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DIVISION DE NUEVAS CREACIONES

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

Santafé de Bogotá, D.C.

02-01-09-

Re.: Expediente No. 00 - 32.671

Solicitud de Patente

Debidamente traducida, adjunto acompaño la copia oficial de la solicitud de patente estadounidense No. 09/309.012 la cual le solicito agregar a este expediente para los efectos legales respectivos.

De Ustedes atentamente,

GERMAN CASTILLO GRAU

T.P. No. 2.978 del C.S.J.

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AB

APARATO Y MÉTODO PARA REALIZAR LLAMADAS DE GRUPO EN SISTEMAS DE COMUNICACIONES INALÁMBRICAS

REIVINDICACIONES:

1. En un sistema de comunicaciones inalámbricas que incluye una pluralidad de unidades de transceptor distribuidas, cada una de las cuales es operativa para comunicarse con terminales por una pluralidad de canales de comunicación, un método para propagar una llamada de grupo que comprende los siguientes pasos:

transmitir un mensaje de origen de llamada de grupo de una terminal de origen;

recibir el mensaje de origen de llamada de grupo en una unidad de transceptor;

transmitir un mensaje de designación de canal de tráfico para llamada de grupo dirigido a un grupo de terminales de las unidades de transceptor en que responde al mensaje de origen de llamada de grupo recibido, el mensaje de designación de canal de tráfico para llamada de grupo transmitido designando un canal de tráfico común; y

comunicación entre terminales del grupo de terminales por el canal de tráfico común designado.

2. Un método según la Reivindicación 1, en donde la pluralidad de unidades de transceptor comprende una pluralidad de cabezas de radio de un sistema privado de comunicaciones inalámbricas.

3. Un método según la Reivindicación 1, en donde dicho paso de la comunicación comprende el paso de dirigir comunicaciones semidúplex entre las terminales por el canal de tráfico común.

4. Un método según la Reivindicación 1, en donde el canal de tráfico común comprende una serie de intervalos en una banda de frecuencia portadora.

5. Un método según la Reivindicación 1, en donde dicho paso de comunicación comprende los siguientes pasos:

la comunicación entre una de las terminales y la primera unidad de transceptor durante una llamada de grupo; y luego

la comunicación entre una terminal y una segunda unidad de transceptor durante la llamada de grupo, sin un traspaso.

6. Un método según la Reivindicación 1, en donde dicho paso de la comunicación comprende el paso de la comunicación entre terminales del grupo de terminales sin requerir buscar una terminal en el grupo de terminales.

7. Un método según la Reivindicación 1, en donde dicho paso de transmitir un mensaje de origen de llamada de grupo comprende el paso de transmitir el mensaje de origen de llamada de grupo en respuesta al ingreso de un usuario en la terminal de origen.

8. Un método según la Reivindicación 1, en donde dicho paso de transmitir un mensaje de designación de canal de tráfico para llamada de grupo comprende el paso de transmitir un mensaje de designación de canal de tráfico para llamada de grupo por un canal de control.

9. Un método según la Reivindicación 8, en donde dicho paso de la comunicación comprende los siguientes pasos:

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transmitir datos de una del grupo de terminales;

recibir los datos transmitidos en una unidad receptora; y

transmitir los datos recibidos de la pluralidad de unidades de transceptor por el canal de tráfico común.

10. Un método según la Reivindicación 9, en donde dicho paso de transmitir los datos recibidos de la pluralidad de unidades de transceptor es seguido por los pasos de:

transmitir un mensaje de desprendimiento de la pluralidad de unidades de transceptor por el canal de tráfico común; y luego

monitorear el canal de control para un nuevo mensaje de designación de canal de tráfico para llamada de grupo en las terminales en respuesta al recibo del mensaje de desprendimiento transmitido en las terminales.

11. Un método según la Reivindicación 8, en donde el canal de control comprende una serie de intervalos en una banda de frecuencia portadora, y en donde dicho paso de transmitir un mensaje de designación de canal de tráfico para llamada de grupo comprende el paso de transmitir el mensaje de designación de canal de tráfico para llamada de grupo en un solo intervalo asignado a canal de control.

12. Un método según la Reivindicación 11, en donde el mensaje de origen de llamada de grupo y el mensaje de designación de canal de tráfico para llamada de grupo son dirigidos con base en valores TMSI asignados por el sistema de comunicaciones inalámbricas.

13. Un método según la Reivindicación 12:

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en donde dicho paso de transmitir un mensaje de origen de llamada de grupo es precedido por la comunicación de campos TMSI a terminales atendidas por el sistema de comunicaciones inalámbricas para de este modo asignar valores TMSI a las terminales, de manera que los valores TMSI asignados representados por los campos TMSI comunicados sean limitados a un valor menor o igual al valor máximo representado por una porción menos significativa de un campo TMSI;

en donde el mensaje de designación de canal de tráfico para llamada de grupo incluye:

un campo de usuario que incluye la porción menos significativa del campo TMSI comunicado a la terminal de origen combinada con un bit de control indicando si el mensaje de origen de llamada está solicitando una llamada de grupo;

un campo de usuario llamado que representa un valor TMSI asignado a una terminal del grupo de terminales; y

en donde dicho mensaje de designación de canal de tráfico para llamada de grupo incluye un campo de usuario llamado incluyendo el valor TMSI asignado a la terminal del grupo de terminales combinado con el bit de control del mensaje de designación de canal de tráfico para llamada de grupo.

14. Un método según la Reivindicación 10, en donde dicho paso de monitorear el canal de control es seguido por el paso de pasar a un modo durmiente si transcurre un intervalo de tiempo predeterminado sin recibir un nuevo mensaje de designación de canal de tráfico para llamada de grupo.

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15. Un método según la Reivindicación 14, en donde dicho paso de transmitir un mensaje de desprendimiento comprende el paso de transmitir un mensaje de desprendimiento que indique el intervalo de tiempo predeterminado.

16. Un método según la Reivindicación 10, en donde dicho paso de transmitir un mensaje de desprendimiento es seguido por los pasos de:

transmitir un mensaje de origen de llamada de grupo de una terminal del grupo de terminales;

recibir el mensaje de origen de llamada de grupo en una unidad de transceptor;

transmitir un mensaje de designación de canal de tráfico para llamada de grupo dirigido al grupo de terminales; el mensaje de designación de canal de tráfico para llamada de grupo identifica un segundo canal de tráfico común; y

reanudar comunicaciones entre terminales del grupo por el segundo canal de tráfico común.

17. Un método según la Reivindicación 16, en donde el primero y el segundo canales son el mismo canal.

18. Un método según la Reivindicación 19, en donde dicho paso de transmitir los datos recibidos es precedido por un mensaje de confirmación de llamada de grupo que identifica la terminal de origen de la pluralidad de unidades de transceptor por el canal de tráfico común.

19. Un método según la Reivindicación 18, en donde dicho paso de transmitir datos de una terminal del grupo de terminales comprende el paso de

transmitir datos de la terminal identificada en el mensaje de conformación de llamada de grupo.

20. Un método según la Reivindicación 1, en donde intervalos asignados a canales de control forman un hipermarco que comprende una pluralidad de supermarcos, y en donde dicho paso de la comunicación es precedido por el paso de monitorear un conjunto de intervalos que ocurren de manera periódica en una pluralidad de submarcos dentro de un supermarco para mensajes de designación de canal de tráfico.

21. Un método según la Reivindicación 20, en donde dicho paso de monitorear comprende el paso de monitorear un subcanal de búsqueda de llamada de grupo del canal de control.

22. Un método para operar una terminal inalámbrica en un sistema de comunicaciones inalámbricas incluyendo una pluralidad de unidades de transceptor distribuidas, cada una de las cuales es operativa para comunicarse con terminales por una pluralidad de canales de comunicación, el método comprende los siguientes pasos:

la recepción de un mensaje de designación de canal de tráfico para llamada de grupo dirigido a la terminal; el mensaje de designación de canal de tráfico para llamada de grupo designa un canal de tráfico común; y

la comunicación con una pluralidad de las otras terminales por el canal de tráfico común designado.

23. Un método según la Reivindicación 22, en donde dicho paso de la comunicación comprende el paso de dirigir comunicaciones semidúplex entre las terminales por el canal de tráfico común.

24. Un método según la Reivindicación 22, en donde el canal de tráfico común comprende una serie de intervalos en una banda de frecuencia portadora.

25. Un método según la Reivindicación 22, en donde dicho paso de comunicación comprende los siguientes pasos:

la comunicación entre la terminal y una primera unidad de transceptor durante una llamada de grupo; y luego

la comunicación entre la terminal y una segunda unidad de transceptor durante la llamada de grupo, sin un traspaso.

26. Un método según la Reivindicación 22, en donde dicho paso de la comunicación comprende el paso de la comunicación entre la terminal y la pluralidad de otras terminales en una llamada de grupo originada por una de las otras terminales sin recibir una búsqueda en la terminal.

27. Un método según la Reivindicación 22, en donde dicho paso de recibir es precedido por el paso de transmitir un mensaje de origen de llamada de grupo de la terminal.

28. Un método según la Reivindicación 27, en donde dicho paso de transmitir un mensaje de origen de llamada de grupo comprende el paso de transmitir el mensaje de origen de llamada de grupo en respuesta a la entrada de un usuario en la terminal.

29. Un método según la Reivindicación 28, en donde dicho paso de transmitir un mensaje de origen de llamada de grupo comprende el paso de transmitir el mensaje de origen de llamada de grupo en respuesta a la activación de un dispositivo PTT por parte de un usuario.

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30. Un método según la Reivindicación 22, en donde dicho paso de recibir un mensaje de designación de canal de tráfico para llamada de grupo comprende el paso de recibir un mensaje de designación de canal de tráfico para llamada de grupo por un canal de control.

31. Un método según la Reivindicación 30, en donde dicho paso de la comunicación comprende los pasos de:

recibir datos por el canal de tráfico común; y luego

recibir un mensaje de desprendimiento por el canal de tráfico común; y luego

monitorear el canal de control en busca de un nuevo mensaje de designación de canal de tráfico para llamada de grupo.

32. Un método según la Reivindicación 30, en donde dicho paso de monitorear el canal de control comprende los pasos de:

monitorear el canal de control a una primera velocidad por un periodo no mayor que un intervalo predeterminado luego del recibo de un mensaje de desprendimiento por el canal de tráfico común; y luego

monitorear el canal de control a una segunda velocidad menor que la primera velocidad si el intervalo predeterminado transcurre sin recibir un nuevo mensaje de designación de canal de tráfico para llamada de grupo.

33. Un método según la Reivindicación 32, en donde dicho medio para recibir un mensaje de desprendimiento comprende medios para recibir un mensaje de desprendimiento indicando el intervalo de tiempo predeterminado.

34. Un método según la Reivindicación 22, en donde intervalos asignados al canal de control forman un hipermarco que comprende una pluralidad

de supermarcos, y en donde dicho paso de recibir es precedido por el paso de monitorear intervalos del canal de control que forman una pluralidad de submarcos dentro de cada supermarco.

35. Un método según la Reivindicación 34, en donde dicho paso de monitorear comprende el paso de monitorear un subcanal de búsqueda de llamada de grupo del canal de control.

36. Un método según la Reivindicación 30, en donde el canal de control comprende una serie de intervalos en una banda de frecuencia portadora, y en donde dicho paso de recibir un mensaje de designación de canal de tráfico para llamada de grupo comprende el paso de recibir el mensaje de designación de canal de tráfico para llamada de grupo en un solo intervalo asignado al canal de control.

37. Un método según la Reivindicación 36, en donde el mensaje de designación de canal de tráfico para llamada de grupo es dirigido con base en una TMSI asignada a una terminal por el sistema de comunicaciones inalámbricas.

38. Un método según la Reivindicación 37, en donde el sistema comunica campos TMSI a terminales atendidas por el sistema de comunicaciones inalámbricas para con ello asignar valores TMSI a las terminales, de manera que los valores TMSI asignados representados por los campos TMSI comunicados sean limitados a un valor menor o igual que un valor máximo representado por una porción menos significativa de un campo TMSI, y en donde el mensaje de designación de canal de tráfico para llamada de grupo incluye:

un campo de usuario que incluye la porción menos significativa del campo TMSI comunicado a la terminal de origen combinado con un bit de control que indica si el mensaje de origen de llamada está solicitando una llamada de grupo;

un campo de usuario llamado que representa un valor TMSI asignado a una terminal del grupo de terminales; y

en donde dicho mensaje de designación de canal de tráfico para llamada de grupo incluye un campo de usuario incluyendo el valor TMSI asignado a la terminal del grupo de terminales combinado con el bit de control del mensaje de designación de canal de tráfico para llamada de grupo.

39. Un método según la Reivindicación 22, en donde dicho paso de la comunicación comprende el paso de recibir un mensaje de confirmación de llamada de grupo que identifica una terminal de origen por el canal de tráfico común designado.

40. Un método según la Reivindicación 39, en donde dicho paso de la comunicación consiste además del paso de transmitir datos por el canal de tráfico común si el mensaje de confirmación de llamada de grupo recibido identifica la terminal.

41. Un sistema de comunicaciones inalámbricas que comprende:

medios para recibir un mensaje de origen de llamada de grupo de una terminal de origen;

medios, en respuesta a dichos medios para recibir un mensaje de origen de llamada de grupo, para transmitir un mensaje de designación de canal de tráfico para llamada de grupo dirigido a un grupo de terminales en respuesta al recibo del mensaje de origen de llamada de grupo; el mensaje de designación de canal de tráfico para llamada de grupo designa un canal de tráfico común; y

medios, en respuesta al canal de tráfico común, para comunicar entre terminales del grupo de terminales por el canal de tráfico común designado.

42. Un sistema según la Reivindicación 41, en donde dichos medios para recibir un mensaje de origen de llamada de grupo, dichos medios para transmitir un mensaje de designación de canal de tráfico para llamada de grupo y dichos medios para comunicar entre terminales comprenden una pluralidad de unidades de transceptor distribuidas.

43. Un sistema según la Reivindicación 42, en donde dicha pluralidad de unidades de transceptor comprenden una pluralidad de cabezas de radio.

44. Un sistema según la Reivindicación 42, en donde dichos medios para recibir un mensaje de origen de llamada de grupo, dichos medios para transmitir un mensaje de designación de canal de tráfico para llamada de grupo y dichos medios para comunicar entre terminales comprenden además:

una central de radio celular conectada a cada una de dicha pluralidad de unidades de transceptor distribuidas; y

un servidor de movilidad conectado a dicha central de radio celular.

45. Un sistema según la Reivindicación 41, en donde dichos medios para comunicar comprenden medios para dirigir comunicaciones semidúplex entre las terminales por el canal de tráfico común designado.

