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IMAGE-BASED ELECTRONIC POCKET ORGANIZER

Field of the Invention

The invention relates in general to compact electronic organizers that are capable of storing information (for example schedule information, telephone numbers, memos, etc.) commonly used by individuals on a day-to-day basis. More specifically, the invention is related to a compact electronic pocket organizer that is capable of entering and storing personal information in the form of both text and image data in a manner that permits the information to be quickly and easily correlated between a plurality of databases when entered and retrieved.

Background

A wide variety of compact electronic organizers are currently available that permit an operator to enter various information related to the operator's personal schedule and business contacts. For example, the WIZARD (Tm) series of hand-held electronic organizers available from the Sharp Electronics Corporation includes a keyboard and display that permits the operator to enter schedule information, telephone numbers and memos for later review and retrieval. The operator can also create a business card file in which information related to a number of business cards can be stored, sorted and retrieved.

A primary drawback of the type of electronic organizer described above is the method in which information is entered and subsequently retrieved by the operator. Specifically, the operator is forced to use a very small keyboard to enter text data as the electronic organizer is designed to be of a compact or "pocket" size. Many individuals find the small keys on the keyboards to be difficult to use and may therefore

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experience a large number of errors when trying to enter or retrieve information.

Attempts have been made to overcome the problem of small keys by having the operator use an input stylus to activate the keys or buttons on the keyboard. While the stylus does make it easier for the operator to select a desired key, the overall data entry operation using the stylus is very slow as the operator must use a "hunt and peck" approach to enter data. Thus, the transfer of data from various source materials into the organizer, for example the transfer of name, address, company name and telephone number from a business card to a business card file within the organizer, becomes a very tedious and time consuming operation.

Another disadvantage in the method of entering data in conventional organizers is that, in many instances, the same data must be re-entered in a number of different databases. For example, it may be desirable to include identical information concerning a particular individual, such as the individual's name, in a telephone directory file, a business card file and a memo file. Conventional organizers do not provide a mechanism to relate data between databases. Thus, the user of the organizer is forced to re-enter the same name information in each of the desired files, thereby increasing the number of key strokes required and the probability that a data entry error will occur.

A further drawback of currently available electronic organizers is the inability to correlate various information from different databases for easy access and retrieval. For example, an operator using the electronic organizer's schedule function mode of operation may find that an appointment is indicated for a particular individual at a certain time. The operator may wish to contact the noted individual by telephone to cancel the

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scheduled appointment. To obtain the individual's telephone number, the operator must exit the schedule function mode and enter a telephone directory function mode. The operator must then search a telephone directory file for the individuals name to obtain the telephone number. Thus, the operator is required to enter a number of commands to switch from one discrete mode of operation to another to obtain the desired information. The requirement to use multiple discrete modes to retrieve information is timing consuming and tedious.

In view of the above, it is an object of the present invention to provide an electronic organizer that incorporates a user interface that reduces the amount of effort required to enter and retrieve both text and image data into the electronic organizer. It is a further object of the invention to provide an electronic organizer with the ability to correlate and relate information between several different databases to permit the operator to quickly and easily enter and retrieve related information with a minimal amount of effort. Other objects and advantages of the invention will become apparent from the detailed description of the best mode of practicing the invention provided below.

Summary of the Invention

The present invention provides an electronic organizer incorporating an easy to learn and use interface that includes an internal electronic scanner and a touch sensitive display screen to enter text and image data. The internal electronic scanner permits both machine generated text and image data to be scanned and directly entered into the electronic organizer, thereby reducing the number of manual data entry operations required by the operator. Hand-printed text data is also

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entered via the touch sensitive display screen using a stylus or pen. The scanned machine generated text, the scanned image data and the hand-printed text can either be preserved as an image-oriented bit map, or optical character recognition routines can be applied to the data to identify characters and convert the identified characters to computer coded text data. Data entered into the electronic organizer is arranged in a relational database, which permits the operator to quickly and easily enter and retrieve related information between a number of different databases with a minimal amount of effort. A small document transport mechanism is also provided to assist in the scanning of small documents.

