INTELLIGENT PORTABLE INTERACTIVE PERSONAL DATA SYSTEM

FIELD OF THE INVENTION

This invention relates to transaction cards and, in particular, to a card containing a microprocessor, memories and interfacing capabilities which is described herein as an "intelligent transaction card".

BACKGROUND OF THE INVENTION

The use of transaction cards has increased tremendously over the past couple of years. These cards are used for a variety of purposes, including, credit cards, security-identification cards to control access to secured areas and devices, and bank cards for use in automatic teller machines.

Typically, the transaction card has information encoded on the card to identify the cardholder. This information may be magnetically, electronically or optically encoded. For example, a financial transaction card such as a credit or debit card has the necessary account information stored in a magnetic strip on the back of the card.

As the use of transaction cards has increased, it has become desirable to increase the functionality in the cards by encoding additional information on the card, by making it possible to change such information, and by providing processing and/or input/output capabilities. For example, Moreno, U.S. Pat. No. 3,971,916 describes the use of a semiconductor memory for the storage of information. Ugon, U.S. Pat. No. 4,211,919 describes the addition of a microprocessor to the card to control the input and output of information from the memory. Dreifus, U.S. Pat. No. 4,575,621 also describes a microprocessor based system which can operate in conjunction with a terminal or operate in a stand-alone mode during which it monitors itself for abnormal conditions which may be caused by component failure or physical intrusion of the card.

These microprocessor based transaction cards are often referred to as "smart cards". However, these cards are still limited in that they are constructed to perform a predetermined function. Some smart cards prohibit any modification of the card once the card is fully assembled. The microprocessor in Ugon controls the input and output of information from memory. In Dreifus, a ROM stores system program information which cannot be changed. Instead the system information stored in ROM may be modified by information stored in RAM. However, the original programmed function of the card remains and is never permanently changed or removed from the card.

In addition, the above described cards are typically operated in conjunction with a terminal device rather than independently of any such device. Finally, these cards were not designed to be "user friendly". With prior art transaction cards, the cardholder has to memorize the proper procedure to operate the card.

SUMMARY OF THE INVENTION

In the present invention, a general-purpose reprogrammable intelligent card is disclosed. The card includes an alphanumeric keypad, an alphanumeric display and one or more input/output ports controlled by a microprocessor and programs stored in a memory associated with the microprocessor. The microprocessor is provided with an operating system and may be

programmed or reprogrammed for a specific application or for a variety of applications.

The system can be used in conjunction with a terminal device or independently in a stand-alone mode. The card is menu-driven and user friendly. It prompts the cardholder on proper operating procedure and displays clear, concise messages that the cardholder can understand. Security features may be programmed into the card to prevent the use of the card by unauthorized persons.

BRIEF DESCRIPTION OF THE DRAWINGS

The objects, features and advantages of the transaction card of the present invention will be apparent from the following detailed description of the preferred embodiment in which:

FIGS. **1A** and **1B** illustrate the front and back views of one embodiment of the transaction card of the present invention.

FIGS. **2A** and **2B** illustrate the front and side views of another embodiment of the transaction card of the present invention.

FIG. **3** illustrates the operating system flow.

FIG. **4** is a flowchart of the keyboard module.

FIG. **5** is a flowchart of the update clock/calendar auto-shutoff module.

FIG. **6** is a flowchart of the communications module.

FIGS. **7A** and **7B** is a flowchart of the keyboard service routine.

FIG. **8** is a flowchart of the display service routine.

FIG. **9** is a flowchart of the communications service routine.

FIGS. **10A**, **10B** and **10C** are flowcharts of the memory management service routines.

FIG. **11** is a flowchart of the application service routine.

FIG. **12** is a flowchart of the system clear/restart service routine.

FIG. **13** illustrates the basic structure and access of the application programs.

FIG. **14** is a flowchart of the cardholder notes application program.

FIG. **15A** is a flowchart of the set time application program.

FIG. **15B** is a flowchart of the set date application program.

FIG. **15C** is a flowchart of an application program to change the cardholder's personal identification number (PIN).

FIG. **16** is a flowchart of the credit/purchase application program.

FIG. **17** is a flowchart illustrating the use of the ITC for transportation.

FIG. **18** is a flowchart for the calculator emulator application program.

FIG. **19** illustrates a preferred embodiment of the display of the transaction card of the present invention.

FIG. **20** is a schematic of one embodiment of the transaction card of the present invention.

FIG. **21** is a schematic of the CPU and custom integrated circuit used in another embodiment of the present invention.

FIG. **22A** and **22B** illustrates the location of the magnetic card interface in the transaction card of the present invention.

FIG. **23** illustrates the configuration of the ITC to the terminal interface.