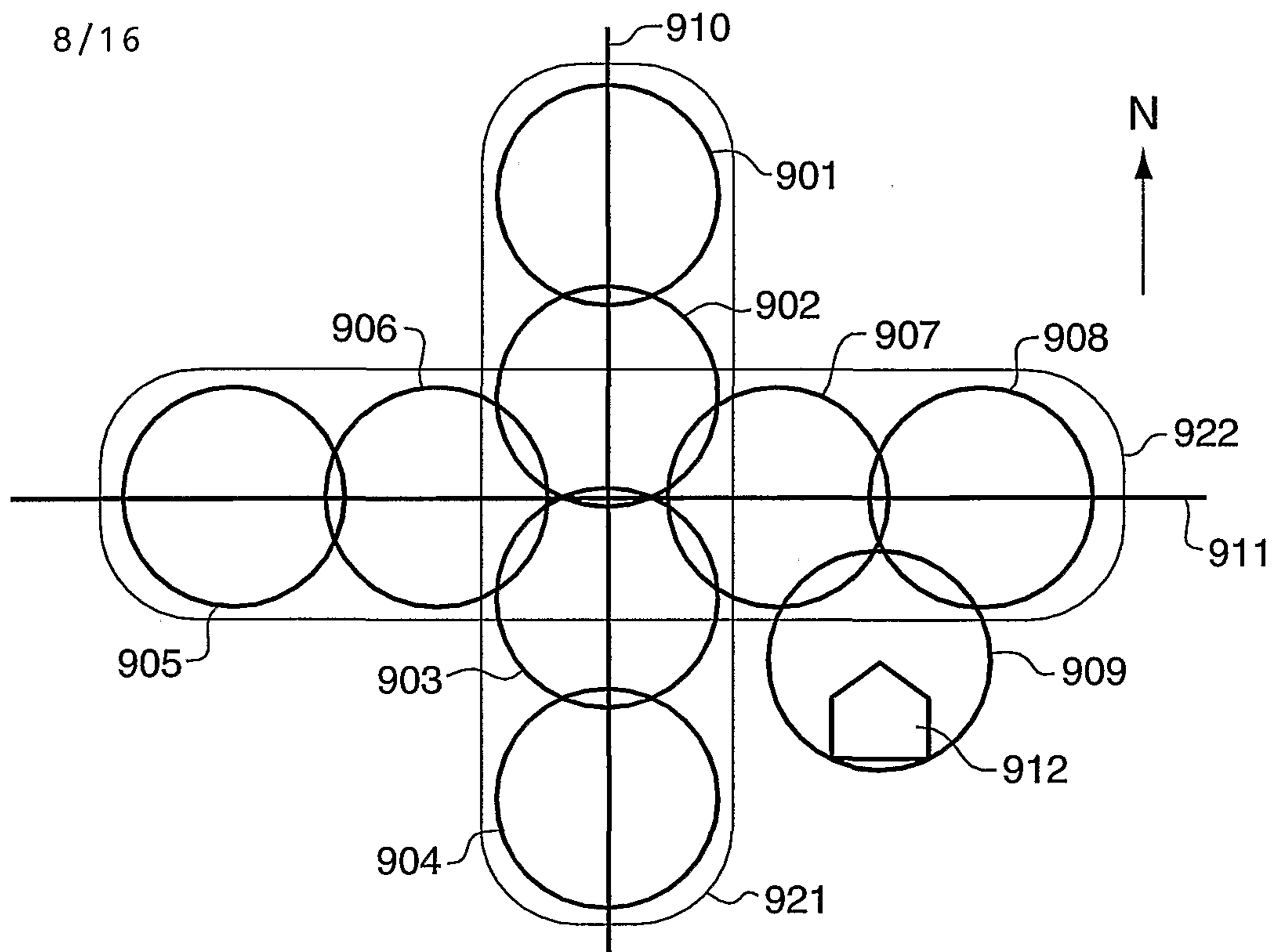


FIG. 9