46. Un sistema según la Reivindicación 41, en donde el canal de tráfico común comprende una serie de intervalos en una banda de frecuencia portadora.

47. Un sistema según la Reivindicación 41, en donde dichos medios para comunicar comprenden medios para comunicar entre una de las terminales y una primera unidad de transceptor durante una llamada de grupo, y luego comunicar

entre esa una terminal y una segunda unidad de transceptor, sin que intervenga un traspaso.

48. Un sistema según la Reivindicación 41, en donde dichos medios para comunicar entre terminales comprenden medios para comunicar entre terminales del grupo en respuesta al recibo del mensaje de origen de llamada de grupo sin una búsqueda precedente de una terminal en el grupo de terminales.

49. Un sistema según la Reivindicación 41, en donde dichos medios para transmitir un mensaje de designación de canal de tráfico para llamada de grupo comprenden medios para transmitir un mensaje de designación de canal de tráfico para llamada de grupo por un canal de control.

50. Un sistema según la Reivindicación 49, en donde dichos medios para comunicar comprenden:

medios para recibir datos transmitidos de una del grupo de terminales por el canal de tráfico común designado en una unidad de transceptor de una pluralidad de unidades de transceptor distribuidas; y

medios, en respuesta a dichos medios para recibir datos, para transmitir los datos recibidos de la pluralidad de unidades de transceptor por el canal de tráfico común.

51. Un sistema según la Reivindicación 50, que además comprende medios para transmitir un mensaje de confirmación de llamada de grupo que identifica la terminal de origen por el canal de tráfico común designado antes de que los datos transmitidos de la terminal de origen sean transmitidos por el canal de tráfico común.

52. Un sistema según la Reivindicación 50:

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en donde dichos medios para recibir datos de esa una terminal comprenden medios para recibir un mensaje de desprendimiento transmitido de esa una terminal del grupo de terminales por el canal de tráfico común; y

en donde dichos medios para transmitir los datos recibidos comprenden medios, en respuesta a dichos medios para recibir un mensaje de desprendimiento, para transmitir un mensaje de desprendimiento de la pluralidad de unidades de transceptor por el canal de tráfico común.

53. Un sistema según la Reivindicación 52, en donde dichos medios para transmitir un mensaje de desprendimiento comprenden medios para transmitir un mensaje de desprendimiento que indica un intervalo de tiempo predeterminado durante el cual las terminales del grupo deben monitorear el canal de control en busca de un nuevo mensaje de designación de canal de tráfico para llamada de grupo.

54. Un sistema según la Reivindicación 49, en donde intervalos asignados al canal de control forman un hipermarco que comprende una pluralidad de supermarcos, y en donde dichos medios para transmitir un mensaje de designación de canal de tráfico para llamada de grupo comprenden medios para transmitir mensajes de designación de canal de tráfico para llamada de grupo en intervalos que ocurren periódicamente del canal de control que forman una pluralidad de submarcos dentro de un supermarco.

55. Un sistema según la Reivindicación 54, en donde dichos medios para transmitir un mensaje de designación de canal de tráfico para llamada de grupo comprenden medios para transmitir un mensaje de designación de canal de tráfico para llamada de grupo por un subcanal de búsqueda de llamada de grupo del canal de control.

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56. Un sistema según la Reivindicación 41, en donde dichos medios para transmitir un mensaje de designación de canal de tráfico para llamada de grupo comprenden medios para transmitir un mensaje de designación de canal de tráfico para llamada de grupo en un solo intervalo asignado a un canal de control.

57. Un sistema según la Reivindicación 56, en donde el mensaje de designación de canal de tráfico para llamada de grupo es dirigido con base en una identificación TMSI asignada a una terminal.

58. Un sistema según la Reivindicación 57, que además comprende medios para comunicar campos TMSI a terminales de manera tal que los valores TMSI asignados representados por los campos TMSI comunicados sean limitados a un valor menor o igual que un valor máximo representado por una porción menos significativa de un campo TMSI;

en donde el mensaje de designación de canal de tráfico para llamada de grupo incluye:

un campo de usuario incluye la porción menos significativa del campo TMSI comunicado a la terminal de origen combinado con un bit de control que indica si el mensaje de origen de llamada está solicitando una llamada de grupo;

un campo de usuario llamado que representa un valor TMSI asignado a una terminal del grupo de terminales; y

en donde dicho mensaje de designación de canal de tráfico para llamada de grupo incluye un campo de usuario llamado que incluye el valor TMSI asignado a la terminal del grupo de terminales combinado con el bit de control del mensaje de designación de canal de tráfico para llamada de grupo.

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59. Una terminal para uso en un sistema de comunicaciones inalámbricas que incluye una pluralidad de unidades de transceptor distribuidas, cada una de las cuales es operacional para comunicarse con terminales por una pluralidad de canales de comunicaciones, la terminal comprende:

medios para recibir un mensaje de designación de canal de tráfico para llamada de grupo dirigido a la terminal; el mensaje de designación de canal de tráfico para llamada de grupo recibido designa un canal de tráfico común; y

medios, en respuesta a dichos medios para recibir, para comunicar con una pluralidad de otras terminales por el canal de tráfico común designado.

60. Una terminal según la Reivindicación 59, en donde el canal de tráfico común comprende una serie de intervalos en una banda de frecuencia portadora.

61. Una terminal según la Reivindicación 59, en donde dichos medios para comunicar comprenden medios para comunicarse con una pluralidad de otras terminales por el canal de tráfico común en respuesta al mensaje de designación de canal de tráfico para llamada de grupo recibido sin recibir una búsqueda.

62. Una terminal según la Reivindicación 59, que además comprende medios para transmitir un mensaje de origen de llamada de grupo en respuesta a una entrada por parte de un usuario.

63. Una terminal según la Reivindicación 62, que además comprende un dispositivo PTT operacional para recibir la entrada del usuario.

64. Una terminal según la Reivindicación 59, en donde dichos medios para recibir un mensaje de designación de canal de tráfico para llamada de grupo

comprenden medios para recibir un mensaje de designación de canal de tráfico para llamada de grupo por un canal de control.

65. Una terminal según la Reivindicación 64, que además comprende:

medios para recibir un mensaje de desprendimiento por el canal de tráfico común; y

medios en respuesta a dichos medios para recibir un mensaje de desprendimiento, para monitorear en respuesta el canal de control para un nuevo mensaje de designación de canal de tráfico para llamada de grupo.

66. Una terminal según la Reivindicación 65, en donde dichos medios para monitorear el canal de control comprenden medios para monitorear el canal de control a una primera velocidad no mayor que el intervalo predeterminado luego de que reciba un mensaje de desprendimiento por el canal de tráfico común, y para luego monitorear el canal de control a una segunda velocidad menor que la primera si el intervalo predeterminado termina sin recibir un nuevo mensaje de designación de canal de tráfico para llamada de grupo.

67. Una terminal según la Reivindicación 66, en donde dichos medios para recibir un mensaje de desprendimiento comprenden medios para recibir un mensaje de desprendimiento indicando el intervalo de tiempo predeterminado.

68. Una terminal según la Reivindicación 64, en donde intervalos asignados al canal de control forman un hipermarco que comprende una pluralidad de supermarcos, y que además comprenden medios para monitorear intervalos del canal de control que forman una pluralidad de submarcos dentro de cada supermarco.

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69. Una terminal según la Reivindicación 68, en donde dichos medios para monitorear comprenden medios para monitorear un subcanal de búsqueda del canal de control.

70. Una terminal según la Reivindicación 66, en donde un canal de control comprende una serie de intervalos en una banda de frecuencia portadora, y en donde dichos medios para recibir un mensaje de designación de canal de tráfico para llamada de grupo comprenden medios para recibir un mensaje de designación de canal de tráfico para llamada de grupo en un solo intervalo asignado al canal de control.

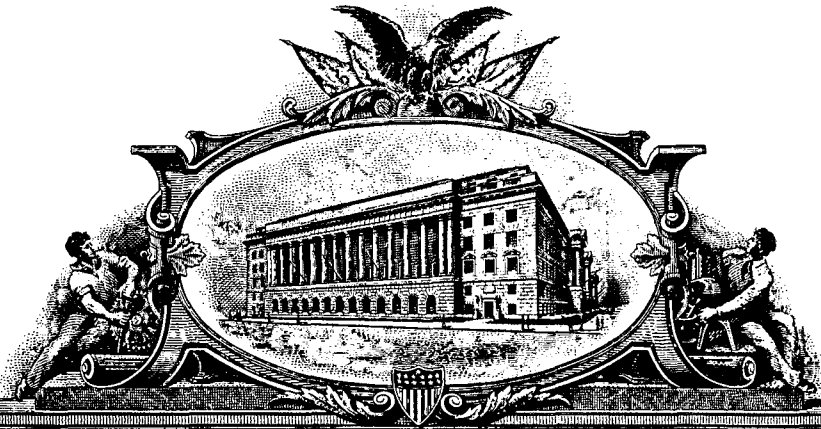
71. Una terminal según la Reivindicación 70, en donde dichos medios para recibir un mensaje de designación de canal de tráfico para llamada de grupo comprenden medios para recibir un mensaje de designación de canal de tráfico dirigido a la terminal con base en una identificación TMSI asignada a la terminal.

72. Una terminal según la Reivindicación 71, en donde el sistema de comunicaciones inalámbricas comunica campos TMSI a terminales atendidas por el sistema de comunicaciones inalámbricas para con ello asignar valores TMSI a las terminales, de tal manera que los valores TMSI asignados representados por los campos TMSI comunicados sean limitados a un valor menor o igual a un valor máximo representado por una porción menos significativa, en donde el mensaje de designación de canal de tráfico para llamada de grupo incluye un campo de usuario que incluye la porción menos significativa del campo TMSI comunicado a la terminal de origen combinado con un bit de control que indica si el mensaje de origen de la llamada está solicitando una llamada de grupo, y un campo de usuario llamado que representa un valor TMSI asignado a una terminal del grupo de terminales, y en donde dicho mensaje de designación de canal de tráfico para llamada de grupo incluye un campo de usuario llamado que incluye el valor TMSI

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asignado a la terminal del grupo de terminales combinado con el bit de control del mensaje de designación de canal de tráfico para llamada de grupo.

73. Una terminal según la Reivindicación 59, en donde dichos medios para comunicar comprenden medios para recibir un mensaje de confirmación de llamada de grupo identificando una terminal de origen por el canal de tráfico común designado.

74. Una terminal según la Reivindicación 73, en donde dichos medios para comunicar comprenden además medios para transmitir datos por el canal de tráfico común si el mensaje de confirmación de llamada de grupo identifica la terminal.



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THE UNITED STATES OF AMERICA

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UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

July 27, 2000

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: 09/309,012

FILING DATE: May 10, 1999



**By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS**

H. Phillips
H. PHILLIPS
Certifying Officer

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PATENT
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09/309012
05/10/99
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY DOCKET NO.: 8194-267
DATE: May 10, 1999

UTILITY PATENT APPLICATION TRANSMITTAL LETTER
AND FEE TRANSMITTAL FORM (37 CFR 1.53(b))

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Transmitted herewith for filing under 37 CFR 1.53(b) is:

- ☒ a patent application
☐ a Continuation ☐ a Divisional ☐ a Continuation-in-Part (CIP)
of prior application no.: ; filed .
☐ A Small Entity Statement(s) was filed in the prior application; Status still proper and desired.

Inventor(s) or Application Identifier:

Timothy E. Dailey
Forest, Virginia

Entitled: APPARATUS AND METHODS FOR CONDUCTING GROUP CALLS IN WIRELESS
COMMUNICATIONS SYSTEMS

Enclosed are:

1. ☒ Application Transmittal Letter and Fee Transmittal Form (*A duplicate is enclosed for fee processing*)
2. ☒ 32 pages of Specification (including 74 claims)
3. ☒ 9 sheets of Informal Drawings (35 USC 113)
4. ☒ Oath or Declaration
 - a. ☒ newly executed (*original or copy*)
 - b. ☐ copy from prior application (37 CFR 1.63(d) (*for continuation/divisional*) [Note Box 5 Below]
 - c. ☐ DELETION OF INVENTOR(S) (*Signed statement deleting inventor(s) named in the prior application*)
5. ☐ Incorporation By Reference (*useable if box 4b is checked*)

The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. ☐ Microfiche Computer Program (*Appendix*)
7. ☒ Assignment papers (*cover sheet(s) and document(s)*)
8. ☐ Small Entity Statement(s)
9. ☐ Information Disclosure Statement, PTO-1449, and references cited
10. ☒ Preliminary Amendment (*Please enter all claim amendments prior to calculating the filing fee.*)
11. ☐ English Translation Document
12. ☐ Certified Copy of

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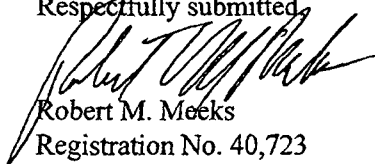
13. ☐ Sequence Listing/ Sequence Listing Diskette
a. ☐ computer readable copy
b. ☐ paper copy
c. ☐ statement in support
14. ☐ An Associate Power of Attorney
15. ☒ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
16. ☐ Other:

The fee has been calculated as shown below:

	Column 1 No. Filed	Column 2 No. Extra	Small Entity Rate Fee	Large Entity Rate Fee
BASIC FEE			\$380.00	\$760.00
TOTAL CLAIMS	74 - 20 =	54	x 09 = \$	x 18 = \$972.00
INDEP CLAIMS	4 - 3 =	1	x 39 = \$	x 78 = \$78.00
☐ MULTIPLE Dependent Claims Presented			+ 135 = \$	+ 270 = \$
If the difference in Col. 1 is less than zero, Enter "0" in Col. 2			Total \$	Total \$1,810.00

- ☐ A check in the amount of \$ to cover the filing fee is enclosed.
- ☒ A check in the amount of \$1,850.00 is enclosed to cover the filing fee, PLUS the Assignment Recordation fee (\$40.00).
- ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 50-0220.
- ☒ Any additional filing fees required under 37 CFR 1.16.
- ☒ Any patent application processing fees under 37 CFR 1.17.