Brief Description of the Drawings

With the above as background, reference should now be made to the following detailed description and the accompanying drawings, in which:

Fig. 1 is a top perspective view of an electronic organizer in accordance with the present invention;

Fig. 2 is a perspective view of the bottom of the electronic organizer shown in Fig. 1;

Fig. 3 is a schematic diagram of a small document transport mechanism employed in the electronic organizer shown in Fig. 1;

Fig. 4 is a schematic representation of the layout of a scanning unit in the electronic organizer illustrated in Fig. 1;

Fig. 5 is a schematic block diagram of the electrical operating system of the electronic organizer illustrated in Fig. 1;

Fig. 6 illustrates the display of information on a display unit of the electronic organizer illustrated in Fig. 1 on power up;

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Fig. 7 illustrates the display of a daily schedule screen on a display unit of the electronic organizer illustrated in Fig. 1;

Fig. 8 illustrates the display of information related to one of the fields of the daily schedule illustrated in Fig. 7;

Fig. 9 illustrates the overlay of a Find function option screen over the display illustrated in Fig. 8;

Fig. 10 illustrates the overlay of a Find screen over the display illustrated in Fig. 8;

Fig. 11 illustrates the display of information retrieved from a memory card located in a memory card expansion slot of the organizer illustrated in Fig. 1;

Fig. 12 illustrates the display of a calculator tool screen in a Tool function mode of operation;

Fig. 13 illustrates how data can be correlated using a relational database in the organizer illustrated in Fig. 1;

Fig. 14 illustrates the display of a virtual alphanumeric keyboard on the display unit of the organizer illustrated in Fig. 1;

Fig. 15 illustrates the entry of hand-printed text information using the pen input unit of the organizer illustrated in Fig. 1;

Fig. 16 illustrates a database record file that is displayed on the display unit of the organizer illustrated in Fig. 1;

Fig. 17 illustrates the blocking of identified text fields by the system shown in Fig. 5;

Fig. 18 is a flow diagram illustrating the operation of the scanner unit and digital signal processor illustrated to scan an image;

Fig. 19 is a flow diagram illustrating the entry of data in the Text input window illustrated in Fig. 15 using the pen input unit shown in Fig. 1;

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Fig. 20 illustrates an accessory docking station that is used in conjunction with the organizer illustrated in Fig. 1; and

Fig. 21 illustrates an organizer in accordance with the invention that includes an electronic camera unit.

Modes of Carrying Out the Invention

A top perspective view of a hand-held electronic pocket organizer according to the present invention is illustrated in Fig. 1. The organizer includes a main unit 10, a battery power unit 12 releaseably coupled to the main unit 10, a high resolution touch sensitive electronic display panel 14 located on a top surface of the main unit 10, a pen input unit 16, memory card expansion slots 18 located in the main unit 10, scanner control start and stop buttons 20-21, and a main unit power ON/OFF switch 22. A pen holder slot 24 is also located on the main unit 10 to hold the pen input unit 16 when it is not in use.

The operator interacts with the main unit 10 through the use of the pen input unit 16 and the touch sensitive electronic display panel 14. Various overlay screens or "windows" are displayed on the display panel 14 and the operator touches the pen input unit 16 to the display panel 14 at specified locations to perform various functions such as data entry --including hand-printed text entry and virtual alphanumeric keyboard operations-- and organizer navigational operations --i.e. moving from one organizer function to another-- as will be described in greater detail below.

The display panel 14 preferably includes a resistive type pen input material that overlays a liquid crystal display having a pixel count of at least 640 X 200 in a text mode of operation and 320 x 200 in a graphics mode of operation when displayed at 72 dpi. The resistive pen

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input material consists of several layers of transparent materials which are fabricated such that the application of pressure by a pen shaped object will result in a voltage being generated and measured that is spatially proportional to the incident pens physical position. The use of such resistive type touch sensitive pen input devices in electronic digitizer tablets is well known in the art. It will be understood, however, that the term "touch sensitive" is not intended to limit the display panel 14 to a resistive type unit that requires physical contact. For example, touch screens that use light beams to locate the position of an object that passes through a plane located above the actual display surface can also be utilized for the display panel 14. Other types of displays may also be used, provided that the operator can selectively enter information by simply touching or pointing to prespecified areas of the display unit.

As shown in Fig. 2, the organizer also includes an imaging window 26 for a linear electronic scanner unit incorporated within the main unit 10, a small document transport mechanism platen 28 that extends from the main unit 10 during the operation of a small document transport mechanism incorporated within the main unit 10, a speaker unit 30 which is used to generate acoustic telephone dial tones, and external power connectors 32. Front transport wheels or rollers 34 are preferably located adjacent to the imaging window 26 of the linear electronic scanner unit and rear transport wheels 36 are provided at the opposite end of the organizer. The front and rear transport wheels 34, 36 permit the organizer to be rolled over the surface of materials to be scanned including, for example, materials having machine generated text --i.e. printed materials such as telephone directory listings-- and images --i.e. photographs or

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graphics-- for direct entry into the memory of the organizer.

