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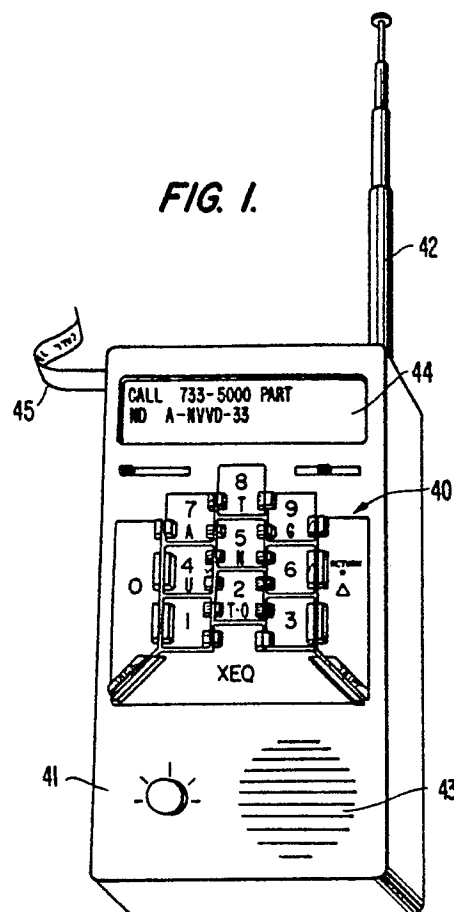
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54 **Keyboard operated paging system operated alphanumerically from twelve keyboard keys.**

57 A pocket-sized paging instrument (40) for two way alphanumeric communication with a similar instrument by way of an antenna (42) has only twelve keys arranged in a format for touch typing for entry of both decimal and alphabetic characters. Internal data processing means is controlled by the same twelve keys as provided for entering the alphanumeric data for communication. The capabilities of the system to handle large amounts of transmitted data either in digital form or audio by way of a speaker-microphone (43) depends upon modern data processing equipment with internal storage capabilities that communicate with a viewing panel (44) and/or printing means (45) in the manner employed by personal computers.



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KEYBOARD OPERATED PAGING SYSTEM OPERATED ALPHANUMERICALLY FROM TWELVE KEYBOARD KEYS

Technical Field

This invention relates to paging systems operable with personal portable pocket-sized paging instruments that afford two way communication, and more particularly it relates to keyboard operated paging instruments processing alphanumeric characters for transmission and display.

Background Art

Operation of pager systems with alphanumeric data from keyboards on the pager which display and print out messages are known at this stage of the art as exemplified by US-A-4,028,661.

In such prior art systems there are, however, several deficiencies. They are not always compatible with the ability to store and display more than a minute amount of information, such as a telephone number. Many systems are limited to transmission of numeric characters. Some do not provide for two way communications and require an auxiliary communication system such as calls via telephone lines to complete the communication.

One serious deficiency is the inability to effectively produce in a pocket-sized paging instrument the keyboard capacity to manually input alphanumeric messages. Systems such as that shown in US-A-4,028,661 require over thirty keys to give alphabetic capability. In the pocket-sized paging instruments, such keys are located so close together that they cannot be easily fingered, and are not all conducive to touch typing methods.

Thus, suitable two-way miniaturized pocket-sized paging instruments have not heretofore been available in the art in spite of the significant advantages to two-way digital communication, including: the ability to code and keep messages private, the ability to transmit digital data over transmission channels at very high transmission rates, the ability to record communicated messages by storing and printing, the ability to convey critical amounts of data, and the ability to communicate with deaf or mute handicapped persons.

It is therefore a primary objective of this invention to provide improved two-way digital communication paging instruments resolving the aforesaid problems and providing a personal communication system with hand carried pocket-sized instruments with substantially unlimited communication capacity and responsive to keyboard operation in an alphanumeric mode with keys adapted for touch typing.

