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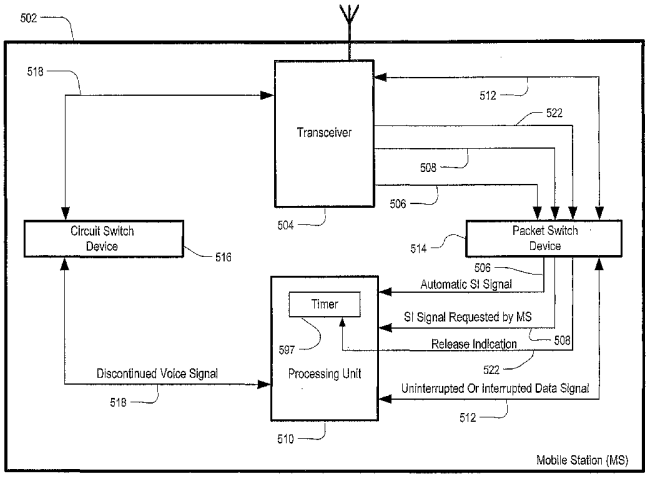

(57) Abstract: A method and terminal are disclosed for use in a wireless communication system, in order for the terminal to transition from a dual mode, in which a packet switched connection and circuit switched connection are used, to a single mode in which packets are transferred. The mobile terminal is for receiving minimum system information necessary to perform this transition in an uninterrupted manner. This system information is sent to the mobile terminal automatically or on a regular basis, and is additionally sent to the mobile terminal partly upon request of the mobile terminal. A release indication is sent to the terminal separately from the system information, notifying the terminal that the circuit switched connection will be released, at which point a timer is started. The system information is employed by the mobile terminal to transition from the dual mode in the uninterrupted manner, if the timer has not expired.

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ENHANCED HANDLING OF SYSTEM INFORMATION MESSAGES WHEN MOVING FROM DUAL TRANSFER MODE TO PACKET TRANSFER MODE

Related Applications

The present application is related to copending U.S. application 10/802,407 and copending U.S. application 10/763,936. The latter copending U.S. application 10/763,936 is incorporated herein by reference, and is titled "Enhancement of Dual Transfer Mode When Circuit Switched Resources Are Released."

Field of the Invention

The present invention relates to wireless communication, and more particularly to packet switching and circuit switching for wirelessly communicating with a mobile terminal.

Background of the Invention

The first Global System for Mobile (GSM) communication networks were designed for voice services rather than for data services. When the use of GSM data services started, it soon became evident that the Circuit Switched (CS) bearer services were not well-suited for certain types of applications with a bursty nature. Therefore the new Packet Switched (PS) data transmission service GPRS (General Packet Radio Service) was developed for packet services. GPRS is a packet radio network utilizing the GSM network, and GPRS endeavours to optimize data packet transmission by means of GPRS protocol layers on the air interface between a mobile station (hereinafter also called a mobile terminal) and a GPRS network.

A GPRS mobile station (MS), also called a mobile terminal, can operate in one of three modes of operation, as described in 3GPP TS 23.060, "Service description; Stage 2," Section 5.4.5. The three modes are Class-A Mode, Class-B Mode, and Class-C Mode. According to the Class-A mode of operation, the MS is attached to both GPRS as well as other GSM services, and therefore Class-A Mode corresponds to Dual Transfer Mode (DTM) (hereinafter also called dual mode). The mobile user in Class-A Mode can make and/or receive calls on the two services simultaneously, for

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example having a normal GSM voice call and receiving GPRS data packets at the same time. According to the Class B mode of operation, the MS is attached to both GPRS and other GSM services, but the MS can only operate one set of services at a time. According to the Class C mode of operation, the MS can only be attached either to the GSM network or the GPRS network; the selection is done manually and there are no simultaneous operations.

Based on the current standard (3GPP TS 44.018, "Radio Resource Control Protocol"), when the MS releases a CS connection (also referred to as a radio resource or RR connection) while in the Dual Transfer Mode (DTM), all packet resources are aborted. This is illustrated in FIG. 1 (also see 3GPP TS 43.064, "Overall description of the GPRS radio interface; Stage 2"), which shows RR operating modes and transitions between Class-A (DTM supported) and Class-B. An RR Release moves the MS from the Dual Transfer Mode **102** into an Idle/Packet Idle state **104**, after which the MS must then obtain packet access in order to perform packet transfer. In other words, after the release of the CS connection, the MS is in the packet idle mode and must perform a complete acquisition of system information and ask for PS resources again, in order to get into the Packet Transfer Mode **106**.

FIG. 2 further illustrates how the system is currently working, according to the prior art. The four vertical lines represent portions or stages of the network. The line **202** represents the mobile station (MS), the line **204** represents the base station system (BSS), the line **206** represents the serving GPRS support node (SGSN), and the line **208** represents the mobile switching center (MSC). FIG 2 shows that initially a packet switched session **210** and a circuit switched session **212** are in progress according to the dual mode. Then, either the MS or the network can initiate a disconnect of the CS connection, which causes the circuit switched call to be released at call control level and subsequently the channel is released.

In FIG. 2, the difference between the "release" and the subsequent "channel release" is as follows. The "RELEASE" message is a GSM Call Control protocol message, which merely releases the circuit-switched call at the Call Control level. Note that this message exchange (RELEASE, RELEASE COMPLETE) does not occur with

all dedicated connections, such as Short Message Service (SMS) or MM Location Update. Regarding the 'CHANNEL RELEASE' message in FIG. 2, that is a GSM Radio Resource protocol message which indicates that the Radio Resource (i.e. channel) is being released, after which the MS returns to (packet) idle mode according to FIG. 2. Thus, the two 'release' messages belong to different protocol entities. In FIG 2, the MS initiates the disconnect of the CS connection, and the MS then transfers to the packet idle state **214** from which the MS must perform a complete acquisition of system information in order to get back into a packet switched session **216**.