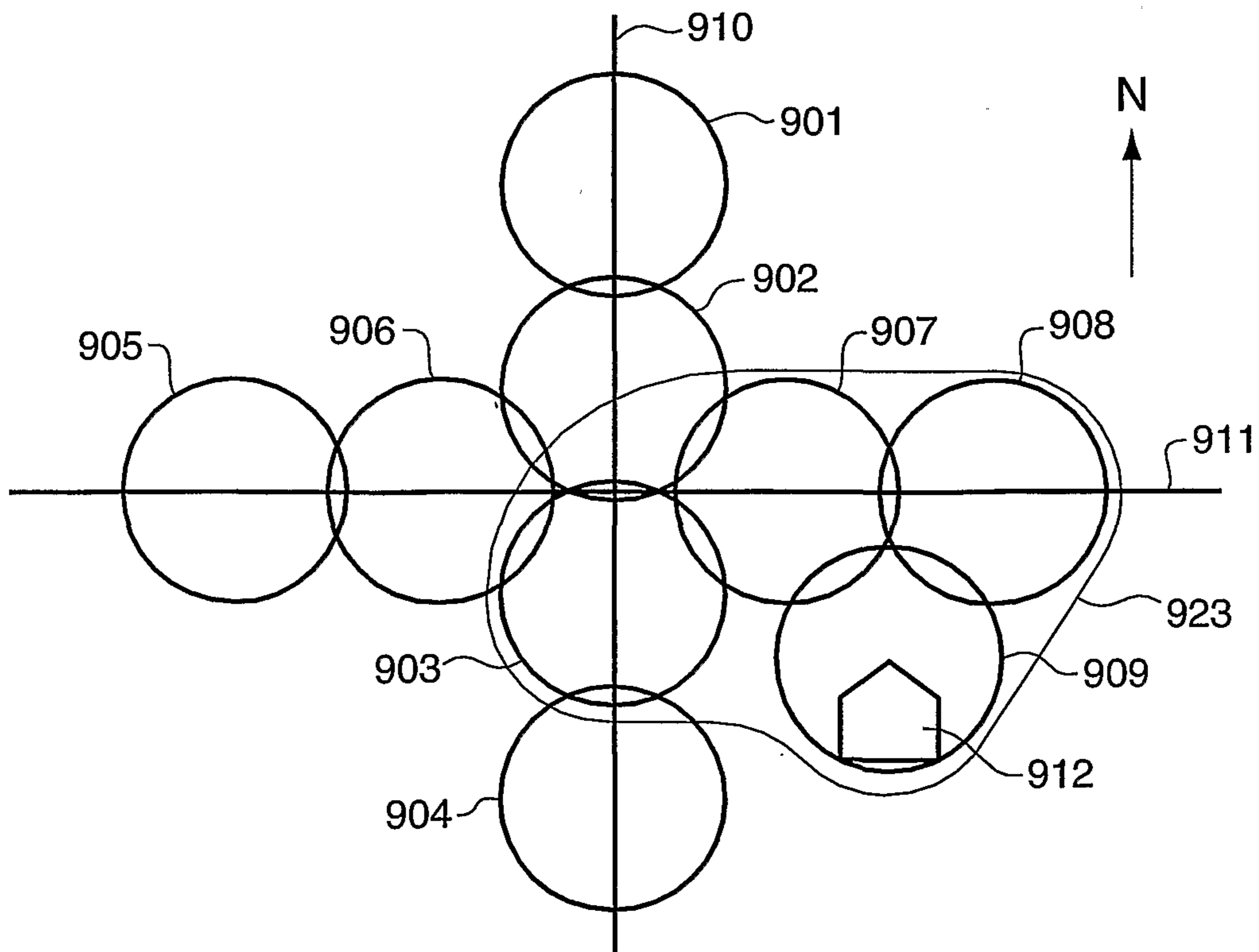
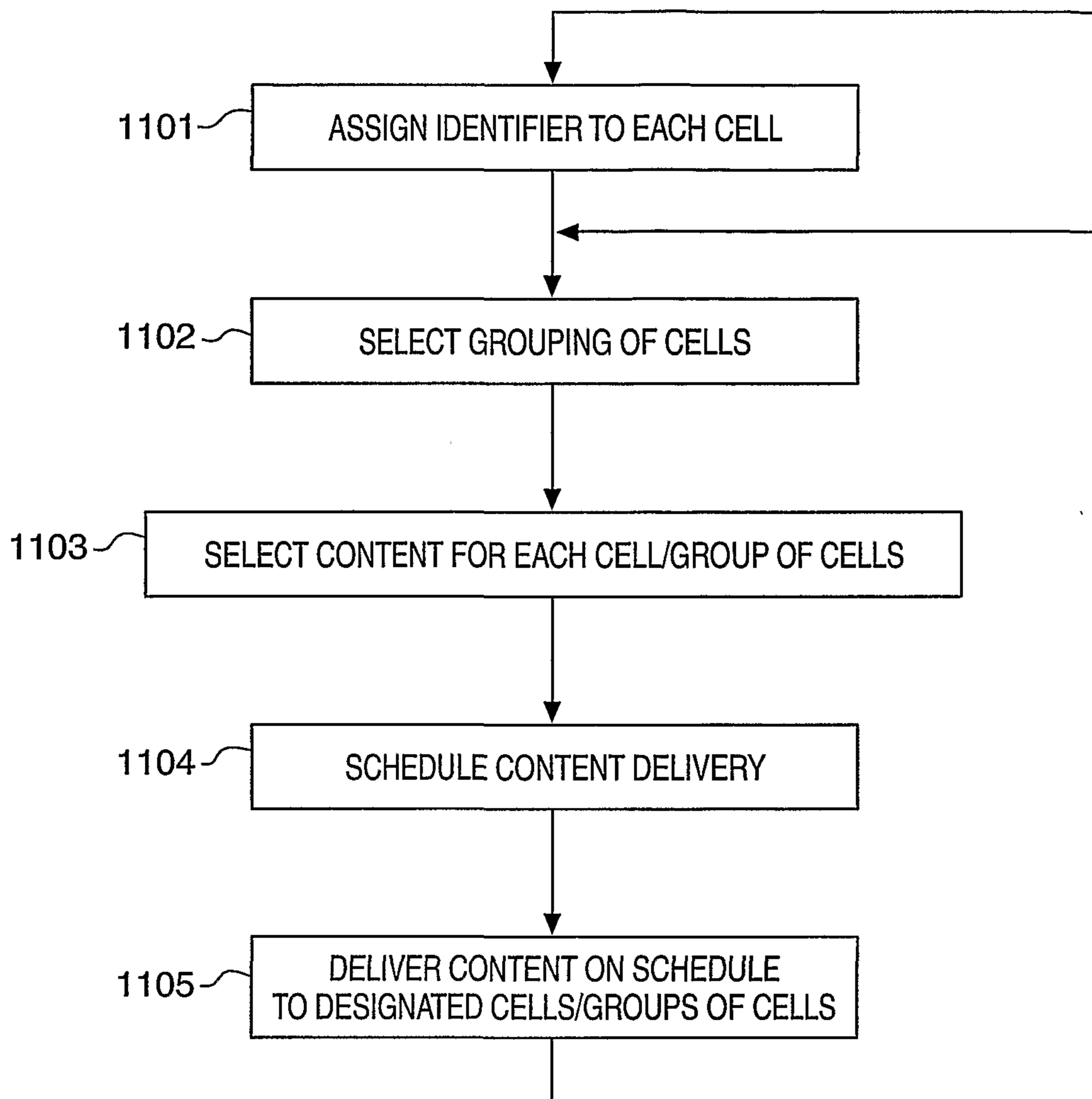
