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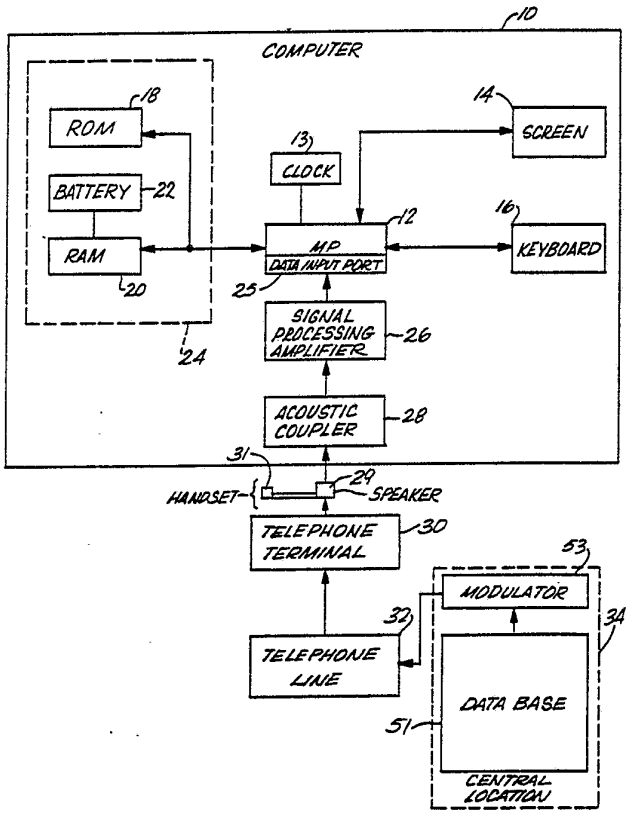
(54) Title: DATA TRANSMISSION AND STORAGE

(57) Abstract

A sequence of data groups are modulated at a central location (34) and coupled to a telephone line (32) in response to a call-up signal. The sequence is transmitted through the telephone lines to a remote computer (10). The computer receives the signal, demodulates them, and couples them to a memory. The data is stored at a particular address, and in coupling the data to the memory, the computer checks a flag at that address to determine whether the data has already been written over. When the flags indicate that the data received corresponds to data already written over, it signals the end of a transmission. The data stored in the memory can be accessed by an operator using input controls. The available data transmission and storage schemes require that the data transfer be done synchronously which requires expensive and complex equipment. The advantage of the invention is that it allows a synchronous data transfer by using a small portable inexpensive device.



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DATA TRANSMISSION AND STORAGE

Field of the Invention

The present invention relates to the field of data transmission and storage and, in particular, to transmitting and receiving data over telephone lines asynchronously and then storing it for later retrieval and display.

Background of the Invention

A variety of data transmission and storage schemes using telephone systems are available. These schemes normally require that the data transfer be done synchronously, i.e., that a known signal begins at a known location in a data stream and transmits through to a known end. Synchronicity is typically insured using a two-way handshake protocol. At the receiver, some hardware is dedicated to demodulating the received data and converting it to a binary signal, while other hardware is dedicated to the tasks of conducting the handshake and of assembling, sorting, and storing the data. These functions are all duplicated at the transmitter as well. The conventional transmission and storage schemes require expensive complex equipment at both the transmitting and receiving ends, together with two-way communication capability.

The expense and complexity of equipment required for existing schemes make it difficult to produce a

portable information display which can be easily updated over the telephone, yet is still compact enough to be tucked in a pocket or purse.

Summary of the Invention

The present invention allows a remote and preferably portable device to receive data over the phone line asynchronously and store it in memory for later recall. It provides for a small portable inexpensive device for displaying sorted stored data which can easily be updated by dialing a telephone number.

In one embodiment, the invention is a method for accessing data by the following steps. A data base arranged in date groups specifying addresses in the memory of the remote device is stored in binary form at a central location. One or more telephone lines are connected to the central location. The data base is modulated and coupled in a prescribed sequence of data groups to one of the telephone lines in response to a call-up signal. A call-up signal is sent to one of the telephone lines from a telephone terminal at a remote location. At the remote location, there is a computer with a memory for storing a data base in data groups at the addresses specified by the data at the central location. Each data group of the memory has a flag bit that is alternately in a set or reset state. The computer also has a screen for selectively displaying the stored data base. A plurality of input controls and a microprocessor coupled to the telephone terminal and programmed to retrieve selected data (selected by operating the input controls) from the memory and display such data on the screen.

