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[54] **SYSTEM AND METHOD FOR TRANSMITTING INFORMATION FROM A PAGING DEVICE TO A RECEIVER**

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[52] **U.S. Cl.** **340/825.22**; 340/825.07; 340/825.44; 379/56.1; 379/56.3; 455/67.7; 455/68; 455/70

[58] **Field of Search** 340/825.22, 825.07, 340/825.44; 455/67.7, 68, 70; 379/56, 57, 58, 56.1, 56.3

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,995,099	2/1991	Davis	455/343
5,311,570	5/1994	Grimes et al.	379/57
5,418,524	5/1995	Fennell	340/825.22
5,479,408	12/1995	Will	370/94.1
5,590,396	12/1996	Henry	455/33.1

FOREIGN PATENT DOCUMENTS

0 426 966 A2	5/1991	European Pat. Off. .
2220290	1/1990	United Kingdom .

OTHER PUBLICATIONS

1996 Radio Shack Catalog, "Local and Nationwide Pagers", p. 25.

Telecom Sources, Oct., 1995, "Value–Loaded Pagers, Low Prices Prices Create Buyer's Market".

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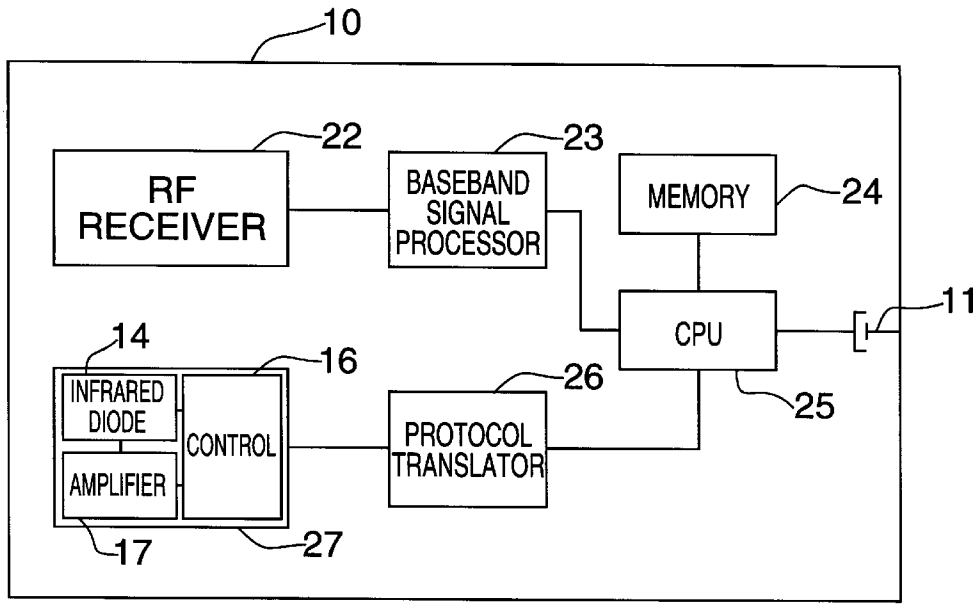
[57] **ABSTRACT**

A system and method of displaying incoming pager messages on a receiver using infrared signals. The paging device includes a receiver for receiving paging signals including paged information. The output signal from the receiver is supplied to a baseband processor where it is converted into a digital signal, under the control of a processor. If the thus digitized signal is determined to be the selecting signal for the particular paging receiver, the digital signal is then preferably sent directly to a protocol translator, where it is converted into a signal having an infrared protocol. After processing in the protocol translator, the signal is then sent to a transmitter and transmitted as an infrared signal. The infrared signal is then received in a light-receiving element in a receiver where it is thereafter decoded by a protocol decoder in accordance with instructions contained in a memory connected thereto to retrieve the paging signal or paged message. The receiver has a display for displaying the decoded information and preferably has an indicator for confirming receipt of the infrared signals in the receiver.