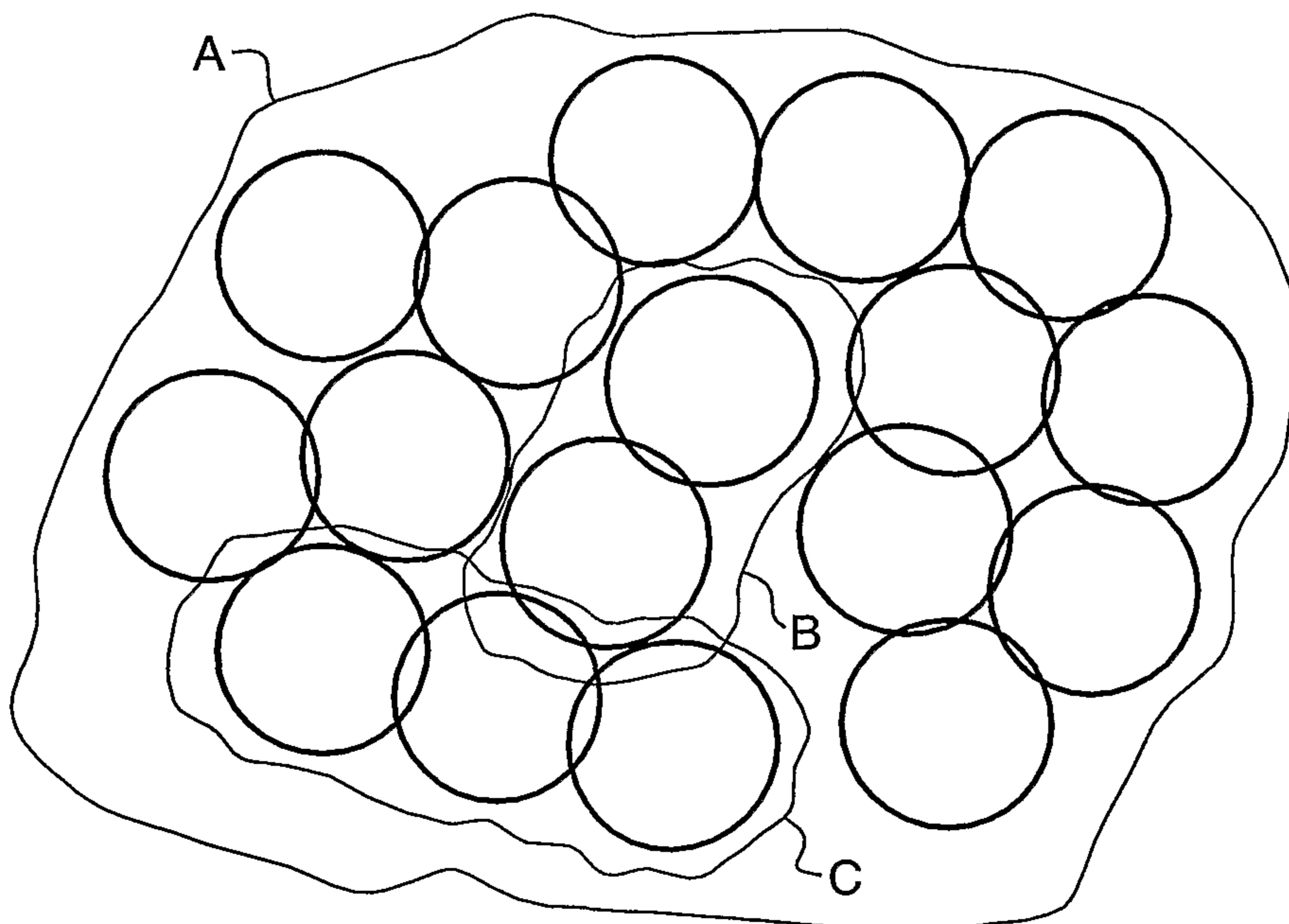