Respectfully submitted,


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CERTIFICATE OF EXPRESS MAILING

Express Mail Label No. EL299764700US
Date of Deposit: May 10, 1999

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Candi L. Riggs
Date of Signature: May 10, 1999

Attorney's Docket No. 8194-267

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Timothy E. Dailey

Serial No.: To Be Assigned

Filed: Concurrently Herewith

For: APPARATUS AND METHODS FOR CONDUCTING GROUP CALLS IN
WIRELESS COMMUNICATIONS SYSTEMS

May 10, 1999

BOX PATENT APPLICATION

Assistant Commissioner for Patents

Washington, DC 20231

PRELIMINARY AMENDMENT

Dear Sirs:

Please amend the above-identified application as follows:

IN THE SPECIFICATION:

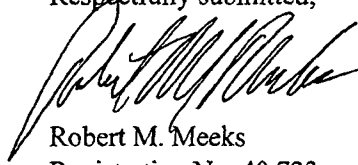
On page 1 under the heading **Related Applications**, please replace the text with the following:

--This application is related to: Application Serial No. _____
(Attorney Docket No. 8194-255) entitled *Methods and Systems for Providing Group Calls with Reduced Setup Times*; Application Serial No. _____ (Attorney Docket No. 8194-257) entitled *Methods And Systems For Providing Temporary Identification Numbers For Mobile Terminals*; Application Serial No. _____ (Attorney Docket No. 8194-268) entitled *Methods, Systems, and Terminals for Assigning Control Channel Time Slots for Group and Individual Pages*; and Application Serial No. _____ (Attorney Docket No. 8194-271) entitled *Methods, Systems, and Terminals for Providing Group Communications over a Common Traffic Channel*. Each of these applications are being filed concurrently with the present application, each of these applications have common inventorship,

Timothy E. Dailey
Serial No. To Be Assigned
Filed Concurrently Herewith
Page 2

and each of these applications are assigned to Ericsson, Inc. In addition, the disclosures of each of these applications are hereby incorporated herein by reference.--

Respectfully submitted,



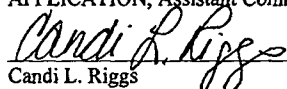
Robert M. Meeks
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CERTIFICATE OF EXPRESS MAILING

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Candi L. Riggs
Date of Signature: May 10, 1999

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**APPARATUS AND METHODS FOR CONDUCTING GROUP CALLS IN
WIRELESS COMMUNICATIONS SYSTEMS**

Related Applications

This application is related to: Application Serial No. _____
(Attorney Docket No. 8194-255) entitled *Methods and Systems for Providing Group
Calls with Reduced Setup Times*; Application Serial No. _____ (Attorney
Docket No. 8194-257) entitled *Methods And Systems For Providing Temporary
Identification Numbers For Mobile Terminals*; Application Serial No. _____
(Attorney Docket No. 8194-268) entitled _____; Application
Serial No. _____ (Attorney Docket No. 8194-271) entitled
_____; and Application Serial No. _____ (Attorney
Docket No. 8194-_____) entitled _____. Each of these
applications are being filed concurrently with the present application, each of these
applications have common inventorship, and each of these applications are assigned
to Ericsson, Inc. In addition, the disclosures of each of these applications are hereby
incorporated herein by reference.

Field of the Invention

The present invention relates to wireless communications systems (apparatus)
and methods, and more particularly, to systems and methods for communicating
among terminals in wireless communication systems.

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Background of the Invention

Wireless communications systems are commonly employed to provide voice
and data communications to subscribers. For example, analog cellular radiotelephone
systems, such as those designated AMPS, ETACS, NMT-450, and NMT-900, have
been long been deployed successfully throughout the world. Digital cellular
10 radiotelephone systems such as those conforming to the North American standard IS-
54 and the European standard GSM have been in service since the early 1990's. More
recently, a wide variety of wireless digital services broadly labeled as PCS (Personal
Communications Services) have been introduced, including advanced digital cellular

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systems conforming to standards such as IS-136 and IS-95, lower-power systems such as DECT (Digital Enhanced Cordless Telephone) and data communications services such as CDPD (Cellular Digital Packet Data). These and other systems are described in *The Mobile Communications Handbook*, edited by Gibson and published by CRC Press (1996).

Included among the wireless communications systems in use today are low-power private wireless systems that are used to cover a limited geographic area, such as office, a building or a campus. An example of such a private wireless system is the Digital Wireless Office System (DWOS) developed by Ericsson Inc., the assignee of the present invention. As illustrated in Fig. 1, the DWOS 110 is designed for use by wireless terminals 150 that are also configured to access a public cellular network 130, such as a cellular network complying with IS-41, IS-136 or other standards. The DWOS 110 includes a plurality of radio heads 118, i.e., transceiver units that function in a manner similar to base stations of the public cellular network 130. The radio heads 118 are networked with a private cellular radio exchange (CRE) 114 that handles air interface and switching functions, and a mobility server 116 that provides such functions as home location registration, authentication, interfacing the DWOS to the public cellular network 130, as well as other operation and maintenance functions. The DWOS 110 also includes one or more scanning heads 119, receiver units that monitor the radio frequency (RF) environment and determine which frequencies the DWOS 110 can use with the least interference. The DWOS 110 also includes a public exchange (PBX) that connects the radio infrastructure to regular wireline telephones 111 and to the public switched telephone network (PSTN) 120.

The Ericsson DWOS system described is specifically designed to operate according to an IS-136 time division multiple access (TDMA) air interface. An IS-136 TDMA system is implemented by communicating over a plurality of carrier frequency bands during repeating series of time slots, with each repeating series of time slots constituting a "physical channel." "Logical channels" are mapped onto the physical channels by assigning selected slots of a physical channel to selected channels in repeating frame, superframe and hyperframe structures, in a manner well known to those skilled in the art.

Typically included among the channels are dedicated control channels, including forward (downlink) control channels for conveying information from base stations (or radio heads, in the DWOS) to terminals, and reverse control channels for

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conveying information from terminals to base stations. The information broadcast on a forward control channel may include such things as an identification of a geographic cell served by a transmitting base station, and associated network identification, system timing and other information needed to access the wireless system. Reverse control channels are typically used for transmitting access requests and page acknowledgments from terminals.

An exemplary slot allocation utilized by wireless systems complying with the IS-136 standard is illustrated in Fig. 2. For groups of three repeating slots on the uplink and downlink carrier frequency bands used by a base station, a "slot pair" on one pair of carrier frequency bands is reserved for the provision of a forward (downlink) Digital Control Channel (FDCCH) and a reverse (uplink) DCCCH (RDCCH). Other slot pairs may be assigned to Digital Traffic Channels (DTCs), i.e., channels assigned to particular terminals on a dynamic basis for communication of voice or other data.

As illustrated in Fig. 3, an IS-136 FDCCH has a plurality of logical channels mapped thereon, including a multiplexed Broadcast Channel (BCCH) designed to convey information about system configuration and system access rules, and a multiplexed point-to-point short message service (SMS), paging and access response channel (SPACH). The BCCH is further divided into a Fast Broadcast Channel (F-BCCH) for conveying time-critical information such as system identification (ID) and registration information, an Extended Broadcast Channel (E-BCCH) for conveying less time critical information such as neighboring cell lists, and an SMS Broadcast Channel (S-BCCH). The SPACH comprises a short message service channel (SMSCH) for carrying messages, a paging channel (PCH) for conveying system pages, and an access response channel (ARCH) for providing system response to queries from subscriber units and other administration information. A Shared Channel Feedback (SCF) field contains information about the reservation status of an associated Random Access Channel (RACH) on the RDCCH. The RACH is used by terminals to transmit requests to access the wireless system.

A call between terminals 150 in a standard wireless system such as the DWOS 110 of Fig. 1 is typically initiated by one of the terminals 150 transmitting a call origination message that identifies the number the originating terminal desires to call. This origination message is received by one of the radio heads 118, and conveyed to other elements of the DWOS for authorization and traffic channel designation. Once

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the call request is authorized, the system transmits a traffic channel designation message to the originating terminal, designating a traffic channel for use by that terminal. The DWOS 110 also transmits a page message addressed to the called terminal from selected radio heads 118, typically based on location information maintained by the mobility server 116. The called terminal acknowledges the page by transmitting a page acknowledgment message, which typically is received by more than one of the radio heads. Typically based on relative signal strengths of the acknowledgments received at the radio heads, one of the radio heads is selected to communicate with the called terminal, and an appropriate traffic channel designation message is transmitted to the called terminal, designating a traffic channel for its use.

Communications between the terminals are then conducted over the designated traffic channels. During the call, both voice and control information may be communicated over the designated channels using so-called "in-band" signaling channels mapped onto the designated traffic channels. Signals communicated over the designated traffic channels are also typically monitored for signal quality. This in-band signaling and monitoring is typically used to guide handoffs as terminals 150 move among areas served by different radio heads 118.

This call setup procedure may also be used to setup a group call among more than two terminals. However, the above-described call setup procedure may be too cumbersome for some group call applications, such as emergency police or other safety applications, due to the overhead associated with paging multiple terminals.

Summary of the Invention

In light of the foregoing, it is an object of the present invention to provide efficient apparatus and methods for group calling.

It is another object of the present invention to provide apparatus and methods for group calling in a private wireless system.

These and other objects, features and advantages are provided according to the present invention by wireless communications apparatus and methods in which a group call among terminals is conducted, preferably in a half-duplex manner, over a common traffic channel. For example, in a private wireless system comprising a plurality of synchronized distributed transceiver units or radio heads, voice data can be communicated to terminals over a common physical channel, i.e., frequency/time slot.

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5 A user at an originating terminal of a predefined group may initiate a group call to other terminals in the group by transmitting a group call origination message, preferably one having a special abbreviated format, on a reverse control channel. The call origination message may be transmitted, for example, in response to actuation of a push-to-talk (PTT) device on the originating terminal. The system may respond to the group call origination message by transmitting a group call traffic channel designation message, also preferably having an abbreviated format, to the other terminals in the group over a forward control channel, without paging the other terminals in the group. In response to receipt of the traffic channel designation messages, the terminals may tune to the designated traffic channel and await an in-band confirm message that indicates which of the terminals has been designated to speak on the common channel. When the user at the designated terminal releases the traffic channel, e.g., by releasing the PTT button on the terminal, a user at another terminal in the group can gain control of the common channel by, for example, depressing the PTT button at that terminal and causing a new group call origination message to be transmitted from the terminal.

10 According to a "transmission trunking" aspect of the present invention, a terminal in control of the common traffic channel indicates relinquishment of the common channel by transmitting a release message that is communicated over the common channel to the other terminals of the group. When a terminal of the group receives a release message over the common traffic channel, it preferably jumps back to the control channel and actively monitors (e.g., on a slot-by-slot basis) the control channel for new group traffic channel designation messages, thus freeing the common traffic channel for other users. If a terminal in the group receives a new group call traffic channel designation message within a predetermined "hang time" following the release message, it tunes to the common traffic channel designated in the new designation message and the group call continues over the newly designated common traffic channel. If a terminal in the group fails to receive a new group call traffic channel designation message within the hang time, however, the terminal can assume that the group call has terminated and can transition to a power-saving sleep mode.

20 Other aspects of the present invention can further increase group call setup efficiency. A special group call "paging" subchannel may be defined that includes slots that repeat multiple times in a "normal" control channel superframe, thus providing a subframe structure within the superframe. The increase frequency of the

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slots of such a group call paging channel in comparison to normal paging channels can allow group-call enabled terminals to more quickly receive traffic channel designation messages, and can thus reduce group call setup times. Even greater efficiency can be gained by using a compressed addressing scheme that allows a group call origination or a group call traffic channel designation message to be transmitted in a single slot, while maintaining compatibility with terminals that are not group call enabled.

The present invention can provide ways to quickly and efficiently establish and conduct group calls. By using half-duplex communications over a common traffic channel, the overhead associated with normal call setup and control procedures can be avoided. For example, pages and page acknowledgments need not be transmitted to establish a group call, and handoffs need not occur as a terminal moves across a coverage boundary during a call. Addition efficiency may be gained using the special group call paging channels and compressed message formats. In some system, e.g., in private systems in which security is less important, additional economy can be gained by setting up group calls without authentication procedures that are typically used for "regular" calls.

In particular, according to the present invention, a group call is conducted in a wireless communications system including a plurality of distributed transceiver units, e.g., radio heads of a private wireless system, each of which are operative to communicate with terminals over a plurality of communications channels. A group call origination message is transmitted from an originating terminal, preferably in response to a user input at the originating terminal, more preferably in response to actuation of a push-to-talk (PTT) device at the originating terminal. The transmitted group call origination message is received at a transceiver unit and, in response, a group call traffic channel designation message addressed to a group of terminals is transmitted from the transceiver units, the transmitted group call traffic channel designation message designating a common traffic channel. Communications then occur among terminals of the group of terminals, preferably in half-duplex mode, over the designated common traffic channel.

According to an aspect of the present invention, a group call traffic channel designation message is transmitted over a control channel which terminals of the group actively monitor when no data is being transferred over the common traffic channel. Data is transmitted from one of the group of terminals over the common

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traffic channel and received at a transceiver unit. The received data is then transmitted from the plurality of transceiver units over the common traffic channel. Transmission of the received data may then be followed by transmission of a release message from the plurality of transceiver units over the common traffic channel. In response to receipt of the release message, the terminals monitor the control channel for a new group call traffic channel designation message, thus freeing the common traffic channel for other use.

According to another aspect of the present invention, slots assigned to control channels make up a hyperframe comprising a plurality of superframes. Group call enabled terminals monitor a set of periodically occurring slots in a plurality of subframes within a superframe at a terminal, e.g., slots assigned to a special group call paging subchannel of the control channel, such that these terminals can receive traffic channel designation messages in a more timely fashion than ordinary pages.

According to another aspect of the present invention, a group call confirm message is transmitted over the common traffic channel prior to transmission of data received from one of the terminals of the group. The confirm message identifies the originating terminal, thus allowing the terminals to determine which terminal should transmit over the common traffic channel.

According to still another aspect of the present invention, the control channel comprises a series of slots on a carrier frequency band, and a group call traffic channel designation message is transmitted in a single slot assigned to the control channel. The group call traffic channel designation message may be addressed based on a Temporary Mobile System Identification (TMSI) assigned to a terminal by the wireless communications system in order to fit the message into a single slot. Preferably, a least significant portion of a TMSI field is used to allow group-call enabled terminals to send and receive group call control information in a manner which is compatible with addressing of non-group call enabled terminals.

According to yet another aspect of the present invention, a terminal transitions from active monitoring of the control channel to a sleep mode if a predetermined time interval following receipt of a release message elapses without receipt of a new group call traffic channel designation message on the control channel. The predetermined interval may be indicated in a release message received over the common traffic channel. If a new group call traffic channel designation message designating the same or a new common traffic channel is received at the terminals of the group before lapse

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of the predetermined interval, however, the group call may resume on the second designated traffic channel. The new group call traffic channel designation message may be transmitted in response to a call origination message transmitted by a terminal of the group, e.g., in response to a user at one of the terminals depressing a PTT button to take control of the group call.