If the network supports a Packet Broadcast Control Channel (PBCCH), then the MS will not perform packet access or enter the packet transfer mode **216** until it has acquired the PACKET SYSTEM INFORMATION TYPE 1 (PSI1) message, and acquired a consistent set of PSI2 messages, and also made at least one attempt to receive the complete set of PSI messages on PBCCH. See 3GPP TS 44.060, "Radio Link Control/Medium Access Control (RLC/MAC) protocol" and 3GPP TS 45.008, "Radio Subsystem Link Control." If the network supports the PACKET PSI STATUS message, the mobile station may perform packet access, and enter packet transfer mode **216**, as soon as the PSI1 message and a consistent set of PSI2 messages have been received.

On the other hand, if the PBCCH is not present in the network, then the MS must perform a complete acquisition of Broadcast Control Channel (BCCH) messages, in which case the mobile station will not perform packet access or enter the packet transfer mode **216** until it has acquired the SYSTEM INFORMATION TYPE 3 (SI3), SI13 and, if present, SI1 messages, and additionally has made at least one attempt to receive other SI messages that may be scheduled within one TC cycle on BCCH. TC is a formed mathematical expression of a GSM "multiframe modulo." The TC value is cyclic and runs from values 0 to 7 (i.e. the TC can have values TC=0, TC=1, TC=2,... TC7). One GSM multiframe (on BCCH/CCCH) consists of 51 TDMA frames, adding up to 51 times 60/13 ms which equals approximately 235 ms. Therefore, 8 multiframes (i.e. TC0...TC7) adds up to approximately 1.8 seconds. The reason for quoting the TC value in the context of the present invention is to establish

the significant delay experienced from the SYSTEM INFORMATION RECEPTION on the BCCH, in case the CS connection needs to be released before packet access is again possible for the MS (as is specified now according to the prior art).

If the network supports the PACKET SI STATUS message, the MS may perform packet access, and enter packet transfer mode, as soon as the SI3, SI13 and, if present, SI1 messages have been received.

The main problem with these prior art techniques is that the MS is not allowed to immediately enter the packet transfer mode **216** until it has performed various steps. Thus, the mobile station will be forced to idle its packet switching capabilities, while it sets up the packet switching session **216**. The related U.S. application "Enhancement of Dual Transfer Mode When Circuit Switched Resources Are Released" addresses this problem, and the present invention also addresses this problem (this related U.S. application is similar to 3GPP Tdoc G2-040288). The present invention covers some issues that this related U.S. application did not address: first, the indication of system information delivery on the packet associated control channel (PACCH), and second, system information handling in the MS, based upon validity time. A possible problem with the solution of the application "Enhancement of Dual Transfer Mode When Circuit Switched Resources Are Released" is that it is possible for a gap to occur in the PS session after the CS connection release, and the present invention solves this possible problem. For further background regarding system information messages, see 3GPP TS Tdoc GP-041144, "Introduction of non-segmented provision of serving cell SYSTEM INFORMATION messages on PACCH."

Summary of the Invention

The present invention is an improvement of the invention in the copending U.S. application titled "Enhancement of Dual Transfer Mode When Circuit Switched Resources Are Released" which is incorporated herein by reference. The present invention enhances the MS behaviour in the Class-A mode of operation, in order to expedite a transition to Class-B mode.

One way to accelerate the radio resource (RR) mode transition from the dual transfer mode (Class-A) to a packet transfer mode (Class-B) is to offer the minimum

system information to continue packet transfer already occurring in the dual transfer mode, and then offering the rest of the system information after the transfer from dual mode to packet mode. Accordingly, the present invention includes a method, mobile terminal, and system for use in a wireless communication system, in order for the mobile terminal to be able to transition from a dual transfer mode, in which a packet switched connection and circuit switched connection are used together, to a packet transfer mode in which packets are transferred.

A method and mobile terminal are disclosed here for use in a wireless communication system in order for the mobile terminal to be able to transition from the dual mode, in which a packet switched connection and circuit switched connection are used together, to a single mode in which packets are transferred. The mobile terminal is for receiving minimum system information necessary to perform the transition in an uninterrupted manner, instead of an interrupted manner. This system information is sent to the mobile terminal automatically or on a regular basis, and is also sent to the mobile terminal partly or entirely by upon request. A release indication is sent via a packet associated control channel (PACCH) to the mobile terminal, notifying the mobile terminal that the circuit switched connection will be released, and this starts a timer. The system information is then employed by the mobile terminal to transition from the dual mode to the single mode in the uninterrupted manner, if the timer has not expired. Especially if the mobile terminal is not moving rapidly from one service area to another, it will also be advantageous for the mobile terminal to try maintaining a valid set (or at least part or percentage of a valid set) of the minimum system information, even if the indication has not yet been received.

This invention has the advantage that the MS can maintain PS resources and gain better quality of service for a packet application. Gaps in PS service are minimized, especially if the MS has not changed location area during the CS connection. This invention thus allows an RR operation mode to be changed directly from dual transfer mode to the packet transfer mode without the release of packet resources after the release of the RR connection.

Brief Description of the Drawings

Figure 1 shows how a mobile terminal transitions from dual transfer mode according to the prior art.

Figure 2 details the transition from dual mode to packet mode according to the prior art.

Figure 3 details the transition from dual transfer mode to packet transfer mode according to the present invention.

Figure 4 is a flow chart of a method according to an embodiment of the present invention.

Figure 5 is a block diagram of a mobile terminal according to the present invention.

Detailed Description of the Invention

The present invention describes a way to enhance the transition between two main situations: dual transfer mode, and packet transfer mode. Regarding action while in dual transfer mode, as mentioned previously, the MS obtains a certain set of system information depending on whether a packet control channel is supported or not by the network, in order to continue without a service gap in the packet transfer mode after an RR connection is released.

FIG 3 depicts the enhanced transition from dual mode, due to an RR connection release. It is assumed in this embodiment that a packet control channel is supported. The RR connection **212** release is initiated by the MSC **208** that sends the CLEAR COMMAND **310** message to the BSS **204**. The BSS indicates the start of this procedure by sending a new message, for example a PACKET CS RELEASE INDICATION **320** on the PACCH (or on the main dedicated control channel so that the message can be an RR level message). To make sure that the mobile station **202** has received this message, the network may poll it or send the message several times. Adding this indication (that the release procedure is starting) in RLC/MAC messages can also accomplish this indicating task. In case of PSI messages **350**, the addition of the indication is possible because those messages have free space. However, a problem may exist with using SI messages **340**. The SI messages are encapsulated in the

PACKET SERVING CELL SI message **340** (sent via PACCH) that may be totally full, and therefore the addition of new information would be impossible. The indication would be added to every (P)SI message **350** (i.e. in the required set) and therefore that solution for alerting the MS **202** about the release cannot be seen as favorable as compared to using a single new message **320**.