FIG. 10

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**FIG. 11****FIG. 12**

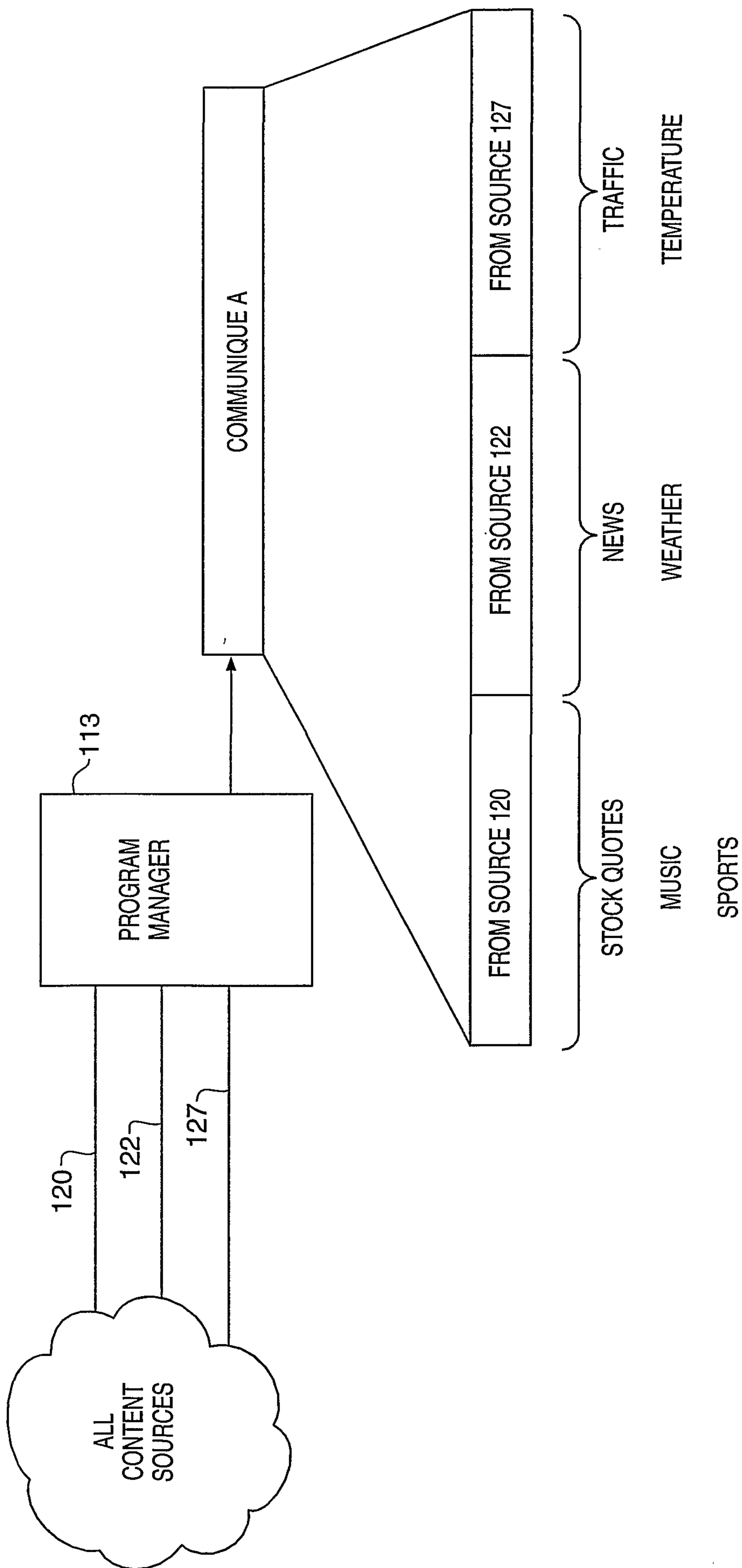


FIG. 13

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COMMUNIQUE	TIME	NARROWCAST REGION
A	6AM-10AM DAILY	910
B	6AM-10AM DAILY	922
C	6AM-11PM AS REQUIRED	909
.	.	.
.	.	.
.	.	.
M	3PM-7PM	923
N	6PM-11PM	909
.	.	.
.	.	.