In another embodiment according to the present invention, a wireless communications system comprises means for receiving a group call origination message from an originating terminal. Means are provided, responsive to the means for receiving a group call origination message, for transmitting a group call traffic channel designation message addressed to a group of terminals in response to receipt of the group call origination message, the transmitted group call traffic channel designation message designating a common traffic channel. Means are also provided, responsive to the common traffic channel, for communicating among terminals of the group of terminals over the designated common traffic channel. The means for receiving a group call origination message, the means for transmitting a group call traffic channel designation message and the means for communicating among terminals preferably comprise a plurality of distributed transceiver units, a cellular radio exchange connected to each of the plurality of distributed transceiver units, and a mobility server connected to the cellular radio exchange.

In another embodiment according to the present invention, a terminal for use in wireless communications systems includes means for receiving a group call traffic channel designation message addressed to the terminal, the received group call traffic channel designation message designating a common traffic channel; and means, responsive to the means for receiving, for communicating with a plurality of other terminals over the designated common traffic channel. The terminal may further comprise means for transmitting a group call origination message responsive to a user input.

Improved methods, systems and terminals for conducting wireless group calls may thereby be provided.

Brief Description of the Drawings

Fig. 1 illustrates a private wireless communications system according to the prior art.

Fig. 2 illustrates physical channel assignment for a time division multiple access (TDMA) wireless communications system according to the prior art.

Fig. 3 illustrates logical control channel assignments for a wireless communications system according to the prior art.

Figs. 4-5 illustrate a wireless terminal in which group calling methods and apparatus may be embodied according to the present invention.

Fig. 6 illustrates a private wireless system in which group calling methods and apparatus may be embodied according to the present invention.

Fig. 7 illustrates exemplary group calling operations according to an aspect of the present invention.

Fig. 8 illustrates exemplary group calling operations according to another aspect of the present invention.

Fig. 9 illustrates exemplary call origination and traffic channel designation message formats according to an aspect of the present invention.

Fig. 10 illustrates an exemplary frame structure according to an aspect of the present invention.

Detailed Description of Embodiments

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

Fig. 4 illustrates a wireless terminal 400 in which apparatus and methods according to the present invention may be embodied. The terminal 400 includes an antenna 410 for receiving radio frequency (RF) signals. The terminal 400 provides a user interface including a display 420 for displaying information such as dialed numbers, short messages, directory listings and the like, and a keypad 430 for entering dialed numbers and accepting other user inputs for controlling the terminal 400. The user interface also includes a speaker 440 for producing audio signals and a microphone 450 for receiving voice information from a user. As shown in Fig. 5, the terminal 400 also includes a controller 470 that controls and/or monitors the display

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420, the keypad 430, the speaker 440, the microphone 450 and a radio transceiver 480 tied to the antenna 410. The controller 470 may comprise, for example, a microprocessor, microcontroller or other data processing device that is operative to load and execute computer instructions for performing the group call functions described herein.

The terminal 400 also includes a push-to-talk (PTT) button 460, operatively associated with the controller 470 and used to initiate and conduct group calls as described herein. Those skilled in the art will appreciate that the PTT button 460 is a feature commonly provided on so-called "land mobile radio" terminals that are typically used by police, fire, security and similar personnel who desire the ability to communicate with predetermined groups of terminals in a dispatch mode, e.g., with other police officers or firemen, without having to enter a telephone number at the keypad 430. According to an aspect of the present invention, receipt of a user input at the PTT device 460 initiates a sequence of operations in which a call to a predetermined group of terminals is set up, all of which may occur without input at the keypad 430. According to other aspects of the present invention, the PTT device 460 controls half-duplex communications among terminals in a group call.

Fig. 6 illustrates an exemplary DWOS system 600 in which methods and apparatus of the present invention may be embodied. The DWOS system includes a plurality of distributed transceiver units 618, e.g., radio heads, that are networked with a cellular radio exchange (CRE) 614 and a mobility server 616. The transceiver units 618, in conjunction with the CRE 614 and the mobility server 616 are operative to communicate with wireless terminals 400 located throughout the coverage area served by the system 600 and, in particular, are operative to establish, conduct and terminate group calls among the terminals 400 as described in detail below.

The DWOS 110 described herein provides a system operator with the capability to operate an IS-136 "cell" to cover premises, such as a building or campus. Standard IS-136 terminals can access this private cell, making calls without using the public cellular network. The DWOS 110 typically provides coverage with a number of very low power radio heads (transceiver units). Each radio head typically supports a number of carrier frequency bands, which are divided into TDMA time slots to produce physical channels. One of the physical channels typically is dedicated to a Digital Control Channel (DCCH), which typically is broadcast by all of the radio heads all of the time. The radio heads are typically synchronized such that DCCH

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signals broadcast by one radio head do not unduly interfere with DCCH signals transmitted by other radio heads. The ultimate effect of this DCCH synchronization is to present a "single" DCCH to terminals roaming about the area covered by the radio heads, such that the system appears to the terminals as a single IS-136 cell.

5 Figs. 7 and 8 are flowchart illustrations illustrating exemplary operations for establishing, conducting and terminating a group call according to aspects of the present invention. It will be understood that blocks of the flowchart illustrations of Figs. 7 and 8, and combinations of blocks in the flowchart illustrations, can be implemented by computer program instructions which may be loaded onto a computer
10 or other programmable data processing apparatus, such as the controller 470 of the terminal 400 of Figs. 4 and 5 and the CRE 614 and mobility server 616 of the DWOS 600 of Fig. 6, to produce a machine such that the instructions which execute on the computer or other programmable data processing apparatus create means for implementing the functions specified in the flowchart block or blocks. The computer
15 program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational steps to be performed on the computer or other programmable apparatus to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions specified in the
20 flowchart block or blocks.

Accordingly, blocks of the flowchart illustrations of Figs. 7 and 8 support combinations of means for performing the specified functions and combinations of steps for performing the specified functions. It will also be understood that each block of the flowchart illustrations of Figs. 7 and 8, and combinations of blocks
25 therein, can be implemented by special purpose hardware-based computer systems which perform the specified functions or steps, or combinations of special purpose hardware and computer instructions.

Fig. 7 illustrates exemplary operations 700 for conducting a group call in a wireless system such as the system 600 of Fig. 6 using wireless terminals such as the
30 terminal 400 of Figs. 4-5. A group call origination message is transmitted from an originating terminal (Block 705). The transmitted group call origination message is received at one of the system transceiver units (Block 705). In response, the system transmits a traffic channel designation message addressed to terminals in the group associated with the group call origination message, identifying a common traffic

channel over which the group call is to be conducted (Block 715). Communications are then conducted among the group of terminals over the designated common traffic channel (Block 720).

The present invention arises from the realization that, for group calls in a system such as the DWOS system described above, it is desirable to use a single transmit/receive frequency pair (traffic channel) for all terminals of a group, rather than a separate pair for each terminal of the group, resulting in the use of fewer channels for the group call. Preferably, the communications among the group of terminals are conducted in a half-duplex mode, i.e., one terminal talks while the others listen. However, in order to provide handoffs as terminals move from an area served by one radio head to another area served by another radio head, information typically must be transmitted over the traffic channel by the terminal. Since most terminals of the group are not transmitting at any given time during a half-duplex group call, information needed for handoffs for these terminals typically cannot be transmitted by these terminals.

According to an aspect of the present invention, the inability to perform handoffs is addressed by conducting the group call over a common traffic channel, preferably from all of the transceiver units of the system. Because the group call is transmitted over a common traffic channel in several cells, a terminal can move from a cell served by one transceiver unit to another cell served by another transceiver unit without losing the group call and without requiring a handoff. Preferably, the transceiver units of the system are sufficiently synchronized to prevent undue interference among the transceiver units.

Because a group call is broadcast in several cells simultaneously on a common channel, there is no requirement that the system page the terminals of the group. This can reduce the overhead involved in setting up a group call, as a group call can be setup by simply receiving a predetermined type of call origination message from a terminal of a group, and responsively transmitting a group call traffic channel designation message to the other terminals of the group. In the DWOS 110 described above, this can be achieved by transmitting the group call traffic channel designation message over a paging subchannel mapped onto the common control channel (DCCH) that is broadcast by each radio head 118 of the system 110. Terminals receiving a group call traffic channel designation message can then simply tune to the traffic channel designated in the message, e.g., to the frequency/slot identified in the

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message, and await reception of voice data over the common traffic channel. Preferably, no ring will occur at these terminals; they simply will unmute their speakers and begin generating audio signals upon receipt of voice data over the common traffic channel. Preferably, the terminals incorporate a speaker and amplifier sufficient to allow the user to hear commencement of the group call while the terminal is located in a position away from the user's ear, such as on the user's belt.

Because the group call is preferably broadcast by all the transceivers of the system, the common traffic channel preferably is allocated in a manner that minimizes idle time on the traffic channel. According to another aspect of the present invention, a "transmission trunking" technique is used to reduce system loading during a group call by releasing the common traffic channel when none of the terminals of the group is talking. Fig. 8 illustrates exemplary operations 800 for conducting a group call according to this transmission trunking aspect. A group call is originated using, for example, the operations of Fig. 7 (Block 805). After designation of the common traffic channel, a confirm message is transmitted to the terminals of the group over the designated common traffic channel (Block 810).

An exemplary format for the confirm message is given in Table I:

Table I

Information Element	Type	Length (bits)
Protocol Discriminator	M	2
Message Type	M	8
BSMC	M	8
Caller	M	14

Confirm messages preferably are Fast Associated Control Channel (FACCH) messages that are repeatedly transmitted by the transceiver units of the system over the common traffic channel until the originating terminal begins to transmit voice or other data over the common traffic channel. The Base Station Manufacturer's Code (BSMC) is used to create a new message type that is compatible with IS-136. Confirm messages also preferably include the 14-bit identification of the originating terminal taken from the group call origination message transmitted by the originating terminal. This addressing technique is described in greater detail below with respect

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to compressed message formats for the group call origination and the group call traffic channel designation message.

A confirm message identifies the originating terminal, i.e., the terminal that transmitted the group call origination message accepted by the system, so that any other terminals who may have transmitted a group call origination message around the same time that the originating terminal's message was received can be informed that they did not "win" the traffic channel. For example, a terminal receiving a confirm message identifying itself as the originating terminal may receive an audible beep or similar indication that the terminal can proceed to transmit voice information over the common traffic channel. Conversely, terminals receiving a confirm message identifying another terminal as the originating terminal may receive no indication.

After receiving a confirm message that identified itself, the originating terminal can proceed to communicate data, e.g., voice data, to a system transceiver unit over the common traffic channel (Block 815). For example, this may be accomplished by the originating user continuing to actuate the PTT button on the originating terminal and talking into the microphone of the originating terminal, causing the originating terminal to generate voice data and transmit the generated voice data to a system transceiver unit over the common traffic channel. The voice data is then communicated from the transceiver units of the system to the other terminals of the group on the common traffic channel (Block 820). If the user at the originating terminal finishes talking and indicates relinquishment of the common channel by, for example, releasing the PTT button on the terminal, a release message is generated by the originating terminal and communicated through the system to the other terminals of the group over the common traffic channel (Block 825). Upon receipt of a release message, each of the terminals transitions to monitoring the control channel to await a new traffic channel designation message (Block 830).

An exemplary format for the release message is provided in Table II:

Table II

Information Element	Type	Length (bits)
Protocol Discriminator	M	2
Message Type	M	8
BSMC	M	8
Hang time in seconds	M	6

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As with confirm messages, release messages preferably are Fast Associated Control Channel (FACCH) messages, and preferably use the Base Station Manufacturer's Code (BSMC) to create a new message type that is compatible with IS-136.

5 Preferably, a terminals engaged in a group call monitors the control channel in an "awake" mode for a predetermined "hang time" after receiving a release message, preferably at a higher rate than the terminal normally would monitor the control channel in its sleep mode, wherein it may only monitor a selected assigned paging channel or set of paging channels in order to conserve energy. For example, a terminal in sleep mode may monitor an assigned paging subchannel, such as the group

10 call paging subchannel described in detail below, and may monitor each paging subchannel mapped onto the control channel, or some subset thereof. Accordingly, terminals in the awake mode can more quickly receive and respond to group call traffic channel designation messages to resume a group call. The hang time for the awake mode may, for example, be preprogrammed in the terminals or communicated

15 to the terminals in release messages or other control messages.

A new traffic channel designation message may be transmitted over the control channel in response to transmission of a group call origination message transmitted by one of the group terminals in response to a user pressing its PTT button. If a new group call origination message is transmitted by one of the terminals

20 and causes generation of a new group call traffic channel designation message on the control channel that is received before the hang time elapses, the group call resumes with the transmission of confirmation messages over the common traffic channel designated in the newly generated traffic channel designation messages (Block 810). The new group call traffic channel designation message can identify a new traffic

25 channel (e.g., a new frequency/time slot), or may redesignate the previously designated traffic channel. If no new traffic channel designation messages are received within the hang time, the terminals assume that the group call has terminated and transition to back to a power-saving standby mode (Block 835).

According to another aspect of the invention, group call set up times can be

30 further reduced (in comparison to normal call setup procedures) by utilizing special group call paging subchannels that include slots that repeat multiple times in a control channel superframe, as illustrate in Fig. 9. An exemplary control channel frame structure 900 includes a hyperframe 910, e.g., an IS-136 Digital Control Channel (DCCH) hyperframe, includes a primary and second superframes 920, each

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comprising slots O allocated to physical layer overhead and a plurality of slots assigned to various logical control channels including paging subchannels P. As terminals engaged in a group call do not require paging, group call traffic channel designation messages can be transmitted in selected paging channel slots 935 that make up higher-frequency subframes 930 within the superframes 920.

A group call enabled terminal monitors one or more paging channel slots assigned to the transmission of group call traffic channel designation messages for the presence of a new group call traffic channel designation message. Because the slots assigned to group call traffic channel designation messages occur more frequently than slots assigned to a single normal paging subchannel, traffic channel designation messages can be more quickly presented to a group than normal pages.

Consequently, a terminal monitoring these slots can avoid delay associated with communicating normal traffic channel designation messages to a terminal in sleep mode. Supervisory terminals, i.e., terminals operative to monitor several different groups, can monitor multiple group calls by monitoring each of the paging subchannel slots that are assigned to the transmission of group call traffic channel designation messages.