The scanning of small documents is a problem common in conventional hand-held type scanning devices, as it is difficult to properly locate and hold a small document in place as the scanner is passed over the small document. Thus, conventional hand-held type scanning devices may require that small documents, such as business cards, be secured to a surface with tape or some other mechanism prior to performing a scanning operation. The small document transport mechanism incorporated in the main unit 10 solves the problem of scanning small documents by providing a mechanism for grasping and transporting small documents past the imaging window 26 of the linear scanning unit.

As shown in Fig. 3, the front transport wheels 34 of the organizer are preferably connected to a drive axle 50, which in turn is coupled through a pinch roller drive gears 39 to a document pinch roller 41. The drive axle 50 is also coupled via encoder gears 43 to an optical encoder unit 45.

The small document transport mechanism platen 28 shares a common pivot axis (at either end) with the drive axle 50. Tension springs 47 are employed to pull the platen 28 up against the bottom of the document pinch roller 41. The document pinch roller 41, the transport wheels 34 and the drive axle 50 are mounted on a frame 51 that is spring loaded within the main unit 10 to permit the frame 51 to be extended or lowered from the bottom surface 53 of the main unit 10 during operation of the small document transport mechanism 38. In the lowered position, the platen 28 and the document pinch roller 41 form a nip into which a small document is inserted for scanning.

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In operation, a small document is placed in the nip of the small document transport mechanism 38 and the organizer is rolled over a smooth surface. The rotation of the front transport wheels 34 causes the drive axle 50 to rotate, which in turn causes the document pinch roller 41 to rotate. The pinch roller 41 subsequently drives the small document past the imaging window 26 of the linear electronic scanning unit. The illustrated small document transport mechanism 38 is particularly well suited for use in the organizer, as it does not require an electrical motor to transport the small document and therefore does not drain energy from the battery unit 12.

It should be noted that, in the illustrated embodiment, the small document is actually scanned in the opposite direction than a large document. The organizer is moved from left-to-right across a page to scan a large document. The small document, however, transports the small document past the scanning window from right-to-left. Thus, compensation for the change in the scanning direction must be made either when data is initially stored or a translation operation on the data must be performed prior to the display of the data on the display panel 14.

The optical encoder unit 45 generates encoding signals in accordance with the rotation of the axle 50 that correspond to the movement of the organizer over a surface. The encoding signals produced by the optical encoder unit 45 are used to clock the operation of the linear electronic scanning unit so that a line of image data is generated as the organizer is moved a predetermined distance over the surface in a manner well known in the hand-held scanning art and need not be described detail. The encoding signals are also used by a central processing unit (CPU), located on a motherboard 48 within the main unit 10 of the organizer, to monitor

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the speed of the scanning operation. The central processing unit preferably generates a warning signal if the scanning speed is exceeding a predetermined limit. The warning signal can be either an audio warning signal generated by activating the speaker unit 30 and/or a visual warning signal displayed either on the display panel 14 or on a separate LED indicator provided on the main unit 10. In either case, the warning signal is preferably of a type that provides feedback to the operator to warn the operator when the scanning speed limit is being approached, for example by increasing the frequency of the audio warning signal, changing the color of the visual warning signal, or by flashing the visual warning signal at varying frequencies. The visual or audio feedback permits the operator to reduce the scanning speed before the predetermined speed limit is exceeded.

The layout of the linear electronic scanning unit within the main body 10 of the organizer is illustrated in Fig. 4. The linear electronic scanning unit includes a light source 40, a mirror 42, a lens array 44, and a linear electronic image sensor 46. In operation, the image being scanned is reflected by the mirror 42 to the lens array 44, which in turn focuses the image on the linear electronic image sensor 46. The linear electronic image sensor 46, with its associated control circuitry, converts the image to digital image data in a conventional manner. The digital image data is then supplied to a digital signal processing unit (DSP) located on the motherboard 48 in the form of a bit map.