It is also an objective to provide a system having very comprehensive operational characteristics with control from the keyboard, utilizing the current capacity of the data processing art to miniaturize storage capacity and produce a large range of data processing functions.

Other objects, features and advantages of the invention will be found throughout the following description, drawings and claims.

Disclosure of the Invention

This invention provides a pocket-sized portable two-way digital radio communication center with a twelve key keyboard permitting entry of both decimal and alphabetic characters, as well as a large number of commands or instructions. The twelve keys are arranged and spaced for touch typing with a single hand resting at a single home key position. This corrects the prior art problems of requiring many keys in the very small space available on a portable pocket-sized pager instrument, such as thirty, for alphanumeric data input to pagers, where they are too close together for easy input and are not adaptable to touch typing techniques.

The keyboard is compatible with a comprehensive pager system which includes a wide range of data processing, printing, display, audio, recording, etc. capabilities now available in the computer arts, all controllable by the twelve key keyboard. This is achieved by providing a paging-data processing system responsive to keyboard input signals from two successive keystrokes in time sequence, thereby giving the capability for 144 combinations of coded signals from the twelve keys.

Brief Description of the Drawings

Figure 1 is a perspective view of a pocket-sized keyboard controlled two-way communication center paging instrument with a video readout panel and printout capability;

Figure 2 is a schematic keyboard diagram illustrating the processing of a full range of alphanumeric characters and control instructions from a set of twelve keys; and

Figure 3 is a block system diagram of the alphanumeric paging system organization of the pocket sized paging instruments afforded by this invention.

Detailed Description of a Preferred Embodiment

As may be seen in the front view of Figure 1, a twelve key keyboard layout is afforded that provides a comfortable and spacious arrangement for the fingers of one hand to type in a touch typing mode. Those twelve keys are used in this invention to afford about 144 coded selections, thereby providing for entry of numerical and alphabetic characters and an additional range of about one hundred control codes that may be used for data processing instructions, generally involving the use of the execute key XEQ.

Preferably the key columns are laid out on the keyboard 40 to conform with the shape of a human hand to thereby fit the natural finger position of the hand to the keys in operating position. This reduces fatigue, and prevents errors from unnatural reach positions or those that require an abnormal finger position.

With the twelve keys therefore a keyboard 40 having alphanumeric capacity and operable in the touch type mode with the fingers of one hand is made possible by this invention in the compact miniature pocket-sized housing 41, slightly larger than the size of a human hand. Radio transmissions are handled by antenna 42, and may permit audio communications by way of speaker-microphone 43. Provisions are made for visual readout on panel 44 and for printout or storage on tape 45 from an internal printer or recorder. The internal data processing and communications system is of the modern computer-data processing type that affords internal storage and stored program subroutines that permit many different kinds of functions for providing such features as dictating mode of operation, calculations, data organization, and communication with like pager instruments.

The key diagram of Figure 2 illustrates the advance in the art made by this invention in communicating with alphanumeric character capabilities by means of manual keyboard input from only twelve keys. The system thus is constructed to include special data handling features by operation of the keyboard keys to process entries in response to two successive mutually exclusive time sequential keystrokes from different ones of the keys. Thus, the operation in the two keystroke per entry mode is as set forth in our US-A-4,547,860. As set forth in that patent even fewer keyboard keys are required by operation of the decimal point key 46 in a mode that permits it to be an entry key. Since a decimal point only appears once within a numeric word, the second decimal point will serve as an entry key in a numeric calculating mode. It is thus possible to operate in a one stroke per entry mode for numeric data and to use the execute key

XEQ to change the mode to a two stroke per entry mode for providing 144 selections including a full alphabet.

Thus the keys in the row of keys 47 are designated with a keyboard chart to show entry of a set of 36 alphabet characters. Consider entry of the letter "A" for example. Because of location on the "4" key it serves as the first keystroke entry of two sequential keystrokes required for entry of an alphabetic character. The second keystroke is identified on the chart as the "7" key. This an "A" is entered by keystrokes 4-7. Similarly a "G" is entered by strokes 6-7, etc. Clearly there is ample room on the twelve keys for all the control functions and alphanumeric characters desired, even for a comprehensive paging system providing many of the data processing functions encountered with general purpose and programmable computers, if desired.

