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# United States Patent [19]

**Buchholz et al.**

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[45] **Date of Patent: Jul. 11, 2000**

[54] **METHOD AND APPARATUS IN A WIRELESS COMMUNICATION SYSTEM FOR CONTROLLING A DISPLAY OF TEMPLATE DATA BY A PROTABLE SUBSCRIBER UNIT**

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[73] Assignee: **Motorola, Inc.**, Schaumburg, Ill.

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[22] Filed: **Jun. 23, 1998**

[51] **Int. Cl.**[7] ..... **G09G 5/00**

[52] **U.S. Cl.** ..... **370/310**; 455/418; 455/517; 455/575

[58] **Field of Search** ..... 370/310, 328; 455/517, 418, 419, 420, 425, 550, 575, 561

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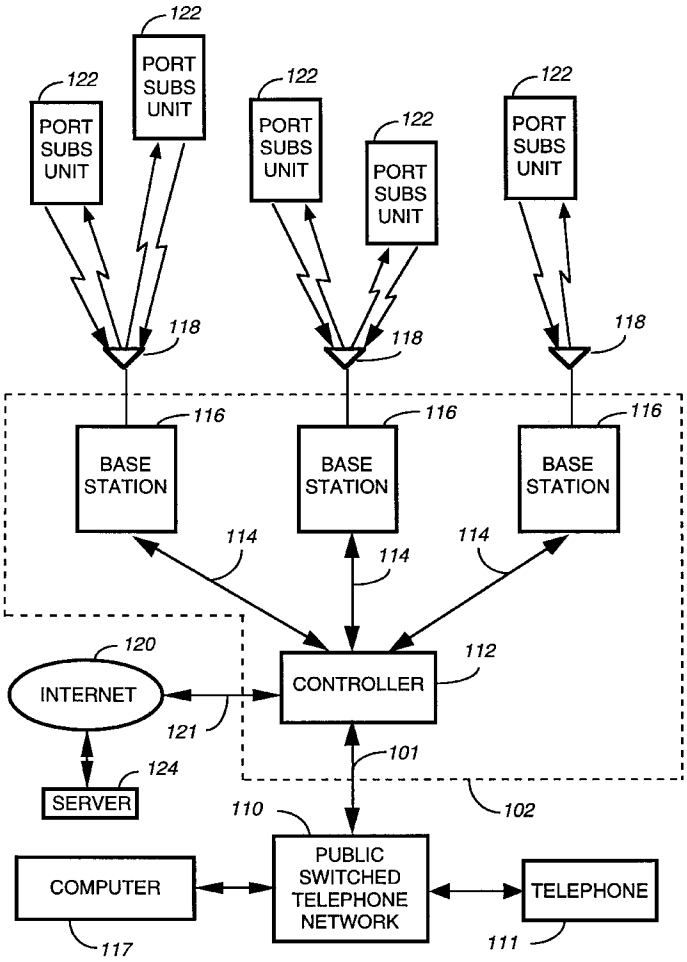
*Primary Examiner*—Huy D. Vu
*Attorney, Agent, or Firm*—R. Louis Breeden

[57] **ABSTRACT**

A pack **(209)** is programmed **(402)** into a portable subscriber unit **(122)**, the pack including a bundle of templates for formatting template data received for display on at least one page. A server **(124)** then transmits **(404)** the template data through the wireless communication system. The portable subscriber unit receives **(406)** the template data and displays **(408)** the template data in accordance with the pack.

