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AUTOMATIC FUNCTION CONTROL FOR AN ELECTRONIC TYPEWRITER

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(57) Claim

1. An electronic typewriter comprising a keyboard for the keying of a selected language, a platen, a print mechanism including a print element carrying a plurality of characters for said selected language and indicia indicative of the pitch of the print element, correction means for correcting erroneously typed characters and symbols, escapement means for moving said print mechanism relative to said platen, and electronic control means for receiving commands from said keyboard and controlling operations of said print mechanism and said escapement means in accord with the pitch of said print element; said electronic control means further comprising:

detection means for sensing the removal and replacement of a print element and detecting said indicia on said print element;

means for storing for future reference a pitch parameter representing the pitch of said print element obtained from the detected indicia;

memory means for receiving and storing codes corresponding to said commands from said keyboard in the sequence entered through said keyboard, said commands defining a keyboard parameter representing the pitch of characters and symbols for said keyboard;

means for reading said memory means to determine the pitch of

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characters and symbols stored therein in correspondence with the movement of the print mechanism;

function control means for controlling at least one editing function of the operation of said typewriter in response to operator commands invoked through said keyboard; and

means for invoking said editing function only when said pitch parameter corresponds to said keyboard parameter for characters and symbols previously stored in said memory means in correspondence with the position of said print mechanism, whereby the ability to perform said function is dependent upon the typewriter having the pitch parameter in correspondence with the keyboard parameters for the text stored in said memory means.

5. An electronic typewriter comprising a keyboard for the keying of a selected language, a platen, a print mechanism including a print element carrying a plurality of characters for said selected language and indicia indicative of the pitch of the print element, correction means for correcting erroneously typed characters and symbols, escapement means for moving said print mechanism relative to said platen, and electronic control means for receiving commands and a designator indicative of a keyboard corresponding to a selected language, from said keyboard and controlling operations of said print mechanism and said escapement means in accord with said designator; said electronic control means further comprising:

detection means for sensing said designator for said keyboard;

memory means for previously receiving and storing codes corresponding to a designator indicative of a keyboard for a language and commands defining characters and symbols;

means for reading said memory means to determine the stored designator in coordination with the movement of the print mechanism;

function control means for controlling at least one editing function of the operation of said typewriter in response to operator command invoked through said keyboard; and

means for invoking said editing function only when the sensed designator corresponds to the designator previously stored in said memory means in coordination with the position of said print mechanism, whereby the ability to perform said function is dependent upon the typewriter having a keyboard, for which a designator corresponds to a previously stored designator.

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Complete Specification for the invention entitled:

Automatic Function Control for an Electronic Typewriter

The following statement is a full description of this invention, including the
best method of performing it known to me/us

AUTOMATIC FUNCTION CONTROL FOR AN ELECTRONIC TYPEWRITER

This invention relates to electronic typewriter functions and specifically to the function of automatically setting the pitch of the typewriter escapement to the pitch indicated on the print element and enabling the print mechanism to perform error corrections only after the pitch has been set to the same value as that in which the characters being corrected were typed and the function of enabling the operation of the typewriter, if a keyboard language change has been detected, only after the operator has changed the keyboard identifier for the typewriter. In both functions the operator must change a parameter of the typewriter, the print element or the keyboard identifier, in order to bring the typewriter into correspondence with the parameter stored in the text memory, for the typewriter to continue to operate.

Background of the Invention

Electronic typewriters, such as the IBM WHEELWRITER typewriters, have the capability of having the print element removed and a different print element inserted. This permits the typist to change type fonts to a different style appearance, change pitches and/or languages. When the type element is inserted into the typewriter, the typewriter selection motor engages the type element and rotates it to properly position the print element to a known or home position.

While this is occurring, the print element, which carries on its structure, indicia of the pitch for that type element and a homing indicia, passes these indicia past a sensor which detects them and determines when the print element is in the home position and what the pitch is for that print element. The electronic controls of the typewriter then store this information so that the electronic controls may use it to control the escapement of the print mechanism.

When text has been typed in one pitch, and the operator changes print elements, the typewriter senses this pitch change as described in U.S. Patent 4,541,746. The newest pitch data is stored and the electronic controls then use this data to govern the escapement operations of the typewriter. The problem, from the operator standpoint, is that the typewriter either flushes the correction memory of its contents or does not differentiate in the correction memory between text typed in a first pitch and that typed in a second pitch. This results in the operator being able to attempt corrections with the improper pitch print element installed on the typewriter. Such attempts usually result in such unsatisfactory results that the typed work must be retyped.

Similarly, typewriters have the ability to electronically reassign keys on the keyboard to specific positions on the print element and thereby allow the typing of languages which utilize different characters and keyboard letter positions.

This capability leads to the problem of the operator selecting an alternate language keyboard and forgetting to change the print element to correspond to the selected language keyboard.

It is an object of the invention to enable the operation of selected functions of the typewriter only when the typewriter is equipped with a print element of the same pitch as that in which text to be edited was originally typed.

It is an additional object of the invention to enable the correction of typed text only when the parameters of the typewriter are the same as those in which the text was originally typed.

Summary of the Invention

The disclosed invention detects the pitch of an installed print element as the print element is installed, and the pitch data is stored for use by the control system of the typewriter, which may be microprocessor based. The pitch data is used to control the distance that the print mechanism escapes with each print operation. As the text is stored, line headers, which contain data relating to the position of the text relative to the page and the pitch of the text, are stored in the text memory as well as the pitch data being stored in the text data stream in the text memory. When the operator changes a print element to one of a different pitch, the new pitch data is stored in the status registers of the electronic

In accordance with one broad aspect of the present invention there is disclosed an electronic typewriter comprising a keyboard for the keying of a selected language, a platen, a print mechanism including a print element carrying a plurality of characters for said selected language and indicia indicative of the pitch of the print element, correction means for correcting erroneously typed characters and symbols, escapement means for moving said print mechanism relative to said platen, and electronic control means for receiving commands from said keyboard and controlling operations of said print mechanism and said escapement means in accord with the pitch of said print element; said electronic control means further comprising:

detection means for sensing the removal and replacement of a print element and detecting said indicia on said print element;

means for storing for future reference a pitch parameter representing the pitch of said print element obtained from the detected indicia;

memory means for receiving and storing codes corresponding to said commands from said keyboard in the sequence entered through said keyboard, said commands defining a keyboard parameter representing the pitch of characters and symbols for said keyboard;

means for reading said memory means to determine the pitch of characters and symbols stored therein in correspondence with the movement of the print mechanism;

function control means for controlling at least one editing function of the operation of said typewriter in response to operator commands invoked through said keyboard; and

means for invoking said editing function only when said pitch parameter corresponds to said keyboard parameter for characters and symbols previously stored in said memory means in correspondence with the position of said print mechanism, whereby the ability to perform said function is dependent upon the typewriter having the pitch parameter in correspondence with the keyboard parameters for the text stored in said memory means.