A telephone line voice grade communication system has been proposed in US-A-3,967,273, as a means of communicating with digitalized audio tones coded in alphanumeric format as obtained from a telephone instrument having only twelve keyboard keys operated in a two-stroke per character mode. The received information may be decoded and stored as alphanumeric text for input to a conventional computer system.

However, we do not wish to limit the mode of transmission, and the transmission channel 56 of Figure 3 operates independently from the two stroke per character coding of keyboard 40. Accordingly the interface data organizer 55 of the alphanumeric digital data processor 50 provides data that can be efficiently transmitted in digital format at high transmission speeds over a radio communication link.

Furthermore, the information transmitted in digital form is compatible with the alphanumeric information organized and stored in the register 52 from keyboard input so that when sent or received at high speed transmission rates greatly exceeding manual keyboard entry speeds it is readily processed in register 52. Thus the keyboard 40 may set up instructions for printout (58) or display at the viewing panel 44 of the data received and stored in register 52. Alternatively the system may serve only to provide a signal alarm when a message is received, so that the data may be recalled from the memory when desired by means of appropriate keyboard entered instructions.

If desired to make the system an on line voice transmission system, audio communications may also be transmitted. In such systems, the pager instrument may be comprehensive enough to have a voice recorder and dictation controls coupled to the transmission channel in a manner directed by control signals entered by the keyboard 40 to pro-

gram the data processor or to select stored program subroutines therein.

The keyboard input signals coded in the two keystroke per entry format are processed in the keyboard interface data organizer 51 to communicate to the alphanumeric digital data processor 50 in internal machine language and are not used in the transmission channel. The display register 57, of the type used in digital computers, processes the information called out from storage in register 52 in a format for sequentially printing out or viewing on the viewing panel 44 in the manner common in personal computers, all under control of the instructions provided by the keyboard, as provided also in personal computer operation.

This invention advances the art by providing a hand-held, keyboard controlled sending and receiving paging instrument having only twelve keys operable to produce decimal characters and alphabetic characters with a further set of over 100 instruction and control entries being available. Thus a keyboard operating in the two stroke per entry mode is directly coupled to actuate a digital data processing system and to enter alphanumeric information thereinto by the twelve key keyboard.

This data processing system then organizes data for transmission by a radio transmission link to like pager instruments in a two-way communication system, which sends alphanumeric information out at high transmission rates. The transmissions are not limited in length, except by the capacity of the internal pager memory. The system is flexible in its capacity to organize data compatible with various radio transmission system specifications. With the data processing system controlled by the 144 input functions from only twelve keys this system can be most comprehensive in designating or organizing the functions to be performed. Yet on a pocket-sized instrument, a keyboard simple to use in a touch typing mode is afforded that eliminates the large number of keys formerly used on data processing or paging devices having alphanumeric capabilities.

Claims

1. A pocket-sized pager instrument of the type for communicating with like pagers over a communications channel and having alphanumeric data processing capability with a manual keyboard for entering alphanumeric characters and control instructions, **characterized by:**

data processor means for processing and storing alphanumeric data,

a keyboard of a few keys arranged on said pager in an array with each key operable by the fingers of one hand without interference coupled to said

data processing system for entering thereinto for storage and processing a set of alphanumeric characters,

transmitting means coupled to the data processing means for communication by radio communication over a paging communication channel of messages stored in the data processor means to other data processor means including pocket-sized pager instruments, and

message processing means in the instrument for receiving and displaying in alphanumeric format data received over the communication channel.

2. An instrument as defined in claim 1, **characterized** in that the instrument comprises two way communication devices with said transmitting means and message processing means including data interfacing means for communication by radio transmission between instruments located at the transmitting and receiving ends of the communication channel.