According to yet another aspect of the present invention, additional economy can be achieved by using a compressed format for group call origination messages and/or group call traffic channel designation messages. Fig. 10 illustrates compressed format group call origination and group call traffic channel designation messages 1010, 1020 that are designed for transmission in a single slot. Such single slot messages can reduce access time, increase robustness of the system and reduce loading on the control channel. Robustness may be improved because of a reduced likelihood of corruption in comparison to the two-slot call origination messages typically used in IS-136 systems. In a group call scenario, origination and designation messages preferably are not acknowledged to save time in transmission and contention resolution. Without acknowledgement, however, the system may be unable to determine whether a message was received by a terminal. Using single slot messages can reduce the chance that a single message is missed, and messages can be repeated to further reduce this chance without undue channel loading.

As illustrated in Fig. 10, call origination and traffic channel designation messages 1010, 1020 can be compressed into a single slot by using compressed addresses. IS-136 defines multiple address types, including the 34-

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bit Mobile Identification Number (MIN) that necessitates that use of 2-slot messages. A preferable choice for group call addressing is the Temporary Mobile System Identification (TMSI), a 20-bit number assigned to a terminal by the system on a temporary basis. In a private system such as DWOS, however, 20 bits is usually more than needed to uniquely address all of the terminals using the system, and therefore, according to the embodiment illustrated in Fig. 10, the least significant 14 bits of the TSMI is used to address call origination and traffic channel designation messages 1010, 1020.

The caller field of the call origination message 1010 preferably includes the 14 least significant bits of the TMSI assigned to the originating (caller) terminal, along with control bits that indicate whether the call is a group call and/or other type of message, such as a broadcast or emergency message. To keep the call origination message 1010 to a single slot, the callee field in the call origination message 1010 is preferably limited to a four digit called party number, which typically is sufficient for a private system such as DWOS (and may also be sufficient for a subsection of a public cellular system in which TMSI addressing is used). The callee field of the origination message 1010 includes a 16-bit field representing the 4 digit called party number in BCD (binary coded decimal) format (4 bits per digit), along with 16 bits of overhead information.

The corresponding traffic channel designation message 1020, is addressed using the 14 bit binary equivalent of the 4-digit called party number, along with 6 bits of control information taken from the call origination message 1010. The traffic channel designation message 1020 preferably does not include an identification of the calling party in order to keep the message within a single slot. As described above, the calling party may be identified in a confirm message transmitted over the common traffic channel identified in the group call traffic channel designation message.

It will be appreciated that the above-described addressing scheme allows dispatch features to be used without disrupting the operations of non-dispatch feature enabled terminals (e.g., normal IS-136 terminal that do not support the DWOS group call feature). As TMSIs are assigned by the system and are preferably constrained to 14-bit values, terminals that do not implement group call or other dispatch features will be assigned TMSIs that have zeroes in the bits corresponding to the control information. Accordingly, these terminals will, for example, ignore traffic channel

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	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2
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THAT WHICH IS CLAIMED IS:

1. In a wireless communications system including a plurality of distributed transceiver units, each of which are operative to communicate with terminals over a plurality of communications channels, a method of conducting a group call comprising the steps of:

- 5 transmitting a group call origination message from an originating terminal;
receiving the group call origination message at a transceiver unit;
transmitting a group call traffic channel designation message addressed to a group of terminals from the transceiver units responsive to the received group call origination message, the transmitted group call traffic channel designation message
10 designating a common traffic channel; and
communicating among terminals of the group of terminals over the designated common traffic channel.

2. A method according to Claim 1, wherein the plurality of transceiver units comprises a plurality of radio heads of a private wireless communications system.

3. A method according to Claim 1, wherein said step of communicating comprises the step of conducting half-duplex communications among the terminals over the common traffic channel.

4. A method according to Claim 1, wherein the common traffic channel comprises a series of slots on a carrier frequency band.

5. A method according to Claim 1, wherein said step of communicating comprises the steps of:
communicating between one of the terminals and first transceiver unit during a group call; and then
5 communicating between the one terminal and a second transceiver unit during the group call, without a handoff.

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6. A method according to Claim 1, wherein said step of communicating comprises the step of communicating among terminals of the group of terminals without requiring paging a terminal in the group of terminals.

7. A method according to Claim 1, wherein said step of transmitting a group call origination message comprises the step of transmitting the group call origination message responsive to a user input at the originating terminal.

8. A method according to Claim 1, wherein said step of transmitting a group call traffic channel designation message comprises the step of transmitting a group call traffic channel designation message over a control channel.

9. A method according to Claim 8, wherein said step of communicating comprises the steps of:

transmitting data from one of the group of terminals;

receiving the transmitted data at a transceiver unit; and

transmitting the received data from the plurality of transceiver units over the common traffic channel.

10. A method according to Claim 9, wherein said step of transmitting the received data from the plurality of transceiver units is followed by the steps of:

transmitting a release message from the plurality of transceiver units over the common traffic channel; and then

monitoring the control channel for a new group call traffic channel designation message at the terminals in response to receipt of the transmitted release message at the terminals.

11. A method according to Claim 8, wherein the control channel comprises a series of slots on a carrier frequency band, and wherein said step of transmitting a group call traffic channel designation message comprises the step of transmitting the group call traffic channel designation message in a single slot assigned to the control channel.

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12. A method according to Claim 11, wherein the group call origination message and the group call traffic channel designation message are addressed based on Temporary Mobile System Identification (TMSI) values assigned by the wireless communications system.

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13. A method according to Claim 12:
wherein said step of transmitting a group call origination message is preceded by communicating TMSI fields to terminals served by the wireless communications system to thereby assign TMSI values to the terminals, such that the assigned TMSI values represented by the communicated TMSI fields are constrained to be less than or equal to a maximum value represented by a least significant portion of a TMSI field;

wherein the group call traffic channel designation message includes:

10 a caller field including the least significant portion of TMSI field communicated to the originating terminal combined with a control bit indicating whether the call origination message is requesting a group call;

a callee field representing a TMSI value assigned to a terminal of the group of terminals; and

15 wherein said group call traffic channel designation message includes a callee field including the TMSI value assigned to the terminal of the group of terminals combined with the control bit from the group call traffic channel designation message.

14. A method according to Claim 10, wherein said step of monitoring the control channel is followed by the step of transitioning to a sleep mode if a predetermined time interval elapses without receipt of a new group call traffic channel designation message.

15. A method according to Claim 14, wherein said step of transmitting a release message comprises the step of transmitting a release message indicating the predetermined time interval.

16. A method according to Claim 10, wherein said step of transmitting a release message is followed by the steps of:

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transmitting a group call origination message from one terminal of the group of terminals;

5 receiving the group call origination message at a transceiver unit;

transmitting a group call traffic channel designation message addressed to the group of terminals, the group call traffic channel designation message identifying a second common traffic channel; and

10 resuming communications among terminals of the group over the second common traffic channel.

17. A method according to Claim 16, wherein the first and second channels are the same channel.

18. A method according to Claim 10, wherein said step of transmitting the received data is preceded by the transmitting a group call confirm message identifying the originating terminal from the plurality of transceiver units over the common traffic channel.

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19. A method according to Claim 18, wherein said step of transmitting data from one of the group of terminals comprises the step of transmitting data from the terminal identified in the group call confirm message.

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20. A method according to Claim 1, wherein slots assigned to control channels make up a hyperframe comprising a plurality of superframes, and wherein said step of communicating is preceded by the step of monitoring a set of periodically occurring slots in a plurality of subframes within a superframe for traffic channel designation messages.

21. A method according to Claim 20, wherein said step of monitoring comprises the step of monitoring a group call paging subchannel of the control channel.

22. A method of operating a wireless terminal in wireless communications system including a plurality of distributed transceiver units, each of which are

operative to communicate with terminals over a plurality of communications channels, the method comprising the steps of:

- 5 receiving a group call traffic channel designation message addressed to the terminal, the group call traffic channel designation message designating a common traffic channel; and

communicating with a plurality of other terminals over the designated common traffic channel.

23. A method according to Claim 22, wherein said step of communicating comprises the step of conducting half-duplex communications among the terminals over the common traffic channel.

24. A method according to Claim 22, wherein the common traffic channel comprises a series of slots on a carrier frequency band.

25. A method according to Claim 22, wherein said step of communicating comprises the steps of:

communicating between the terminal and a first transceiver unit during a group call; and then

- 5 communicating between the terminal and a second transceiver unit during the group call, without a handoff.

26. A method according to Claim 22, wherein said step of communicating comprises the step of communicating between the terminal and the plurality of other terminals in a group call originated by one of the other terminals without receiving a page at the terminal.

27. A method according to Claim 22, wherein said step of receiving is preceded by the step of transmitting a group call origination message from the terminal.

28. A method according to Claim 27, wherein said step of transmitting a group call origination message comprises the step of transmitting the group call origination message responsive to a user input at the terminal.

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29. A method according to Claim 28, wherein said step of transmitting a group call origination message comprises the step of transmitting the group call origination message responsive to user actuation of a push-to-talk (PTT) device.

30. A method according to Claim 22, wherein said step of receiving a group call traffic channel designation message comprises the step of receiving a group call traffic channel designation message over a control channel.

31. A method according to Claim 30, wherein said step of communicating comprises the steps of:

receiving data over the common traffic channel; and then

receiving a release message over the common traffic channel; and then

5 monitoring the control channel for a new group call traffic channel designation message.

32. A method according to Claim 30, wherein said step of monitoring the control channel comprises the steps of:

monitoring the control channel at a first rate for no greater than a

5 predetermined interval following receipt of a release message over the common traffic channel; and then

monitoring the control channel at a second rate less than the first rate if the predetermined interval lapses without receipt of a new group call traffic channel designation message.

33. A method according to Claim 32, wherein said means for receiving a release message comprises means for receiving a release message indicating the predetermined time interval.

34. A method according to Claim 22, wherein slots assigned to the control channel make up a hyperframe comprising a plurality of superframes, and wherein said step of receiving is preceded by the step of monitoring slots of the control channel that make up a plurality of subframes within each superframe.

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35. A method according to Claim 34, wherein said step of monitoring comprises the step of monitoring a group call paging subchannel of the control channel.

36. A method according to Claim 30, wherein the control channel comprises a series of slots on a carrier frequency band, and wherein said step of receiving a group call traffic channel designation message comprises the step of receiving the group call traffic channel designation message in a single slot assigned
5 to the control channel.

37. A method according to Claim 36, wherein the group call traffic channel designation message is addressed based on a Temporary Mobile System Identification (TMSI) assigned to a terminal by the wireless communications system.

38. A method according to Claim 37, wherein the system communicates TMSI fields to terminals served by the wireless communications system to thereby assign TMSI values to the terminals, such that the assigned TMSI values represented by the communicated TMSI fields are constrained to be less than or equal to a
5 maximum value represented by a least significant portion of a TMSI field, and wherein the group call traffic channel designation message includes:

a caller field including the least significant portion of TMSI field communicated to the originating terminal combined with a control bit indicating whether the call origination message is requesting a group call;

10 a callee field representing a TMSI value assigned to a terminal of the group of terminals; and

wherein said group call traffic channel designation message includes a callee field including the TMSI value assigned to the terminal of the group of terminals combined with the control bit from the group call traffic channel designation message.

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39. A method according to Claim 22, wherein said step of communicating comprises the step of receiving a group call confirm message identifying an originating terminal over the designated common traffic channel.

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40. A method according to Claim 39, wherein said step of communicating further comprises the step of transmitting data over the common traffic channel if the received group call confirm message identifies the terminal.

41. A wireless communications system, comprising:
means for receiving a group call origination message from an originating terminal;

5 means, responsive to said means for receiving a group call origination message, for transmitting a group call traffic channel designation message addressed to a group of terminals in response to receipt of the group call origination message, the transmitted group call traffic channel designation message designating a common traffic channel; and

10 means, responsive to the common traffic channel, for communicating among terminals of the group of terminals over the designated common traffic channel.

42. A system according to Claim 41, wherein said means for receiving a group call origination message, said means for transmitting a group call traffic channel designation message and said means for communicating among terminals comprise a plurality of distributed transceiver units.

43. A system according to Claim 42, wherein said plurality of transceiver units comprises a plurality of radio heads.

44. A system according to Claim 42, wherein said means for receiving a group call origination message, said means for transmitting a group call traffic channel designation message and said means for communicating among terminals further comprises:

5 a cellular radio exchange connected to each of said plurality of distributed transceiver units; and

a mobility server connected to said cellular radio exchange.

45. A system according to Claim 41, wherein said means for communicating comprises means for conducting half-duplex communications among the terminals over the designated common traffic channel.

46. A system according to Claim 41, wherein the common traffic channel comprises a series of slots on a carrier frequency band.

47. A system according to Claim 41, wherein said means for communicating comprises means for communicating between one of the terminals and a first transceiver unit during a group call and then communicating between the one terminal and a second transceiver unit, without an intervening handoff.

48. A system according to Claim 41, wherein said means for communicating among terminals comprises means for communicating among terminals of the group responsive to receipt of the group call origination message without a preceding paging of a terminal in the group of terminals.

49. A system according to Claim 41, wherein said means for transmitting a group call traffic channel designation message comprises means for transmitting a group call traffic channel designation message over a control channel.

50. A system according to Claim 49, wherein said means for communicating comprises:

means for receiving data transmitted from one of the group of terminals over the designated common traffic channel at a transceiver unit of a plurality of

5 distributed transceiver units; and

means, responsive to said means for receiving data, for transmitting the received data from the plurality of transceiver units over the common traffic channel.

51. A system according to Claim 50, further comprising means for transmitting a group call confirm message identifying the originating terminal over the designated common traffic channel before the data transmitted from the originating terminal is transmitted over the common traffic channel.

52. A system according to Claim 50:

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wherein said means for receiving data from the one terminal comprises means for receiving a release message transmitted from the one terminal of the group of terminals over the common traffic channel; and

5 wherein said means for transmitting the received data comprises means, responsive to said means for receiving a release message, for transmitting a release message from the plurality of transceiver units over the common traffic channel.

53. A system according to Claim 52, wherein said means for transmitting a release message comprises means for transmitting a release message indicating a predetermined time interval for which terminals of the group should monitor the control channel for a new group call traffic channel designation message.

5 54. A system according to Claim 49, wherein slots assigned to the control channel make up a hyperframe comprising a plurality of superframes, and wherein said means for transmitting a group call traffic channel designation message comprises means for transmitting group call traffic designation messages in periodically occurring slots of the control channel that make up a plurality of subframes within a superframe.

55. A system according to Claim 54, wherein said means for transmitting a group call traffic channel designation message comprises means for transmitting a group call traffic channel designation message over a group call paging subchannel of the control channel.

5 56. A system according to Claim 41, wherein said means for transmitting a group call traffic channel designation message comprises means for transmitting a group call traffic channel designation message in a single slot assigned to a control channel.

57. A system according to Claim 56, wherein the group call traffic channel designation message is addressed based on a Temporary Mobile System Identification (TMSI) assigned to a terminal.