~~header will not correspond so that the typewriter will~~
fail to operate and the typewriter will signal the operator. The signal may take the form of an audible signal, a warning light or a message on a display if the typewriter is so equipped.

This invention serves to eliminate errors by stopping the operation of the typewriter whenever the typewriter detects a difference in the keyboard identifier or the pitch of the printwheel, from the memory, and not reenabling the operation of the typewriter until the operator has changed the keyboard selection, or moved the print point to where there is no keyboard or pitch mismatch.

A better understanding of the invention may be had by referring to the drawings and the detailed description of the invention to follow.

Drawings

Fig. 1 is a block diagram of the electronic typewriter;

Fig. 2 is a block diagram of the electronic controls of the typewriter;

Fig. 3 is a block diagram of the functional relation of the microprocessor with the software and the keyboard, motors, magnet, and memories of the typewriter;

Figs. 4, 5, 6 and 7 are flow diagrams of the operations performed by the electronic controls of the typewriter in the operation of the automatic pitch selection

function; and

Figs. 8, 9, 10 and 11 are flow diagrams of the operations performed by the electronic controls of the typewriter in the operation of the automatic keyboard/language function.

Detailed Description of the Invention

Referring to Fig. 1, the electronic typewriter 10 is illustrated with the electronic controls 12 shown as a block exterior to the typewriter 10. The electronic controls 12 receive electronic signals from the keyboard 14 and send electronic control signals to the typewriter 10 to cause it to perform the functions that have been designated at the keyboard 14, such as print a character, carriage return, tabulate, correct a character or line feed.

For a better understanding of the electronic controls 12, refer to Fig. 2. Electronic controls 12 are displayed as four blocks, a microprocessor 16, a Read Only Store 18, a bank of status registers 44 in Fig. 3 and a system ASIC or Application Specific Integrated Circuit 20, and memory 35.

The microprocessor 16 may be any of a number of commercially available microprocessors. The preferred microprocessor, chosen for this description, is the Intel 8088. One skilled in the art will recognize that other processors may be substituted. The microprocessor 16 is controlled by supplying to it

software instructions in the form specified by the manufacturer. These instructions constitute a control program which is stored in a suitable memory such as the Read Only Store 18. The Read Only Store memory 18 is loaded with the instructions at the time of manufacture and contains the set of instructions necessary to make the typewriter 10 function as desired.

The system ASIC 20 is a standard set of logic elements which may be customized as the user desires to scan the keyboard 14 and control the signals from the keyboard 14. The ASIC 20 also controls the interrupts to the processor 16 and captures the keyboard signals until they are used by the processor 16. Also the ASIC 20 controls the signals from the processor 16 and directs the processor output signals to a set of driver circuits 26 typically called drivers 26 which convert the processor signals into signals that can be used to drive motors 22 and magnet 24. One of the drive motors 22 drives the escapement system 9 which is essentially a cable and idler pulleys that move the print element along platen 13 to define a writing line.

The specific combination of the discrete logic elements in the ASIC 20 is designed to provide a number of functions and signals. Some of the signals and functions provided are the keyboard scan to detect any newly depressed keys, interrupts of the processor 16 to cause the processor to accept a signal and the timing of signals sent to the drivers 26 so that the motors and magnet 24 of the typewriter operate in the proper

time frame and sequence.

The keyboard scan function, timer operation, interrupt operation and other functions of the ASIC 20 are all found in discrete commercially available chips or components and perform the same operation. The ASIC 20 only serves to consolidate all such operations on a single chip and thus economize in space as well as cost.

To further expand the description of the feature, Fig. 3 illustrates an expanded functional representation of the microprocessor 16 and its associated software. The microprocessor and associated software includes segments 32, 34, 38, 40 and controls 28 and 30. The software may be prepared by any programmer of ordinary skill in the art and may take any number of forms, any of which will adequately perform the functions of controlling the typewriter 10.

The ASIC 20 is connected to the processor 16 and is responsive to the keyboard control 28. The ASIC 20 scans the keyboard 14 and interrupts the microprocessor 16 when the ASIC 20 detects a key state change. The keyboard control 28 causes the storage of the keystrokes from the keyboard in the keyboard surge buffer 42 until the typewriter control 32 is ready to work on the keyboard scan data.

The printer control segment 30 generates and sends the signals that are needed to operate the printer to the ASIC 20 so that the signals may be properly sequenced

and timer controlled.

The typewriter control 32 serves to accept the keyboard data from the keyboard control 28 whenever the processor 16 is available to process textual data and acts to determine whether the keyboard data is representative of the alphanumeric symbols that are to be printed or representative of the functions that may be keyboard controlled. The typewriter control 32 utilizes the capabilities of the Keyboard Control 28 to retrieve the stored scan codes from the keyboard surge buffer 42.

To manipulate the text in storage 36 and retrieve the text, the Text Storage Management segment 34 (TSM) controls the storage of text and the necessary other codes that facilitate the efficient operation of the Random Access Memory 36. The Random Access Memory 36 is the repository of the stored code containing the text. When Character Processor 40 indicates a need for a new line for text the TSM segment 34 utilizes the contents of the status registers 44, which contain the location of the print element 15, relative to the record sheet 11 and platen 13, to build the line header and store it in the memory 36.

In order to perform functions automatically in response to keyboard commands, the Automatic Functions segment 38 is responsible for the controlling of the functions which are performed by the typewriter 10, and which are not character processing operations. The output signals of the Automatic Functions segment 38

pass to the printer control segment 30 where the signals are processed to generate the precise control signals necessary to control the motors 22 of the typewriter 10.

To identify, select and print characters and escape the print element 15, the Character Processor segment 40 has the dedicated purpose of receiving those codes from the typewriter control segment 32 that represent the characters or other symbols that are to be printed on the record sheet 11. The Character Processor segment 40 receives a decoded scan output of the keyboard 14 and determines if it is printable in the desired location. The Character Processor segment 40 is also responsible for storing the character codes in the correction buffer which is a part of the TSM Random Access Memory 36.

The Character Processor 40 passes the printable character code to the Printer Control segment 30 which then, based on the data received, determines the specific motors 22, numbers of pulses, direction, and current levels to the motors 22 and magnet 24 that are required to properly print the symbol on the record sheet 11.

A keyboard surge buffer 42 is provided so that in the event that keyboard scan data is received by the system ASIC 20 at a higher rate than the system can or does utilize the key strokes the scan data will not be lost by the keyboard control 28.

The illustration of the different segments of the operations are schematically illustrated as dedicated functional blocks of the processor 16 with the software instructions stored in the Read Only Storage 18 interacting with the processor 16 to perform the necessary data processing and produce the output signals required to control the typewriter 10 to either perform a function or to print a symbol at the desired location on the record sheet 11. Thus Fig. 3 is a functional diagram expressed in both hardware and a combination of hardware and software.