**17 Claims, 4 Drawing Sheets**



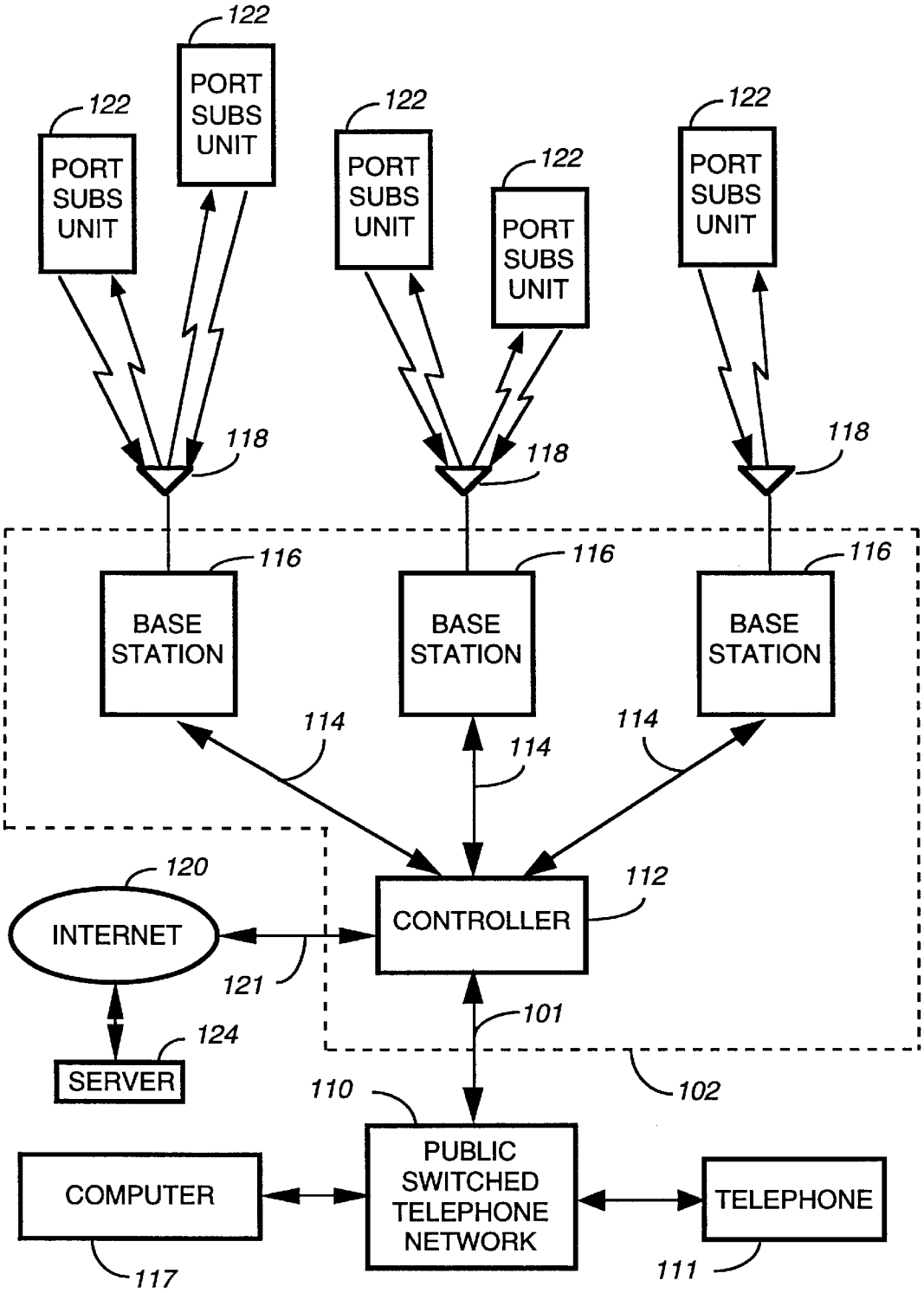

122
PORT SUBS UNIT
122
PORT SUBS UNIT
122
PORT SUBS UNIT
122
PORT SUBS UNIT
122
PORT SUBS UNIT
118
118
118
116
BASE STATION
116
BASE STATION
116
BASE STATION
114
114
114
120
INTERNET
121
CONTROLLER
112
124
SERVER
101
102
110
PUBLIC SWITCHED TELEPHONE NETWORK
COMPUTER
TELEPHONE
117
111

*FIG. 1*

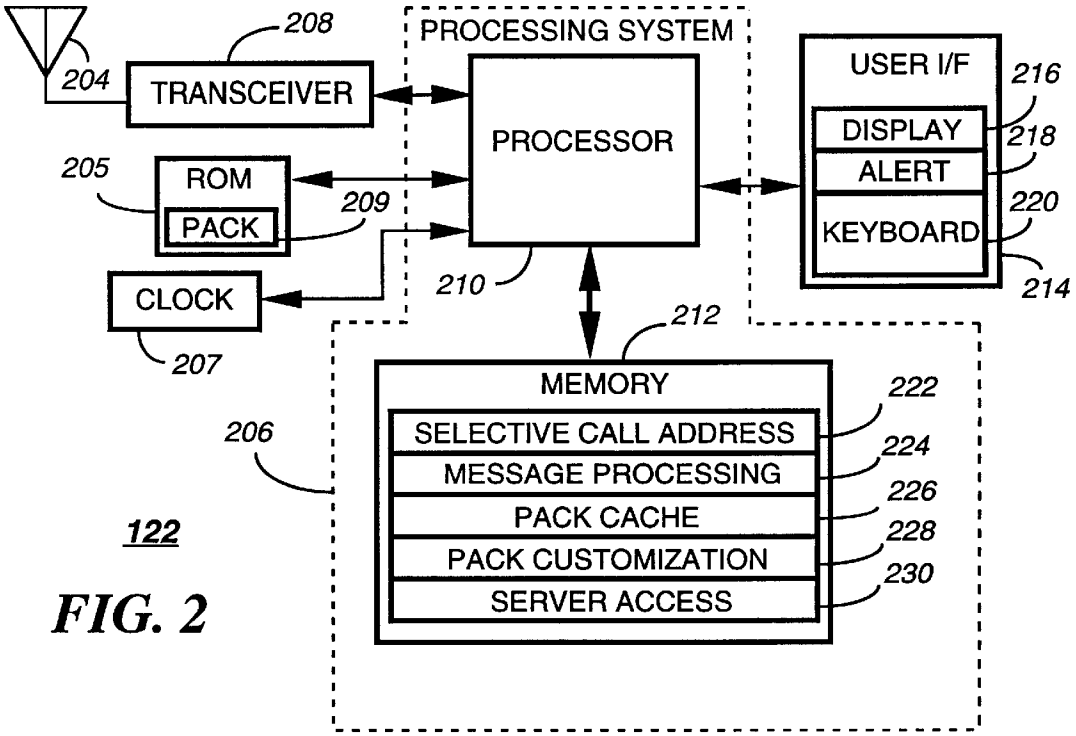

PROCESSING SYSTEM
TRANSCEIVER
PROCESSOR
USER I/F
DISPLAY
ALERT
KEYBOARD
ROM
PACK
CLOCK
MEMORY
SELECTIVE CALL ADDRESS
MESSAGE PROCESSING
PACK CACHE
PACK CUSTOMIZATION
SERVER ACCESS
204
205
206
207
208
209
210
212
214
216
218
220
222
224
226
228
230
122

