IMPROVEMENTS IN OR RELATING TO CHINESE CHARACTER DISPLAYS

This invention relates generally to improvements in or relating to Chinese character display, and in particular to information display pagers. More specifically, it relates to improvements in means for displaying information to the users of such pagers.

There are, of course, numerous devices for displaying information to the users of pagers. Such displays have taken the form of using liquid crystal display panels to provide the user information in English and alphanumerics.

The usefulness and attractiveness of information display pagers can be enhanced considerably by the provision of a pager capable of displaying greater amount of information to the users in the Chinese language.

According to the present invention, there is provided a Chinese character display device comprising a display means operative to automatically display Chinese characters produced by a character generator in response to received codes, the character generator being capable of generating the characters of a Chinese character set made up of a multiplicity of such characters, the received codes used to drive the character generator each being a respective one and a half bytes that is, 12 bit code, memory means for storing the codes for a series of such characters and control means for operating the display means and character generator so as to display the characters corresponding to the codes in said series, the control means being arranged to enable the displayed characters to be scrolled.

Preferably the control means are arranged to enable the display to be scrolled in the forward and/or reverse directions and more preferably circularly so that a series of characters forming a message or part thereof may be repeated. The control means may be arranged to enable

the display to be scrolled continuously and/or character-by-character and, where several series may be stored in the memory means, to enable the display of a series to be curtailed before its end and to display the next series. As will become apparent from the following description this invention can provide a novel pager capable of displaying a large amount of information to the user in Chinese characters.

This may be achieved by utilising one or more microprocessors provided with memory capabilities together with a Chinese character generator to drive a liquid crystal display for displaying information in the Chinese language. At the moment, no such Chinese character display pager exists.

The invention itself is set forth in the claims which are appended hereto and which form a part of this specification. An understanding of an embodiment thereof may be had by reference to the detailed description taken in conjunction with the drawings in which: the sole figure is a block diagram illustrating a pager in accordance with the invention.

The pager illustrated in the figure comprises a pocketable housing (not shown) preferably of the order of size of 2 1/2" x 3" x 1/2" (33.5 x 76 x 12.7 mm) which includes a one-chip CPU3 (Central Processing Unit), a character generator ROM 5 (Read Only Memory), a liquid crystal display driver circuit, a lithium-battery-backed message storage read/write RAM 7 for storing data representing Chinese characters, switches 9 for controlling the pager and other standard components of a pager such as RF Receiver 11 which may incorporate a conventional auto beeper circuit and beeper, power supply and duty circuit, re-chargeable battery and Lithium backup battery for the RAM 7.

A custom LCD (liquid crystal display) 13 providing 8 16 by 16 dot-matrix Chinese characters is provided to display the message for the paged use and is driven by the CPU3 via two LCD segment drives 15a, 15b and an LCD

common-side driver 17.

The pager 1 is constructed and programmed so that it can display Chinese characters. A custom-made Chinese character library in the memory 5 contains more than 4000 frequently used Chinese characters for message display in personal and broadcasting paging.

Upon receipt of messages, the CPU3 of the pager stores the message as coded Chinese characters, in the user RAM 7. This RAM capacity preferably has a storage capacity for at least 4,000 English alphanumeric characters, so as to be able to hold up to 20 personal call messages plus two broadcasting messages of each up to 50 characters. Each received message can be examined by the user on the 16 x 16 dot high contrast custom-made dot matrix LCD display 13 in a scrolling fashion, operated by scroll keys on the keyboard 9. Display illumination is also available, from a conventional light plate 19 adjacent the display 13. Upon receipt of a paging message, the pager 1 can generate different beep tones and blink a LED (Light Emitting Diode, not shown) to alert the user.

The beep tones can be substituted by a vibration alert unit if the user does not like the tone which might disturb other people.

The pager 1 may provide both manual and auto time

shut-off features to conserve power consumption. Battery low alert/indication as well as display illumination can be provided by operating a LIGHT button on the keyboard 9.

The program of the CPU3 can interpret information which has been encoded into a bit stream according to a Chinese character coding system special to the present invention and transmitted in standard POCSAG format in 512 baud speed. It can also support standard POCSAG alphanumeric display.

During data reception, the pager may provide 1 bit self error correction and 2 bits error detection capability to ensure maximum receiving reliability.

The pager 1 is suitably programmed so as to operate under the appropriate one of the following 4 states:

a) Active State

The CPU3 receives and executes commands from the user via the keyboard 9, allocating some spare time periodically to check if any message is coming from the RF receiver. Power is supplied to ALL components in this state.

b) Sleep State

System will go to this state from Active State if NO key

on the keyboard has been pressed for approximate 30 seconds or the user has stepped through all the stored messages. In this state, the LCD 13 will be switched off.

c) Disable State

The pager will enter this state if a DISABLE command has been received. This state is similar to the Sleep State except that further users' commands will not be effective until an ENABLE command is received through broadcast.

d) Off State

User switches the pager 1 to this state by sliding the mode switch to the OFF position. All components except the external RAM chip 7 will be cut off. The pager 1 cannot receive any further message until turned back on.