When the call-up signal is sent to the central location by the telephone terminal, the flag bit of all of the data groups is set. When the telephone line is called up, the data base transmitted from the central

location is received at the telephone terminal, the data base is demodulated, and then coupled from the telephone terminal to the memory of the computer to update the data base stored in the memory. This is done by storing the data group, at the specified address one data group at a time, and resetting the flag bit at that address. After all the flag bits have been reset, the end of transmission is signaled and finally the input controls are operated to access the data stored in the memory of the computer.

Preferably, the step of coupling the data base to the memory of the computer includes checking the flag bit at the specified address of each data group and overwriting the data stored at the specified address with the demodulated group only if the flag bit is set at the time of checking. Preferably, the step of coupling the data base also includes initiating the signaling step if the flag bit is reset at the time of checking.

In another embodiment, the invention is a method composed of the following steps. A data base is stored in binary form at a central location. One or more telephone lines are connected to the central location. The data base is modulated and coupled to one of the telephone lines in response to a call-up signal. A call-up signal is sent to one of the telephone lines from a telephone terminal. The telephone terminal is at a remote location and has a handset. There is also a computer resident at the remote location with a memory for storing the data base, a screen for displaying the data base, input controls, a microprocessor, and an acoustic coupler. The acoustic coupler is placed close to the speaker of the handset to receive the data base transmitted from the central location when the telephone line is called up. The acoustic coupler is connected through an amplifier to the microprocessor, and the microprocessor is

programmed to store the received data base in the memory. The input controls are operated to access the data stored in the memory. The microprocessor is programmed to retrieve data from the memory and display it on the screen in response to operation of the input controls.

Brief Description of the Drawings

FIG. 1 is a block diagram showing a preferred apparatus for embodying the present invention.

FIG. 2 is a graph showing typical waveforms for frequency shift keying according to the present invention.

FIG. 3 is a block diagram illustrating the method for transmitting a data base from a central location over a phone line to a portable hand-held computer.

Detailed Description of the Invention

Figure 1 shows in block diagram form an apparatus for practicing the present invention. A handheld computer 10 is driven by a microprocessor 12 which has an internal clock 13. The microprocessor drives a screen 14 and receives commands through a keyboard 16. A NEC 7008 microprocessor is presently preferred for this embodiment. The programming instructions for the microprocessor are provided by a read only memory (ROM) 18. Data for manipulation by the microprocessor and display on the screen 14 are stored in a random access memory (RAM) 20. The RAM is normally powered by the computer's main power supply. However, when the power supply is shut off, the RAM data is maintained by a battery 22. The ROM, RAM and battery are provided on a removable replaceable cartridge 24. This allows the microprocessor 12 instructions in the ROM 18 and the data stored in the RAM 20 to be replaced by replacing the cartridge.

The microprocessor also has a data input port 25 to receive signals from a signal processing amplifier 26 which processes signals sent to it from an acoustic coupler 28. The acoustic coupler is typically an electret condenser microphone which is placed over the speaker 29 of a handset 31 of a conventional telephone terminal 30. The telephone terminal 30 receives information sent over a telephone line 32 from a central location 34. The central location 34 contains a data base 51 and hardware, including a modulator 53, which allows it to transmit information from the data base into the telephone line to the telephone terminal 30.

An example series of steps to be performed by the apparatus of FIG. 1 is set forth in the flow diagrams of Appendices 1 and 2. Further details are supplied by the source code listing of Appendix 3. The source code is suitable for use with a NEC 7008 microprocessor.

Appendix 1 is a flow diagram for updating the data stored in the RAM 20 by transmitting data from the central location 34 over the telephone line 32 to the telephone terminal 30 where it is detected by the acoustic coupler 28, processed by the amplifier 26, converted to a binary bit sequence by the microprocessor 12, and then stored in the RAM 20. Appendix 2 is a flow chart showing a sequence of steps for selectively displaying the stored data on the screen 14 through operating the input controls on the keyboard 16. In the example of Appendices 1 and 2, the stored data is baseball player and team statistics. The Appendices require only a few input controls or keys on the keyboard. These keys are labeled softkey 1, softkey 2, and softkey 3 for selecting menu items, arrow key up, arrow key down, arrow key left, and arrow key right for moving a cursor on the screen, and a previous key for displaying a previous screen.