FIG. 2

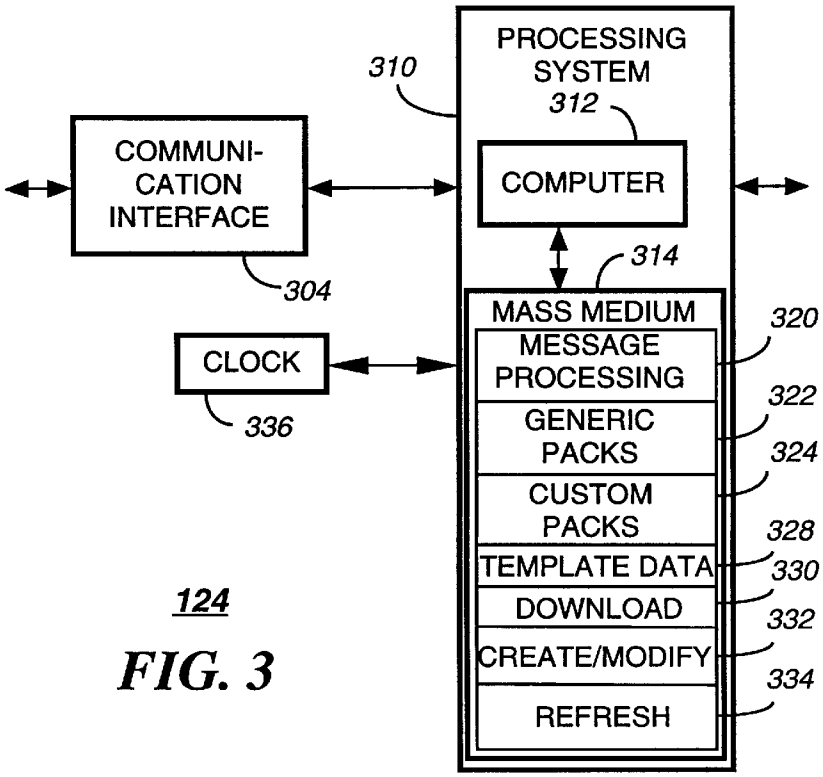

PROCESSING SYSTEM
COMPUTER
COMMUNI-CATION INTERFACE
CLOCK
MASS MEDIUM
MESSAGE PROCESSING
GENERIC PACKS
CUSTOM PACKS
TEMPLATE DATA
DOWNLOAD
CREATE/MODIFY
REFRESH
304
310
312
314
320
322
324
328
330
332
334
336
124