23 Claims, 4 Drawing Sheets



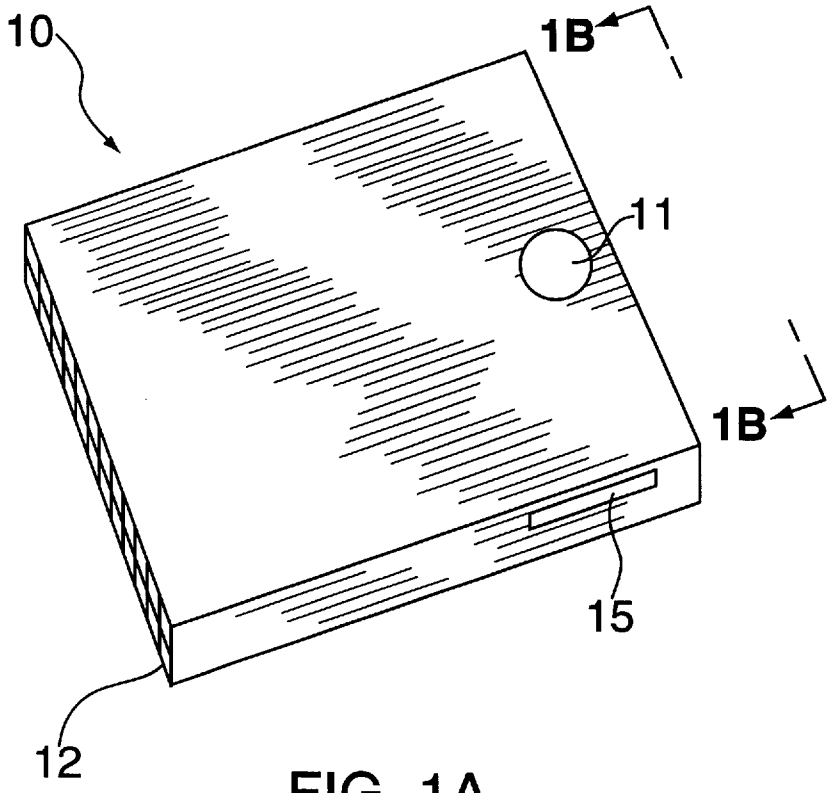


FIG. 1A

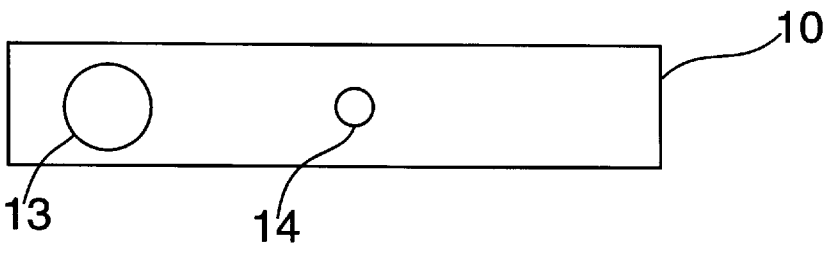


FIG. 1B

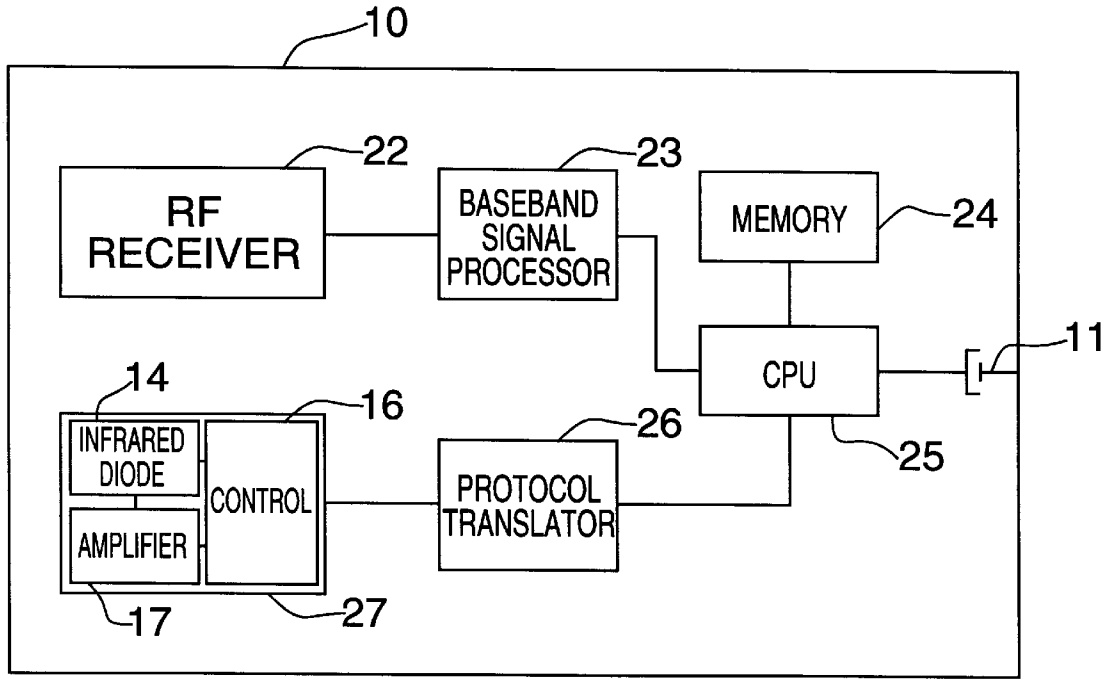

10
22
23
RF RECEIVER
BASEBAND SIGNAL PROCESSOR
MEMORY
24
11
CPU
14
16
26
INFRARED DIODE
AMPLIFIER
CONTROL
PROTOCOL TRANSLATOR
25
17
27