When the operator inserts a print element into the typewriter, the insertion of the print element causes the machine to home the print element as a result of the detection of the print element being inserted. The changing of the print element 15 causes the invoking of the routine as flow diagrammed in Fig. 4 as it resides in the automatic functions segment 38. The routine first detects whether a pitch change has occurred as a result of the print element change, in operation 50. As a part of the homing of the print element, the pitch of the element is detected and stored in one of the status registers 44, as in operation 52. The detection may be effected by the homing sensor 41 which is a light emitter/detector arrangement which senses data on print element 15.

In operation 54 a comparison is performed to determine if the stored pitch value in the status register 44 is equal to the pitch value stored in the text memory 35. For convenience, the text memory pitch value may be

stored in one of the status registers 44, obviating the need to scan through memory, which is a relatively slow operation. If the values are in fact equal, then the pitch of the print element 15 corresponds to the pitch of the text typed and stored in the memory 35, at the point on the page 11 and in the memory corresponding to the location of the print mechanism 15. Where the two pitch values are equal, there is no mismatch and any pitch mismatch flag which has been set in one of the status registers 44 is cleared in operation 56. With this condition present, the control of the microprocessor is returned to the typewriter control segment 32, in operation 59.

However, if the two pitch values described above are not equal, then there is a pitch mismatch and a pitch mismatch flag is set in one of the status registers 44. The setting of the pitch mismatch flag is accomplished in operation 58. Once the mismatch flag is set, in operation 58, the typewriter is then ready to accept additional keystroke input from the keyboard 14 and awaits such a key stroke entry. This occurs after the operation control of the typewriter is returned to the typewriter control segment 32, in operation 59.

With reference to Fig. 5, anytime a keystroke is entered which requires an escapement movement of the print element 15 and it is detected in operation 60, the text memory pitch value is stored in one of the status registers 44 and if the escapement results in the crossing of a point in memory 35 and on the page 11 where a pitch change occurred, then the text memory

pitch value will change in the status register 44.

Again a check is made to determine if the pitch in which the typewriter is operating, based on the print element 15 is the same as the text memory pitch, in operation 64, which is the same as that described with reference to operation 54.

Likewise operations 66 and 68 are the same as operations of 56 and 58 in Fig. 4, with the control being returned to the typewriter control segment 32, in operation 69.

If desired, but not necessary to the invention, the operator may be informed of mismatch conditions by warning lights or display annunciators, if the typewriter is equipped with a display. As illustrated in Fig. 6A, thereafter, when a graphic or erase key is entered on the keyboard 14, as in operation 70, a determination of the status of the mismatch flag is made in operation 72 and if there is no mismatch flag set then the key is processed normally, in operation 74.

If, however, the mismatch flag is set, then it must be determined if the print point of the print element and the corresponding point in text memory 36, reside over a space in operation 76. If the active point, as both of these points may be referred to, is not positioned over a space, it must be positioned over a symbol and since the print element 15 has not been changed to correspond to the text pitch as in text memory 36, the operation of the printing or the erasing

of a character cannot be properly accomplished. The operator is notified by a warning and the keystroke is discarded, in operation 78, thereby preventing the keyed operation where there is a high likelihood of a misalignment of the print point with the characters on the page 11. Thereafter, the logic flow returns to typewriter control 32, in operation 79.

If on the other hand, the active point is not over a character, then it resides over a space and the text memory 36 is scanned from the active point to the left until all contiguous blank spaces have been scanned and a symbol code is encountered. This position is marked as position #1, an arbitrary designation. This occurs in operation 80. Similarly, in order to delimit the boundaries of the blank space, the memory is scanned from the active point to the right until all contiguous blank space has been scanned. This limit is marked as position #2, as shown in operation 82.

After the spaces have been delimited in operations 80 and 82, operation 84 deletes the spaces between the two positions.

It is now necessary to store an indication of the new pitch in the text memory 36. This is accomplished by the insertion of a pitch code point or code designating the new or changed pitch, at the point immediately following the last text in another pitch, or alternatively stated, at position #1, in operation 86

In order to align the print element 15 with the

character boundaries of the character positions between positions #1 and #2, it may be necessary to insert a small space between the last text and the next character position boundary in the new pitch. This small space insertion is accomplished in operation 88.

After the small space is inserted in the text memory 36, the remaining distance from the small space to position #2 is then filled with the required number of spaces in the new pitch. This may result in a partial space remaining between the last space and the following text in another pitch. To compensate for this, a small space is inserted in the memory ending at position #2. This space and small space insertion is accomplished in operation 90.

Since there is now a change from the new pitch to a previously typed pitch, it is now necessary to insert another pitch change code point at position #2 to indicate the reversion to a previously type pitch. If position #2 is at the end of memory, then there is no following text and no code point need be inserted. The insertion of the code point, if needed, is carried out in operation 92.

In operation 93, the active point of the memory is repositioned to match the position of print element of the typewriter 10 so that they both correspond to each other. In order to clear the pitch mismatch condition existing, it is necessary to set the text memory pitch value and the pitch value for the machine stored in the status register 44 equal, as performed in

operation 94. With this setting of the memory pitch value in operation 94, operation 96 then clears the pitch mismatch flag.

With the pitch mismatch flag cleared, the processor is no longer prevented from processing the graphic or correction keystroke and the operation 98 causes the processing of the graphic or correction by returning the flow to the control of the character processor segment 40. A correction keystroke in a conventional manner causes the print mechanism 8, and the correction ribbon 7 to coact with print element 15 and the correction ribbon impacted against record sheet 11. Print mechanism 8, correction ribbon 7, and print element 15 comprise correction means 6.

Typewriters of the type discussed herein typically possess the ability to play out of memory the text that has been stored therein. For such a typewriter it is necessary to accommodate pitch changes stored in the text memory 36. The accommodation of the pitch changes in stored text is best understood in referring to Fig. 7.

During the playout of the text from the memory 36, the software of the typewriter will retrieve the stored codes from memory 36 and process those codes to cause the typewriter 10 to perform the necessary operations to print the symbols on page 11. As the stored codes are retrieved from the memory 36, there may be stored therein codes representing pitch changes. The typewriter software and the microprocessor 16

continually check to see if a pitch change code point is found in the data string of codes from the memory 36. If no pitch change is found as a result of operation 100, as will be the case most of the time, the control will flow back to the typewriter control 32 for it to direct the processing of the codes in a normal manner, as illustrated in operation 101.

When a pitch change code point is read from the memory, the play out from memory is stopped, as in operation 102. At this point, the operator must be apprised that there is a need for a pitch change if the playout is to be as the operator wished when the text was keyed and stored in the memory 36. The signalling of the operator is accomplished as a result of the operation 104, in the form of a tone, a bell, a light being illuminated, a message on a display, or a printer audible feedback, all of which are equally acceptable in the appropriate environment.