FIG. 3

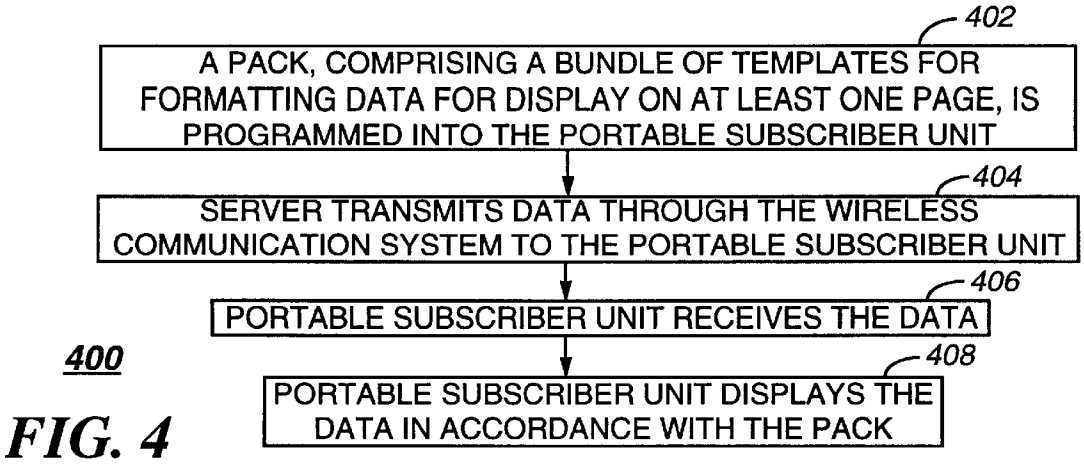



FIG. 4

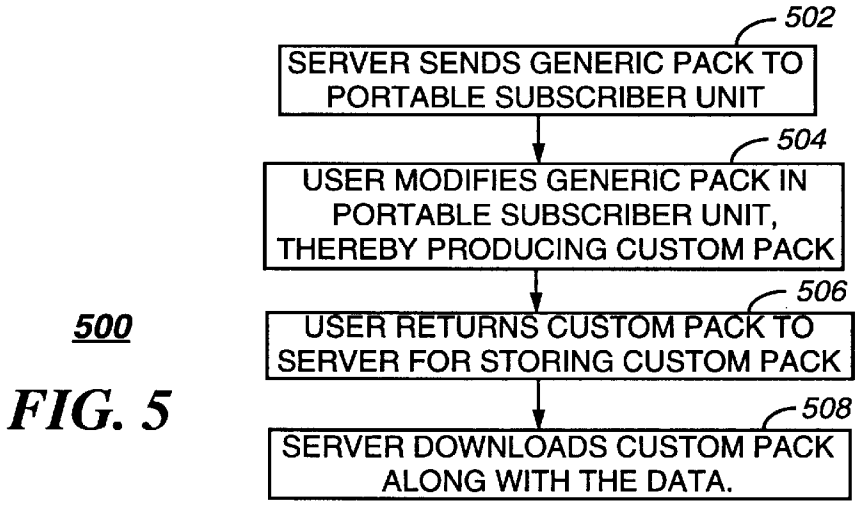



FIG. 5

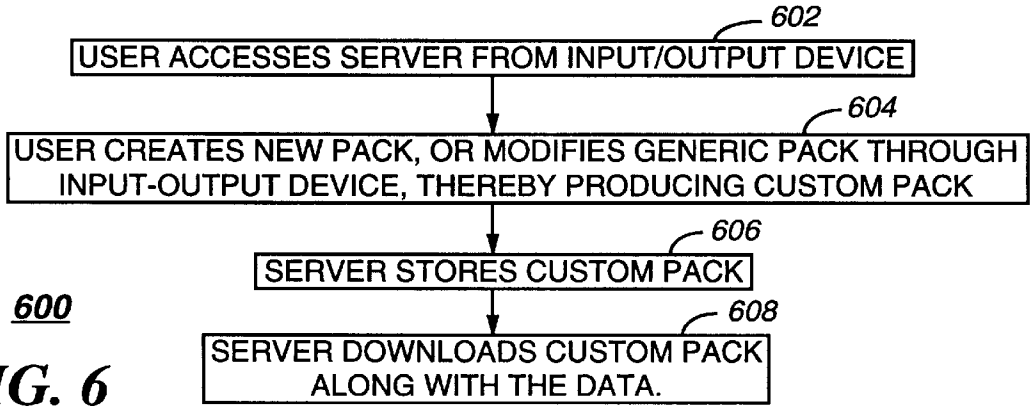
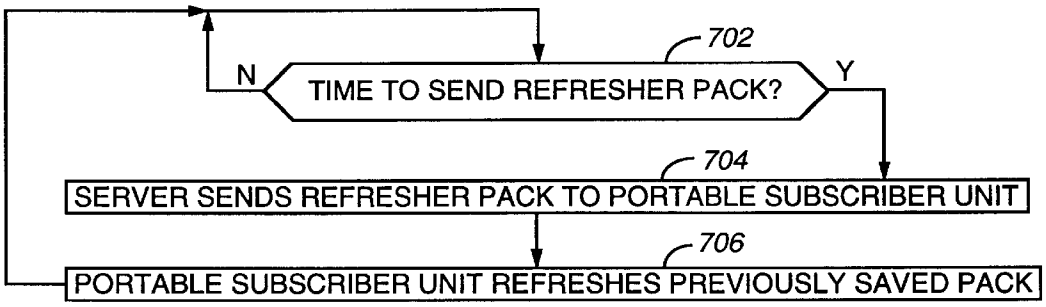
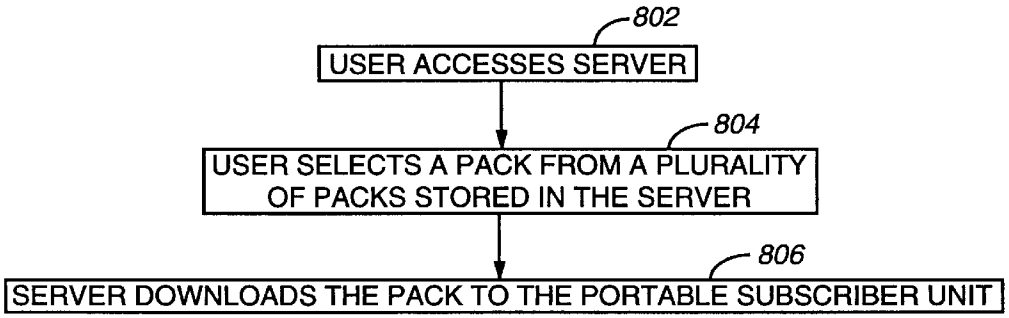



FIG. 6




700

*FIG. 7*




800

*FIG. 8*

# METHOD AND APPARATUS IN A WIRELESS COMMUNICATION SYSTEM FOR CONTROLLING A DISPLAY OF TEMPLATE DATA BY A PROTABLE SUBSCRIBER UNIT

## FIELD OF THE INVENTION

This invention relates in general to wireless communication systems, and more specifically to a method and apparatus in a wireless communication system for controlling a display of template data by a portable subscriber unit.

## BACKGROUND OF THE INVENTION

Information services are becoming increasingly popular in the wireless service market as they can provide subscribers with up-to-date information on stocks, sports, news, and the like. To increase the value of these services it is helpful to customize them for each individual subscriber. Customization is not desirable, however, if it requires a large increase in the amount of traffic traveling over the air.