The PACKET CS RELEASE INDICATION **320** has the following structure in this embodiment:

```
<Packet CS Release Indication> ::=
        {0 , GLOBAL_TFI : Global TFI IE > >
        | 1 < TLLI : < TLLI IE > > }
        < PACKET CS_RELEASE INDICATION : bit (1) >
<padding bits> ;
```

Immediately after sending the above-described indication message **320**, the network sends a corresponding set of (P)SI messages **350**. In further contrast to what is described in the copending application titled "Enhancement of Dual Transfer Mode When Circuit Switched Resources Are Released," a PACKET SERVING CELL DATA message from the network is not used here. The network can send PSI messages **350** on the PACCH, and SI messages may be encapsulated in the PACKET SERVING CELL SI message **340**.

If packet control channels are supported, then the network may send PSI1 and a consistent set of PSI2 messages when the MS is in the dual transfer mode. However, if packet control channels are not supported, then the network may send SI3, SI13 and, if present, SI1 messages when the MS is in the dual transfer mode.

The network will send the needed system information before the release of an RR connection. The CHANNEL RELEASE message **370** is sent after the MS **202** acknowledges that it has received correctly all needed system information. The PACKET (P)SI STATUS message **360** can be used to acknowledge the receipt of system information, as discussed in the copending application titled "Enhancement of Dual Transfer Mode When Circuit Switched Resources Are Released."

If a network cannot send all needed information, or if it has insufficient resources, then the network can just send a CHANNEL RELEASE message with a notification that the MS is not allowed to continue in the packet transfer mode immediately after the release of the RR channel. In this case, after the release of the PS resources, the MS may ask for them again, as already specified in the prior art. Alternatively, the network will preferably indicate that the MS is allowed to continue in the packet transfer mode after the release of CS resources.

A timer **380** is defined in the network for awaiting a response from the MS to the receipt of system information messages. The network starts the timer when the indication is sent to the MS **202**, and it is stopped when the network receives the PACKET (P)SI STATUS message **360** acknowledging that the required set of (P)SI messages have been received by the MS, as shown in FIG. 3. In case no response is received by the network (i.e. the timer expires), the network will send a CHANNEL RELEASE message **370** with an indication that the MS is not allowed to continue in the packet transfer mode after release of an RR connection. The value of the timer **380** shall be set so that the network resources are not wasted too long; for example, when the MS has only DL TBF allocated, it shall wait until it is polled to send a PACKET DOWNLINK ACK/NACK message.

Another option in handling of system information while in DTM is for the MS to attempt to maintain the above-described sets of system information at all times. While in DTM, the MS may receive PSI or SI messages on the PACCH. On the PACCH, PSI messages can be sent, since they are RLC/MAC messages, but SI messages are encapsulated in the PACKET SERVING CELL SI message.

In 3GPP TS 44.060, "Radio Link Control/Medium Access Control (RLC/MAC) protocol," it is specified that the MS shall check every 30 seconds whether the system information has been changed. This can also be a reasonable way for the MS to check for PSI messages received on the PACCH when in dual transfer mode. This means that the MS cannot use PSI messages received more than 30 seconds ago. Note that the MS may disregard (P)SI messages sent on the PACCH.

If the MS is missing some system information message(s), or if messages are too old, the MS may request them by using the PACKET (P)SI STATUS message. In a static case (i.e. the MS remains in the same call), it would be enough to simply check PSI1 when the PBCCH exists on the cell, and otherwise then check PSI14 or PSI13. PSI1 includes a PBCCH_CHANGE_MARK field in which is indicated whether some packet system information messages have been changed. Correspondingly, PSI14 and PSI13 include a BCCH_CHANGE_MARK indication for system information messages. If the (P)BCCH_CHANGE_MARK field does not indicate the change, then the current set is still valid. If some message(s) have been changed, then the MS shall request them by using the PACKET (P)SI STATUS message.

In a mobility scenario, for example after handover, the MS will request the required set of target cell system information. If the MS moves and is handed over frequently, many set updates are required. Therefore, system information handling based on validity time (i.e. maintaining a valid basic set all the time) would have less merit than the previous option described above.

A further option in the CS connection release would be to send system information messages on the dedicated resource as acknowledged messages on the main DCCH, or as unacknowledged messages on the SACCH main DCCH. When using main DCCH (SDCCH/FACCH), the system information messages are sent in a point-to-point manner or upon request of the mobile terminal, and the MS can acknowledge them. However, the MS cannot acknowledge system information messages when using UI-frames (SACCH/FACCH). The structure of the message sent via the main DCCH or using UI-frames is shown in the following table:

IEI	Information Element	Type/Reference	Presence	Format	Length
	GTTP Protocol Discriminator	Protocol Discriminator 10.2	M	V	1/2
	Skip Indicator	Skip Indicator 10.3.1	M	V	1/2
	System Information Message Type	Message Type 10.4	M	V	1/2
	System Information PDU	System Information PDU Container	M	V	20-n

Note that the system information PDU in this table contains an information element describing whether the message includes a BCCH (RR) or PBCCH (RLC/MAC) PDU.

Referring now to the flowchart of FIG 4, this illustrates a method according to embodiment of the present invention. This method is for a mobile terminal to transition from a dual transfer mode, in which a packet switched connection and circuit switched connection are used together, to a packet transfer mode in which packets are transferred. In the step **402**, at least a portion of minimum system information is received that is necessary to perform the transition in an uninterrupted manner. In this step **402**, the information is sent on a regular basis or automatically (i.e. not in response to particular requests from the mobile terminal) to the mobile terminal. In step **404**, the mobile terminal receives an indication, sent separately from any of the system information, that a circuit switched connection will be released so as to transition the mobile terminal from dual mode to only packet switching mode, and this step additionally includes starting a timer. Then, further system information is obtained **406** (if such further information is still needed) via point-to-point communication or upon request, instead of on a regular or automatic basis, provided that the timer has not yet expired. Receipt of all necessary further information is acknowledged **408**, and then the circuit switching channel is released **410**. If all the needed system information was obtained before expiration of the timer, then an uninterrupted transition from dual mode

occurs **412**, but otherwise the transition will be interrupted **414**. As indicated in step **406**, valid system information can be obtained via communication upon request even prior to the indication **404**, and this validity time period may be particular useful in situation where the mobile terminal is not rapidly moving from one cell to another.