In the presently preferred embodiment, the computer 10 is updated when data is transmitted from the central location 34. The data is transmitted in the form of sine waves. Sine waves are preferred because they are best suited to telephone line transmission, however, any other waveform or signal format may be used. The central location contains a data base of the data which is to be transferred to the computer at its remote location. At the central location the data is drawn from the data base, modulated and then coupled to the phone lines. It is presently preferred to use 1200 hertz for a binary data 0, 1800 hertz for a binary data 1, and 2400 hertz for the start of a data packet. Sine waves at these frequencies are well suited to transmission over conventional telephone lines 32.

The sine waves or tones sent through the telephone line can be generated from a binary data base in response to each telephone call or they can be

generated continuously and played simultaneously to any and all callers. The tone can also be generated once and then stored on an audio tape so that the audio tape is played into the telephone line when a call is connected. The tones on the audio tape are rerecorded when there is a change in the binary data.

The modulated signal is sent through the telephone line to the terminal where it is filtered, amplified, and converted to a stable square-wave function. This provides signal edges for the microprocessor to detect. The acoustic coupler 28 is preferably an isolated electret microphone which is placed over the earpiece or speaker of the telephone terminal handset. The unamplified sine wave is received from the handset speaker, and transmitted to the signal processing amplifier. It is then fed to an automatic gain control circuit for further filtering and amplification. The automatic gain control circuit provides a more steady signal over varying input amplitudes. The output of this is fed to a 30 to 1 gain stage to provide sharp clipped edges of the sine waves. Finally the amplified semisquare wave is fed through a capacitor and a bias set divider set into a Schmitt trigger. The output of the Schmitt trigger is a virtual square wave determined by the input bias set point. This virtual square wave is the output of the signal processing amplifier and fed to the microprocessor 12 through a standard buffer circuit where it is interpreted by the software. The circuitry described above can be implemented using techniques well known in the art. As described above, this circuitry receives and demodulates the data received over the telephone line, shaping the data base for processing along the lines outlined in Appendix 1. In general, amplifier 26 converts the signal transmitted over telephone line 32 to a form compatible with the input to microprocessor 12.

The updating process begins by setting a software control error flag associated with each data packet stored in the RAM 20. The data from the central location is received and stored in groups or blocks which shall be referred to as packets. In the example of Appendix 1, these packets correspond to the statistics for one baseball player i.e., each packet is a file for one particular player. In Appendix 1, each packet is called a player database. A software error flag is set in the RAM 20 for each player before any data is received from the central location. If any error flags are not reset during an updating cycle, the microprocessor can detect this and indicate to the user when the data is displayed that the corresponding player databases are not updated.

It is presently preferred that the system download information from a 900 prefix telephone service although any other telephone service may be used. Each downloading process will be two to three minutes in length and will preferably use an endless loop tape or other continuously cycling data storage device. The 900 service will open the phone line to this tape as soon as the call up signal is received. Therefore, the computer 18 must be able to start receiving data in the middle of a transmission at any point on the tape. In addition, there is no synchronization protocol or clock synchronizing protocol. The transmission is asynchronous. Assuming that the data stream is continuous, the end of a transmission cycle occurs when data has been written to one player data base twice. This is determined by examining the error flags in the RAM 20. A player is only written over when the error flag is set, indicating that the player has not yet been updated. The error flags can also be used to determine whether each player database has been updated and display this fact on the screen.

As mentioned above, data is frequency keyed using frequencies of 1200, 1800, and 2400 hertz. The data is formatted into a series of packets. Each packet begins with a 2400 hertz start signal. This is followed by a two-byte header. The header serves as an address to the RAM 20 in the computer and also contains the error flag in the reset state. Following the header is the player data to be stored in the RAM and finally an error detection code. Each data byte contains a start bit which is always zero, eight data bits and a stop bit which is always one, so that each new byte begins with a transition from one to zero. The error detection bits are used to determine whether the data has been accurately transmitted. Any simple error detection scheme could be used including parity and summing. The error detection bits are not stored in RAM 20. An error detection and correction sequence could be included as a part of the microprocessing functions, however, for simple and small databases it is less expensive to simply retransmit the data base from the central location when the transmission contains a large number of errors.