Fig. 4 also illustrates the preferred location of the card expansion slots 18 with respect to the motherboard 48. The card expansion slots 18 accept memory cards that can either be used to expand the system memory of the organizer or to hold special software

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application programs or database packages. The card expansion slots 18 are preferably configured to hold memory cards that conform to the standards established by the Personal Computer Memory Card International Association (PCMCIA), including cards conforming to the Execute-In-Place (XIP) standard, although memory cards utilizing other configurations could be utilized. Memory cards that could be employed in the invention are currently available from the Maxell Corporation of Fair Lawn, New Jersey and have memory capacities on the order of one megabyte.

A basic electrical schematic block diagram of the organizers operating system is illustrated in Fig. 5. The central processing unit (CPU) 60 (for example a F8680 processor available from Chips & Technology Corporation) and the digital signal processing unit (DSP) 62 (for example a TS350C51 processor available from Texas Instruments Corporation) mentioned above are coupled to a bus 64. System memory is provided by a one megabyte capacity random access memory (RAM) unit 66 and a two megabyte capacity read only memory (ROM) unit 68. As was mentioned above, additional memory can be provided by inserting memory cards in the card expansion slots 18 which are also coupled to the bus 64. The CPU 60 controls the overall operation of the organizer, while the DSP 62 works in conjunction with the CPU 60 to support processing operations related to scanned data.

The organizer preferably supports two modes of scanning operations, namely, a Text Mode of operation (default mode) which is used to scan machine generated text images and a Photo Mode of operation (user selected) which is used to scan high resolution images such as photographs or graphics. Images processed in the Text Mode of operation are converted to one bit/pixel by thresholding and the image pixels are packed eight bits

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per byte. The images are preferably compressed by a CCITT GIII/IV (Committee Communications Internationale de Telephone et Telegraph Group III and IV) lossless method. Text Mode images may be displayed directly on the display unit 14, or an optical character recognition algorithm (OCR) can be applied to the image to convert the text image data to computer coded text data, e.g. ASCII. Images in the Photo Mode of operation are processed by an error diffusion method wherein the images are converted to one bit/pixel by distributing the gray level error into the surrounding pixels. The pixels are packed eight bits per byte and the images are compressed using a lossey or lossless method, for example, JPEG (Joint Professional Engineering Group) algorithm. The Photo Mode of operation optimizes the quality of scanned photographic images as for display on the display unit 14.

Conventional OCR algorithms can be employed by the DSP 62 to identify text data in the Text Mode of operation. Two representative algorithms for machine-print recognition include: WORDSCAN (Tm) sold by Calera Recognitions Systems of Santa Clara, California; and OMINPAGE (Tm) sold by Caere Corporation of Los Gatos, California. A separate hand-print algorithm is used by the DSP 62 to identify characters that are written on the display unit 14 by the pen unit 16 in a write mode of operation that will be discussed in greater detail below. One representative hand-print character recognition algorithm that can be employed is incorporated in the HANDWRITER (Tm) product sold by Communications Intelligence Corporation of Menlo Park, California.

The DSP 62 is preferably powered down when not in use in order to conserve power. The DSP 62, however, does not contain power down data storage capability. All internal data required by the DSP 62, including OCR

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algorithms and image processing programs, must therefore be downloaded to the DSP 62 each time it is powered up to perform a processing function. The DSP 62 is configured such that the internal registers of the DSP 62 are accessed by the CPU 60 as input/output devices over the bus 64.

A real time clock 74 is also included in the operating system to provide a time base to support time of day, date, calendar and alarm functions of the organizer. The operation of the real time clock 74 is controlled by a crystal oscillator to insure accuracy and stability. The real time clock 74 remains operational when the rest of the operating system is turned off by the user.

Power is supplied to the operating system via the power management circuit 50, which is coupled to the battery power unit 12 and to an emergency rechargeable back-up battery 72, when the main unit power ON/Off switch 22 is activated. The power management circuit 50 includes a monitoring circuit that monitors the power level of the battery power unit 12 and switches to the emergency rechargeable back-up battery 72 if the monitored level falls below a predetermined value. A recharging circuit is also provided within the power management circuit 50 to recharge the back-up battery 72 either from the battery power unit 12 (once a new or recharged battery power unit 12 is installed) or from an external AC or DC source that is coupled to the power management circuit 50 via the external power connectors 32. The function performed by the power management circuit 50 is particularly important to prevent the loss of data stored in the RAM unit 66 which must be continually supplied with power.