Referring now to FIG 5, this shows a mobile terminal **502** according to an embodiment of the present invention, for transitioning in a wireless communication system from a dual mode wherein a packet switched connection and circuit switched connection are used together, to a single mode wherein packets are transferred. This mobile terminal includes a transceiver **504**, for sending toward a processing unit **510** at least one automatic system information signal **506** and at least one further system information signal **508** requested by the MS, in order to provide the processing unit **510** at least minimum information necessary to perform the transition in an uninterrupted manner. The processing unit **510** is responsive to the minimum system information, and is for employing that information to transition the mobile terminal from the dual mode to the single mode in the uninterrupted manner. The processing unit **510** is also responsive to the release indication signal **522** that starts a timer **597**. The transition is uninterrupted only if the timer has not expired by the time the transition from dual mode occurs, and if it has expired then the transition will be temporarily interrupted as in the prior art. Of course, the timer can alternatively be located at the network side. The mobile terminal **502** further includes a packet switch device **514**, for processing and passing the data signal **512** between the processing unit **510** and the transceiver **504**. The mobile terminal further includes a circuit switch device **516**, for processing and passing a voice or other non-bursty signal **518** between the processing unit **510** and the transceiver **504**, the voice signal **518** being discontinued whereas the data signal **512** is uninterrupted or temporarily interrupted. Thus, this mobile terminal shown in FIG 5 is capable of performing the method illustrated in FIG 4.

It is to be understood that all of the present figures, and the accompanying narrative discussions of best mode embodiments, do not purport to be completely rigorous treatments of the method, terminal, and system under consideration. A person skilled in the art will understand that the steps and signals of the present application represent general cause-and-effect relationships that do not exclude intermediate

interactions of various types, and will further understand that the various steps and structures described in this application can be implemented by a variety of different combinations of hardware and software which need not be further detailed herein, without departing from the spirit and scope of the present invention.

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WHAT IS CLAIMED IS:

1. A method in a wireless communication system for a mobile terminal to transition from a dual mode, in which a packet switched connection and circuit switched connection are used together, to a single mode in which packets are transferred, comprising:

receiving at least minimum system information necessary to perform the transition in an uninterrupted manner, wherein said system information is sent to the mobile terminal automatically, and may additionally be sent to the mobile terminal upon request of the mobile terminal,

sending a release indication to the mobile terminal, in order to notify the mobile terminal that the circuit switched connection will be released,

starting a timer substantially when the release indication is sent, and

employing the system information to transition from the dual mode to the single mode in the uninterrupted manner if the timer has not expired.

2. The method of claim 1, wherein the release indication is sent separately from the system information.

3. The method of claim 1, wherein the timer stops without expiring, in response to the mobile terminal acknowledging receipt of the system information.

4. The method of claim 1, wherein at least part of the system information received by the mobile terminal upon request is for maintaining a valid set, or portion, of the minimum system information during a period of time before the release indication.

5. The method of claim 4, wherein the dual mode corresponds to a Class-A mode, and the single mode corresponds to a Class-B or Class-C mode.

6. The method of claim 5, wherein the system information includes a packet system information message that is automatically sent to the mobile terminal at regular intervals to furnish updated system information via a packet associated control channel (PACCH).

7. The method of claim 6, wherein the packet system information message is sent before a channel for the circuit switched connection is released.

8. The method of claim 4, further comprising the steps of:

initiating or asking for disconnection of the circuit switched connection before a channel used for the circuit switched connection is released, and

obtaining at least some of the information after initiating or asking for the disconnection, but before the channel is released.

9. The method of claim 8, wherein the at least some of the information in the obtaining step is sent to the mobile terminal via a packet associated control channel (PACCH), without using a packet serving cell data message.

10. The method of claim 8, further comprising the step of sending an acknowledgment from the mobile terminal that all of the minimum system information was obtained, and wherein the channel is released after the acknowledgment is received.

11. The method of claim 4, wherein the mobile terminal receives the system information upon request after receiving the release indication, but before release of a channel supporting the connection.

12. The method of claim 10, wherein a packet SI status, packet PSI status, or another message from the mobile terminal comprises the acknowledgment.

13. The method of claim 1, wherein at least part of the system information is sent via a dedicated resource as at least one acknowledged or unacknowledged message.

14. The method of claim 1, wherein the release indication is sent via a packet associated control channel (PACCH) or a dedicated control channel (DCCH).

15. A computer readable medium encoded with a software data structure sufficient for performing the method of claim 1.

16. A mobile terminal for transitioning in a wireless communication system from a dual mode wherein a packet switched connection and circuit switched connection are used together, to a single mode wherein packets are transferred, comprising:

a transceiver, for sending toward a processing unit at least one automatic system information signal, and at least one further system information signal requested by the mobile terminal, in order to provide the mobile terminal at least minimum system information necessary to perform the transition in an uninterrupted manner; and

the processing unit, responsive to the minimum system information, for employing the minimum system information to transition from the dual mode to the single mode in the uninterrupted manner,

wherein the processing unit is also responsive to a release indication signal that starts a timer, and

wherein the transition is uninterrupted only if the timer has not expired.

17. The mobile terminal of claim 16, further comprising:

a packet switch device, for processing and passing an uninterrupted or temporarily interrupted data signal between the processing unit and the transceiver; and

a circuit switch device, for processing and passing a voice signal between the processing unit and the transceiver, the voice signal being discontinued whereas the data signal is uninterrupted or temporarily interrupted.

18. The mobile terminal of claim 16, wherein the dual mode corresponds to a Class-A mode, and the single mode corresponds to a Class-B or Class-C mode.

19. The mobile terminal of claim 16, wherein the release indication signal is signaled separately from the system information.