As diagrammed in Appendix 1, after the error flag is put in the set state for each current player data base, the microprocessor tests the previous key. If this is depressed, then the update sequence is exited. If it is not depressed, then the "checksum" or error detection register is cleared, the cycle counter and count registers are cleared, the "B pointer" or address register is zeroed and the bit counter is set to "start." The microprocessor then begins testing data received from the signal processing amplifier.

FIG. 2 shows a graph of a portion of a typical frequency keyed microprocessor input signal as received from the signal processing amplifier 26. The square wave 40 is either a low or high state which can easily be recognized by the microprocessor. In Appendix 1,

the low state is called "modem input = 0" and the high state is called "modem input = 1." The input level as a zero or one is tested at each microprocessor clock cycle. It is presently preferred that the microprocessor run at color burst clock speed or 3.5796 Megahertz. The "counts" register records the number of clock cycles between each transition. Since the clock cycles much faster than the high frequency 2400 hertz several counts are accumulated between each transition. After each transition the value of the "count" register is compared to the threshold values to determine the frequency of the received signal. If the count register is in a low range, then the "value" is a zero if it is in an intermediate range, then the "value" is a one, and if it is in a high range then the signal is a start signal, for a new packet of data.

As can be seen in FIG. 2, there are four half cycles for each low frequency or binary zero, 42-1; 42-2; 42-4, and six half cycles for each higher frequency binary one, 42-2. The microprocessor accordingly makes four or six time measurements before determining the valve of each binary bit. This helps eliminate errors, however, the data transmission speed can be increased by transmitting only four half cycles for each bit. The higher frequency binary one would then require less time to transmit than the lower frequency binary zero because its period is shorter.

When the microprocessor first begins receiving data over the telephone line, it waits until a high frequency 2400 hertz start signal is detected. Upon detecting the next following start bit at 1200 hertz, the microprocessor converts the rest of the data stream into a binary bit stream. After a packet has been transmitted and the error detection bits have been received, the processor tests the header to determine whether a positive address for the data packet has been received and then tests the error detection code

against the data to determine if the data received is accurate. The header is used as an address to the RAM 20 where the error flag is retrieved. If the error flag at that address is set, then the new data is copied from a buffer into the player database at that address including the reset error flag. If the address is invalid, an error is detected, or the error flag is reset, then the player data base is not overwritten. These checks are the process subroutine of Appendix 1.

A reset error flag indicates that the corresponding player database has already been updated during the data transmission cycle. The reset error flag signals the end of a transmission cycle and prompts the microprocessor to indicate this to the user through the screen. The user then disconnects the acoustic coupler 28 and hangs up the telephone handset.

In the presently preferred embodiment, the process subroutine is executed during the start signal for the next data packet. The process subroutine can be performed while the start signal is being transmitted so that the microprocessor is ready to decode the next data packet before the start signal ends.

In summary, a data base is transferred from central location 34 to RAM 20 by means of the following procedure which is illustrated in FIG. 3 in the preferred sequence. As depicted by a block 50, data base 51 is stored at central location 34 as the data base to be transmitted. As depicted by a block 52, data base 51 is modulated at central location 34 by modulator 53 when the user of computer 10 sends a call-up signal to central location 34. As depicted by a block 54, the modulated data base is sent over telephone line 32 to telephone terminal 30 and, as depicted in block 56, the flag bits at the memory locations of RAM 20 where the data base is to be stored are all set. As depicted by a block 58, the data base is received, data packet after data packet, at

telephone terminal 30 and, as depicted by a block 60, it is demodulated by microprocessor 12. As depicted by a block 62, the error detection bits of each data packet are checked. If the error check is false (F), as depicted by a block 64, the data packet is discarded. As depicted by a block 65, the flag bit at the address in RAM 20 specified by the data packet is fetched, and as depicted by a block 66, the fetched flag bit is checked if the error check is true (T). As depicted by a block 68, if the checked flag bit is in a set state, the data packet is stored in RAM 20 at the specified address and, as depicted by a block 70, the flag bit at the specified address is reset. As depicted by a block 72, telephone line 32 is disconnected if the checked flag bit is already in a reset state, because this condition only obtains when all the data packets have already been received at telephone terminal 30. Blocks 60 to 72 represent software operations performed under the control of microprocessor 12.