In prior art wireless communication systems, information services providers have broadcast data to an information service address which the subscriber unit uses to identify information. If the subscriber unit has the address activated in its registry, it reads and processes the data. The display of the data, however, has not been configurable by the end-user.

In a similar vein, prior art wireless communication systems have begun to support access to the Internet. Wireline techniques and protocols for Internet access have been tried in wireless systems, but have encountered problems. The technique of requesting a single WEB page (or portion of a page) and then displaying the page (or portion) before requesting another page (or another portion of the same page), as currently used in the wireline protocols, can introduce excessive latency in store-and-forward wireless systems. This is because such systems must queue each response until adequate air time becomes available to transmit the response.

One prior art technique, known as the Wireless Application Protocol (WAP), has partially addressed the latency problem by sending multiple WEB pages, for example, in a single transmission as a "deck" of "cards," each card corresponding to a page of structured content and navigation specifications. Each WAP card, however, has combined the data to be displayed, with formatting instructions used in controlling the display of the data, thereby disadvantageously causing data downloads to be larger than necessary whenever the data uses a fixed display format.

Thus, what is needed is a method and apparatus in a wireless communication system for controlling a display of data by a portable subscriber unit. In particular, what is needed is a method and apparatus that can reduce the size of data downloads and that can allow customization the display of the data according to the desires of the enduser.

## SUMMARY OF THE INVENTION

An aspect of the present invention is a method in a wireless communication system for controlling a display of template data by a portable subscriber unit. The method comprises the steps of programming a pack into the portable subscriber unit, the pack comprising a bundle of templates for formatting the template data for display on at least one page; and transmitting the template data from a server in the wireless communication system. The method further comprises the steps of receiving the template data by the portable subscriber unit, and displaying the template data in accordance with the pack.



Another aspect of the present invention is a portable subscriber unit in a wireless communication system for controlling a display of template data received from a server. The portable subscriber unit comprises a transceiver for communicating with the server to receive the template data, and a processing system coupled to the receiver for processing the template data, the processing system comprising a memory. The portable subscriber unit further comprises a user interface coupled to the processing system for displaying the template data and for accepting an input from a user. The processing system is programmed with a pack comprising a bundle of templates for formatting the template data for display on at least one page. The processing system is further programmed to cooperate with the user interface to display the template data in accordance with the pack.

Another aspect of the present invention is a server in a wireless communication system for controlling a display of template data by a portable subscriber unit. The server comprises a communication interface coupled to a controller of the wireless communication system for communicating therewith, and a processing system coupled to the communication interface for processing information communicated through the communication interface, the processing system comprising a memory. The processing system is programmed to send a pack to the portable subscriber unit, the pack comprising a bundle of templates for formatting the template data for display on at least one page, and to transmit the template data to the wireless communication system for display by the portable subscriber unit in accordance with the pack.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an electrical block diagram of a wireless communication system in accordance with the present invention.

FIG. **2** is an electrical block diagram of a portable subscriber unit in accordance with the present invention.

FIG. **3** is an electrical block diagram of a server in accordance with the present invention.

FIG. **4** is a flow diagram depicting an operation of the wireless communication system in accordance with the present invention.

FIG. **5** is a flow diagram depicting a first programming operation of the wireless communication system in accordance with the present invention.

FIG. **6** is a flow diagram depicting a second programming operation of the wireless communication system in accordance with the present invention.

FIG. **7** is a flow diagram depicting a third programming operation of the wireless communication system in accordance with the present invention.

FIG. **8** is a flow diagram depicting a fourth programming operation of the wireless communication system in accordance with the present invention.

## DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIG. **1**, an electrical block diagram depicts an exemplary wireless communication system in accordance with the present invention, comprising an infrastructure portion **102** including a controller **112** and a plurality of conventional base stations **116**, the communication system also including a plurality of portable subscriber units **122**. The base stations **116** preferably communicate with the portable subscriber units **122** utilizing conventional radio frequency (RF) techniques, and are coupled by conventional

communication links **114** to the controller **112**, which controls the base stations **116**.

The controller **112** is preferably a combination of the Wireless Messaging Gateway (WMG™) Administrator! paging terminal, and the RF-Conductor!™ message distributor manufactured by Motorola, Inc. The base stations **116** are preferably a combination of the RF-Orchestra! transmitter and RF-Audience!™ receiver manufactured by Motorola, Inc. The portable subscriber units **122** are preferably similar to PageWriter™ 2000 data messaging units, also manufactured by Motorola, Inc., and having software modified in accordance with the present invention. It will be appreciated that other similar equipment can be utilized as well for the controller **112**, the base stations **116**, and the portable subscriber units **122**.

Each of the base stations **116** transmits RF signals to the portable subscriber units **122** via an antenna **118**. The base stations **116** preferably each receive RF signals from the plurality of portable subscriber units **122** via the antenna **118**. The RF signals transmitted by the base stations **116** to the portable subscriber units **122** (outbound messages) comprise selective call addresses identifying the portable subscriber units **122**, and data messages originated by message originators, as well as commands originated by the controller **112** for adjusting operating parameters of the radio communication system, and packs for formatting the display of template data in accordance with the present invention, as described further below. The RF signals transmitted by the portable subscriber units **122** to the base stations **116** (inbound messages) comprise responses that include scheduled messages, such as positive acknowledgments (ACKs) and negative acknowledgments (NAKs), and unscheduled messages, such as registration requests and pack requests.