FIG. 14

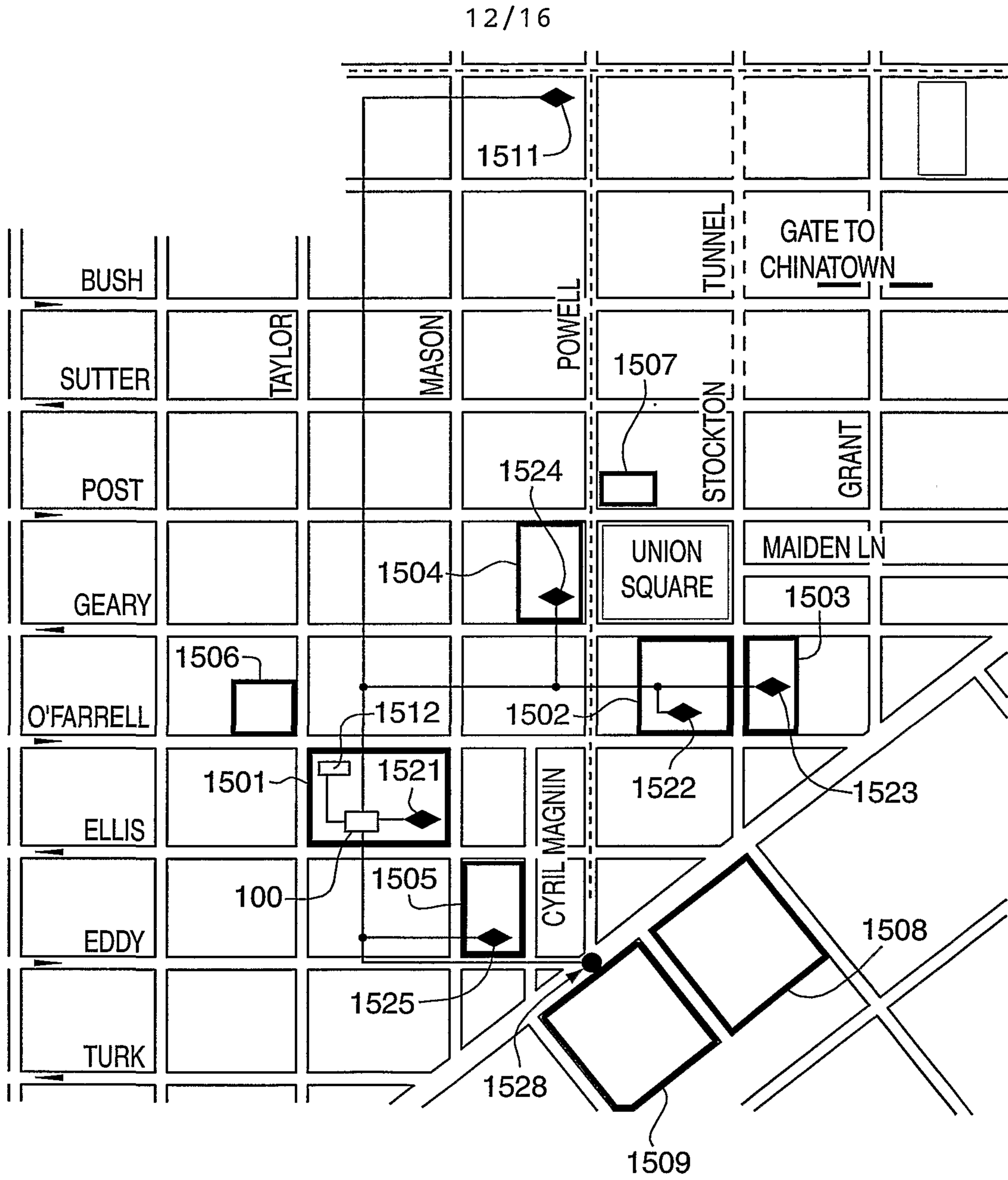