It is presently preferred that the computer be used as a compact portable information display device. One application of the portable display device is as an information source at a baseball game, this is the application contemplated by Appendices 1 and 2. The entire device can be built into a foldable package no larger than a small stack of 5x8 cards. This can easily be slipped into a pocket or purse and brought to the grandstands at a baseball stadium. When the device is unfolded, the user has access to a variety of up-to-date and important statistics for all of the current season's players and teams in the major league. The arrow and soft keys allow the operator to interact with menus displayed on the screen to select precisely the statistics which he wants to view. Using only the previous, cursor direction and soft keys mentioned above, together with menu driven software like that

diagrammed in Appendix 2, the operator can quickly and easily access a large variety of statistics. The computer can also include trivia questions answered by manipulating the keys.

The computer can also be adapted for different kinds of information. It can be used for football, basketball, or racing statistics, as well as updatable price information from wholesale or retail catalogs, corporate telephone books, or flight and scheduling information. By interchanging the removable battery-powered cartridge 24, a single computer can be used for a variety of applications. Since the program instructions are primarily stored in the ROM 18, replacing the cartridge can completely change the screen menus and information available from the computer.

The central location is preferably a conventional telephone answering device with an endless tape loop, although a wide variety of other devices could be used. Current statistics of the desired variety are periodically compiled, formatted, and stored. To update a computer an operator selects the update function from the menu options on his screen, dials the appropriate telephone number from a telephone terminal, couples the acoustic coupler to the speaker of the handset of the telephone terminal and waits. The telephone terminal sends a call-up signal to the central location and the central location in response opens, establishes or sets up a telephone connection between the telephone terminal and the endless tape loop or other signal source. The computer then receives the signals from the tape loop, adapts them to be compatible with the input signal format in microprocessor 12, decodes them, and stores them as described above. By using the standard telephone network, a user can call the central location from any conventional telephone.

Only a few embodiments and variations have been disclosed in this description. The inventor intends in no way to abandon any subject matter thereby, nor to limit his invention to the embodiments disclosed. The scope of the invention extends to all subject matter within the scope of the claims as set forth below.

WHAT IS CLAIMED IS:

1. A method for accessing data comprising the steps of:

storing a data base in binary form at a central location, the data base being arranged in data groups having addresses;

connecting one or more telephone lines to the central location;

modulating and coupling the data base in a prescribed sequence of data groups to one of the telephone lines responsive to a call-up signal;

sending a call-up signal to one of the telephone lines from a telephone terminal at a remote location, there being resident at the remote location a computer having a memory for storing a data base in data groups at the addresses specified at the central location, each data group of the memory having a flag bit that is alternately in a set or reset state, a screen for selectively displaying the stored data base, a plurality of input controls, and a microprocessor coupled to the telephone terminal and programmed to retrieve from the memory and display on the screen data selected by operation of the input controls;

setting the flag bit of all the data groups when the call-up signal is sent to the central location by the telephone terminal;

receiving the data base transmitted from the central location at the telephone terminal when the telephone line is called up;

demodulating the received data base;

coupling the demodulated data base from the telephone terminal to the memory of the computer to update the data base stored in the memory one data group at a time by storing such data group at the specified address and resetting the flag bit at such address;

signaling the end of transmission after all the flag bits have been reset; and

operating the input controls to access the data stored in the memory of the computer.

2. The method of claim 1 in which the step of coupling the data base to the memory of the computer comprises checking the flag bit at the specified address of each data group and overwriting the data stored at said specified address with the demodulated data group only if the flag bit is set at the time of checking.

3. The method of claim 2 in which the step of coupling the data base to the memory of the computer additionally comprises initiating the signaling step if the flag bit is reset at the time of checking.

4. The method of claim 3 in which the signaling step comprises displaying a visual indication on the screen.

5. A method for accessing data comprising the steps of:

storing a data base in binary form at a central location;

connecting one or more telephone lines to the central location;

modulating and coupling the data base in an encoded form to one of the telephone lines responsive to a call-up signal;

sending a call-up signal to one of the telephone lines from a telephone terminal at a remote location, there being resident at the remote location a computer having a memory for storing a data base, a screen for selectively displaying the stored data base, a plurality of input controls, and a microprocessor

with a data input port and an internal clock, the microprocessor being programmed to retrieve from the memory and display on the screen data selected by operation of the input controls;

receiving the data base transmitted from the central location at the telephone terminal when the telephone line is called up;

shaping the received data base to be compatible with the data input port of the microprocessor;

coupling the shaped received data base from the telephone terminal to the microprocessor, the microprocessor being programmed to demodulate and store in the memory the received data base; and

operating the input controls to access the data stored in the memory of the computer.