The controller **112** preferably is coupled by telephone links **101** to a public switched telephone network (PSTN) **110** for receiving selective call message originations therefrom. Selective call originations comprising data messages from the PSTN **110** can be generated, for example, from a conventional telephone **111** or a conventional computer **117** coupled to the PSTN **110**. In addition, the controller **112** preferably is coupled through a conventional communication link **121** to the Internet **120** for acquiring information, e.g., packs and template data, from at least one server **124** also coupled to the Internet. It will be appreciated that, alternatively, the server **124** can be included as an integral portion of the controller **112**.

The over-the-air protocol utilized for outbound and inbound messages is preferably selected from Motorola's well-known FLEX™ family of digital selective call signaling protocols. These protocols utilize well-known error detection and error correction techniques and are therefore tolerant to bit errors occurring during transmission, provided that the bit errors are not too numerous. It will be appreciated that other suitable protocols can be used as well.

FIG. **2** is an electrical block diagram of an exemplary portable subscriber unit **122** in accordance with the present invention. The portable subscriber unit **122** comprises an antenna **204** for intercepting an outbound message and for transmitting an inbound message. The antenna **204** is coupled to a conventional transceiver **208** for receiving the outbound message and for transmitting the inbound message. The transceiver **208** is coupled to a processing system **206** for processing the outbound and inbound messages and for controlling the portable subscriber unit **122** in accordance with the present invention. A user interface **214** preferably is also coupled to the processing system **206** for interfacing with a user. The user interface **214** comprises a conventional display **216** for displaying the inbound and outbound messages, a conventional alert element **218** for alerting the user when the outbound message arrives, and a conventional keyboard **220** for generating the inbound message and for controlling the portable subscriber unit **122**. A conventional clock **207** is also coupled to the processing system **206** for supporting time keeping requirements of the portable subscriber unit **122**. In addition, a conventional read-only memory (ROM) **205** is coupled to the processing system **206**. The ROM **205** comprises a pack **209** for formatting template data for display on at least one page, as described further below.

The processing system **206** comprises a conventional processor **210** and a conventional memory **212**, preferably a random access memory (RAM). The memory **212** comprises software elements and other variables for programming the processing system **206** in accordance with the present invention. The memory **212** preferably includes a selective call address **222** to which the portable subscriber unit **122** is responsive. In addition, the memory **212** includes a message processing element **224** for programming the processing system **206** to process messages through well-known techniques. The memory **212** further comprises a pack cache **226** for storing a pack utilized by the portable subscriber unit **122** in accordance with the present invention, as is described further below. The memory **212** also includes a pack customization element **228** for programming the processing system **206** to customize the pack. In addition, the memory **212** includes a server access element **230** for programming the processing system **206** to allow a user to access the server **124** for creating, modifying, and downloading a pack.

FIG. **3** is an electrical block diagram depicting an exemplary server **124** in accordance with the present invention. The server **124** comprises a conventional communication interface **304** for communicating with the portable subscriber unit **122** through the Internet and through the infrastructure portion **102** of the wireless communication system. The communication interface **304** is coupled to a processing system **310** for controlling and communicating with the communication interface **304**. The processing system **310** is also coupled to a conventional clock **336** for providing a timing signal to the processing system **310**. The processing system **310** comprises a conventional computer **312** and a memory, preferably a conventional mass medium **314**, e.g., a magnetic disk drive, programmed with information and operating software in accordance with the present invention. The mass medium **314** comprises a conventional message processing element **320** for processing messages communicated with the portable subscriber unit **122** through well-known techniques. The mass medium **314** also includes generic packs **322** that can be downloaded to the portable subscriber unit **122** for controlling the display of template data. In addition, the mass medium **314** includes custom packs **324** that have been customized by a user of the portable subscriber unit **122**. The mass medium **314** further comprises template data **328** which is to be transmitted to the portable subscriber unit **122** and formatted for display in accordance with a pack programmed into the portable subscriber unit **122**. In addition, the mass medium **314** comprises a download element **330** for programming the processing system **310** to download a pack to the portable subscriber unit **122**. The mass medium **314** also includes a create/modify element for programming the processing system **310** to allow a user to create and modify a pack. The mass medium **314** further comprises a refresh element **334** for programming the processing system **310** to periodically refresh the pack in a portable subscriber unit **122**.

FIG. **4** is a flow diagram **400** depicting an operation of the wireless communication system in accordance with the present invention. The flow begins when a pack is programmed **402** into the portable subscriber unit **122**. The pack preferably comprises a bundle of templates for formatting template data for display on at least one page. A template is a pattern utilized by the processing system **206** and the user interface **214** to lay out the presentation of information to the user. The template is created by using a template mark-up language, similar to the Hypertext Mark-up Language (HTML) used in creating World Wide Web pages. A template can, for example, define where, and in what size and color, the corresponding template data is to be displayed. The templates of the pack can be related or unrelated in form and functionality, depending upon the use for which the deck and template data are intended. A "page," as used herein, refers to a screen of displayed information. The distinction between "pack" and "template data," as used herein, is that the pack represents a bundle of templates for displaying template data, and the template data is used by the processing system **206** and the user interface **214** to fill in the templates. It will be appreciated that the pack can consist of a single template, e.g., when the amount of template data is small. It will be further appreciated that a user can have a plurality of packs stored in a plurality of locations, e.g., in the server **124**, in a personal computer (not shown), in the controller **112**, or in the portable subscriber unit **122** (either in the ROM **205** or in the pack cache **226**).