FIG. 2

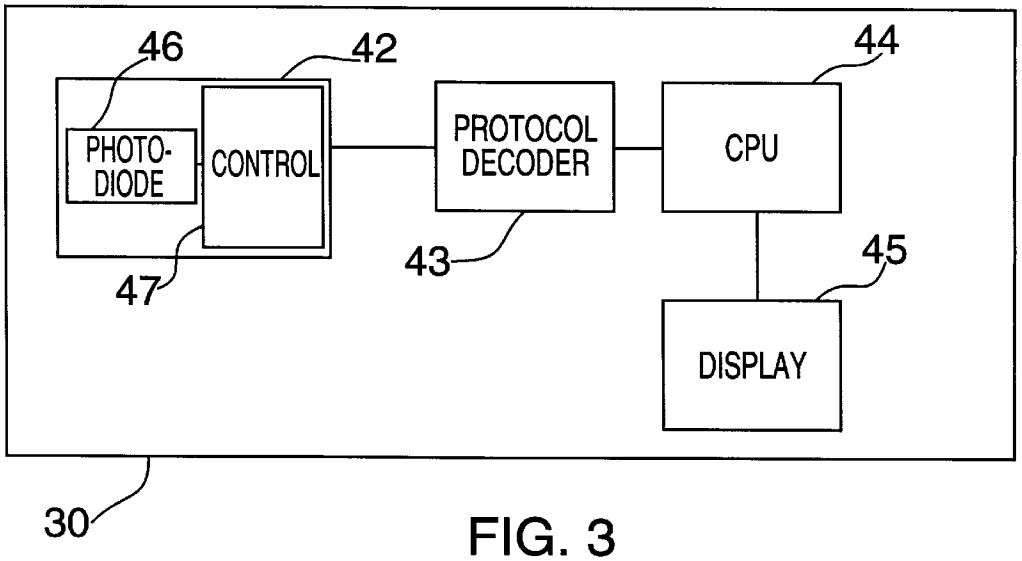

46
42
44
PHOTO-DIODE
CONTROL
PROTOCOL DECODER
CPU
43
45
47
DISPLAY
30

FIG. 3

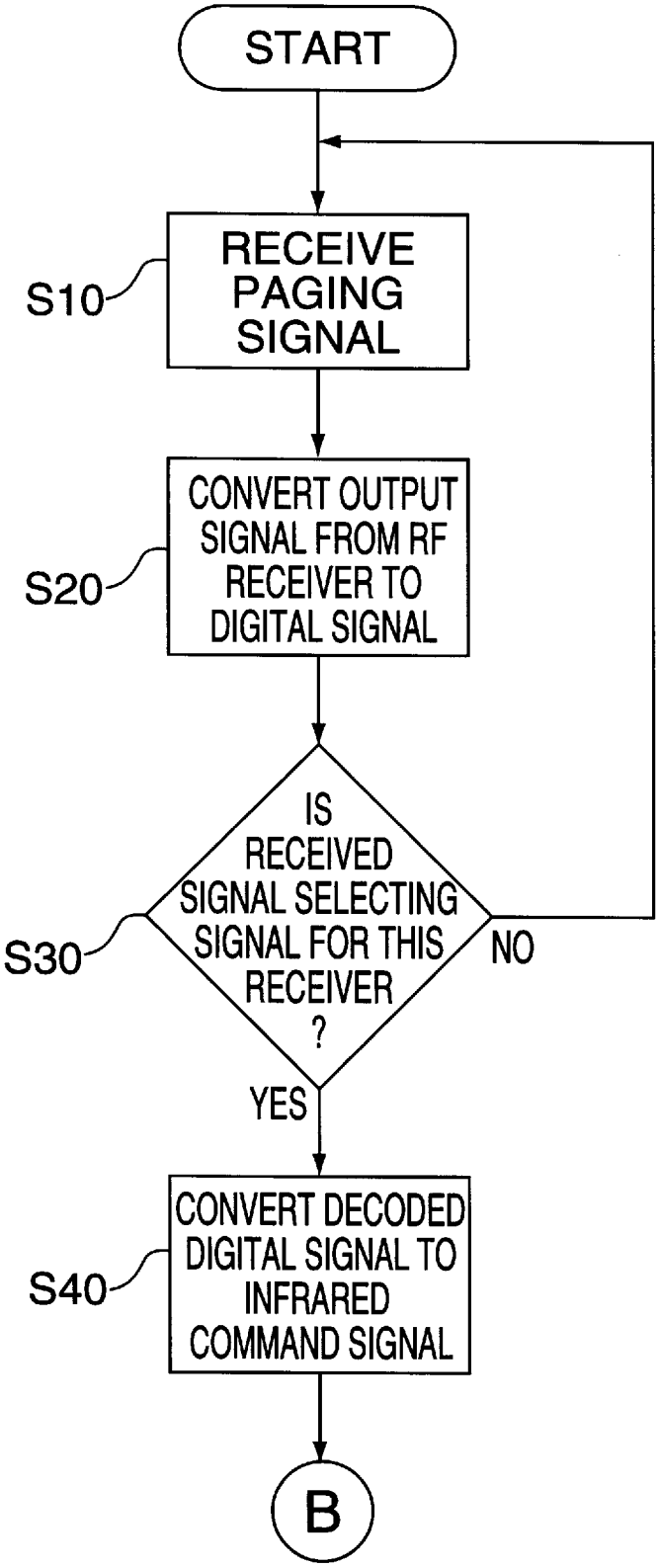

START
S10
RECEIVE PAGING SIGNAL
S20
CONVERT OUTPUT SIGNAL FROM RF RECEIVER TO DIGITAL SIGNAL
S30
IS RECEIVED SIGNAL SELECTING SIGNAL FOR THIS RECEIVER ?
NO
YES
S40
CONVERT DECODED DIGITAL SIGNAL TO INFRARED COMMAND SIGNAL
B

FIG. 4A

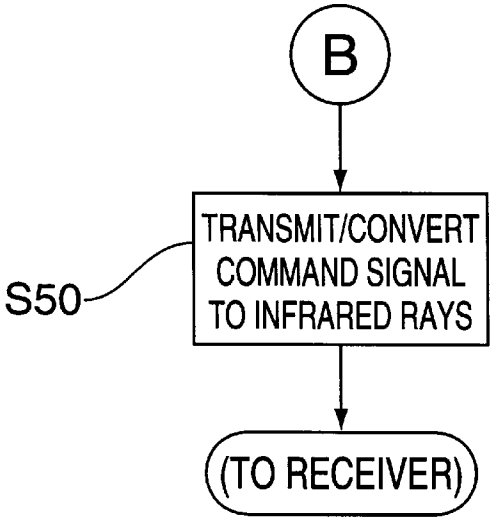

B
TRANSMIT/CONVERT COMMAND SIGNAL TO INFRARED RAYS
S50
(TO RECEIVER)