58. A system according to Claim 57, further comprising means for communicating TMSI fields to terminals such that the assigned TMSI values

represented by the communicated TMSI fields are constrained to be less than or equal to a maximum value represented by a least significant portion of a TMSI field;

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5 wherein the group call traffic channel designation message includes:

a caller field including the least significant portion of TMSI field communicated to the originating terminal combined with a control bit indicating whether the call origination message is requesting a group call;

10 a callee field representing a TMSI value assigned to a terminal of the group of terminals; and

wherein said group call traffic channel designation message includes a callee field including the TMSI value assigned to the terminal of the group of terminals combined with the control bit from the group call traffic channel designation message.

59. A terminal for use in wireless communications system including a plurality of distributed transceiver units, each of which are operative to communicate with terminals over a plurality of communications channels, the terminal comprising:

5 means for receiving a group call traffic channel designation message addressed to the terminal, the received group call traffic channel designation message designating a common traffic channel; and

means, responsive to said means for receiving, for communicating with a plurality of other terminals over the designated common traffic channel.

60. A terminal according to Claim 59, wherein the common traffic channel comprises a series of slots on a carrier frequency band.

61. A terminal according to Claim 59, wherein said means for communicating comprises means for communicating with a plurality of other terminals over the common traffic channel responsive to the received group call traffic channel designation message without receiving a page.

62. A terminal according to Claim 59, further comprising means for transmitting a group call origination message responsive to a user input.

63. A terminal according to Claim 62, wherein further comprising a push-to-talk (PTT) device operative to receive the user input.

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64. A terminal according to Claim 59, wherein said means for receiving a group call traffic channel designation message comprises means for receiving a group call traffic channel designation message over a control channel.

65. A terminal according to Claim 64, further comprising:
means for receiving a release message over the common traffic channel; and
means, responsive to said means for receiving a release message, for
responsively monitoring the control channel for a new group call traffic channel
5 designation message.

66. A terminal according to Claim 65, wherein said means for monitoring the control channel comprises means for monitoring the control channel at a first rate for no greater than a predetermined interval following receipt of a release message over the common traffic channel, and for then monitoring the control channel at a
5 second rate less than the first rate if the predetermined interval ends without receipt of a new group call traffic channel designation message.

67. A terminal according to Claim 66 wherein said means for receiving a release message comprises means for receiving a release message indicating the predetermined time interval.

68. A terminal according to Claim 64, wherein slots assigned to the control channel make up a hyperframe comprising a plurality of superframes, and further comprising means for monitoring slots of the control channel that make up a plurality of subframes within each superframe.

69. A terminal according to Claim 68, wherein said means for monitoring 1 comprises means for monitoring a paging subchannel of the control channel.

70. A terminal according to Claim 66, wherein a control channel comprises a series of slots on a carrier frequency band, and wherein said means for receiving a group call traffic channel designation message comprises means for

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receiving a group call traffic channel designation message in a single slot assigned to the control channel.

71. A terminal according to Claim 70, wherein said means for receiving a group call traffic channel designation message comprises means for receiving a traffic channel designation addressed to the terminal based on a Temporary Mobile System Identification (TMSI) assigned to the terminal.

72. A terminal according to Claim 71, wherein the wireless communications system communicates TMSI fields to terminals served by the wireless communications system to thereby assign TMSI values to the terminals, such that the assigned TMSI values represented by the communicated TMSI fields are constrained to be less than or equal to a maximum value represented by a least significant portion of a TMSI field, wherein the group call traffic channel designation message includes a caller field including the least significant portion of TMSI field communicated to the originating terminal combined with a control bit indicating whether the call origination message is requesting a group call and a callee field representing a TMSI value assigned to a terminal of the group of terminals, and wherein said group call traffic channel designation message includes a callee field including the TMSI value assigned to the terminal of the group of terminals combined with the control bit from the group call traffic channel designation message.

73. A terminal according to Claim 59, wherein said means for communicating comprises means for receiving a group call confirm message identifying an originating terminal over the designated common traffic channel.

74. A terminal according to Claim 73, wherein said means for communicating further comprises means for transmitting data over the common traffic channel if the received group call confirm message identifies the terminal.

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~~17A~~

**APPARATUS AND METHODS FOR CONDUCTING GROUP CALLS IN
WIRELESS COMMUNICATIONS SYSTEMS**

Abstract of the Disclosure

A group call is conducted in a wireless communications system including a plurality of distributed transceiver units, e.g., radio heads of a private wireless system, each of which are operative to communicate with terminals over a plurality of communications channels. A group call origination message is transmitted from an originating terminal, preferably in response to a user input at the originating terminal, more preferably in response to actuation of a push-to-talk (PTT) device at the originating terminal. The transmitted group call origination message is received at a transceiver unit and, in response, a group call traffic channel designation messages addressed to a group of terminals is transmitted from the transceiver units, the transmitted group call traffic channel designation message designating a common traffic channel. Communications then occur among terminals of the group of terminals, preferably in half-duplex mode, over the designated common traffic channel.

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

Attorney Docket No. 8194-267

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As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled APPARATUS AND METHODS FOR CONDUCTING GROUP CALLS IN WIRELESS COMMUNICATIONS SYSTEMS,

the specification of which

☒ is attached hereto

OR

☐ was filed on _____ as United States Application No. or PCT International Application Number _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate, or of any PCT International application having a filing date before that of the application on which priority is claimed.

None			☐ Yes ☐ No
Number	Country	MM/DD/YYYY Filed	Priority Claimed

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I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

None	
Application Number(s)	Filing Date (MM/DD/YYYY)

Application Number(s)	Filing Date (MM/DD/YYYY)

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application (37 C.F.R. § 1.63(d)).

None		
Appln. Serial No.	Filing Date	Status Patented/Pending/Abandoned

Appln. Serial No.	Filing Date	Status Patented/Pending/Abandoned

Appln. Serial No.	Filing Date	Status Patented/Pending/Abandoned

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following registered attorney(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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Raleigh, NC 27627

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(919) 854-1400

Facsimile: (919) 854-1401

Full name of sole inventor: Timothy E. Dailey

Inventor's Signature: T E Dailey Date: 5/5/99

Residence: Forest, Virginia

Citizenship: United States of America

Post Office Address: 2041 Bethel Church Rd.
Forest, Virginia 24551

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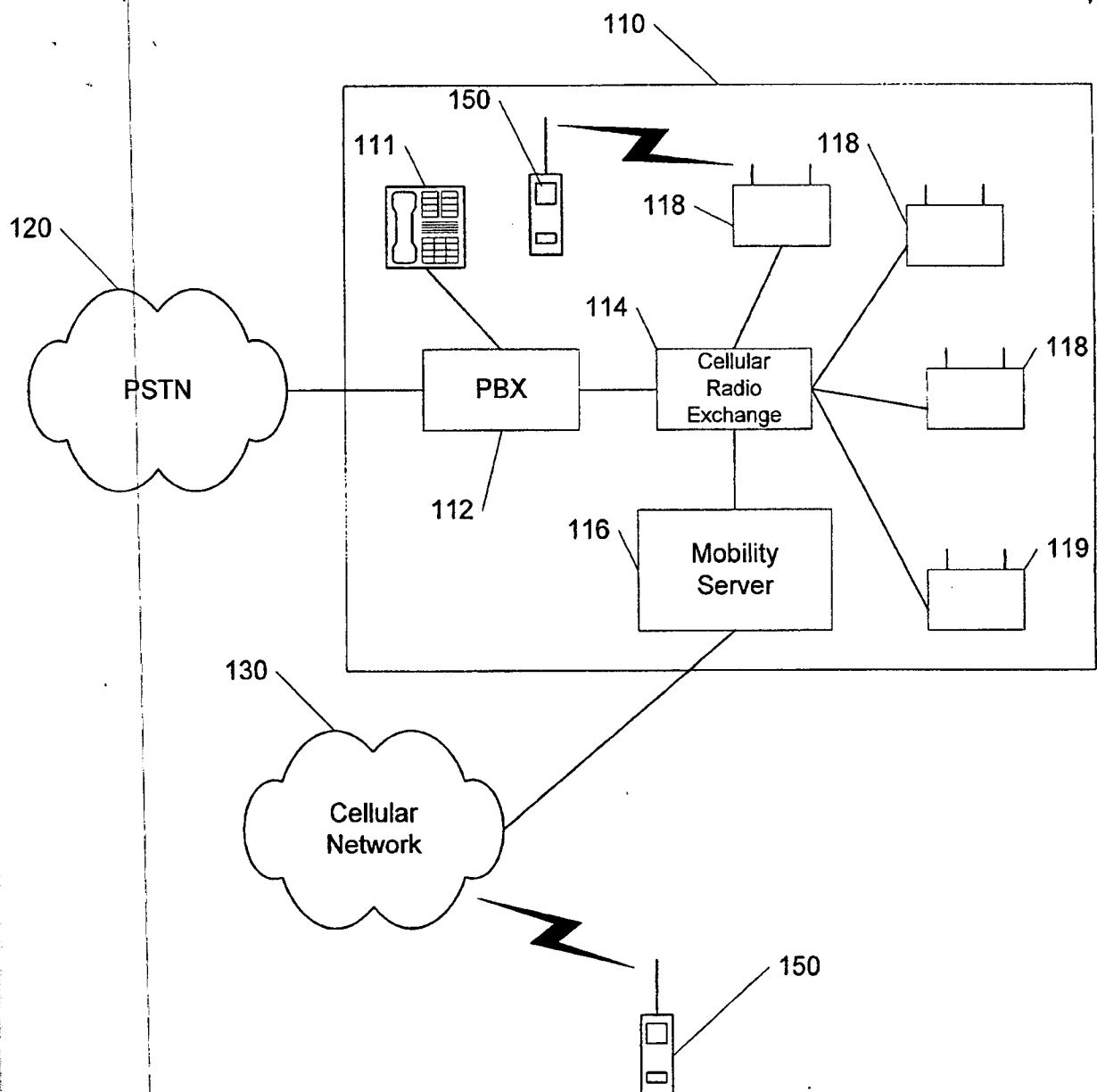


FIG. 1

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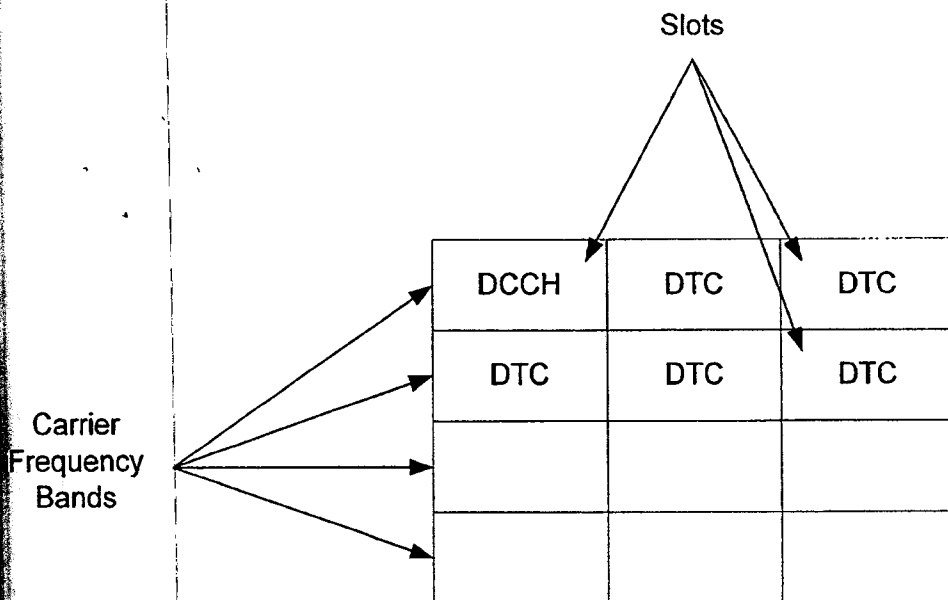