After an appropriate pack has been programmed into the portable subscriber unit **122**, the server **124** transmits **404** the template data through the wireless communication system to the intended portable subscriber unit **122**. The portable subscriber unit **122** receives **406** the template data and then displays **408** the template data in accordance with the templates of the pack. Because the pack is separated from the template data, the pack can be kept in the portable subscriber unit **122** for future reuse. Keeping the pack in the portable subscriber unit **122** advantageously reduces latency for template data that is repeatedly updated and displayed in a fixed format, e.g., information services data such as a stock report. When the pack is stored in the portable subscriber unit **122**, the pack is preferably cached in the pack cache **226**. It will be appreciated that, alternatively, a frequently used pack such as the pack **209**, can be programmed into the ROM **205** during manufacture or upon activation of the portable subscriber unit **122**, for long-time use.

FIG. **5** is a flow diagram **500** depicting a first programming operation of the wireless communication system in accordance with the present invention. The diagram **500** begins with the server **124** sending **502** a generic pack to the portable subscriber unit **122**. Preferably, the generic pack is transmitted through the wireless communication system as a single unit. The user of the portable subscriber unit **122** then can modify **504** the generic pack through the user interface **214** of the portable subscriber unit **122**, thereby producing a custom pack. The user then returns **506** the custom pack to the server **124** for storing the custom pack. Preferably, the transactions between the user and the server **124** take place through the wireless communication system. It will be appreciated that, alternatively, the transactions between the user and the server **124** can take place through a wireline network as well, when the portable subscriber unit **122** is equipped with a conventional wireline network interface (not shown). The server then downloads **508** the custom pack to the portable subscriber unit **122**, preferably as a single unit transmission, whenever the server **124** sends the corresponding template data to the portable subscriber unit **122**. This form of operation advantageously saves memory in the portable subscriber unit **122**, but at the cost of some added latency and air link resources. It will be appreciated that, alternatively, the custom pack can be stored in the portable subscriber unit **122** for improved latency, when sufficient memory is available in the portable subscriber unit **122**.

FIG. **6** is a flow diagram **600** depicting a second programming operation of the wireless communication system in accordance with the present invention. The diagram **600** begins when the user accesses **602** the server **124** from an input/output device. The input/output device can be, for example, a personal computer, a keyboard-display terminal, a display with a handwriting recognition device, a speech recognition device, or the portable subscriber unit **122**, to name a few. The user then creates **604** a new pack, or alternatively, modifies a generic pack through the input/output device, thereby creating a custom pack. The server **124** then stores **606** the custom pack on behalf of the portable subscriber unit **122**. The server then preferably downloads **608** the custom pack to the portable subscriber unit **122** whenever the server sends the corresponding template data to the portable subscriber unit **122**. Preferably, the pack is downloaded through the wireless communication system as a single unit. It will be appreciated that, alternatively, the server **124** can download the custom pack to the portable subscriber unit **122** immediately after the user creates the custom pack, and the portable subscriber unit **122** can store the custom pack in the memory **212**, when sufficient space is available therein.

FIG. **7** is a flow diagram **700** depicting a third programming operation of the wireless communication system in accordance with the present invention. The diagram **700** begins with the server checking **702** whether it is time to send a refresher pack to the subscriber unit **122**. If not, the server keeps checking. When it is time to send the refresher pack, the server **124** sends **704** the refresher pack to the portable subscriber unit **122** through the wireless communication system. In response, the portable subscriber unit **122** refreshes **706** the previously saved pack in the memory **212**. This technique is advantageous for updating a pack that changes frequently, and for replacing a pack that may have been lost when the portable subscriber unit **122** was powered down.

FIG. **8** is a flow diagram **800** depicting a fourth programming operation of the wireless communication system in accordance with the present invention. The diagram **800** begins with the user accessing **802** the server **124** to choose a pack. The user then selects **804** a pack from a plurality of packs stored in the mass medium **314** of the server **124**. The server **124** then downloads **806** the pack to the portable subscriber unit **122**. It will be appreciated that, alternatively, the server **124** can store the pack on behalf of the portable subscriber unit **122**, and download the pack to the portable subscriber unit **122** each time the server **124** sends template data corresponding to the pack to the portable subscriber unit **122**. When this alternative is employed, the pack preferably is downloaded through the wireless communication system as a single unit.

Thus, it should be clear from the preceding disclosure that the present invention provides a method and apparatus in a wireless communication system for controlling a display of template data by a portable subscriber unit. In particular, the method and apparatus advantageously reduces the size of data downloads by separating the template from the template data, and allows customization the display of the template data according to the desires of the end-user.