FIG. 4B

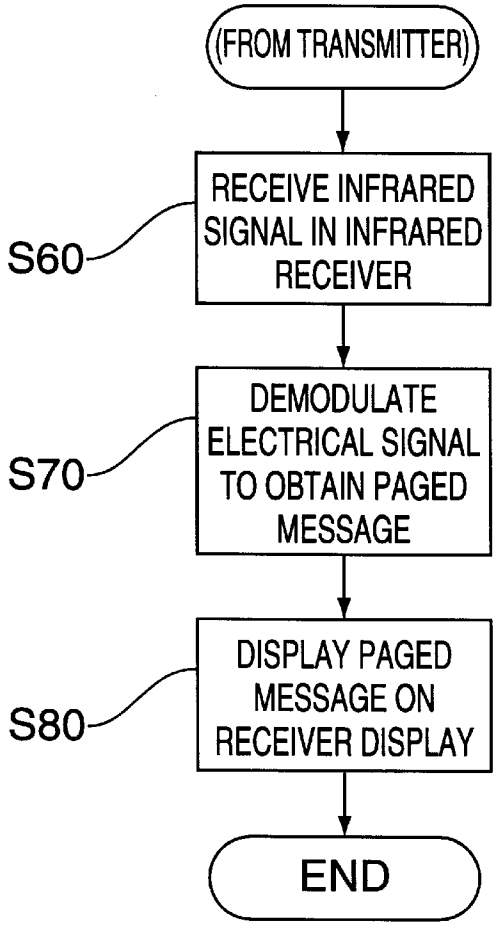

(FROM TRANSMITTER)
RECEIVE INFRARED SIGNAL IN INFRARED RECEIVER
S60
DEMODULATE ELECTRICAL SIGNAL TO OBTAIN PAGED MESSAGE
S70
DISPLAY PAGED MESSAGE ON RECEIVER DISPLAY
S80
END

FIG. 5

SYSTEM AND METHOD FOR TRANSMITTING INFORMATION FROM A PAGING DEVICE TO A RECEIVER

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates to the field of personal communication devices. More particularly, this invention relates to a system and method for transmitting information from a paging device to a receiver such as a PDA (personal digital assistant).

2. General Background

Personal communication devices have become quite popular in the recent past. Paging devices, in particular, have become popular given their compact size, ease of use and relatively low cost. One problem which is pervasive with paging devices, however, is that as these devices have a high battery drain, the battery life of a pager under continuous use is often on the order of a few months. One of the elements of the pager which accounts for a significant amount of this energy consumption is the pager display which is used to display incoming messages. Efforts have been made to find alternatives to displaying incoming pager messages on the pager display in order to assist in conserving the battery life. Another perhaps even more pervasive problem is the difficulty in viewing a large amount of text given the compact size of the device and therefore, the display.

One such alternative is to provide the paging device with a PCMCIA connector which may be disposed in a PCMCIA slot within a receiving device; most commonly, a PDA (personal digital assistant) such as Sony Corporation's personal intelligent communicator, the Magic Link PIC-1000, which may be purchased from Sony Electronics Corporation, 1 Sony Drive, Park Ridge, N.J. 07656. In operation, the pager user connects the PCMCIA connector of the pager device into the PCMCIA slot of the receiving device. Through the firmware built into the device, and under the control of the processor housed therein, the incoming paging messages are caused to be displayed on the receiving device display instead of the pager display. As a result, battery drain which would normally occur as a result of displaying messages on the pager is significantly reduced or eliminated altogether. Additionally, and perhaps more importantly the generally larger display area available on the PDA allows the user to view more of the incoming message at one time. One significant disadvantage with this alternative, however, is that PDA receiving devices have a limited available number of PCMCIA slots, and it is often more desirable to leave these few slots available for use with other applications such as for connection to an external hard disk drive or for the installation of additional application software.

Accordingly, it is one object of the invention to provide a system and method of displaying incoming paging messages without causing a high battery drain from the paging device.

It is also an object of the invention to provide a system and method of displaying incoming pager messages on a receiver with a display.

It is an additional object of the invention to provide a system and method of displaying more of an incoming message so that it is easier for the user to view more of such message.

It is another object of the invention to provide a system and method of displaying pager messages on a receiver having a display without using one of the limited number of PCMCIA slots available on the receiver.

SUMMARY OF THE INVENTION

Therefore, in accordance with one object of the invention, there is provided a system and method of displaying incoming pager messages on a receiver having a display using infrared signals. The paging device includes an RF receiver for receiving paging signals including paged information. The RF receiver provides an output signal to a baseband signal processor unit where it is then converted into a digital signal. If the thus digitized signal is determined to be the selecting signal for the particular paging receiver, the processed signals are then sent to a protocol translator, where the paging signals are converted are into signals having an infrared protocol in accordance with instructions from a memory connected to the protocol translator. After processing in the protocol translator, the signals, including the information, are then sent to a transmitter connected to the protocol translator and are thereafter transmitted as infrared signals.

In accordance with another aspect of the invention, these infrared signals are received in a light-receiving element in a receiver having a display, such as a PDA, where they are thereafter processed by a protocol decoder in accordance with instructions contained in a memory connected thereto. In accordance with these instructions, the protocol decoder demodulates the infrared signal protocol to retrieve the paging signal or paged message. The receiver preferably has a display for displaying the decoded information and an indicator for confirming receipt of the infrared signals in the receiver.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1***a* shows a perspective view of a preferred embodiment of the paging device of the present invention.