20. The mobile terminal of claim 16, wherein the timer stops without expiring in response to the mobile terminal acknowledging receipt of the system information.

21. The mobile terminal of claim 16, wherein at least part of the system information received by the mobile terminal upon request is for maintaining a valid set or portion of the minimum system information during a period of time before the release indication.

22. The mobile terminal of claim 16, wherein the transceiver is also for receiving the at least part of the system information, sent via a dedicated resource, as at least one acknowledged or unacknowledged message.

23. The mobile terminal of claim 16, wherein the transceiver is also for receiving the release indication that is sent via a packet associated control channel (PACCH) or a dedicated control channel (DCCH).

24. A system for transitioning a mobile terminal in a wireless communication system from a dual mode wherein a packet switched connection and circuit switched connection are used together, to a single mode wherein packets are transferred, comprising:

a base station, for providing at least one automatic system information signal, and at least one further system information signal requested by the mobile terminal, in order to provide the mobile terminal at least minimum system information necessary to perform the transition in an uninterrupted manner; and

a mobile terminal, responsive to the minimum system information, for employing the minimum system information to transition from the dual mode to the single mode in the uninterrupted manner,

wherein the mobile terminal is also responsive to a release indication signal that starts a timer, and

wherein the transition is uninterrupted only if the timer has not expired.

25. A base station for transitioning a mobile terminal in a wireless communication system from a dual mode wherein a packet switched connection and circuit switched connection are used together, to a single mode wherein packets are transferred, comprising:

means for providing at least one automatic system information signal, and at least one further system information signal requested by the mobile terminal, in order to provide the mobile terminal at least minimum system information necessary to perform the transition in an uninterrupted manner;

means for providing a release indication signal which starts a timer; and

means for transitioning the mobile terminal from the dual mode to the single mode in the uninterrupted manner only if the timer has not expired.

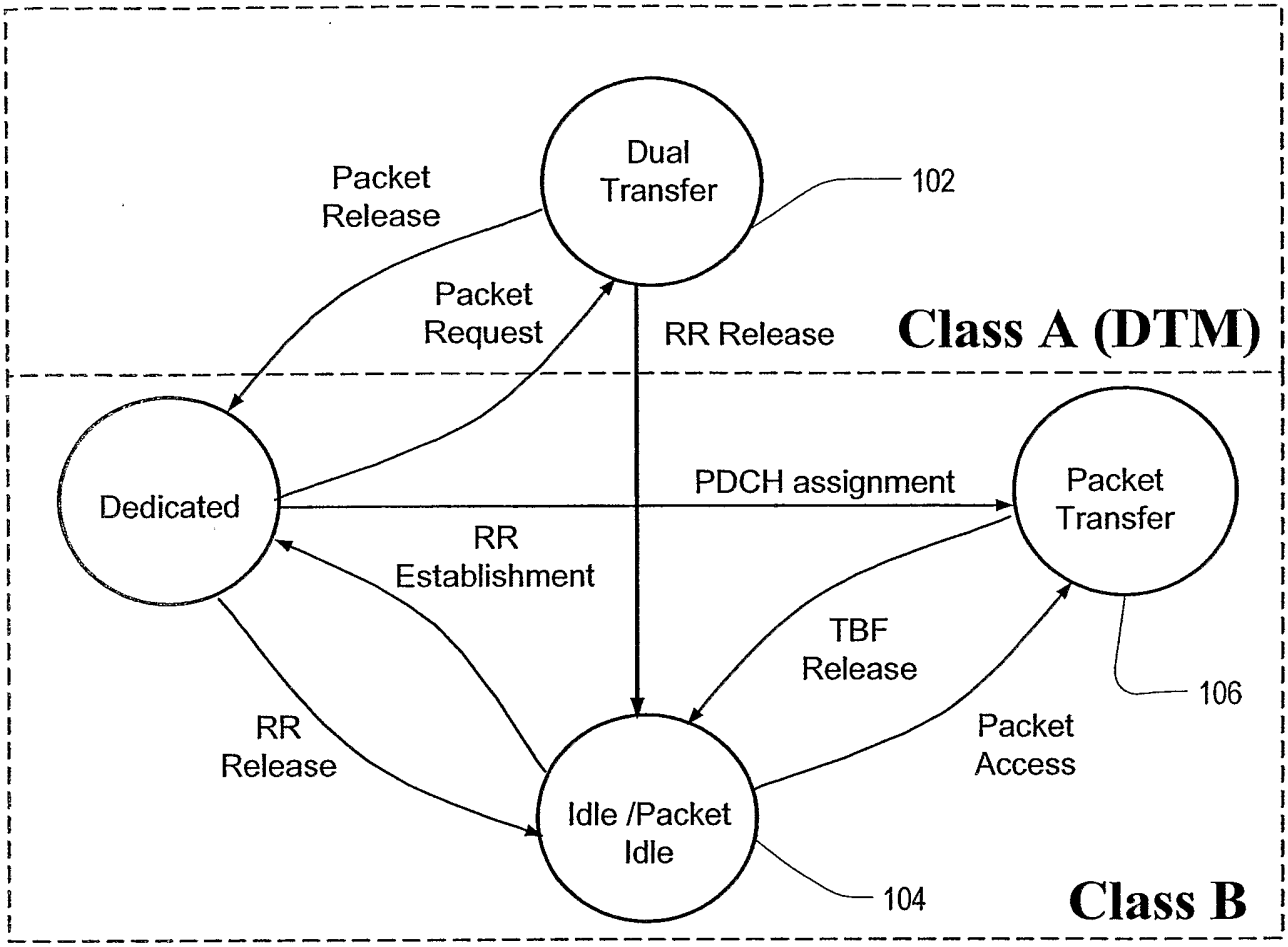

FIG 1
(Prior Art)