FIG. 15

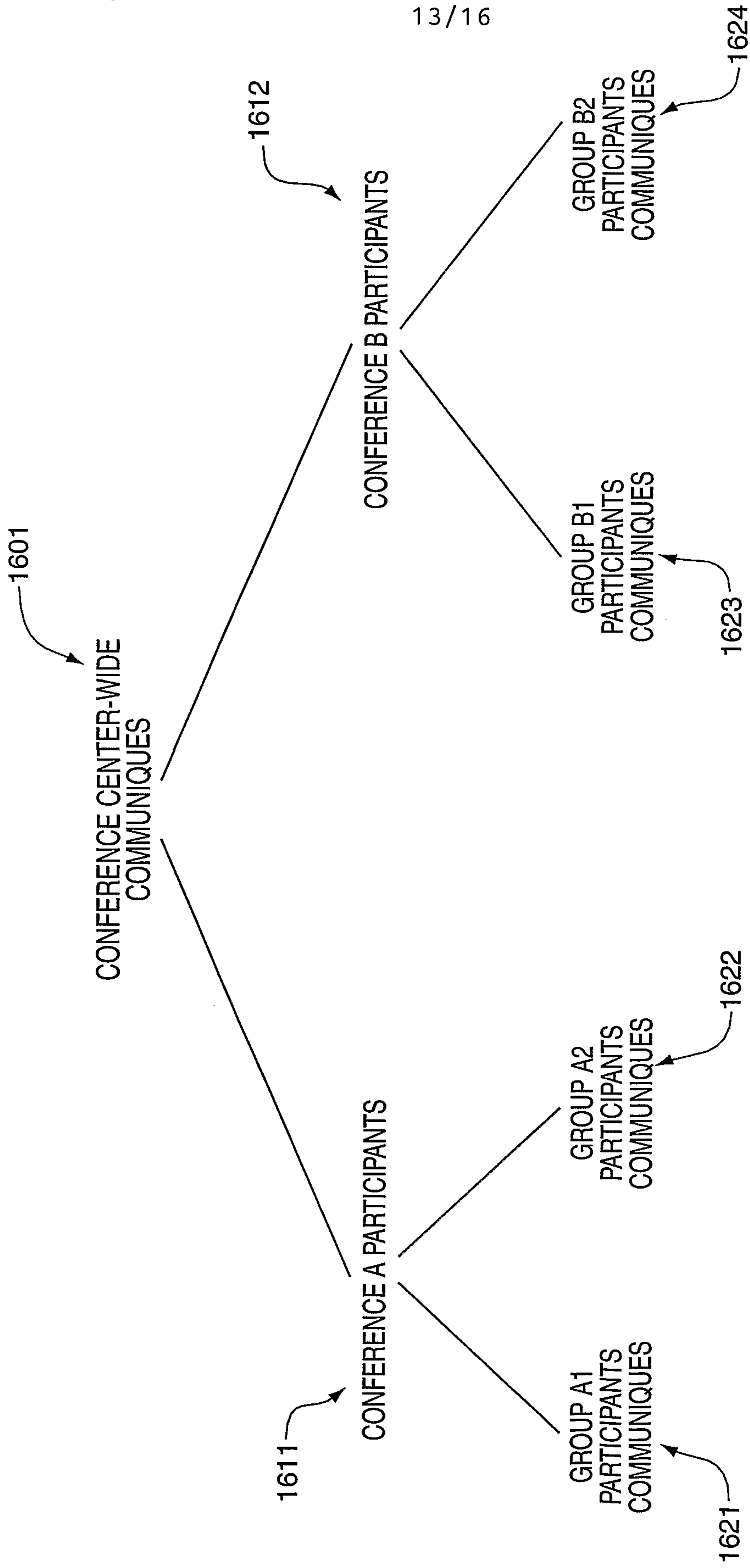