At this point, the typewriter will await some operator action to reinitiate the playout routine, as illustrated in operation 106. It should be noted that nothing is done to change pitches in the status registers and there is no effort to make any accommodation to the pitch change as a result of the detection of the pitch change code point in operation 100. This is so that the operator may have an opportunity to make the print wheel 15 change if it is still desired. There is no requirement that the operator change the print wheel 15 or the pitch.

When the operator restarts the playout, a decision 107 is made as to the source of the text being played. If the source of the text being played is the correction buffer, a part of TSM RAM 36, then the flow branches around decision 108, to operation 112. If the source is other than the correction buffer, then the flow is to decision 108.

In decision 108 it is determined whether the operator has changed the print element 15. If the operator chose not to change the pitch, but rather to continue in the old pitch, and did not therefore change the print element 15, then the flow branches to operation 110 where the pitch change code point is removed from the memory 36 and then with operation 114, the play out is continued.

If however, the operator changed the print wheel in response to the signal to the operator in operation 104, then the pitch of the newly installed print element is stored in the document data string, and the previous pitch change code point is removed, in operation 112. This value will be derived from the status register 44 which was updated upon the installation of the print element 15. At this point, the pitch of the print element 15 and the typewriter are in accord with the pitch stored in the text memory 36 data stream and playout is continued in operation 114, as mentioned above.

The same general flow of logic as is illustrated in Figs. 4-7 may, with only small changes, be used to

control the typewriter so that a change of the keyboard to allow the typing of a word or words in a second language will cause the typewriter to suspend operation until a keyboard change is accomplished. The logic flow for the language detection function is illustrated in Figs. 8-11. For convenience, the reference numerals in Figs. 8-11 are incremented by 100 from the corresponding analogous operation of the logic flow illustrated in Figs. 4-7.

Referring to Fig. 8, the condition of the typewriter is compared to the selection of the keyboard 14 in essentially the same manner as the pitch of the machine was compared to the stored pitch, as described with reference to Fig. 4. The routine is invoked if there has been a keyboard change detected as in operation 150, and the designator of the keyboard is stored in the status registers 44 in operation 152. The keyboard designator may be best referred to as a keyboard tracking value, as in operation 152. In operation 154, the keyboard tracking value in the status register is compared to the tracking value stored in the text memory 36. If the two values are unequal, the keyboard mismatch flag is set in operation 158, while if the values are equal, the keyboard mismatch flag is cleared in operation 156. The keyboard mismatch flag is stored in one of the status registers 44. After either operation, 156 or 158 the logic flow returns to the typewriter control 32 in operation 159.

In Fig. 9, the updating of the keyboard tracking value is accomplished only after a keystroke requiring

carrier movement is detected, in operation 160, and the updating occurs in operation 162. This insures that the updating does not occur until there is a need for the data to be stored in the text memory 36.

Then, in operation 164, there is a check to insure the same value is stored in memory 36 and in the status register 44. If the values are equal, the keyboard mismatch flag is cleared, in operation 166, and if the values are not equal, the keyboard mismatch flag is set in operation 168, indicating that the new language keyboard has not been selected after a keyboard change was detected in the text memory 36 data stream. The operation of the logic is then returned to typewriter control 32 in operation 169.

Referring now to Fig.10A, if a graphic or erase command is detected, in operation 170, then the keyboard mismatch flag is checked to see if a mismatch exists, in operation 172, and if the flag is not set, the keyed operation is processed normally by the typewriter control segment 32, as shown in operation 174.

Should, on the other hand, the keyboard mismatch flag be set, operation 176 will determine if the print element 15 is positioned over a space, by checking the active point in text memory 36. If the active point is not over a space the operator is signaled and the keystroke is discarded and not processed, in operation 178. Then the logic flow is returned to the typewriter control 32 in operation 179.

If the active point is located on a space, then the left and right limits of the spaces are determined as shown in steps 180 and 182.

Changes are then inserted in the text memory 36 to reflect the contents of the status register 44 at position #1 in the text memory and the previous keyboard tracking value is stored in the memory at position #2, to insure that as typing progresses and the end of the blank space is reached, the machine will notify the operator of the need to select a new keyboard at that point. The above storage of the keyboard values occurs in operations 186 and 192 respectively.

In operation 194, the memory keyboard value is set equal to the machine keyboard value and then the keyboard mismatch flag is cleared in operation 196. The control of the processor is returned to the typewriter control segment 32 in operation 198.

As with the pitch change embodiment, when text is being played out of the text memory 36, keyboard change values as stored in operation 192 are encountered, if present, and this serves to stop the typewriter 10 and notify the operator of the need to change the print element 15, so that characters and symbols peculiar to the selected language are available and so the character placement on the print element will correspond to the keyboard locations. This is illustrated in Fig. 11, starting with operation 200, where the typewriter control samples each code

retrieved from the text memory 36 and checks it to determine if it is a keyboard change code. If it is not a keyboard change code then the control reverts to the typewriter control segment 32 as in operation 201.

If, however, the code is a keyboard change code document play is stopped in operation 202, and the keyboard is changed to the new keyboard in operation 203.

Following the change to the new keyboard, the operator is signaled for the print element to be changed to correspond to the new keyboard, in operation 204. The typewriter 10 will then wait for a new keystroke to resume the playout, in operation 206. Upon the receipt of the new keystroke in 206, the playout will resume in operation 208, under the control of the typewriter control segment 32.

As one sees from the foregoing, the microprocessor 16 checks that the condition of the typewriter 10 and its print element 15 are coordinated at all times to properly produce the text that is to be keyed or played out of the text memory 36, and if the print wheel does not correspond to the conditions indicated by the typewriter text memory 36, suspends operations of the typewriter 10 until the operator takes some action to bring the typewriter 10 and its memory 36 into correspondence so that its operation will continue, or overrides the mismatch condition.

Having disclosed two embodiments of the invention, it

will be evident to one skilled in the art that other changes and modifications may be made to the disclosed features and that they may adapted to other functions on an electronic typewriter.

The claims defining the invention are as follows:

1. An electronic typewriter comprising a keyboard for the keying of a selected language, a platen, a print mechanism including a print element carrying a plurality of characters for said selected language and indicia indicative of the pitch of the print element, correction means for correcting erroneously typed characters and symbols, escapement means for moving said print mechanism relative to said platen, and electronic control means for receiving commands from said keyboard and controlling operations of said print mechanism and said escapement means in accord with the pitch of said print element; said electronic control means further comprising:

detection means for sensing the removal and replacement of a print element and detecting said indicia on said print element;

means for storing for future reference a pitch parameter representing the pitch of said print element obtained from the detected indicia;

memory means for receiving and storing codes corresponding to said commands from said keyboard in the sequence entered through said keyboard, said commands defining a keyboard parameter representing the pitch of characters and symbols for said keyboard;

means for reading said memory means to determine the pitch of characters and symbols stored therein in correspondence with the movement of the print mechanism;

function control means for controlling at least one editing function of the operation of said typewriter in response to operator commands invoked through said keyboard; and

means for invoking said editing function only when said pitch parameter corresponds to said keyboard parameter for characters and symbols previously stored in said memory means in correspondence with the position of said print mechanism, whereby the ability to perform said function is dependent upon the typewriter having the pitch parameter in correspondence with the keyboard parameters for the text stored in said memory means.