Data entry and retrieval is primarily accomplished through the high resolution touch sensitive electronic

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display panel 14 (in conjunction with the pen input unit 16). A communications module 76, however, is also coupled to the bus 64 to permit text and image data to be downloaded directly to the operating system from external sources. The communication module 76, for example, includes a standard serial and/or parallel computer interface circuit (for example a standard RS232 interface) which permits the organizer to be directly connected to a computer. A facsimile interface circuit and a modem are also preferably included within the communication module 76 to permit the organizer to receive and transmit data via telecommunication lines. To conserve space within the main unit 10, however, the facsimile interface and modem can be provided as separate accessory modules that are attached to the main unit 10 when needed.

In a preferred embodiment, an infrared communications link is also included in the communications module 76 to permit commands and data to be entered directly into and retrieved from the operating system of the organizer without hard-wired connections. The infrared communication link is particularly useful in providing communications between two organizers without having to provide a physical connection the two organizers. Thus, an individual can easily and quickly download schedule information or other data directly into a co-workers organizer.

The touch sensitive electronic display panel 14, in combination with the linear electronic scanner unit 26, provides an easy to learn and use interface that permits the operator to enter and retrieve data from the organizer with a minimal amount of effort. For example, Fig. 6 illustrates one type of information display that can be presented on the display panel 14 upon power-up of the organizer in a preferred mode of operation. The

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illustrated information identifies the owner of the organizer by name, address, company name (with company logo displayed) and photograph. The advantage of the illustrated organizer over conventional types of organizers can most readily be appreciated through the realization that none of the information displayed in Fig. 6 must be manually entered into the organizer by the operator.

The information displayed in Fig. 6, in contrast to conventional organizers, is entered through the use of the linear scanner unit without requiring the operator to key-in the text data. For example, all of the information is obtained simply by scanning a business card containing a photograph in the Photo Mode of operation. In such a case, the information is retained as a bit-map image file in the RAM unit 66 for later retrieval and display on the display unit 14, i.e., the resulting image displayed on the display unit would be an electronic reproduction of the original business card. Alternatively, the illustrated information can be obtained by scanning different source materials, storing the information in different files, and then linking the files together through the use of a relational database to retrieve and display the information on the display unit 14. For example, if the business card did not contain a photograph, the owner's name, address and company name could be obtained from the business card by scanning the business card with the scanner unit 26 in the Text Mode of operation. An OCR algorithm is then applied to the scanned image data by the DSP 62 to identify the text information contained therein. The identified text information is then stored in a primary database file, for example, a text based business card file. A photograph is then scanned in the Photo Mode of operation by the scanner unit 26 and the scanned

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photographic image data is stored in a bit-map image file in memory. The text data is then retrieved from the business card file and combined with the photographic image data from the bit-map image file upon power-up of the organizer to generate the illustrated display.

In addition to the owner information, various function blocks are displayed on the touch panel display 14. The function blocks include main functions such as Information, Schedule and Memo, support functions such as Change, Find and Connect, and accessory functions such as Help, Tools and Options. Each of the functions are initiated by touching the function block with the pen input unit 16. For example, a daily schedule shown in Fig. 7 is displayed by touching the Schedule function block. The schedule display screen preferably takes on the "look and feel" of a card file. The operator can easily switch days by touching the "card" for the day to be selected.

Information related to selected data fields displayed on the schedule display screen can be retrieved through the use of the relational database simply be touching the in data field with the pen input unit 16. For example, the illustrated schedule indicates that a doctor has a consult visit with a patient, Roger Brown, at 7:00. The doctor, however, may not remember the condition of the patient or may want to contact the patient to change the appointment time. Using conventional organizers, the doctor would be required to leave the schedule file and enter a memo file to retrieve the information on the patients condition and then leave the memo file to enter a telephone directory file to obtain the patient's telephone number. Switching between the various files is time consuming and tedious. In contrast, all the relevant information related to a selected data field is retrieved and displayed in the

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present invention as shown in Fig. 8 simply by touching the patient's name with the pen input unit 16.

The doctor may wish to obtain further information on the drug that has been prescribed for the patient. This can be accomplished by touching the Find function block with the pen input unit 16. A Find function menu screen is displayed in an overlay fashion on the display unit 14 as shown in Fig. 9. Selecting the Look-up option causes a Find inquiry screen to be displayed as shown in Fig. 10. The term to be found can be entered by simply touching the name of the drug on the underlying display screen with the pen input unit 16. The Find inquiry screen also asks where to look for the information. In the illustrated example, the "PDR Card" block is selected, which refers to a memory card containing information from the Physicians Desk Reference published by Medical Economic Co. Inc., of Oradell, New Jersey that would be located in the card interface slot 18. A search of the information in the PDR card is then conducted and the result is displayed as shown in Fig. 11.