FIG. **1***b* shows a side elevational view of the paging device of FIG. **1***a* along the line **1***b*—**1***b*.

FIG. **2** shows a block diagram of a preferred embodiment of the paging device of the present invention.

FIG. **3** shows a block diagram of a preferred embodiment of the receiving device of the present invention.

FIG. **4***a*–**4***b*, **5** show a flowchart of the preferred method of transmitting information from the paging device of the preferred embodiment to a receiving device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

An embodiment of the system and method for transmitting information from a paging device to a receiving device having a display will now be described in detail with reference to the accompanying drawings.

As seen in FIGS. **1***a* and **1***b*, a paging device, or pager card **10**, is provided with a light-emitting element **14**, such as an infrared diode. A transmitting button **11** is also disposed in said device. In one embodiment, the paging device **10** also preferably has a PCMCIA connector **12** for insertion into a PCMCIA slot in a receiver. Preferably, the paging device **10** also includes a paging device battery **15**, and a message incoming indicator light **13**, which confirms the arrival of the paging signals in the paging device **10**. As will be described later with respect to FIG. **3**, a receiving device of one embodiment of the system has a photodiode **46** for receiving incoming infrared signals from the paging device **10**.

Referring to FIG. **2**, a block diagram of a preferred embodiment of the paging device **10** is shown. (Although

the paging device shown therein is a digital pager, it will be appreciated that the present invention is not so limited, and the paging device **10** may instead constitute an analog pager). Paging signals transmitted over the PCS system are received from a terrestrial tower or satellite into the paging device **10** through a receiving antenna (not shown). The received paging signals, which are generally FSK-modulated for digital pagers, are then received in the RF receiver **22**, where, as known in the art, they are amplified, tuned, and mixed with an injection frequency in order to create an intermediate frequency (IF) signal and ultimately converted to a baseband signal. The output signal of the RF receiver **22** is then supplied to a baseband signal processor unit **23** where, as known in the art, the signals are converted into a digital signal, under the control of a processor **25**, which is preferably a CPU. If the thus digitized signal is determined to be the selecting signal for the particular paging receiver, the digital signal is normally then coded for display on the paging device's **10** display (not shown). However, in accordance with the present invention, if it is determined that the selecting signal for the paging device **10** has been received, the processed signal is then preferably sent directly to a protocol translator **26**, where the paging signals are converted are into signals having an infrared protocol. In accordance with the present invention, the processor **25** controls the protocol translator **26** for translating the protocol format of incoming paging signals from a paging protocol to an infrared format (discussed below). The processor is connected to a memory **24**, preferably RAM and ROM, wherein the processor performs on the RAM the aforementioned protocol translation. The processor **25** may also interrogate the ROM which generally contains the instructions necessary to operate the processor **25** to perform the aforementioned operations. (Additionally, although not shown in FIG. **1**, and though not directly relevant to the present invention, it will be understood that the paging device **10** also preferably includes a low frequency amplifier connected to receive the output from the decoder and a loudspeaker connected to the low frequency amplifier. When it is determined that the appropriate selecting signal for the paging device **10** have been selected, the low frequency amplifier is driven so that its output in turn drives the loudspeaker, which produces a calling tone or signal. This calling tone will be produced preferrably in conjunction with the activation of incoming message indicator **13**. Alternatively, other alerting elements known in the art, such as a buzzer or the like, may be used by themselves or in conjunction with the incoming message indicator **13**.)

As discussed above, once the signal is decoded and digitized, and determined to be the selecting signal for paging device **10**, it is then supplied to the protocol translator **26**. Using the memory **24**, the translator **26** receives the bit sequence of the digitized signal. The translator **26** modulates a digital signal of predetermined frequency or frequencies with this carrier signal to produce a command signal. This command signal is then supplied to an infrared transmitter module **27**, which preferably comprises a light-emitting element **14**, such as an infrared diode, and a controller **16** which controls the operation of the light-emitting element **14**. The command signal is then amplified by an amplifier **17** included in the infrared transmitter module **27**, converted into infrared rays by the light-emitting element **14**, and then transmitted therefrom, preferably upon activation of the transmitting button **11** by the paging device user. However, it will be understood that in alternate embodiments, transmission of the infrared signal could be effected automatically. That is, the processor **25** of the paging device **10** could provide a clock signal to control the infrared transmitter module **27** to automatically transmit the infrared signal upon the predetermined or user-definable time has elapsed after the receipt and processing of the paging signal. The paging device **10** could also be provided with a automatic transmission override button which would allow the user to override the automatic transmission option. In such a case, the incoming paging signal would be coded for display on the paging device's **10** display (not shown) and then displayed on the paging device **10** display. The displayed message could then be edited and then transmitted to the receiving device **30** by activation of the transmitting button **11**.