2. An electronic typewriter comprising a keyboard for the keying of a selected language, a platen, a print mechanism including a print element carrying a plurality of characters for said selected language and indicia indicative of the pitch of the print element, correction means for correcting erroneously typed characters and symbols, escapement means for moving said print mechanism relative to said platen, and electronic control means for receiving commands from said keyboard and controlling operations of said print mechanism and said escapement means in accord with the pitch



of said print element; said electronic control means further comprising:

detection means for sensing the removal and replacement of a print element and detecting said indicia on said print element;

means for storing for future reference a pitch parameter representing the pitch of said print element obtained from the detected indicia;

memory means for receiving and storing codes in the sequence entered, corresponding to said commands, said commands defining characters and symbols and the pitch of said characters and symbols;

means for reading said memory means to determine the pitch of characters and symbols stored therein in correspondence to the movement of the print mechanism;

function control means for controlling at least one editing function of the operation of said typewriter in response to operator commands invoked through said keyboard; and

means for invoking said editing function only when said pitch parameter corresponds to the pitch of said characters and symbols previously stored in said memory means in correspondence with the position of said print mechanism, whereby the ability to perform said function is dependent upon the typewriter having installed therein, a print element of the correct pitch parameter.

3. The electronic typewriter of claim 2 wherein said function is an error correction function and the operation of said print mechanism to correct erroneous characters is dependent upon equality between the stored pitch parameter and the pitch of the print element.

4. The electronic typewriter of claim 2 wherein said function is an alternate language function wherein said keyboard and said print element are changeable to permit the typing in a language different from said selected language.

5. An electronic typewriter comprising a keyboard for the keying of a selected language, a platen, a print mechanism including a print element carrying a plurality of characters for said selected language and indicia indicative of the pitch of the print element, correction means for correcting erroneously typed characters and symbols, escapement means for moving said print mechanism relative to said platen, and electronic control means for receiving commands and a designator indicative of a keyboard corresponding to a selected language, from said keyboard and controlling operations of said print mechanism and said escapement means in accord with said designator; said electronic control means further comprising:



detection means for sensing said designator for said keyboard;
memory means for previously receiving and storing codes corresponding to a designator indicative of a keyboard for a language and commands defining characters and symbols;

means for reading said memory means to determine the stored designator in coordination with the movement of the print mechanism;

function control means for controlling at least one editing function of the operation of said typewriter in response to operator command invoked through said keyboard; and

means for invoking said editing function only when the sensed designator corresponds to the designator previously stored in said memory means in coordination with the position of said print mechanism, whereby the ability to perform said function is dependent upon the typewriter having a keyboard, for which a designator corresponds to a previously stored designator.

6. The electronic typewriter of claim 5 wherein said function is an error correction function and the operation of said print mechanism to correct erroneous characters is dependent upon equality between the keyboard designator and the keyboard designator previously stored.

7. The electronic typewriter of claim 5 wherein said function is an alternate language function wherein said keyboard and said print element are changeable to permit the typing in a language different from said selected language.

8. An electronic typewriter, substantially as described herein with reference to the drawings.

DATED this TWENTY-THIRD day of NOVEMBER 1990
International Business Machines Corporation