6. A method for accessing data comprising the steps of:

storing a data base in binary form at a central location;

connecting one or more telephone lines to the central location;

modulating and coupling the data base to one of the telephone lines responsive to a call-up signal;

sending a call-up signal to one of the telephone lines from a telephone terminal having a handset with speaker at a remote location, there being also resident at the remote location a computer having a memory for storing a data base, a screen for selectively displaying the stored data base, a plurality of input controls, a microprocessor, the microprocessor being programmed to retrieve from the memory and display on the screen data selected by operation of the input controls, and an acoustic coupler;

placing the acoustic coupler close to the speaker of the handset to receive the data base transmitted from the central location when the telephone line is called up;

connecting the acoustic coupler to the microprocessor, the microprocessor being programmed to store in the memory the received data base; and

operating the input controls to access the data stored in the memory of the computer.

7. The method of claim 3 in which the data groups stored at the central location also have error checks, the method additionally comprising the steps of inspecting the error checks in the microprocessor prior to the coupling step; checking the flag bits of the displayed data groups, and indicating on the screen that a displayed data group is not updated when the flag bit of said displayed data group is set, the coupling step comprising overwriting the data group stored at said specified address with the demodulated data group and resetting the flag bit only when the error checks are verified by the inspection.

8. The method of claim 3 in which the signaling step comprises disconnecting the telephone line from the telephone terminal at the remote location.

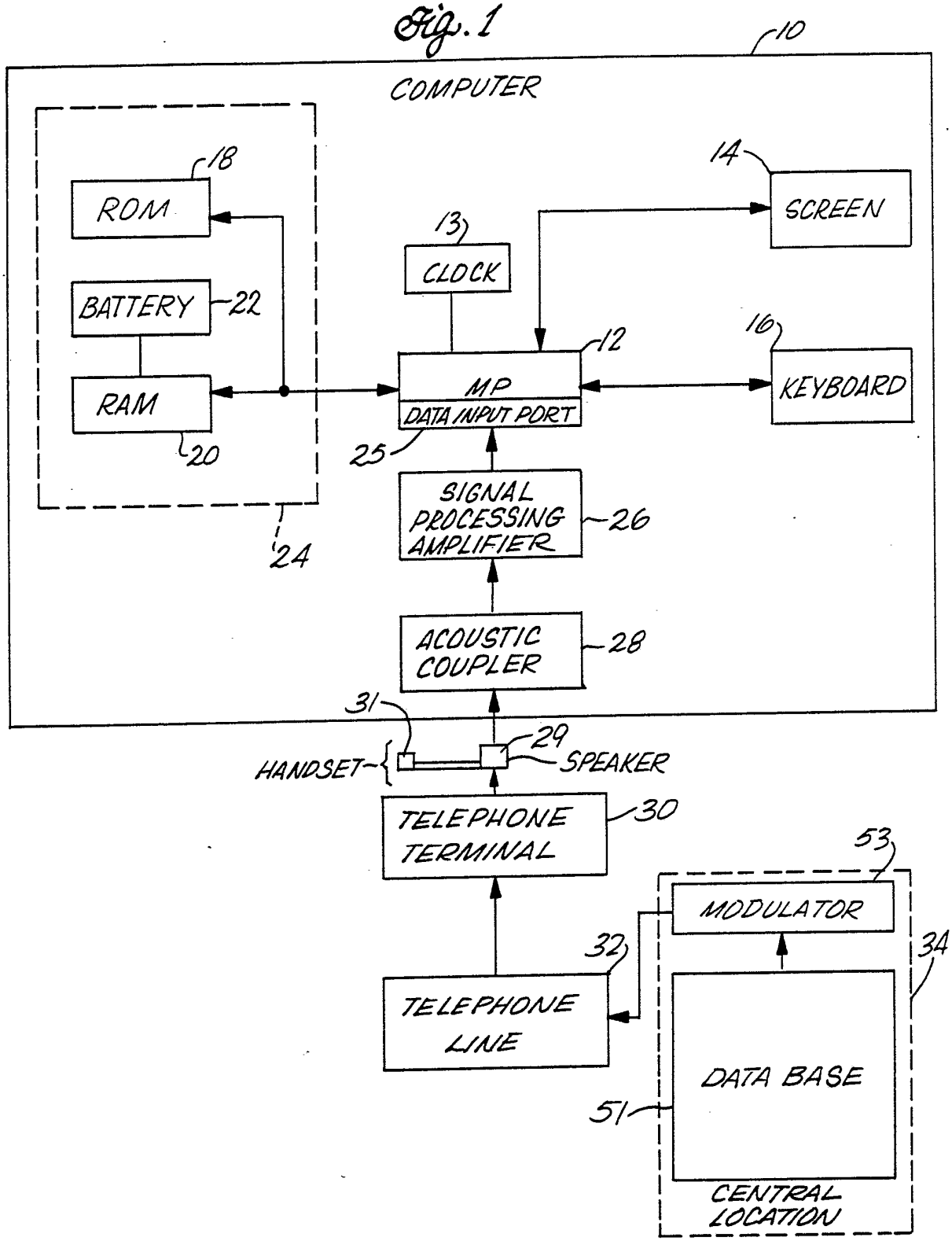
9. The method of claim 1 in which the step of coupling the data base to the memory of the computer additionally comprises initiating the signaling step if the flag bit is reset at the time of checking.