3. An instrument as defined in claim 1, **characterized** by means coupling the keyboard to the data processing means for entry of input alphanumeric characters in response to two successive keystrokes from a subset of two of said keys.

4. An instrument as defined in claim 1, **characterized** by only twelve keys in the keyboard.

5. An instrument as defined in claim 4, **characterized** by the key array being laid out into a format fitting the fingers of a human hand in a comfortable configuration for touch typing on the twelve keys.

6. An instrument as defined in claim 4, **characterized** by a set of operating control functions performed by the twelve keys.

7. An instrument as defined in claim 6, **characterized** by having all the control functions performed from the twelve keys.

8. An instrument as defined in claim 1, **characterized** in a set of operating control functions enterable by the keys.

FIG. 1.

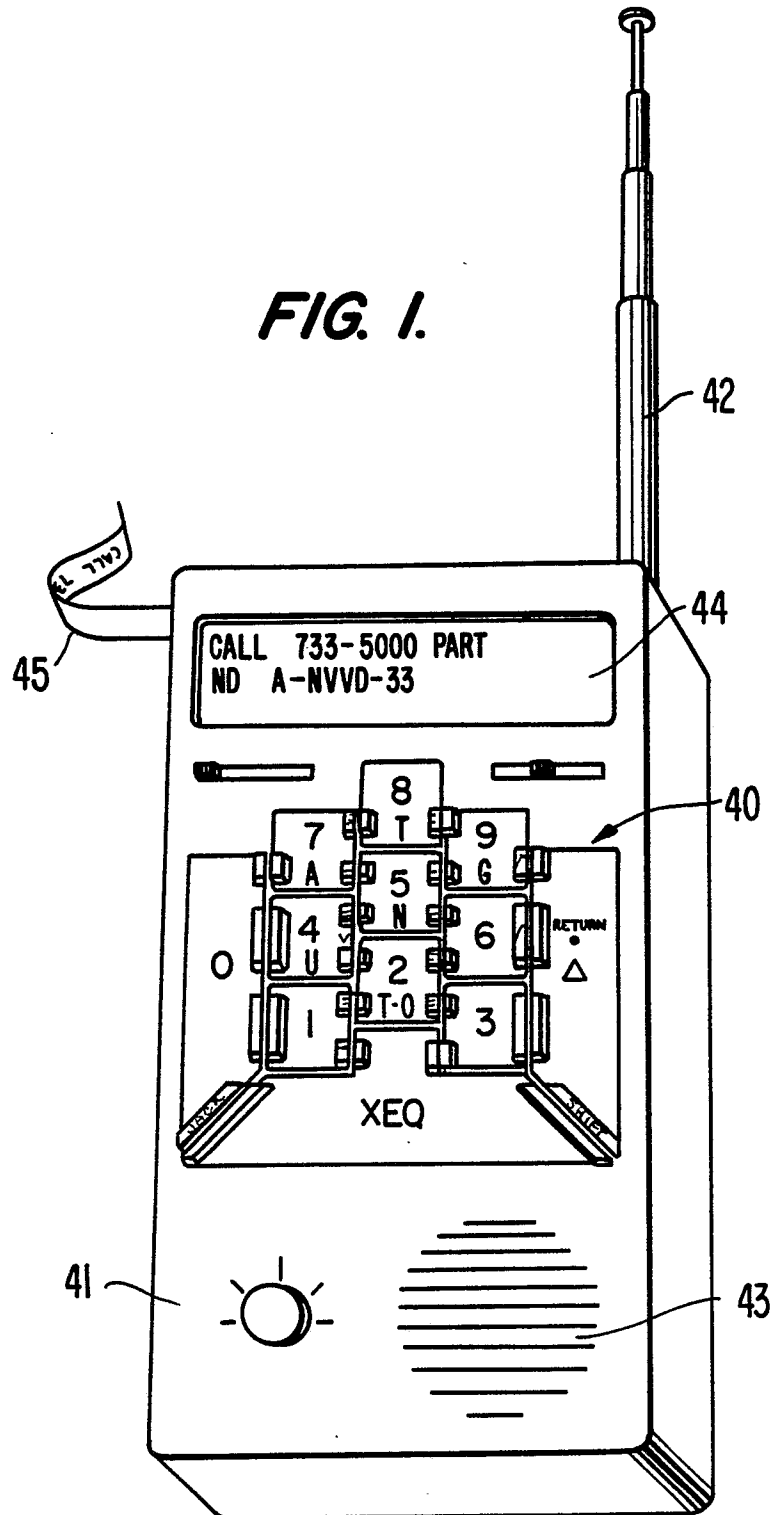
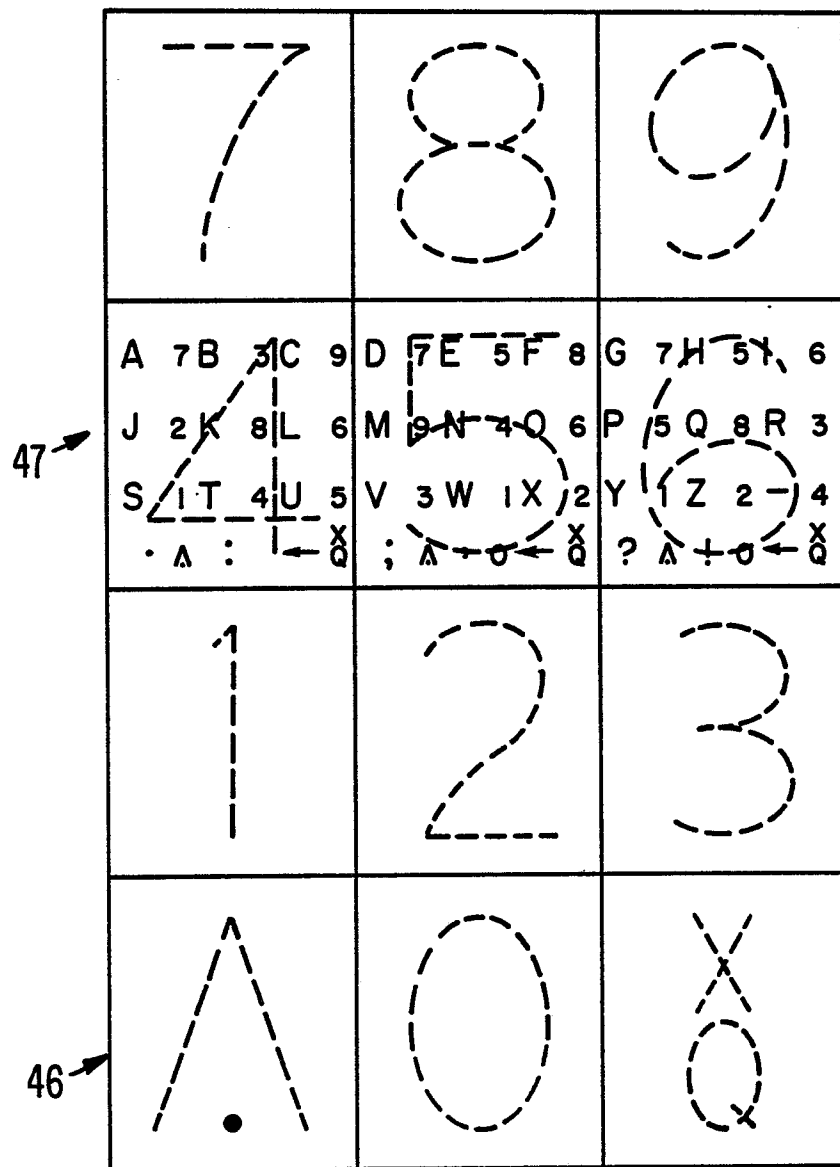


FIG. 2.