In the preferred embodiment, the infrared signal which has been transmitted from the paging device **10**, may then be received by a receiving device, such as a PDA, one embodiment of which is shown in FIG. **3**. In this embodiment, the infrared signal is received through an antenna (not shown) into an infrared receiver **42**. This receiver **42** generally includes a light-receiving element, such as a photodiode **46**, and a control unit **47** which controls the operation of the photodiode **46**. Under the control of the control unit **47**, the photodiode **46** converts the infrared signal into an electrical signal, which is then supplied to a protocol decoder **43** connected to the infrared receiver **42**. The protocol decoder **43**, under the control of the receiver processor **44**, which is preferably a CPU, demodulates the signal to retrieve the paging signal data or paged message. The decoded message is then displayed on the receiving device's display **45**, which is also under the control of the receiving device's processor **44**. Additionally, the receiving device **30** may include a message received indicator (not shown), such as an LED, which will be activated when a message has been successfully transmitted from the paging device **10** to the receiving device **30**.

Referring to FIGS. **4***a* and **4***b*, operation of the system of the present invention will now be described. As seen in FIG. **4***a*, at step **S10**, a paging signal, including data and/or other information, and having a first protocol, is received through an antenna into a paging device **10** where the received signal is tuned, amplified, and mixed with an injection frequency in order to create an IF signal. At step **S20**, the output signal from the RF receiver is then converted into a digital signal. If it is determined at step **S30** that the received and now converted signal is the selecting signal for this particular paging device **10**, the digital signal is then by the protocol translator **26** at step **S40** to a command signal having an infrared format. At step **50**, this command signal is then converted into infrared rays in the infrared transmitter **27** and transmitted therefrom preferably upon activation of the transmitting button **11** by the paging device user.

This infrared signal may then be received in the infrared receiver **42** of a receiving device having a receiver, such as a PDA at step **S60** (FIG. **5**), where the signal is converted from an infrared signal to an electrical signal by the light-receiving element (e.g., a photodiode) included in the infrared receiver **42**. This signal is then provided at step **S70** to the protocol decoder **43** where, under the control of the receiving device's processor **44**, it is demodulated to retrieve the paging data/message. The decoded message is then displayed on the receiving device's display **45** (step **S80**).

Thus it will be appreciated that the above described system and method provides for the transmission of incoming paging messages from a paging device to a receiving device such as a PDA and for the display of such messages on the receiving device's display, instead of the paging device's display. As such, high battery drain from the paging

device is reduced and the limited PCMCIA slots available on the receiving device are not needlessly used.

It is further apparent that in accordance with the present invention, an embodiment that fully satisfies the objectives, aims and advantages is set forth above. While the invention has been described in conjunction with specific embodiments, it is evident that many alternatives, modifications, permutations and variations will become apparent to those skilled in the art in light of the foregoing description. For example, the receiving device **30** may constitute a TV receiver and the receiver display **45** a TV screen. Alternatively, the receiver **30** and receiver display **45** may respectively comprise any other receiver and monitor which have the capability of decoding the incoming infrared signal so that it may be displayed. Additionally, while, in the present invention, the infrared signal is only transmitted upon activation of a transmitting button **11**, it will again be understood that the paging device **10** could be adapted for automatic transmission of an incoming paging a preset or user-definable time after the receipt and processing of the incoming paging signal. The paging device **10** could also be provided with an automatic transmission override button which would allow the user to override the automatic transmission option, and display the message on the pager display and/or edit the message and then transmit the message to the receiving device **30** by activation of the transmitting button **11**. Furthermore, while in the preferred embodiment, the paging device includes a PCMCIA adapter, so that if the user so desires, he may connect the paging device into a PCMCIA slot in the receiving device, it will be understood that such element is not necessary to the present invention, and may be eliminated in alternate embodiments. Likewise, the message received indicator device may be eliminated from alternate embodiments of the present invention, or may comprise alternate devices to confirm the receipt of the infrared signal by the receiving device, such as an audible alarm, or a combination of audible alarm and LED. Other embodiments will occur to those skilled in the art. Accordingly, it is intended that the present invention embrace all such alternatives, modifications and variations as fall within the scope of the appended claims.