At this point, the doctor may wish to calculate a new dosage for the patient by touching the Tools function block to display a calculator tool screen as shown in Fig. 12. The "keys" of the calculator are then activated by touching them with a pen input unit 16. Other tool functions include an acoustic auto-dialer that generates acoustic telephone dial tones via the speaker unit 30 so that the doctor may use the organizer as an acoustic auto-dialer to call the patient.

As was mentioned above, the ease at which related information can be retrieved is a direct result of the use of a relational database to organize all of the various data files to be stored in the organizer. The relational database is functionally illustrated in block diagram form in Fig. 13. All of the various files

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including a memo file, a bitmap image file, a calendar event file, a business card file and a telephone number directory file share one or more common relational information linking fields. The preferred relational information linking fields include name, address, telephone number, subject and date. The operator is prompted at the initiation of a scan operation to identify and attach a file tag, containing one or more of the linking fields, to the image being scanned. The file tag allows each scanned image file to be easily identified and cross-referenced in any of the organizer's modes of operation.

The entry of the file tag information, as well as any annotations that the operator may wish to enter on the scanned image, can be entered by one of two different methods. The first method involves the use of a virtual alphanumeric keyboard that is overlayed on the display unit 14 as shown in Fig. 14. The pen unit 16 is then used to select the "keys" of the virtual alphanumeric keyboard to enter the required information. This method, however, has some of the drawbacks associated with conventional organizers that use a stylus to activate the keys of a keyboard, i.e., it requires a "hunt and peck" type approach for those individuals that are unfamiliar with a standard keyboard layout.

Fig. 15 illustrates a preferred method of entering data in a write mode of operation in which the operator can use the pen input unit 16 to print the information on the display unit 14. In the illustrated example, a diagram of a heart has been scanned from a textbook and displayed on the display unit 14. By activating the pen function block, a text input window is overlayed over the image of the heart. The operator then prints information in the blocks of the text input window using the pen input unit 16. The DSP 62 applies a hand-print text OCR

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algorithm to identify the text characters that were printed in the blocks.

Text information can also be transferred from scanned images directly into a text data file without requiring the operator to key-in the text data. Fig. 16, for example, illustrates a text information file that is displayed on the display unit 14 which contains a patient's personal information as well as information on the patient's medical insurance. The medical insurance information for the text information file is obtained directly from the patient's scanned medical card, the image of which is illustrated in Fig. 17. The CPU 60 performs a text identification routine to a bit map of the scanned medical card to identify areas of the bit map that contain text information. A box is drawn around each of the areas that are determined to contain text information. The DSP 62 then performs an OCR text recognition algorithm to the data contained within the areas specified by the boxes to identify the text data contained within the boxes. The operator can then transfer the identified text data within selected boxes into the text information file by touching a selected box to fill in a template field that is overlayed on the display. The template field continues to prompt the user to select a box for each of the fields in the text information file.

The above-described scanning operations are further illustrated in flow diagram form in Figs. 18 and 19. Fig. 18 illustrates the operation of the scanner unit 26 and DSP 62 to scan an image. At step S1, the operator selects which type of scanning mode (either the Text Mode or the Photo mode) is to be employed. After selection of the scanning mode, instructions are displayed on the display unit 14 at step S2 to tell the operator how to perform the scanning operation. The CPU 60 then enters

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a wait state to wait form the activation of the start scan button by the operation at step S3. Once the start scan button is activated, the CPU 60 turns the display unit 14 off to conserve power at step S4 and then applies power to the linear scanning unit at step S5. The CPU 60 then activates the DSP 62 at step S6 and loads the DSP 62 with the appropriate OCR program based on the type of scanning mode selected by the user. Digitized image data is downloaded from the image sensor to the DSP 62 at step S7 and the DSP 62 processes the image data and stores the result in the RAM unit 66 at step S8. The CPU 60 turns off the DSP 62 and the linear scanning unit once all the image data is processed at step S9 scan lines have been entered.