10. The method of claim 1 in which the data groups stored at the central location also have error checks, the method additionally comprising the steps of inspecting the error checks in the microprocessor prior to the coupling step; checking the flag bits of the

displayed data groups, and indicating on the screen that a displayed data group is not updated when the flag bit of said displayed data group is set, the coupling step comprising overwriting the data group stored at said specified address with the demodulated data group and resetting the flag bit only when the error checks are verified by the inspection.

11. The method of claim 1 in which the setting and resetting steps are software controlled.

Fig. 1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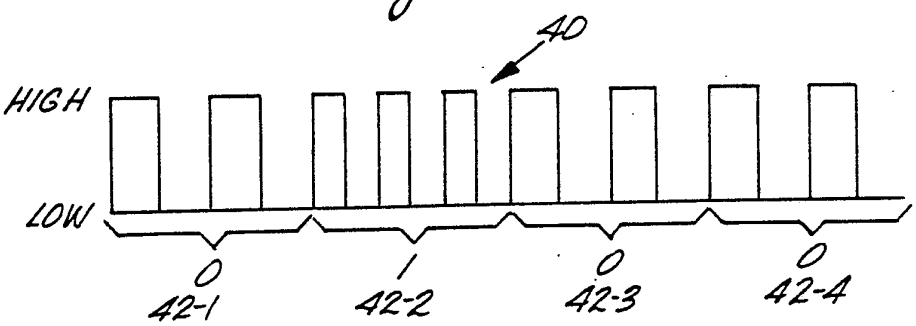
COMPUTER
18
ROM
BATTERY
22
RAM
20
24
13
CLOCK
14
SCREEN
12
MP
DATA INPUT PORT
25
16
KEYBOARD
SIGNAL PROCESSING AMPLIFIER
26
ACOUSTIC COUPLER
28
31
HANDSET
29
SPEAKER
TELEPHONE TERMINAL
30
53
MODULATOR
32
34
TELEPHONE LINE
DATA BASE
51
CENTRAL LOCATION

Fig. 2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LOW
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1
42-2
0
42-3
0
42-4