Patent Attorneys for the Applicant
SPRUSON & FERGUSON



FIG. 1

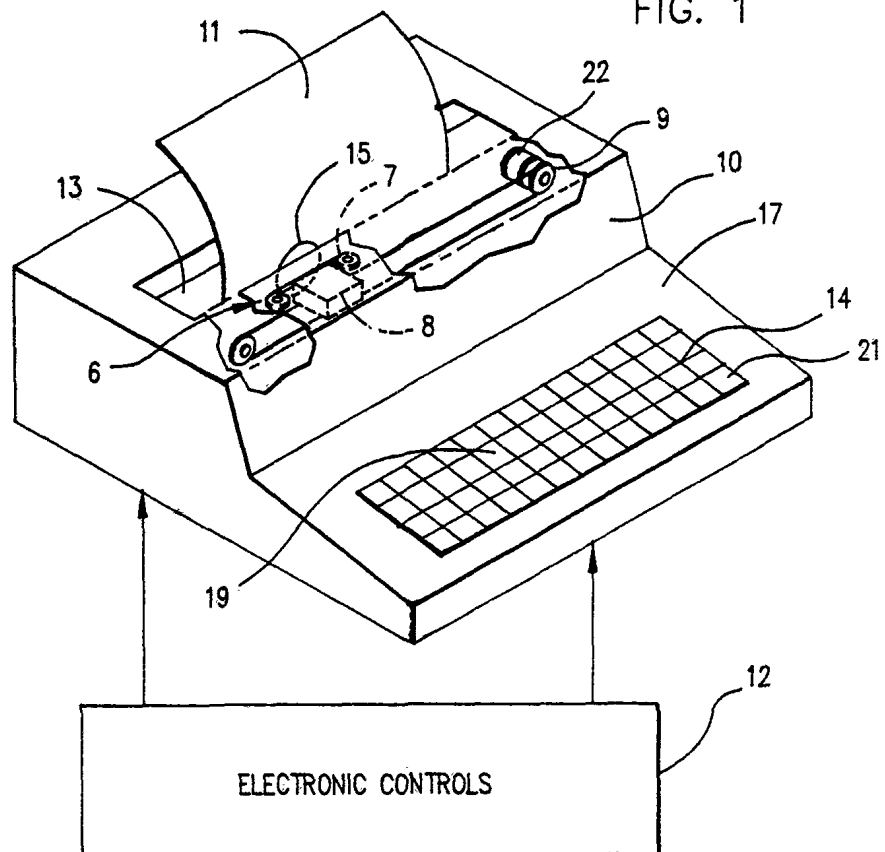


FIG. 2

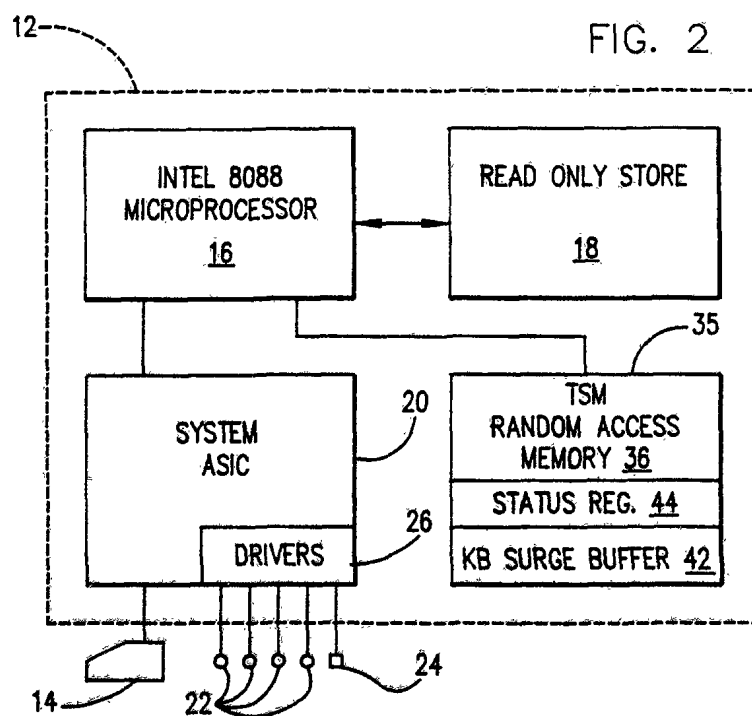


FIG. 3