Fig. 19 illustrates the entry of data in the write mode of operation in the text input window using the pen input unit 16. At step S1, the DSP 62 is powered up and then loaded with the hand-print OCR software from the ROM unit. At step S2-S3, the DSP 62 is placed in a standby mode and the text entry window is displayed on the display unit 14. At step S4, the operator uses the pen input unit 16 to write a character in a block of the text entry window. At step S5, the DSP 62 is removed from the standby mode and a bit-map representation of the hand-print character is passed to the DSP 62 for processing. The DSP 62 applies the free-hand OCR algorithm to the bit-map representation at to determine the text character represented by the bit-map representation. The identified text character is displayed above the block of the text entry window at step S6 for verification by the operator at step S7. The character is stored in memory if it has been correctly identified at step S8. If the character has not been correctly identified an error message is displayed at step S9 and the operator is required to re-enter the character.

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A more complete understanding of the operation of the organizer can be gained through detailed study of the attached Appendix which forms a part of this specification. The attached Appendix contains a detailed program listing of a program which demonstrates the interaction of the various organizer functions described above. The demonstration program is written in the "C" programming language and is intended to be executed on a computer loaded with the BORLAND (Tm) C compiler. Section A of the appendix contains the main operating program "grScreen". The remaining sections of the appendix contain various program modules, target tables, parameters and definitions that are required to run grScreen.

It should be noted that the Appendix contains material that is subject to copyright protection. The copyright owner has no objection to the facsimile reproduction of this specification as it appears in the files of the United States Patent and Trademark Office for the purposes of studying the invention, but otherwise reserves all copyrights whatsoever.

The above described image based electronic organizer provides an easy to learn and use interface, through the combination of the touch sensitive display unit 14, pen input unit 16 and linear scanning unit, which reduces the amount of effort required to enter and retrieve data into the electronic organizer. It further provides the ability to correlate information from several different sources to permit related information to be quickly and easily reviewed with a minimal amount of effort through the use of a relational database. The organizer can also be customized to fit the needs of a variety of business professions.

The utility of the organizer can further be extended through the use of various accessory devices. Fig. 20,

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for example, illustrates a docking station 70 that is designed to hold the organizer when the operator is at a desk or workstation. In the illustrated example, the main unit 10 of the organizer is provided with a docking connector 72 that mates with a corresponding docking connector (not shown) located on the docking station 70. The docking station 70 includes additional memory card expansion slots 74 that are accessible by the main unit 10 when the organizer is located in the docking station 70. Alternatively, memory cards located in the expansion slots 74 can be used to store data received from a facsimile conversion module 76, modem module 78 or personal computer 80 (PC) coupled to the docking station 70 when the main unit 10 is not located in the docking station 70. The memory cards are then transferred from the docking station 70 to the main unit 10 to be accessed.

The docking station 70 further includes a recharge station 74 which is used to charge an additional battery unit 12' that replaces the battery unit 12 when it is discharged. The main unit 10, however, does not use battery power when located in the docking station, but instead draws power from a power supply located within the docking station 70. Thus, the battery units 12, 12' can be recharged while the organizer is located in the docking station 70. Additional accessories, such as a keyboard 82 can also be plugged into the docking station 70 for interaction with the main unit 10 of the organizer.

The invention has been described with reference to certain preferred embodiments thereof. It will be understood, however, that modifications and variations are possible. Fig. 21, for example, illustrates an organizer in accordance with the invention that includes an electronic camera unit having a lens 90 that focuses

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the image of a subject onto an electronic imaging device (not shown) provided within the body of the main unit 10. A shutter release button 92 is provided to activate camera control circuitry (not shown) coupled to the electronic imaging device and the bus 64.

In a preferred mode of operation, partial activation of the shutter release button 92 causes the output from the electronic imaging device to be supplied to the display unit 14 so that the display unit 14 can be used as an active "viewfinder". Once the image of the subject has been properly framed on the display unit 14, the shutter release button 92 is fully depressed in order to capture the image of the subject. Image data from the electronic camera unit is stored as a bit map image in the same manner as image data received from the linear electronic scanning unit 26.

The electronic camera unit can be used in combination with, or in place of, the electronic scanning unit 26 to enter data into the organizer. When used in combination, the electronic camera unit is preferably provided as an accessory module that couples to the docking connector 72 provided on the main unit 10 (See Fig. 20). The provision of a separate accessory module for the electronic camera unit enables the overall size of the main unit 10 to be kept to a minimum.