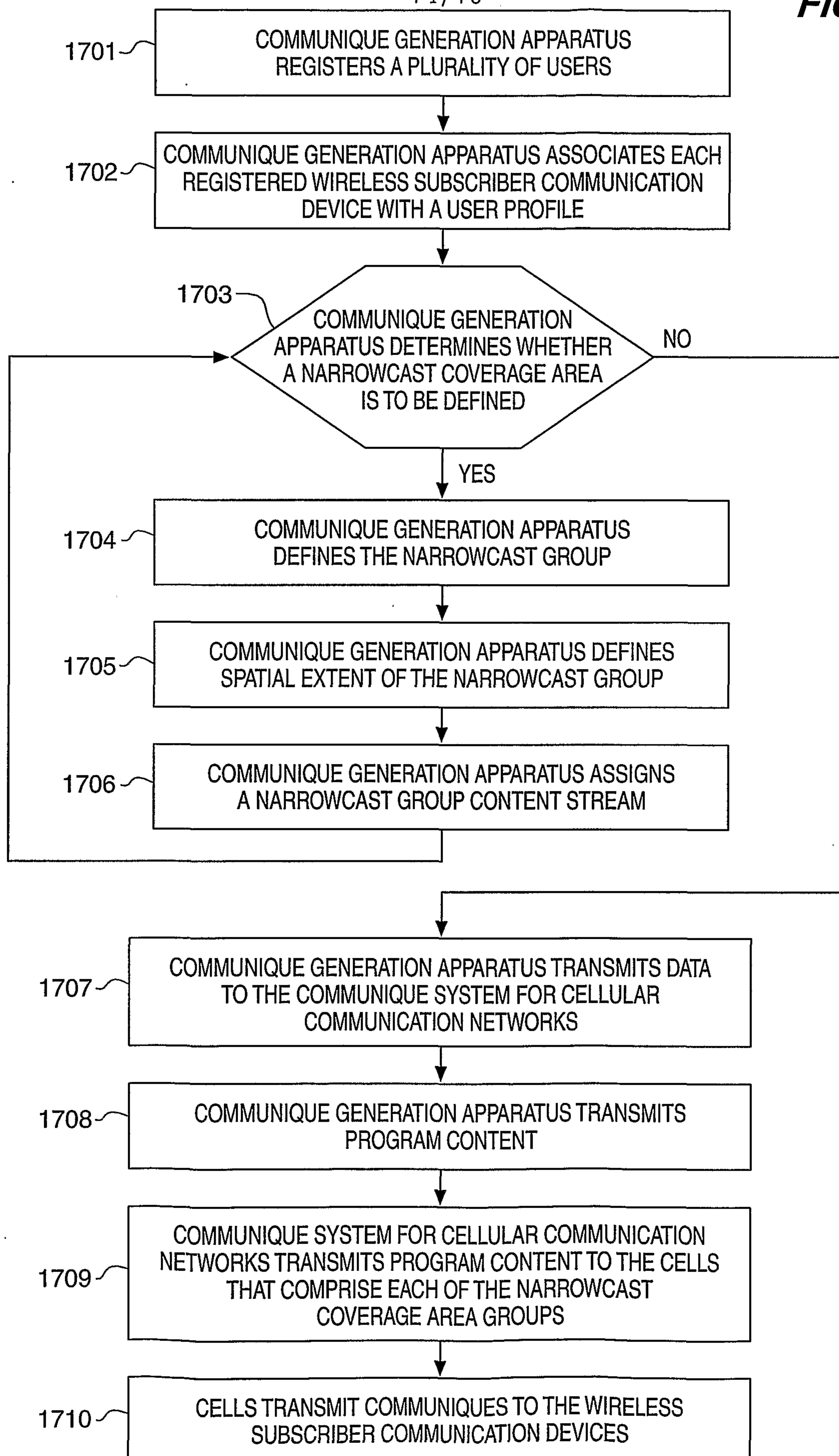