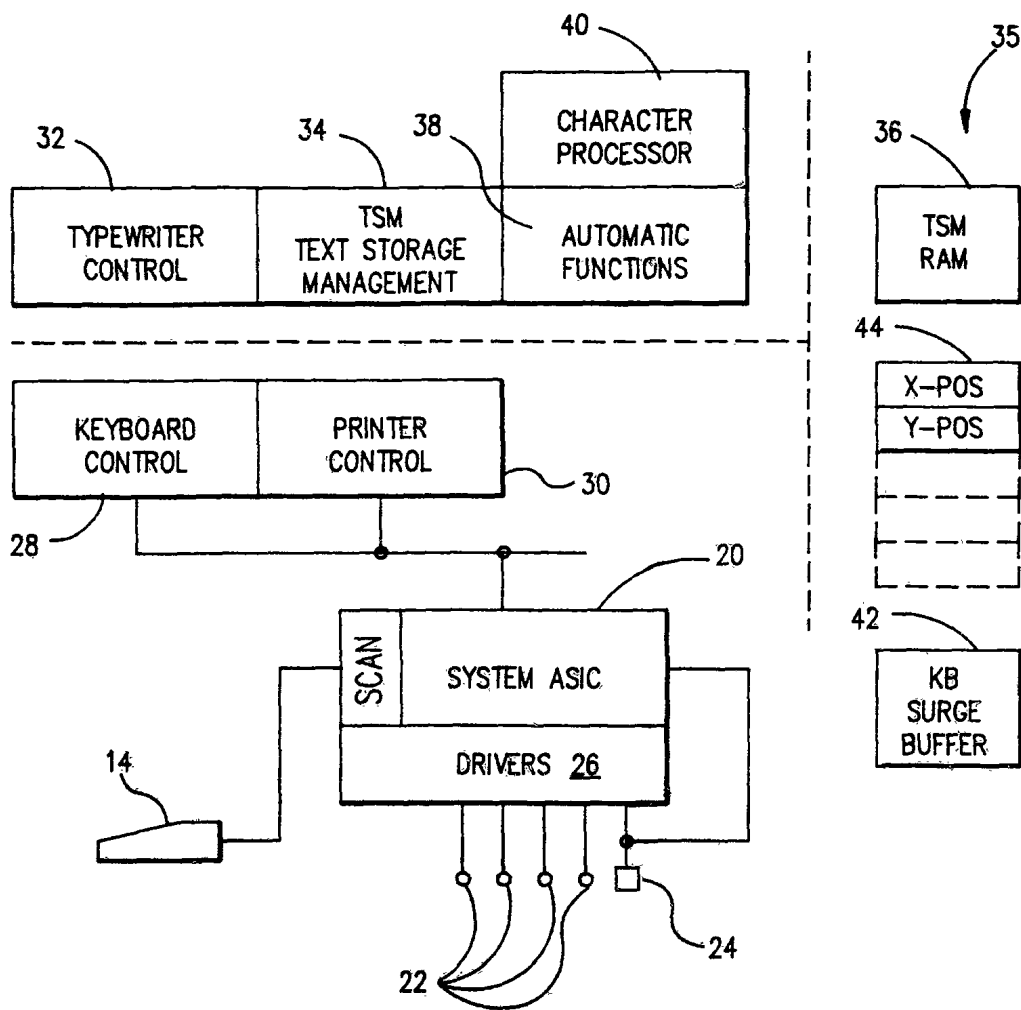


FIG. 4

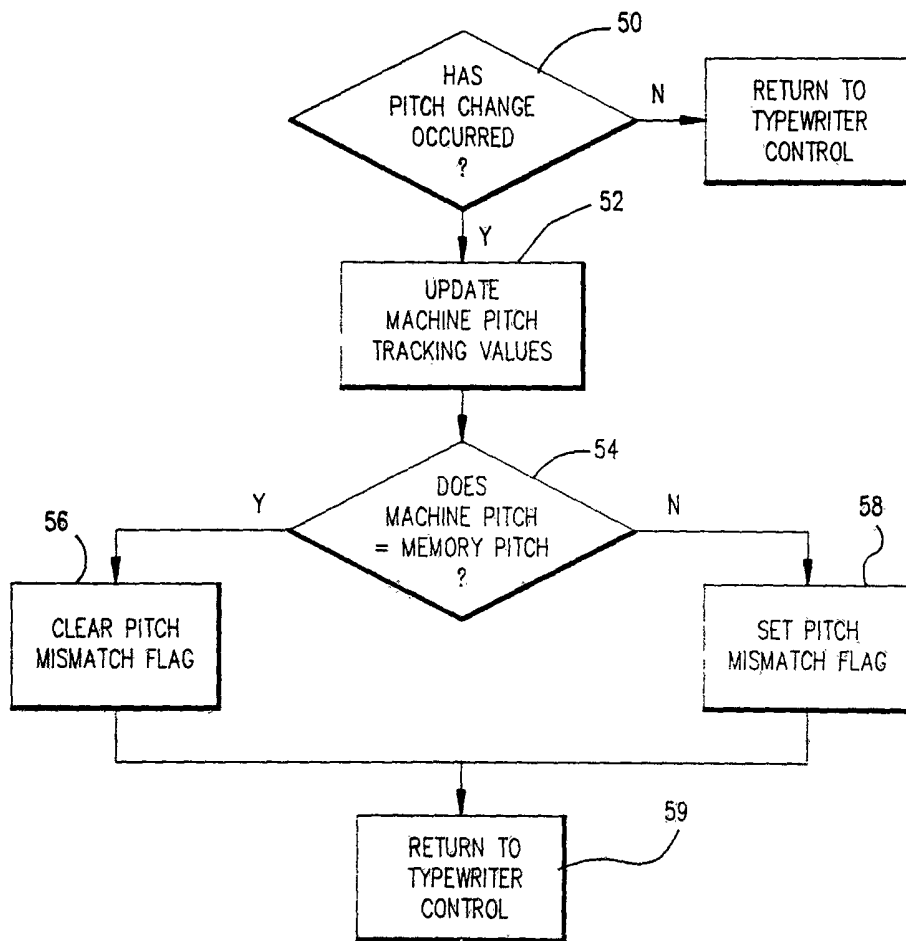


FIG. 5

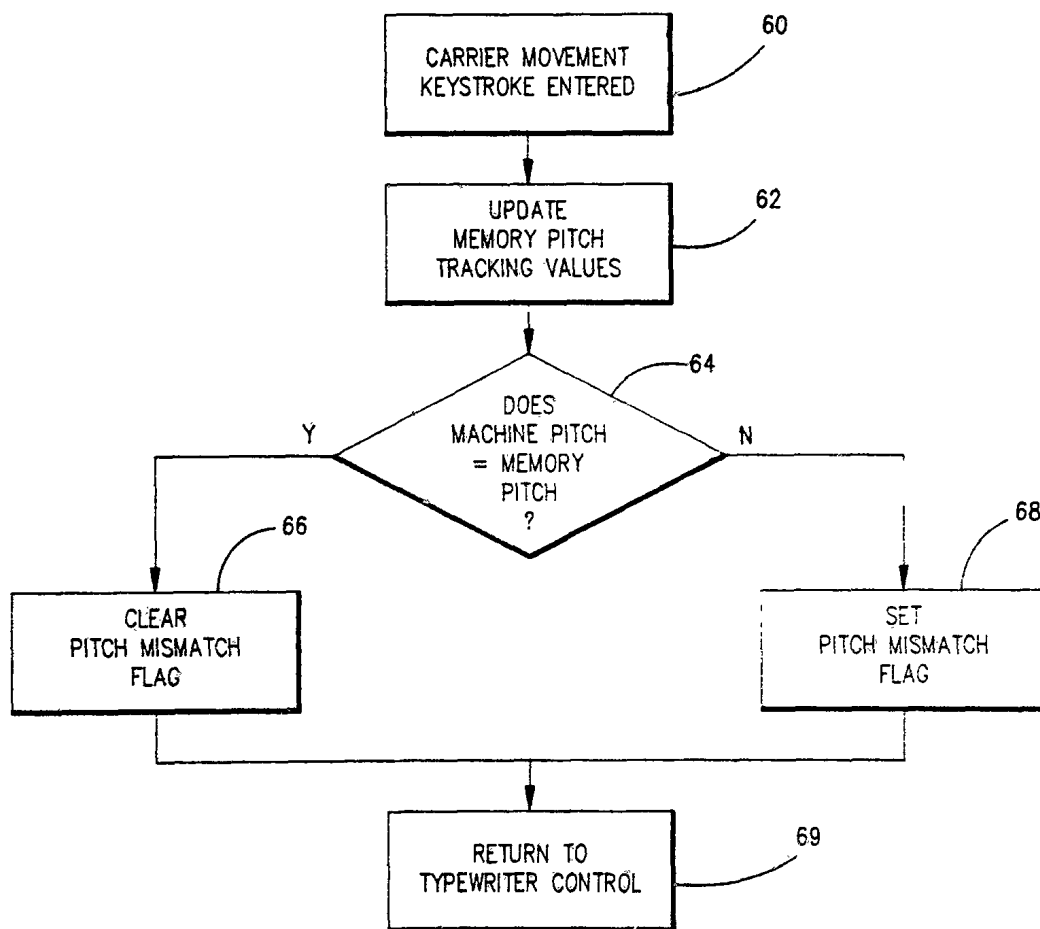


FIG. 6A

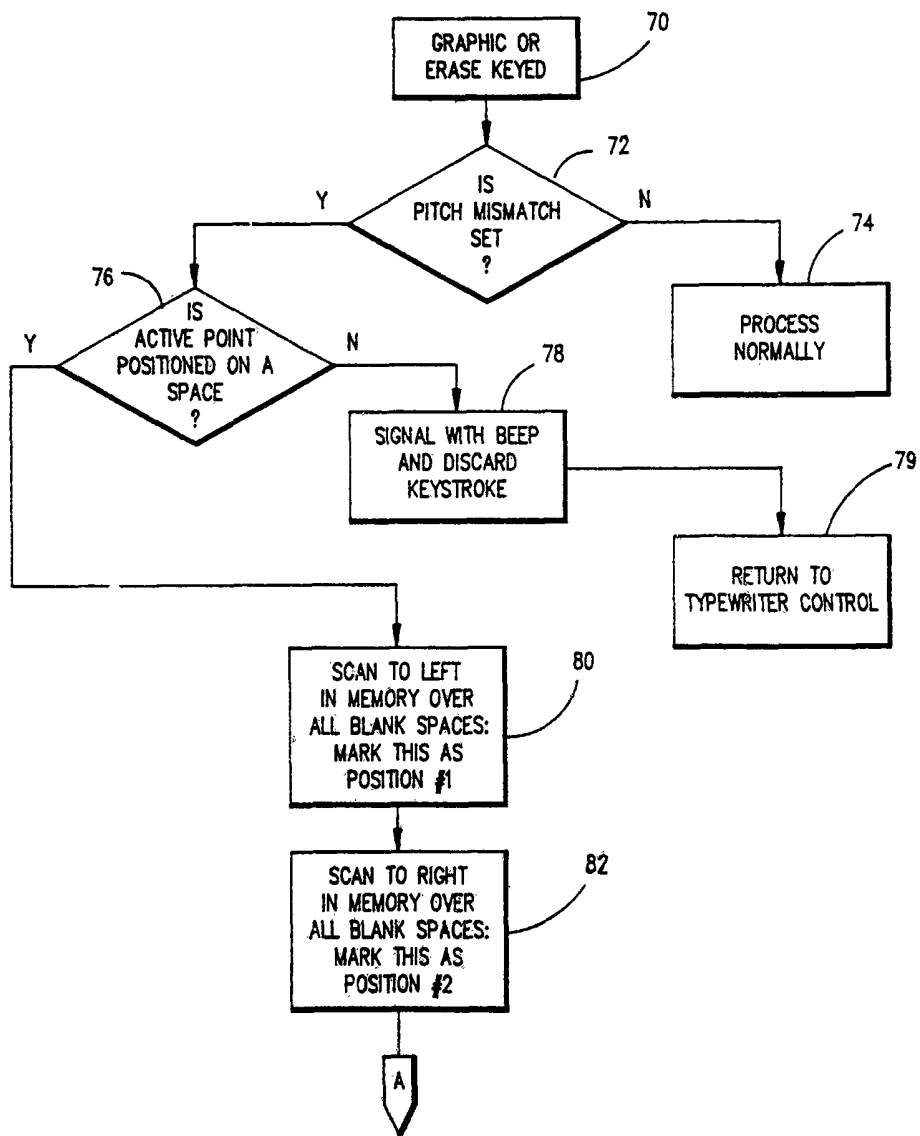