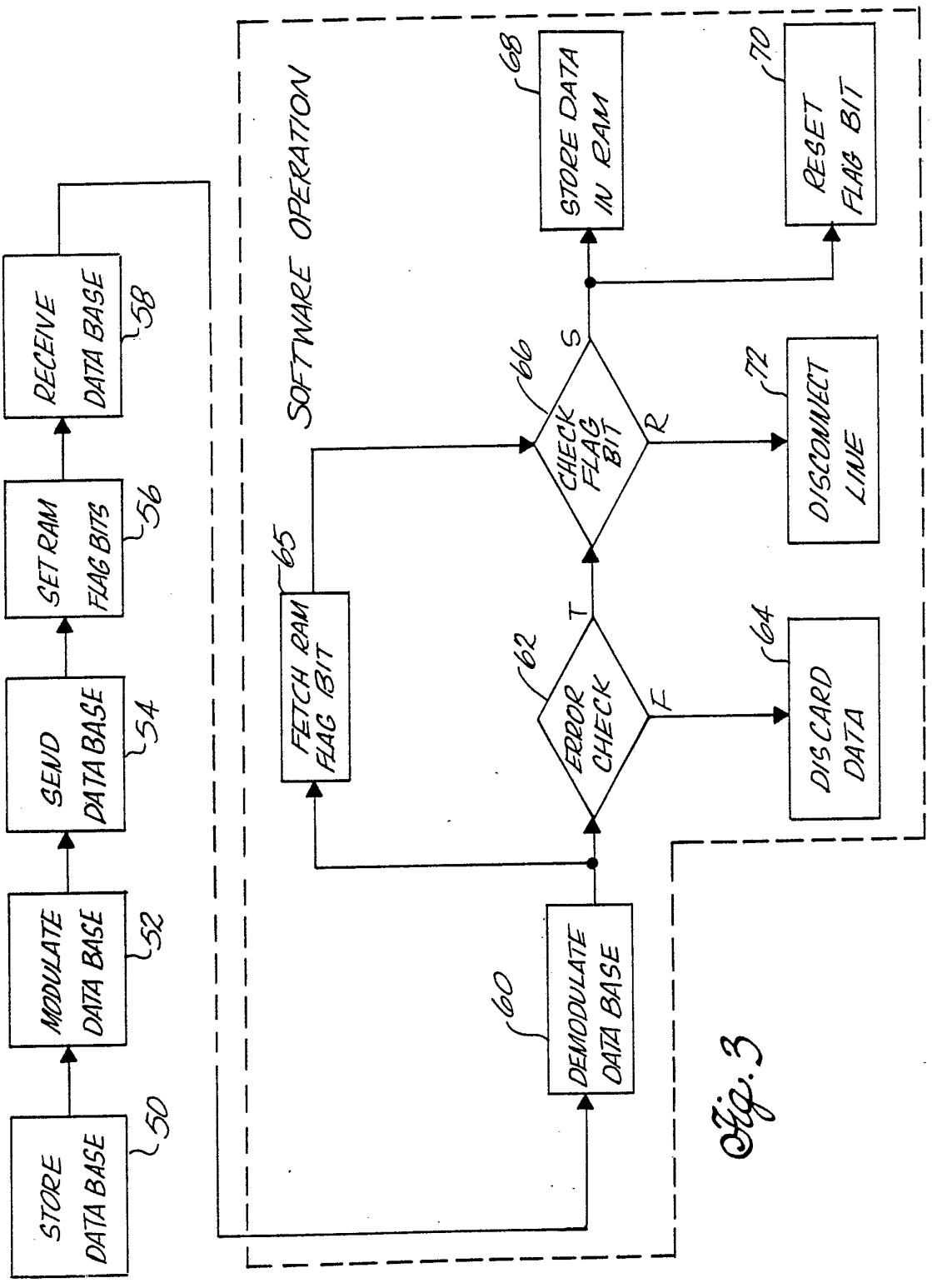
STORE DATA BASE
50
MODULATE DATA BASE
52
SEND DATA BASE
54
SET RAM FLAG BITS
56
RECEIVE DATA BASE
58
SOFTWARE OPERATION
DEMODULATE DATA BASE
60
ERROR CHECK
62
T
F
DISCARD DATA
64
FETCH RAM FLAG BIT
65
CHECK FLAG BIT
66
S
R
STORE DATA IN RAM
68
RESET FLAG BIT
70
DISCONNECT LINE
72

Fig. 3

INTERNATIONAL SEARCH REPORT

International Application No PCT/US91/00049

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC(5): H04M 11/00
US CL.: 379/98

II FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
US	379/94,96,97,98,102,104

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	US, A, 4,814,972 (WINTER et al.) 21 March 1989	
A	US, A, 4,253,157 (KIRSCHNER et al.) 24 February 1981	
A	Telecommunication Magazine, Volume 23, No. 3, page 30, March 1989, "Mintel THE WORKHORSE OF THE INFORMATION AGE".	
A	Mullard Research Laboratories Report by (G.T. Sharpless et al.) pages 19.6-47 - 19.6-50, June 1977	

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
22 FEBRUARY 1991	15 MAR 1991
International Searching Authority [1]	Signature of Authorized Officer [20]
ISA/US	AHMAD MATAR

Form PCT/ISA/210 (second sheet) (May 1986)

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [1]

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers . because they relate to subject matter [1] not required to be searched by this Authority, namely:

2. ☐ Claim numbers , because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out [1], specifically:

3. ☐ Claim numbers_____, because they are dependent claims not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [2]

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

☐ The additional search fees were accompanied by applicant's protest.

☐ No protest accompanied the payment of additional search fees.