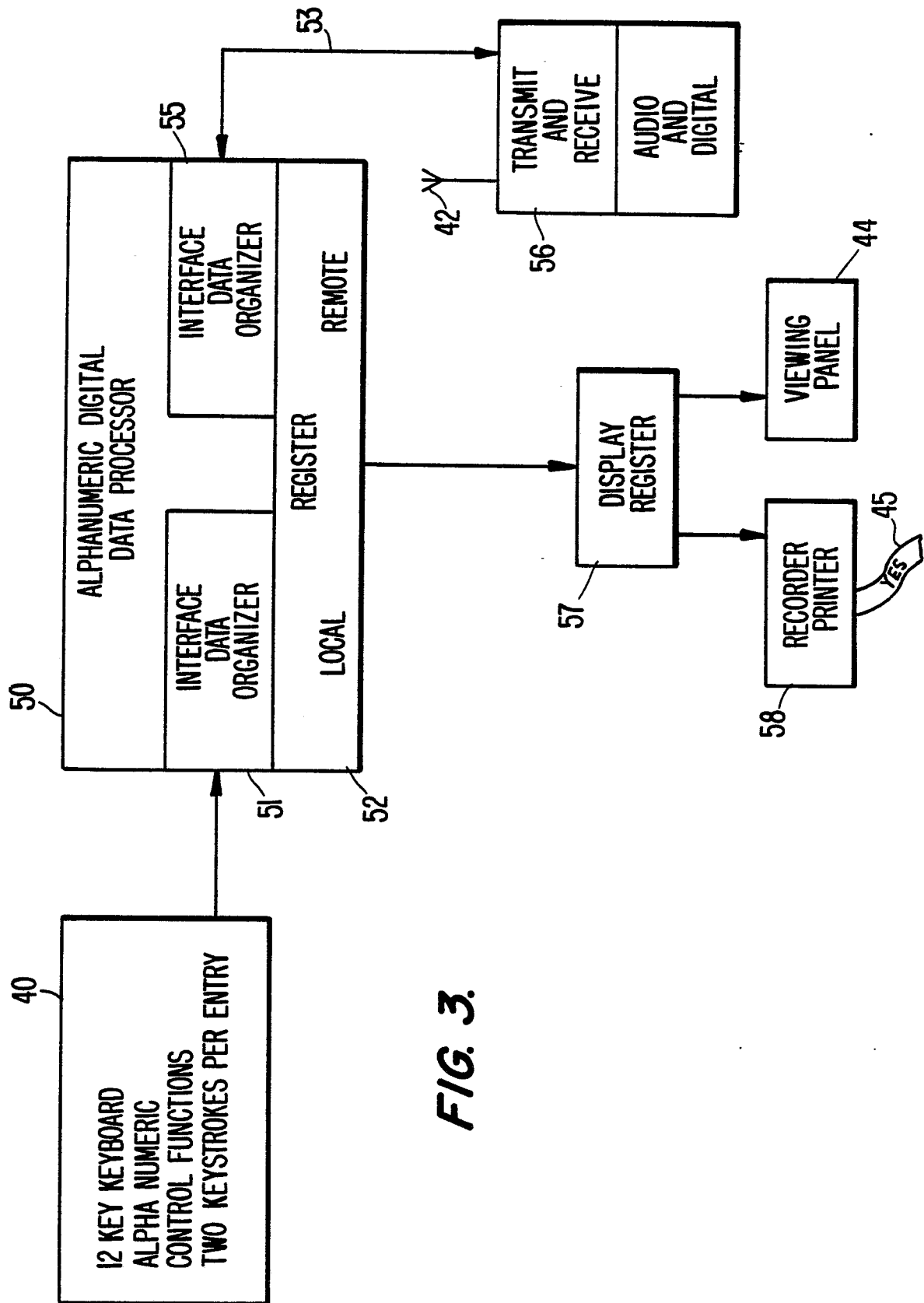


FIG. 3.