Many modifications and variations of the present invention are possible in light of the above teachings. Thus, it is to be understood that, within the scope of the appended claims, the invention can be practiced other than as described herein above.

What is claimed is:

**1**. A method in a wireless communication system for controlling a display of template data by a portable subscriber unit, the method comprising the steps of:

programming a pack into the portable subscriber unit, the pack comprising a bundle of templates for formatting the template data for display on at least one page, comprising the steps of:

sending a generic pack from a server to the portable subscriber unit;

modifying the generic pack, by a user of the portable subscriber unit, thereby producing a custom pack;

returning the custom pack to the server for storing the custom pack; and

downloading the custom pack from the server;

transmitting the template data from the server;

receiving the template data by the portable subscriber unit; and

displaying the template data in accordance with the custom pack.

**2**. The method of claim **1**, wherein the programming step comprises the steps of:

accessing the server, by a user, from an input/output device;

performing, by a user, one of creating and modifying the pack through the input/output device, thereby producing the custom pack;

storing the custom pack in the server; and

downloading the custom pack from the server along with transmitting the template data.

**3**. The method of claim **1**, wherein the programming step comprises the steps of:

sending the pack from the server to the portable subscriber unit; and

caching the pack in the portable subscriber unit.

**4**. The method of claim **1**, wherein the programming step comprises the steps of:

sending a refresher pack from the server to the portable subscriber unit on a periodic basis; and

refreshing a previously saved pack stored in the portable subscriber unit, in response to receiving the refresher pack.

**5**. The method of claim **1**, wherein the programming step comprises the step of:

storing the pack in a read-only memory of the portable subscriber unit.

**6**. The method of claim **1**, wherein the programming step comprises the step of:

selecting, by a user, the pack from a plurality of packs stored in the server; and

thereafter, downloading the pack to the portable subscriber unit.

**7**. The method of claim **1**, wherein the programming step comprises the step of

programming the pack into the portable subscriber unit, the pack consisting of a single template for formatting the template data for display on one page.

**8**. A portable subscriber unit in a wireless communication system for controlling a display of template data received from a server, the portable subscriber unit comprising:

a transceiver for communicating with the server to receive the template data;

a processing system coupled to the transceiver for processing the template data, the processing system comprising a memory; and

a user interface coupled to the processing system for displaying the template data and for accepting an input from a user,

wherein the processing system is programmed with a pack comprising a bundle of templates for formatting data template data for display on at least one page, and

wherein the processing system is further programmed to:

cooperate with the transceiver to receive a generic pack from the server;

cooperate with the user interface to allow the user to modify the pack, thereby producing a custom pack;

cooperate further with the transceiver to return the custom pack to the server for storing the custom pack;

cooperate further with the transceiver to download the custom pack from the server along with the template data; and

cooperate further with the user interface to display the template data in accordance with the custom pack.

**9**. The portable subscriber unit of claim **8**, wherein the processing system is further programmed to:

cooperate with the user interface and the transceiver to allow access to the server by the user;

cooperate further with the user interface and the transceiver to allow the user to create or modify the pack through the user interface, thereby producing the custom pack;

cooperate with the server to store the custom pack in the server; and

cooperate further with the transceiver to download the custom pack from the server along with the template data.

**10**. The portable subscriber unit of claim **8**, wherein the processing system is further programmed to:

cooperate with the transceiver to receive the pack from the server; and

cache the pack in the memory.

**11**. The portable subscriber unit of claim **8**, wherein the processing system is further programmed to:

cooperate with the transceiver to receive a refresher pack from the server, the refresher pack transmitted from the server on a periodic basis; and

refresh a previously saved pack stored in the memory, in response to receiving the refresher pack.

**12**. The portable subscriber unit of claim **8**, further comprising

a read-only memory, and wherein the processing system is further programmed to:

store the pack in the read-only memory.

**13**. The portable subscriber unit of claim **8**, wherein the processing system is further programmed to:

cooperate with the user interface and the transceiver to allow the user to select the pack from a plurality of packs stored in the server; and

download the pack to the portable subscriber unit after the user selects the pack.

**14**. A server in a wireless communication system for controlling a display of template data by a portable subscriber unit, the server comprising:

a communication interface coupled to a controller of the wireless communication system for communicating therewith; and

a processing system coupled to the communication interface for processing information communicated through the communication interface, the processing system comprising a memory, wherein the processing system is programmed to:

send a pack to the portable subscriber unit, the pack comprising a bundle of templates for formatting the template data for display on at least one page, the pack to be modified by a user of the portable subscriber unit thereby producing a custom pack;

receive the custom pack from the portable subscriber unit for storing in the memory; and

download the custom pack to the portable subscriber unit along with the template data.

**15**. The server of claim **14**, wherein the processing system is further programmed to:

provide access to the server, by a user, from an input/output device;

allow a user to perform one of creating and modifying the pack through the input/output device, thereby producing the custom pack; and

store the custom pack in the memory.

**16**. The server of claim **14**, wherein the processing system is further programmed to

send a refresher pack to the portable subscriber unit on a periodic basis.

**17**. The server of claim **14**, wherein the processing system is further programmed to:

allow selection, by a user, of the pack from a plurality of packs stored in the memory; and

thereafter, download the pack to the portable subscriber unit.

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