FIG. 2
Prior Art

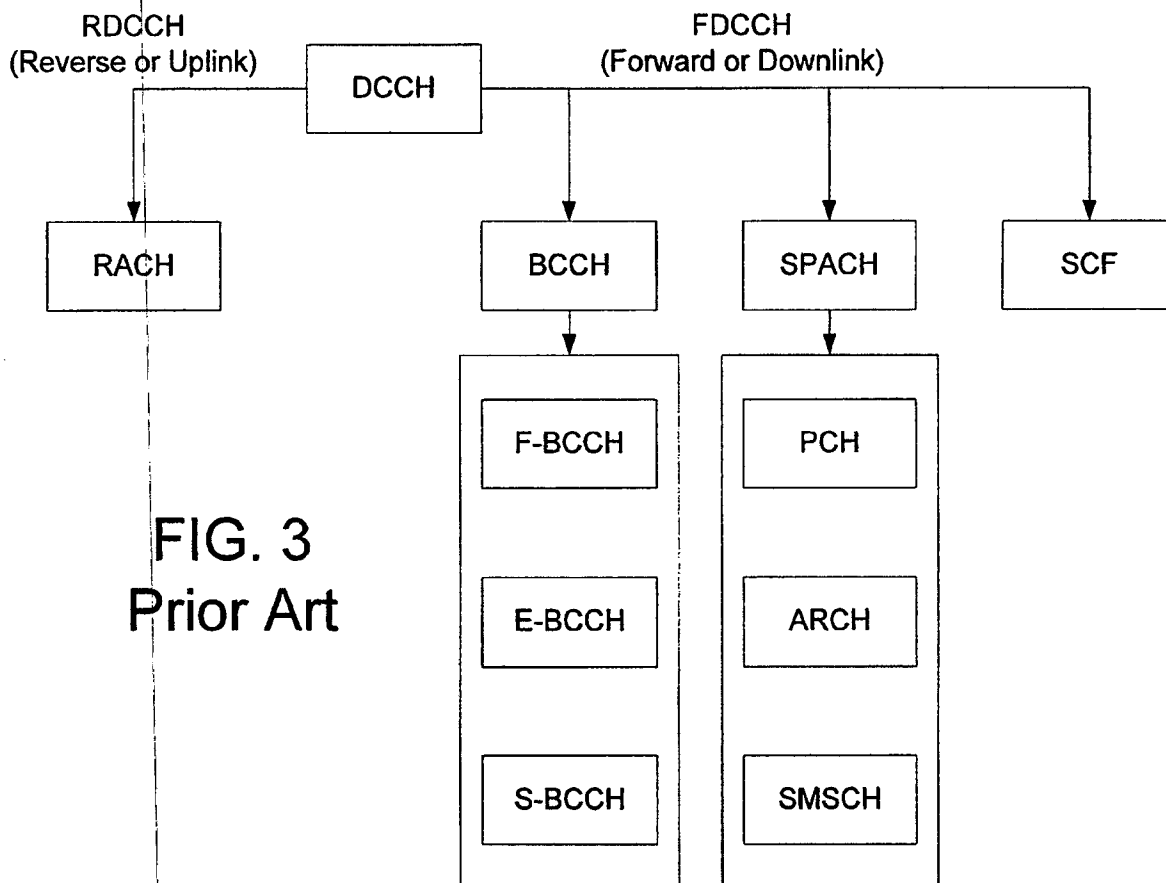


FIG. 3
Prior Art

169 52
177

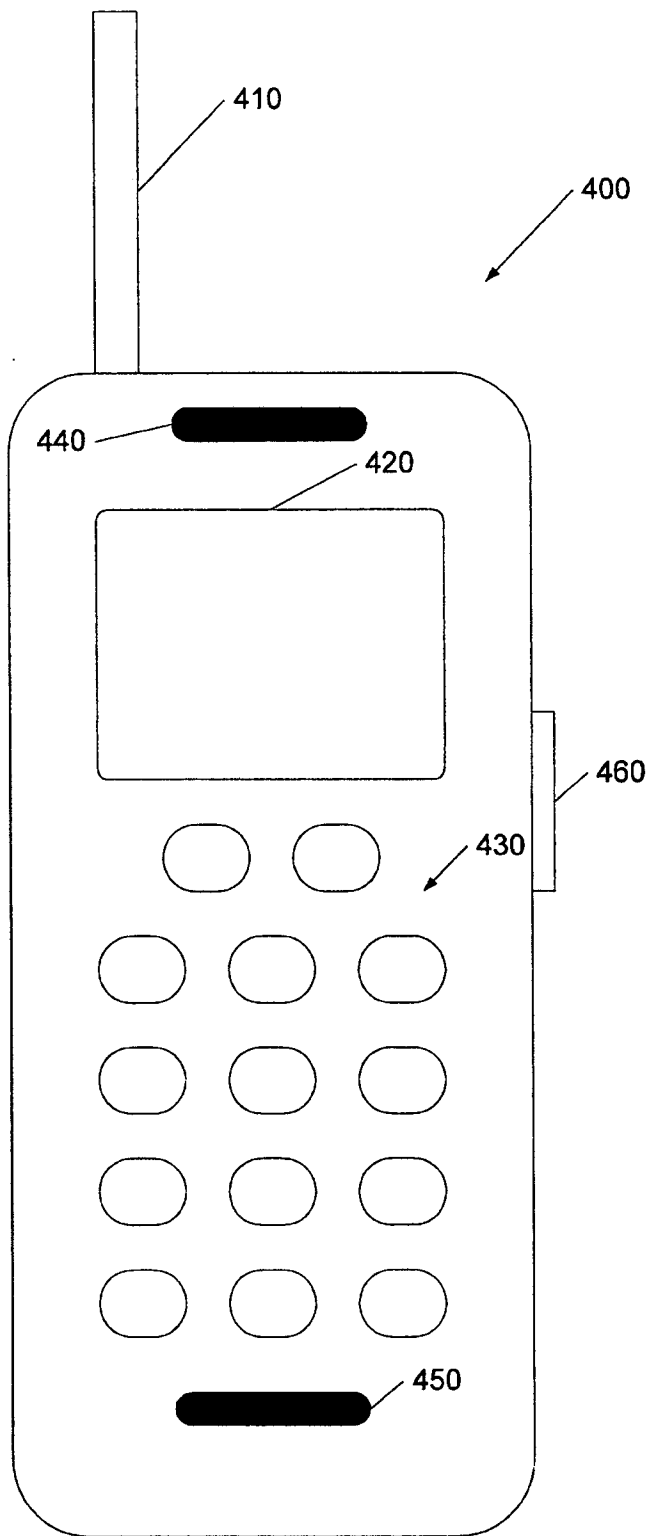


FIG. 4

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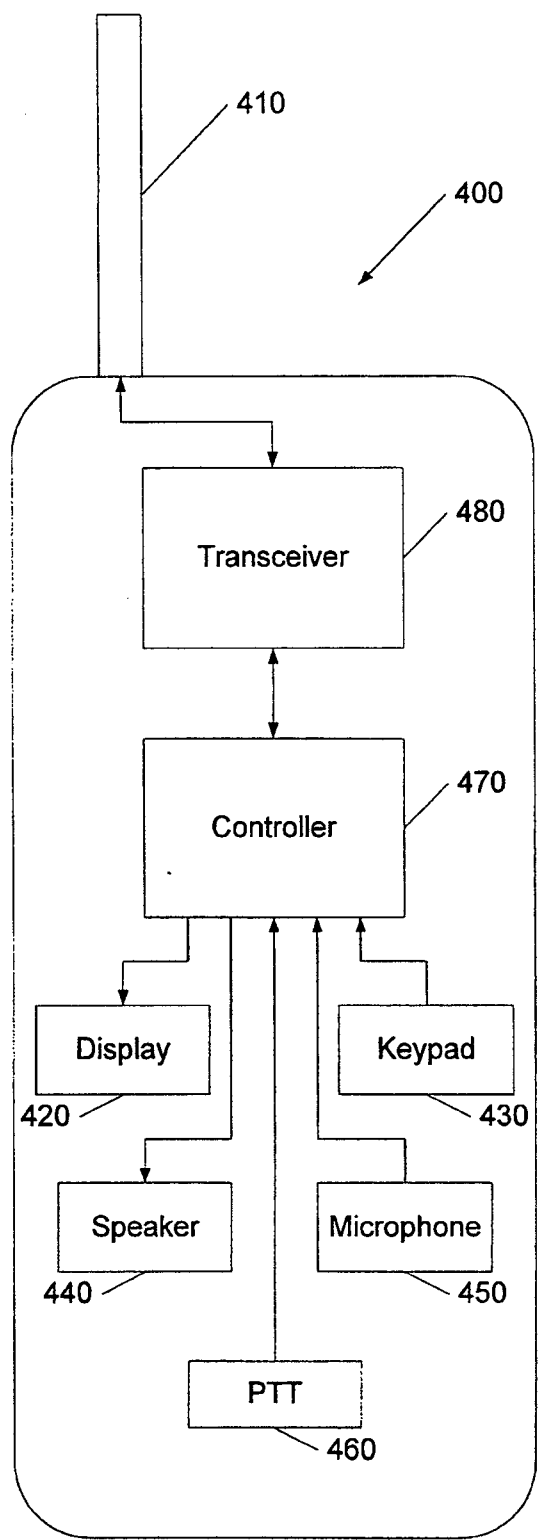


FIG. 5

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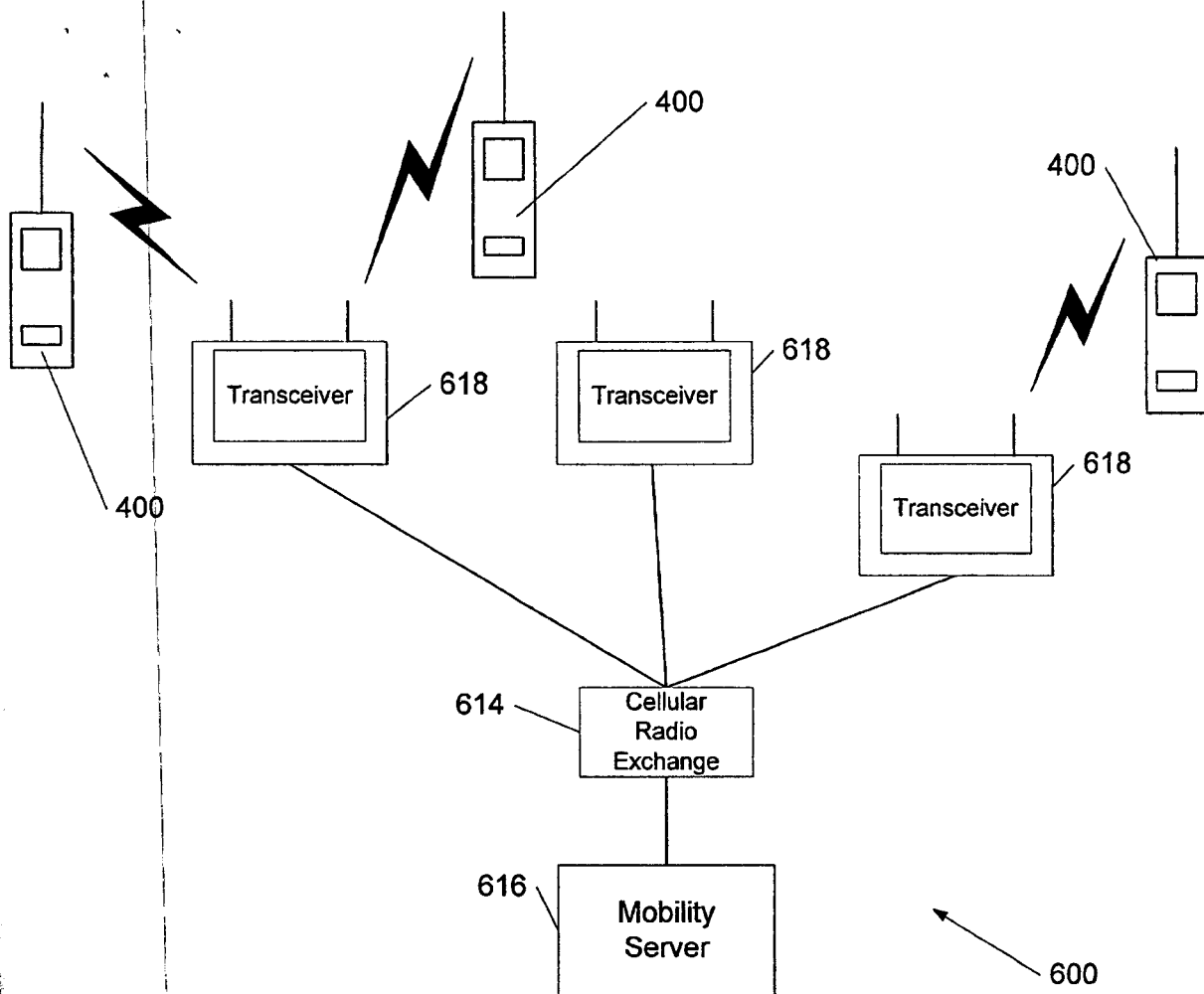


FIG. 6

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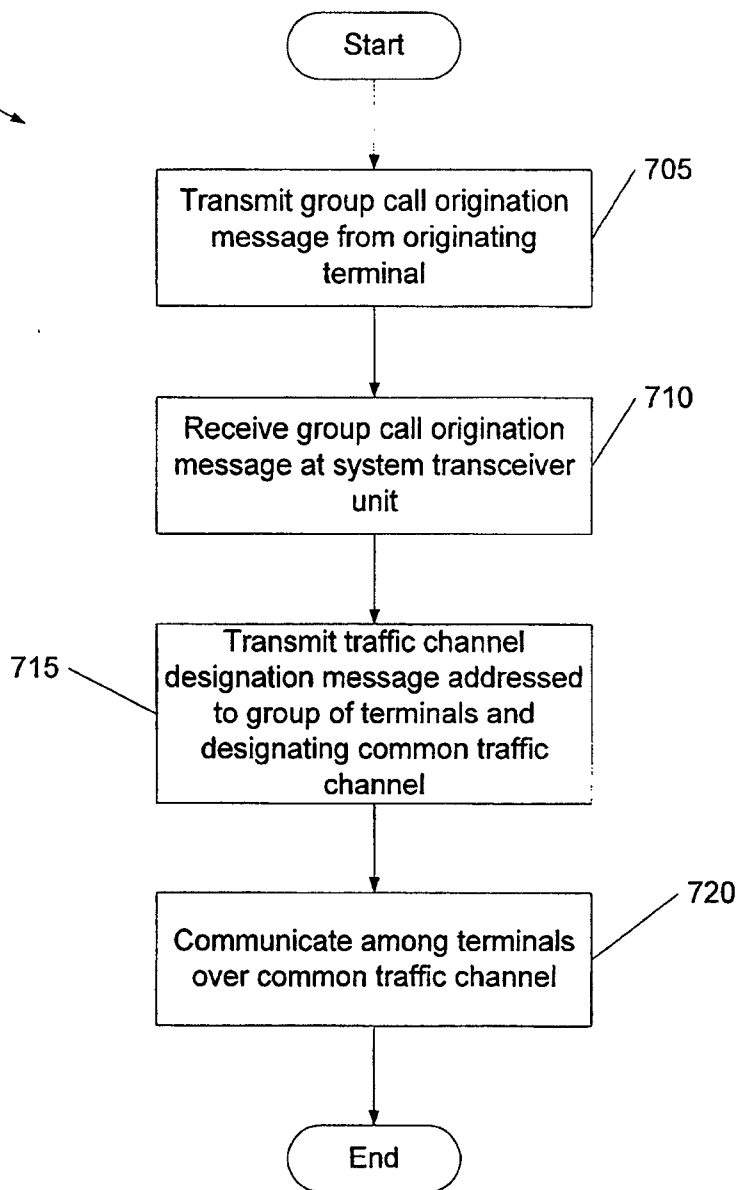