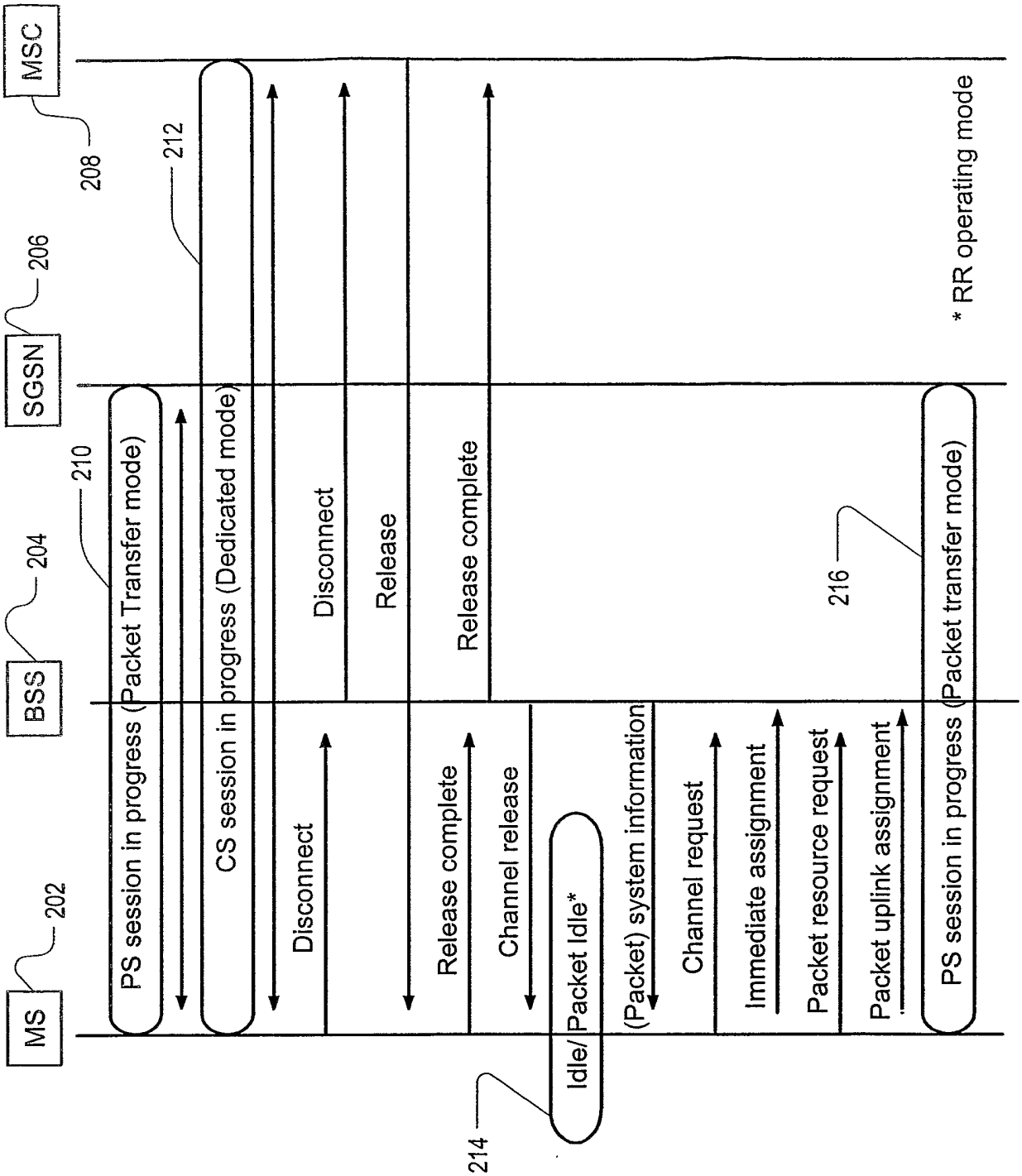

FIG 2
(Prior Art)

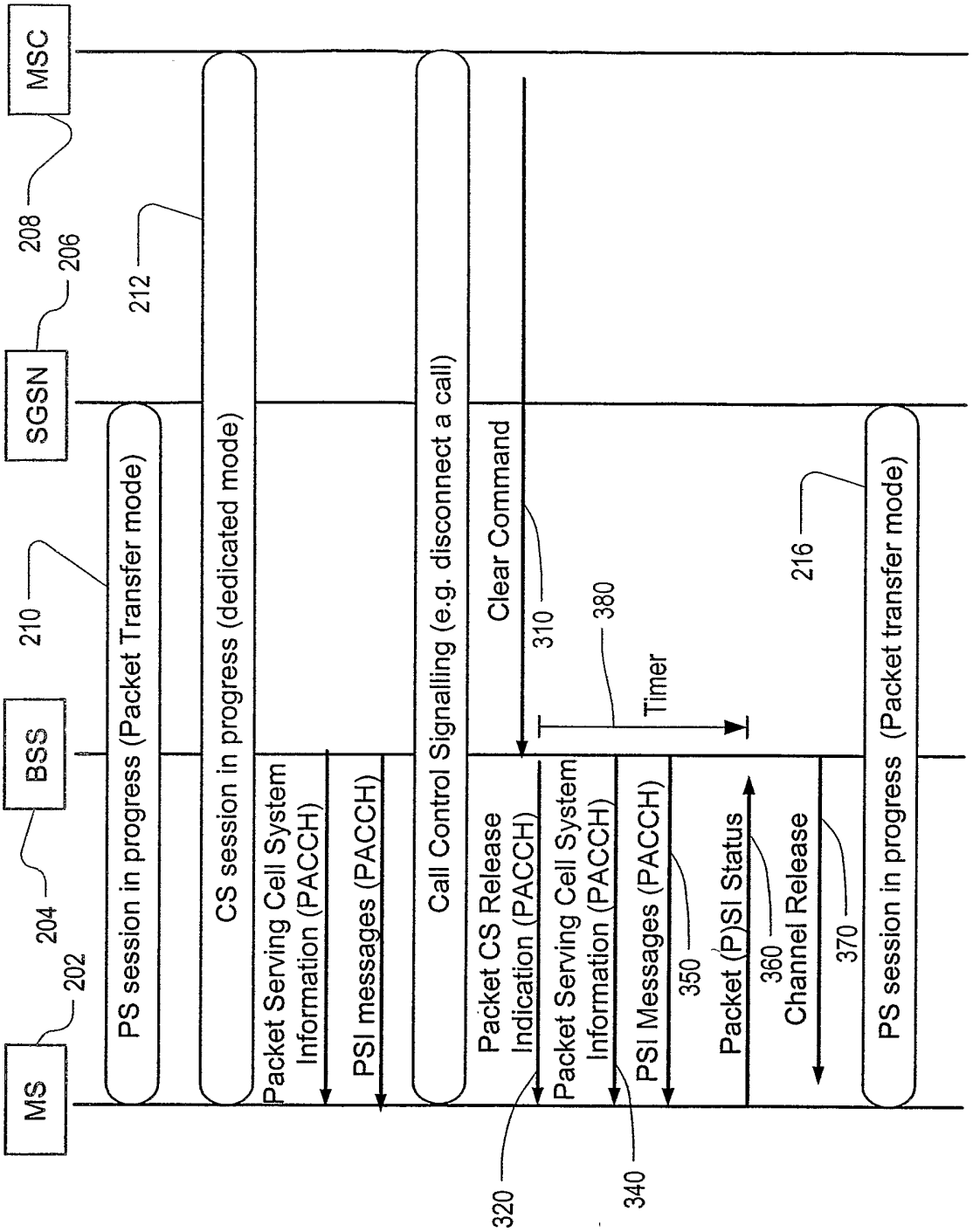
MS
BSS
SGSN
MSC
202
204
206
208
210
212
216
PS session in progress (Packet Transfer mode)
CS session in progress (dedicated mode)
Packet Serving Cell System Information (PACCH)
PSI messages (PACCH)
Call Control Signalling (e.g. disconnect a call)
Clear Command
310
380
Timer
Packet CS Release Indication (PACCH)
Packet Serving Cell System Information (PACCH)
PSI Messages (PACCH)
Packet (P)SI Status
Channel Release
PS session in progress (Packet transfer mode)
320
340
350
360
370