Other structural variations are also possible other than those specifically set forth above. For example, the small document transport mechanism can be configured such that it does not extend from the main unit 10, but instead, includes a document entry slot on the side of the main unit 10, a document path within the main unit 10 that passes the scanning unit, a document pinch roller driven by the transport wheels in the document path, and a document entry slot past the point of the scanning unit.

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Industrial Utility

The invention provides an electronic pocket organizer that is useful in storing information that must be accessed by individual's on a routine basis. The advantages of the organizer are that is can be adapted for a variety of specific uses by modifying the organizer's system software; the user interface employed in the organizer simplifies the entry of both text and image data into the electronic organizer; data is stored in the organizer in a relational database format that further enhances organizer operation by permitting related information to be quickly and easily entered and retrieved from a plurality of databases; and a small document transport mechanism incorporated in the organizer permits small documents to be transported past the linear scanning unit of the organizer without using energy from the organizer's battery unit. The small document transport mechanism, while particularly well suited for use in the organizer, can also be incorporated in any type of hand-held scanner.

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WHAT IS CLAIMED IS:

1. An electronic organizer characterized by: text data entry means for entering text data into a memory unit; image data entry means for entering image data in the memory unit; processing means for retrieving the text and image data entered in the memory unit; and display means for displaying the retrieved text and image data.

2. An electronic organizer as claimed in claim 1, wherein the image data entry means includes a linear electronic scanning unit and the display means includes a touch sensitive display unit.

3. An electronic organizer as claimed in claim 1, wherein the text and image data are stored in the memory unit in a relational database format.

4. An electronic organizer as claimed in claim 2, further comprising a small document scanner mechanism for transporting small documents past the electronic scanning unit.

5. An electronic organizer characterized by: a main unit including an integral scanning unit, a touch sensitive display unit, a memory unit, and control means for controlling the processing and storage of text and image data entered into the main unit through the integral scanning unit and the touch sensitive display unit; a battery unit releaseably coupled to the main unit; and an operator control for activating the main unit.

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6. An electronic organizer as claimed in claim 5, wherein the main unit further comprising a small document transport mechanism.

7. An electronic organizer as claimed in claim 6, wherein the small document transport mechanism extends from the main unit during operation.

8. An electronic organizer as claimed in claim 6, wherein the small document transport mechanism characterizes transport wheels coupled to a drive axle and a document pinch roller coupled to the drive axle by pinch roller drive gears.

9. An electronic organizer as claimed in claim 8, further includes an encoder unit coupled to the drive axle by an encoder gear assembly, wherein the encoder unit generates signals, indicative of the movement of the organizer during a scanning operation, that are supplied to the control means.

10. An electronic organizer as claimed in claim 5, wherein machine generated text data is scanned by the scanning unit to produce scanned text data that is supplied to the control means, and wherein the control means applies an optical character recognition routine to the scanned text data produced by the scanning unit to convert the scanned text data to computer coded text data.

11. An electronic organizer as claimed in claim 10, wherein hand-printed text data is produced by the touch sensitive display unit in response to an operator input and supplied to the control means, and wherein the control means performs and optical

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character recognition routine on the hand-printed text data to generate computer coded text data.

12. An electronic organizer as claimed in claim 5, wherein the image and text data is stored in the memory unit in a relational database format in which a file tag, containing at least one linking field, is used to identify related image and text data in a plurality of databases.

13. An electronic organizer as claimed in claim 5, wherein the control means includes a central processing unit and a digital signal processing unit coupled to a system bus, the display unit and the memory unit are coupled to the system bus, and the scanning unit is coupled to the digital signal processing unit.

14. An electronic organizer as claimed in claim 5, wherein the main unit further includes a speaker unit coupled to the control means.

15. An electronic organizer as claimed in claim 5, wherein the main unit further includes a communications module coupled to the control means.

16. An electronic organizer as claimed in claim 5, further comprising a pen unit that is used to activate the touch sensitive display unit.

17. An electronic organizer as claimed in claim 7, wherein the main unit further includes memory expansion slots coupled to the system bus.

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18. An electronic organizer as claimed in claim 5, further includes an electronic camera unit coupled to the control means of the main unit.

19. An electronic organizer characterized by: a central processing unit, a digital signal processing unit, a random access memory unit, a read only memory unit, a real time clock and memory expansion slots coupled to the system bus; a linear scanning unit coupled to the digital signal processing unit; a touch sensitive display unit coupled to the system bus; and a power management unit coupled to the system bus, a rechargeable primary battery unit and a rechargeable back-up battery unit.

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