What is claimed is:

1. A method sending information including messages from a paging device to a receiver, comprising the steps of:

receiving a radio frequency signal including said information in said paging device;

converting said radio frequency signal into an infrared signal; and,

transmitting said infrared signal including said information from said paging device to said receiver.

2. The method of claim **1**, wherein said receiver has a photodiode, further comprising the step of:

receiving said infrared signal at said photodiode.

3. The method of claim **1**, wherein said radio frequency signal has a first protocol and said infrared signal has a second protocol, and wherein said converting step comprises translating said radio frequency signal protocol through a protocol translator to provide said infrared signal protocol.

4. The method of claim **1**, wherein said receiver comprises a personal digital assistant.

5. The method of claim **1**, wherein said receiver comprises a television receiver.

6. The method of claim **1**, wherein said receiver comprises a monitor.

7. The method of claim **1**, wherein said receiver further includes a display, said method further comprising the step of:

displaying said information on said display of said receiver.

8. The method of claim **1**, wherein said receiver further includes receiver indicator means, said method further comprising the step of:

activating said receiver indicator means upon receipt of said infrared signal.

9. A method of sending information including messages included in a radio frequency signal from a paging device to a receiver, comprising the step of:

transmitting an infrared signal including said information from said paging device to said receiver;

receiving said radio frequency signal including said information into said paging device; and,

converting said radio frequency signal into said infrared signal.

10. The method of claim **9**, wherein said transmitting step automatically occurs at a preselected time after receipt of said radio frequency signal.

11. The method of claim **9**, wherein said paging device includes a transmitting button and wherein said transmitting step occurs in response to actuation of said transmitting button.

12. A paging device for communicating with a receiver, comprising:

receiving means for receiving paging signals including messages and other information, said paging signals having a first protocol;

protocol translating means for translating said paging signals into infrared signals having a second protocol; and,

transmitting means for transmitting said infrared signals to said receiver.

13. The paging device of claim **12**, wherein said transmitting means comprises an infrared diode.

14. A paging device for communicating with a receiver, comprising:

receiving means for receiving paging signals including messages and other information, said paging signals having a first protocol;

protocol translating means for translating said paging signals into infrared signals having a second protocol;

means to determine a period of time after receipt of said paging signals; and,

automatic transmitting means responsive to said determining means for transmitting said infrared signals to said receiver after said period of time.

15. A paging device for communicating with a receiver, comprising:

a receiver for receiving paging signals including messages and other information, said paging signals having a first protocol;

a protocol translator for translating said paging signals into infrared signals having a second protocol; and,

a transmitter for transmitting said infrared signals to said receiver.

16. A system for transmitting paging signals to a receiver, comprising:

receiving means for receiving paging signals including messages and other information, said paging signals having a first protocol;

protocol translating means for decoding said paging signals protocol into infrared signals having a second protocol;

transmitting means for transmitting said infrared signals to said receiver;

infrared receiving means in said receiver for receiving said infrared signals; and,

protocol decoder means in said receiver for decoding said second protocol of said infrared signals.

17. The system of claim **16**, further comprising:

display means for displaying said information.

18. The system of claim **16**, further comprising:

indicator means for indicating when said infrared signals have been received in said receiver.

19. The system **16**, wherein said infrared receiving means comprises a photodiode.

20. The system of claim **18**, wherein said received indicator means comprises an audio signal.

21. The system of claim **18**, wherein said received indicator means comprises an LED.

22. The paging device of claim **16**, wherein said paging device also has a PCMCIA connector for connection to a PCMCIA port in said receiver.

23. A system for transmitting paging signals to a receiver, comprising:

a receiver for receiving paging signals including messages and other information, said paging signals having a first protocol;

a protocol translator means for decoding said paging signals protocol into infrared signals having a second protocol;

a transmitter for transmitting said infrared signals to said receiver;

an infrared receiving device in said receiver for receiving said infrared signals; and,

a protocol decoder in said receiver for decoding said second protocol of said infrared signals.

* * * * *