FIG 3

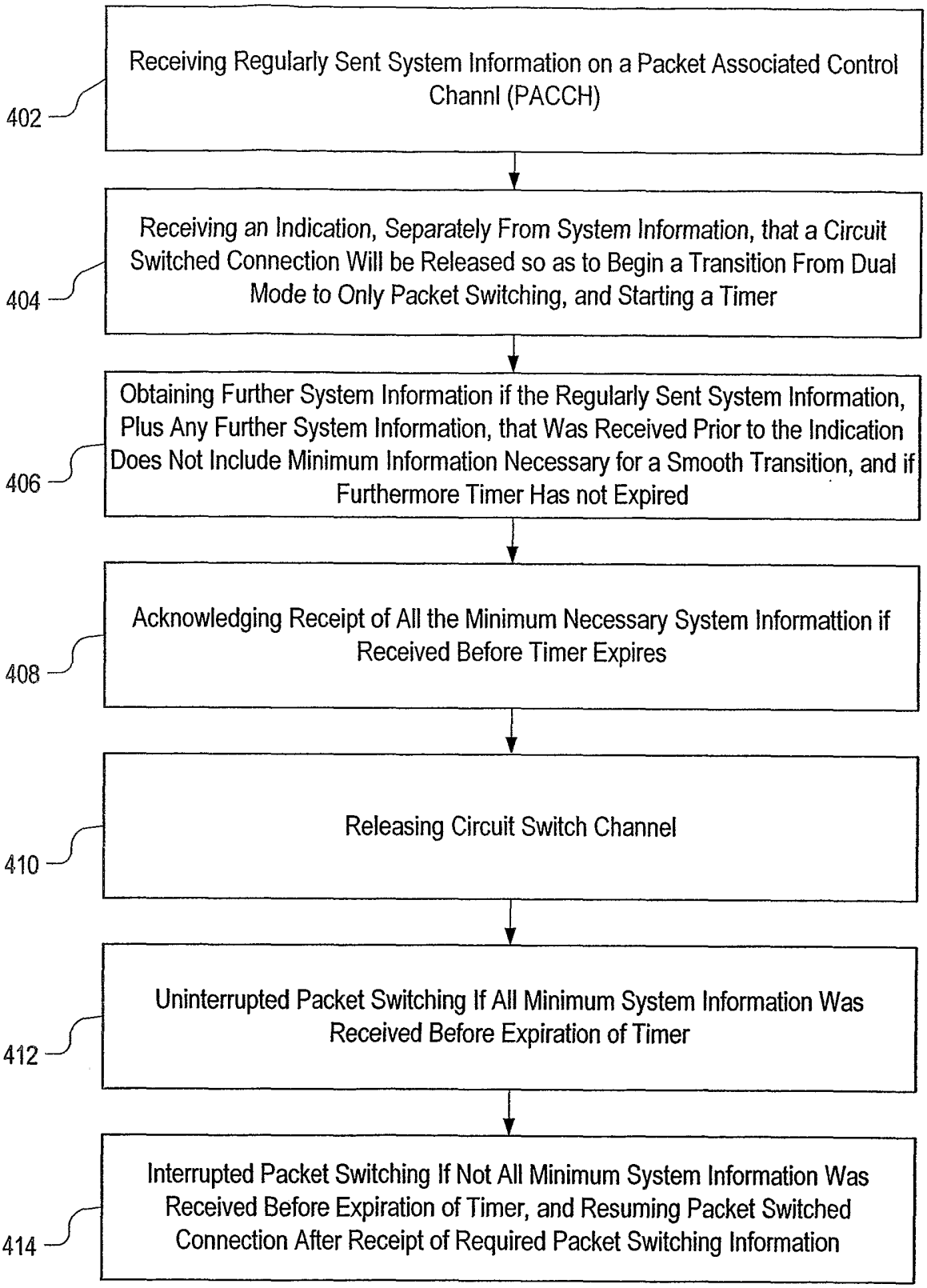
Receiving Regularly Sent System Information on a Packet Associated Control Channl (PACCH)
402
Receiving an Indication, Separately From System Information, that a Circuit Switched Connection Will be Released so as to Begin a Transition From Dual Mode to Only Packet Switching, and Starting a Timer
404
Obtaining Further System Information if the Regularly Sent System Information, Plus Any Further System Information, that Was Received Prior to the Indication Does Not Include Minimum Information Necessary for a Smooth Transition, and if Furthermore Timer Has not Expired
406
Acknowledging Receipt of All the Minimum Necessary System Informattion if Received Before Timer Expires
408
Releasing Circuit Switch Channel
410
Uninterrupted Packet Switching If All Minimum System Information Was Received Before Expiration of Timer
412
Interrupted Packet Switching If Not All Minimum System Information Was Received Before Expiration of Timer, and Resuming Packet Switched Connection After Receipt of Required Packet Switching Information
414