FIG. 7

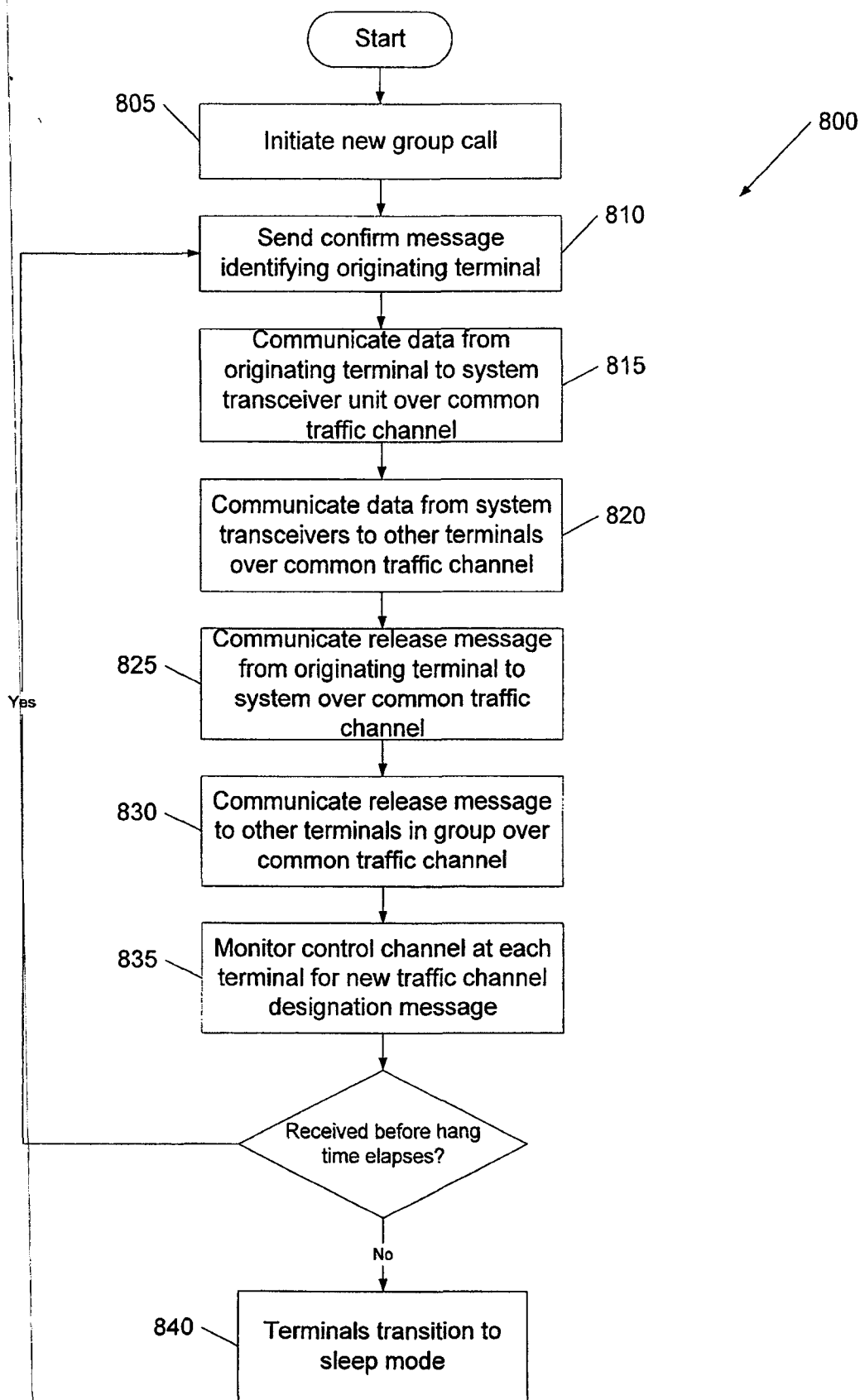


FIG. 8

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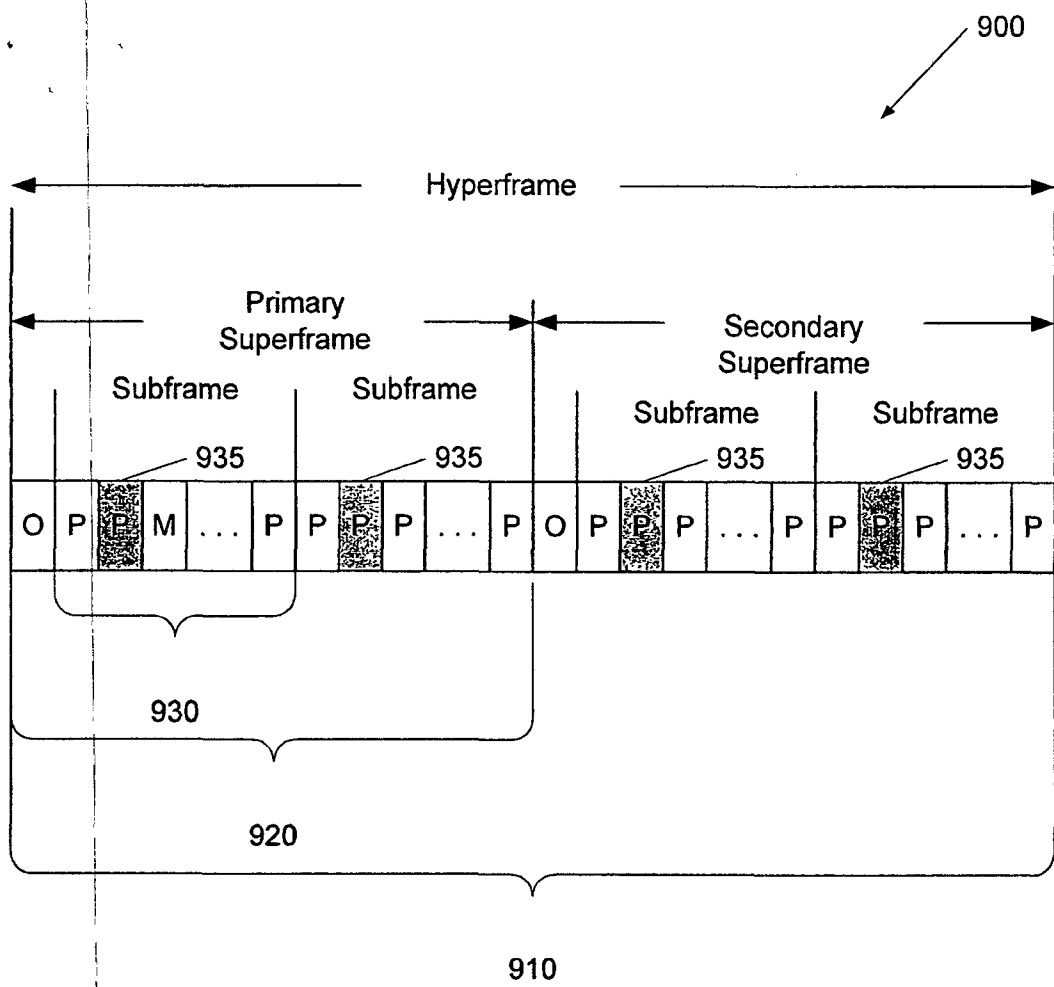


FIG. 9

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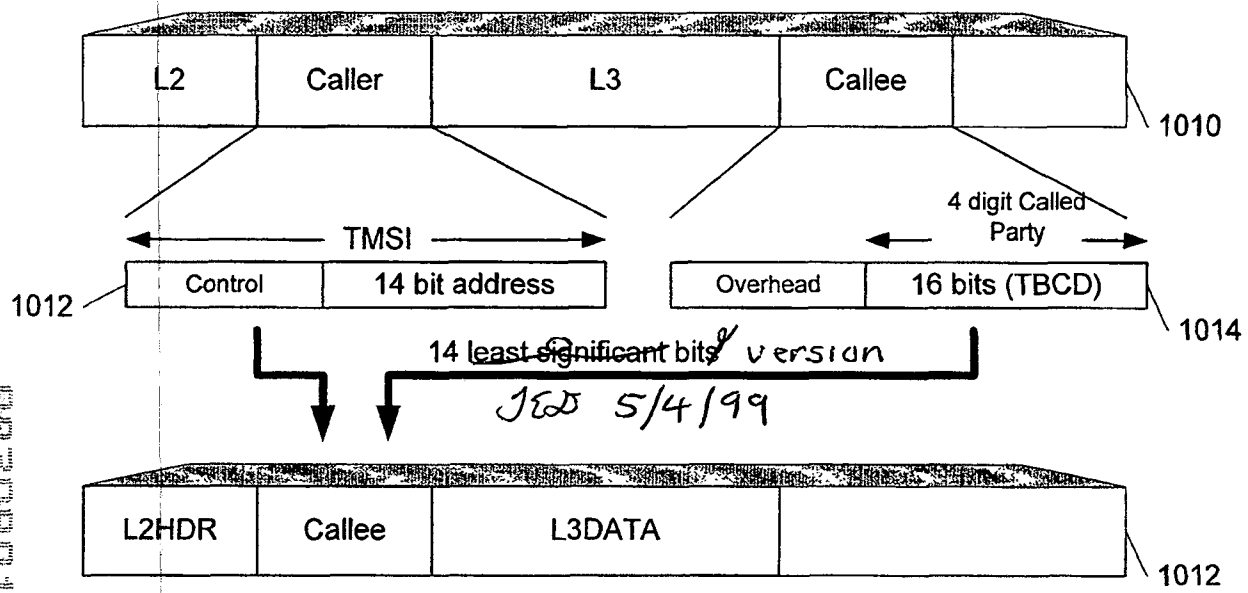


FIG. 10

2do. EXAMEN DE FORMA PATENTE DE INVENCION

Folio

185

Radicación no 00-32671
Concepto Técnico no . 394
Clasificación Internacional de Patentes : 6 H04M3/52

Practicado el examen de acuerdo a lo establecido en el Art. 38 de la Decisión 486 se determinó que esta solicitud de **Patente de Invención**:

- | | | |
|--|--|---|
| SI ☒ | NO ☐ | Contiene un resumen de la invención (Art.26-e). |
| SI ☒ | NO ☐ | Contiene el título o nombre de la invención (Art.27-d). |
| SI ☒ | NO ☐ | Contiene la descripción de la invención (Art.26-b). |
| SI ☒ | NO ☐ | NO ES APLICABLE ☐ Contiene los dibujos necesarios para comprender la invención (Art.26-d) |
| SI ☒ | NO ☐ | Contiene una o más reivindicaciones. (Art.26-c). |
| SI ☐ | NO ☐ | NO ES APLICABLE ☒ Han sido desarrollados los productos y/o procedimientos a partir de recursos genéticos o de sus productos derivados de los que cualquiera de los Países Miembros es país de origen. (Art. 26- h). |
| SI ☐ | NO ☐ | NO ES APLICABLE ☒ Los productos y/o procedimientos han sido obtenidos o desarrollados a partir de los conocimientos tradicionales de las comunidades indígenas, afroamericanas, o locales de los países miembros, de acuerdo a lo establecido en la Decisión 391 y sus modificaciones y reglamentaciones vigentes.(Art.26-i). |
| SI ☐ | NO ☒ | La invención se refiere a un producto relativo a un material biológico. (Art.26-J). |
| SI ☒ | NO ☐ | La prioridad coincide con la materia reivindicada. |
| SI ☒ | NO ☐ | CUMPLE LOS REQUISITOS TÉCNICOS |

OBSERVACIONES Y OTROS: SI ☒ NO ☐ ver hoja(s) anexa(s)

EXAMINADOR TÉCNICO
202044

Bogotá D. C. Febrero 13 de 2003.

Folio 186

Concepto técnico no. 394

OBSERVACIONES

- Envía el documento mediante el cual reivindica la prioridad. Folios 135-184.
- Anexa la traducción del documento de prioridad. Folios 113-134.
- Anexa el extracto de publicación. Folio 66.
- Anexa los dibujos alucivos a la invención. Folios 68-76.
- Anexa un nuevo capítulo reivindicatorio. Folios 77-90.
- Envía un nuevo capítulo descriptivo. Folios 91-111.
- Anexa artes finales , tarjeta de archivo temático y de propietarios. Folios 65 y 67.

EXAMINADOR TECNICO

202044

Bogotá, Febrero 13 de 2003.



Industria y Comercio
SUPERINTENDENCIA

Folio 187

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416
2003-02-14

2020
Bogotá DC

Doctor(a)
GERMAN CASTILLO GRAU
Apoderado(a)

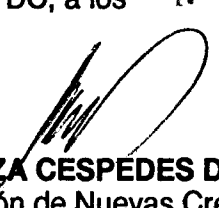
REFERENCIA:	Radicación No.	00-32671
	Trámite	002
	Evento	001
	Actuación	416
	Oficio No.	370
	Folios	001

Teniendo en cuenta que la solicitud de privilegio de patente que se tramita bajo el expediente indicado en la referencia, reúne los requisitos de forma establecidos en los artículos 26 y 27 de la Decisión 486 de la Comisión de la Comunidad Andina, y en las demás disposiciones vigentes sobre la materia, se envía el extracto de la solicitud a la Oficina de Comunicaciones para efecto de su publicación en la Gaceta de Propiedad Industrial, conforme lo establece el artículo 40 de la misma Decisión.

Cúmplase

Dado en Bogotá DC, a los

17 4 FEB. 2003


ALIX CARMENZA CESPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones

202044

DIVISION DE NUEVAS CREACIONES

RADICACIÓN EXPEDIENTE No. 00-032671

EL EXTRACTO DE LA PRESENTE SOLICITUD DE **PATENTE DE INVENCION**
FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No **530**, DE
FECHA **31 DE JULIO DE 2003**, EL TERMINO HABIL SEÑALADO POR LA LEY
EXPIRA EL **28 DE OCTUBRE DE 2003**.

NOTA: Dentro del plazo de los seis (6) meses siguientes a partir de la fecha de publicación en la gaceta de Propiedad Industrial, deberá solicitar y cancelar el examen de patentabilidad so pena de que la solicitud caiga en abandono, de acuerdo con lo establecido en el Artículo 44 de la Decisión 486/2000.

SE PRESENTARON OPOSICIONES POR PARTE DE TERCEROS.

SI ☐

NO ☒

Bogotá D.C., Febrero de 2004

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

180

RADICACIÓN: 0-32671

EDICTO No. 2525

LA SECRETARÍA GENERAL AD-HOC HACE SABER:

Que esta Superintendencia profirió Resolución No. 2442 de 12-FEB-2004. Que el contenido de la parte resolutive es como sigue: El Superintendente de Industria y Comercio.

RESUELVE

ARTICULO PRIMERO: Declarar abandonada la solicitud de privilegio de patente de invención contenida en el expediente de la referencia.

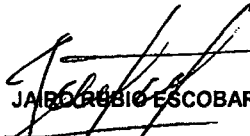
ARTICULO SEGUNDO: Notificar personalmente el contenido de la presente resolución al doctor Germán Castillo Grau, o a quien haga sus veces, en su calidad de apoderado de Ericsson Inc., entregándole copia de la misma, advirtiéndole que contra ella procede el recurso de reposición interpuesto ante el Superintendente de Industria y Comercio, al momento de la notificación o dentro de los 5 días hábiles siguientes a ella.

NOTIFÍQUESE Y CUMPLASE

Dada en Bogotá, D.C., a los

12 FEB. 2004

EL SUPERINTENDENTE DE INDUSTRIA Y COMERCIO,


JAIME ROBERTO ESCOBAR

Para notificar a los interesados, se fija el presente EDICTO en lugar visible al público en la SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO, por el término de (10) diez días hábiles contados a partir de las 8:30 a.m. de hoy.

Secretaría General Ad-Hoc 04-MAR-2004

Secretaría General Ad-Hoc

EDICTO No. 2525

Este edicto se desfija hoy 17-MAR-2004 a las cinco (5:00 p.m.)