FIG. 16

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FIG. 17

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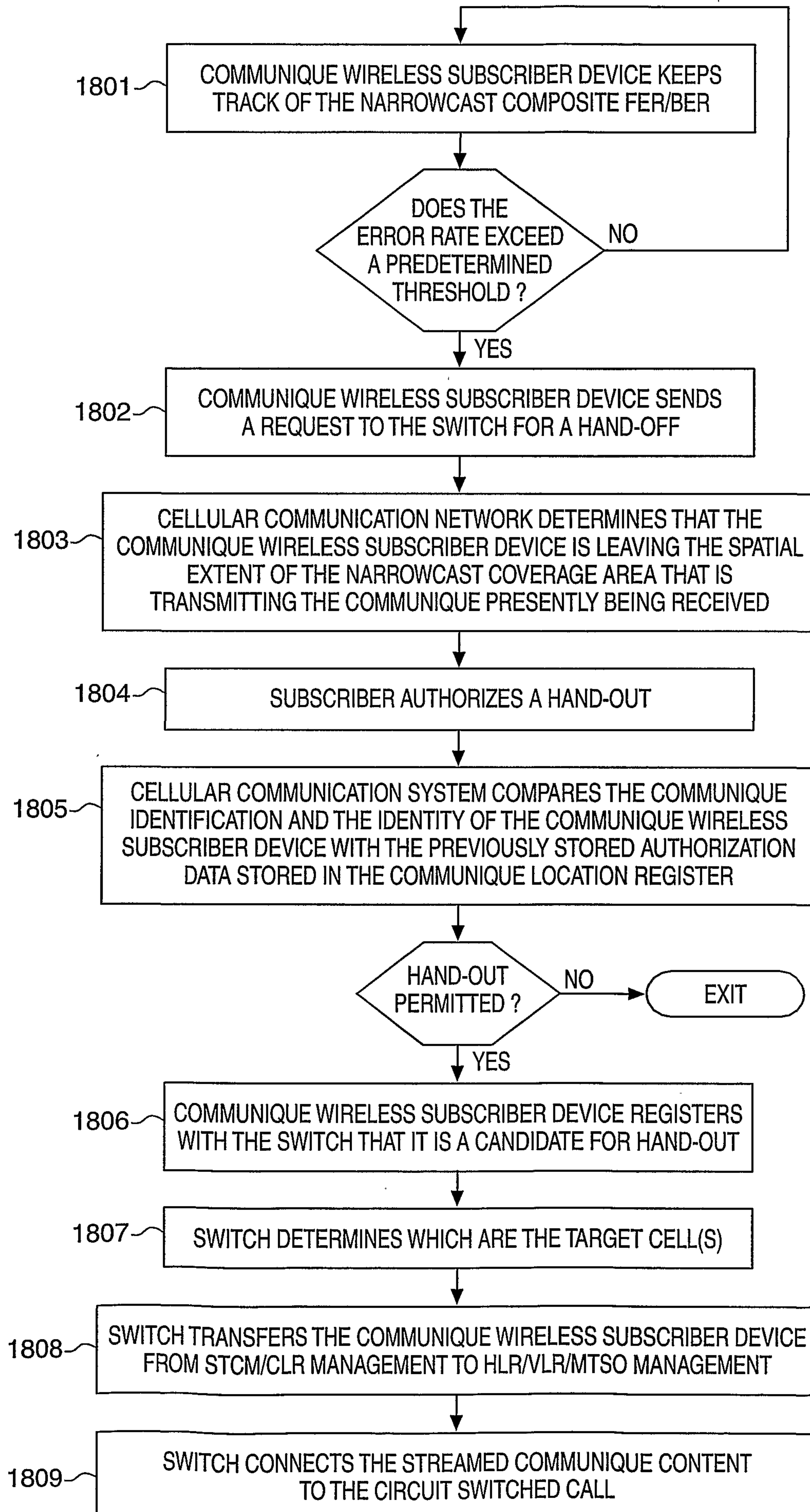
FIG. 18

FIG. 19