FIG. 4

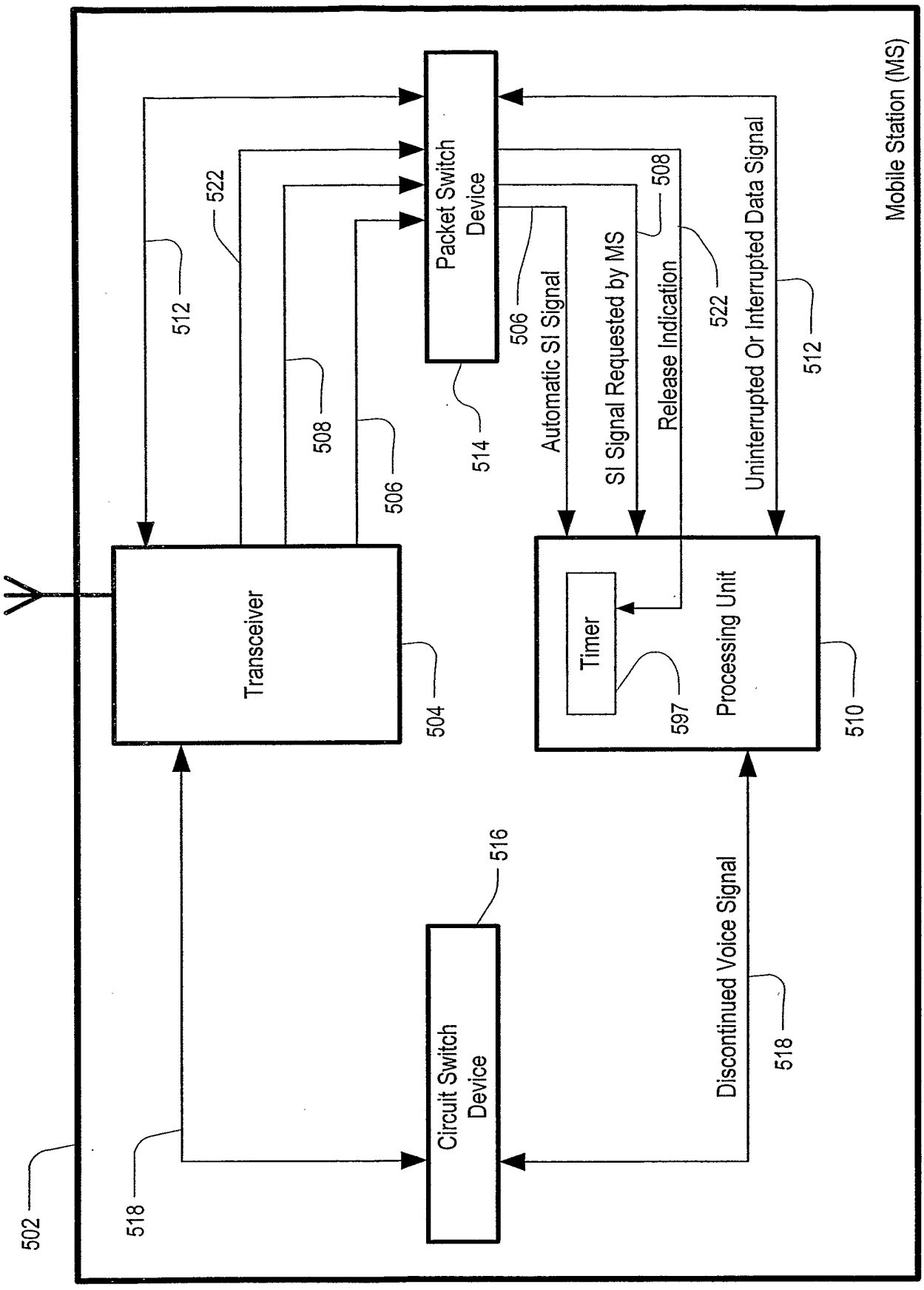
Mobile Station (MS)
Packet Switch Device
Transceiver
Timer
Processing Unit
Circuit Switch Device
Automatic SI Signal
SI Signal Requested by MS
Release Indication
Uninterrupted Or Interrupted Data Signal
Discontinued Voice Signal
502
504
506
508
510
512
514
516
518
522
597

FIG 5

INTERNATIONAL SEARCH REPORT

Inter al application No.
PCT/IB 2005/001642

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/38
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04B, H04L, H04Q

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20020118662 A1 (ARNOLD SHEYNMAN ET AL), 29 August 2002 (29.08.2002), abstract, section 0034 --	1-25
A	WO 0120930 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 22 March 2001 (22.03.2001), claims 1-9, abstract --	1-25
A	US 20020111169 A1 (VIERI VANGHI), 15 August 2002 (15.08.2002), claim 1, abstract --	1-25

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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

Date of the actual completion of the international search	Date of mailing of the international search report
9 November 2005	10-11-2005
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Nils Nordin/MP Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB 2005/001642

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0069188 A1 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 16 November 2000 (16.11.2000), claims 1, 12, abstract -- --------	1-25

US	20020118662	A1	29/08/2002	BR	0204337	A	24/06/2003
				CA	2407539	A	12/09/2002
				MX	PA02010623	A	14/05/2003
				WO	02071707	A	12/09/2002
WO	0120930	A1	22/03/2001	AU	7695500	A	17/04/2001
				CN	1391771	A,T	15/01/2003
				EP	1212903	A	12/06/2002
				MX	PA02002525	A	30/07/2002
				US	6529497	B	04/03/2003
US	20020111169	A1	15/08/2002	US	6937861	B	30/08/2005
				WO	02065716	A	22/08/2002
WO	0069188	A1	16/11/2000	AU	4751000	A	21/11/2000
				EP	1051050	A	08/11/2000
				EP	1177699	A	06/02/2002
				US	6792270	B	14/09/2004