In the following, NORMAL operation refers to operating the pager under Active or Sleep state.

The keyboard 9 may be provided with the following keys, switches and buttons, the CPU3 key suitably programmed to produce operation as described.

1 Mode Switch & Acknowledge Button: A 3 position 2 pole slide switch which can also be pushed down to cancel the

user alert signal generation (or beeper vibration) whenever a call has been received or a battery low signal when appropriate. The position of this switch may be used to define the different users operation modes:

ON : The pager is under Active or Sleep state while an alert tone will be heard and LED will be flashed whenever a call has been received.

M : Same as ON mode except the alert tone will be disabled.

OFF: Pager is OFF. All memorized messages will be erased.

2 Scroll Button: When the CCD pager 1 shows a message on the LCD 13 with a " -> " indicator, the user should press this button to scroll the remaining message on the LCD until he sees the termination mark "O".

3 Light Button: Display illumination will be effective if this button has been pressed and held down.

The pager 1 employs a custom-made graphic dot matrix LCD to display the received messages in Chinese character or Alphanumeric character. Up to one line of 8 Chinese characters or 2 lines of 20 alphanumeric characters can be shown on such as LCD with the message key displayed in a scrolling basis. Each Chinese character occupies 16 x

16 dots while an alphanumeric character occupies 5 x 7 dots. For use by the single chip micro-computer as the heart of the CCD pager, 8K words of program ROM area are provided by the ROM 5 & 512 nibbles of system RAM may be provided for the control of the pager intelligence. Moreover, an additional 1K byte (8192 bits) of display RAM may be in-built in the 2 LCD segment driver ICs 15a, 15b.

The custom Chinese character generator ROM 5 is the largest database in the system and uses a total of 128K bytes in a single piece of ROM. By using a 16 x 16 font, each Chinese character will occupy 32 bytes of data. This means in total, more than 4000 characters can be held. A 3 nibbles (12 bits): two nibbles = 1 byte = 8 bytes) address word will be able to select an unique one of 4K (4096) words in the library. A 3 nibble code word is used to represent a Chinese character in the CCD pager 1. The pager 1 is provided with the 2K-byte low power CMOS static RAM 7 for storing the received messages and all the system parameters. As mentioned before, up to 22 messages each of 50 Chinese characters can be stored.

The above described concept of a Chinese database coupled to a receiver can also be applied to any similar pocket-sized digital radio transceivers, portable telephones, and television sets or such other devices with a

receiver component whereby information encoded in bits stream in a unique one and half byte code when transmitted to this device and received by its receiver component which then makes use of the said means to display Chinese characters.

CLAIMS

1. A Chinese character display device comprising a display means operative to automatically display Chinese characters produced by a character generator in response to received codes, the character generator being capable of generating the characters of a Chinese character set made up of a multiplicity of such characters, the received codes used to drive the character generator each being a respective one and a half bytes that is, 12 bit code, memory means for storing the codes for a series of such characters and control means for operating the display means and character generator so as to display the characters corresponding to the codes in said series, the control means being arranged to enable the displayed characters to be scrolled.

2. A device according to claim 1 wherein the control means is arranged to enable the displayed characters to be scrolled in the forward direction.

3. A device according to claim 1 or 2 wherein the control means is arranged to enable the displayed characters to be scrolled in the reverse direction.

4. A device according to claim 1, 2 or 3 wherein the control means is arranged to allow the series to be scrolled circularly so that a series of characters forming a message or part thereof may be repeatedly displayed.

5. A device according to any one of the preceding claims wherein the memory means has a capacity to store the codes for at least 1,000 Chinese characters.

6. A device according to any one of claims 1 to 4 wherein the memory means has a capacity to store the codes for at least 4000 English alphanumeric characters.

7. A device according to any one of the preceding claims wherein the character generator is operative to generate that one of 4K (4096) characters corresponding to the respective one and one half byte code received thereby.

8. A device according to any one of claims 1 to 7 wherein the control means is operative to enable a message which is to be displayed to be a) scrolled continuously or b) character-by-character.

9. A device according to any one of claims 1 to 8 wherein several series of codes may be stored in the memory means and the control means are arranged to enable the display of a series to be curtailed before its end and to display the next series.

10. A portable radio pager incorporating radio paging circuitry for receiving radio pager messages and a display device according to any one of the preceding claims for displaying received messages.

11. A pager according to claim 10 which is of a pocketable size.

12. A pager according to claim 10 or 11 whose external dimensions are about 2 1/2" x 3" x 1/2".

13. A display device constructed and arranged to

operate substantially as hereinbefore described with reference to and as illustrated in the accomanying drawings.

14. A radio pager contructed and arranged to operate substantially as hereinbefore described with reference to and as illutrated in the accompanying drawings.