FIG. 6B

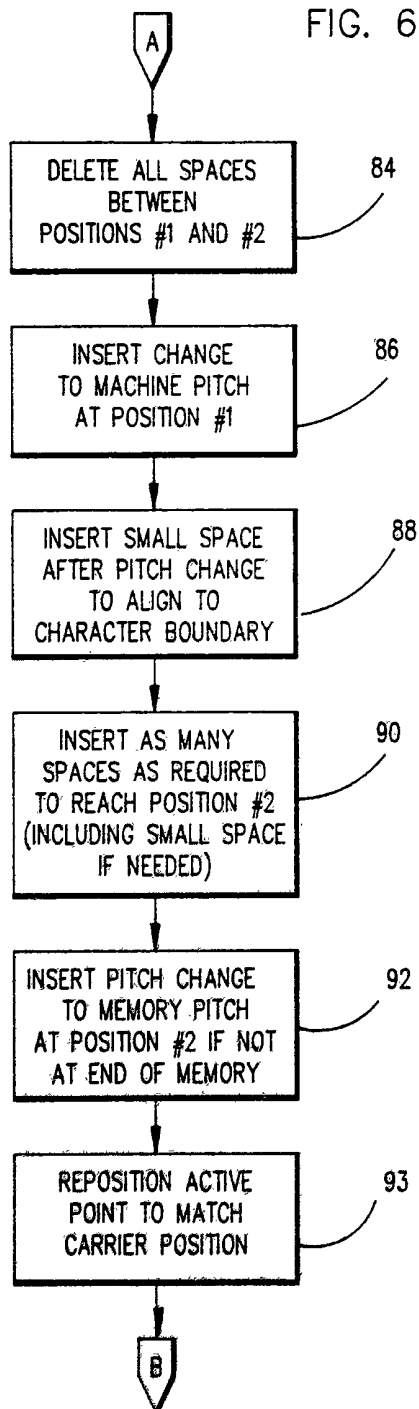


FIG. 6C

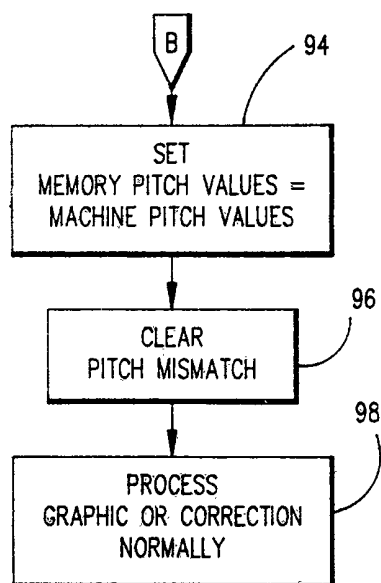


FIG. 7

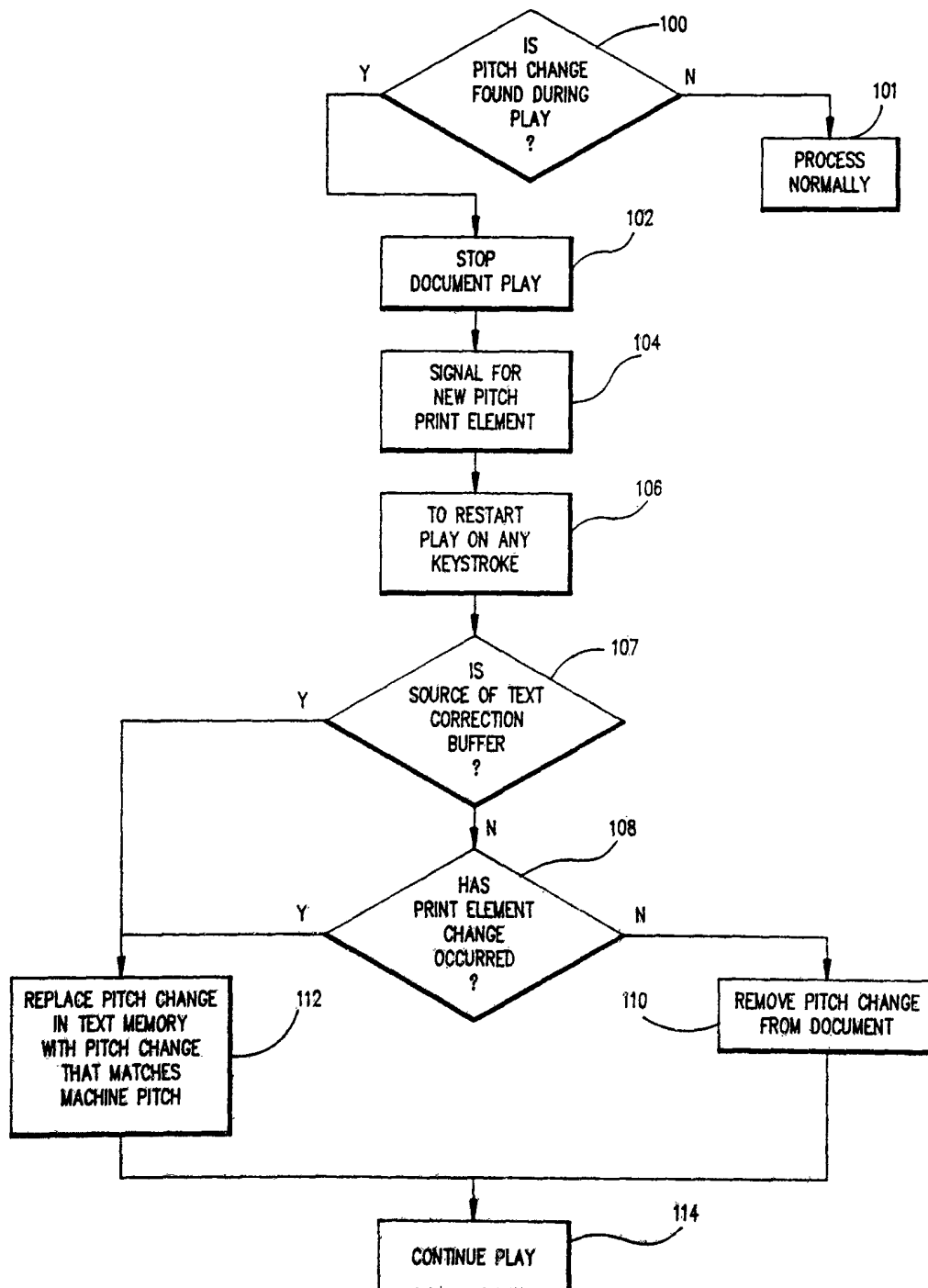


FIG. 8

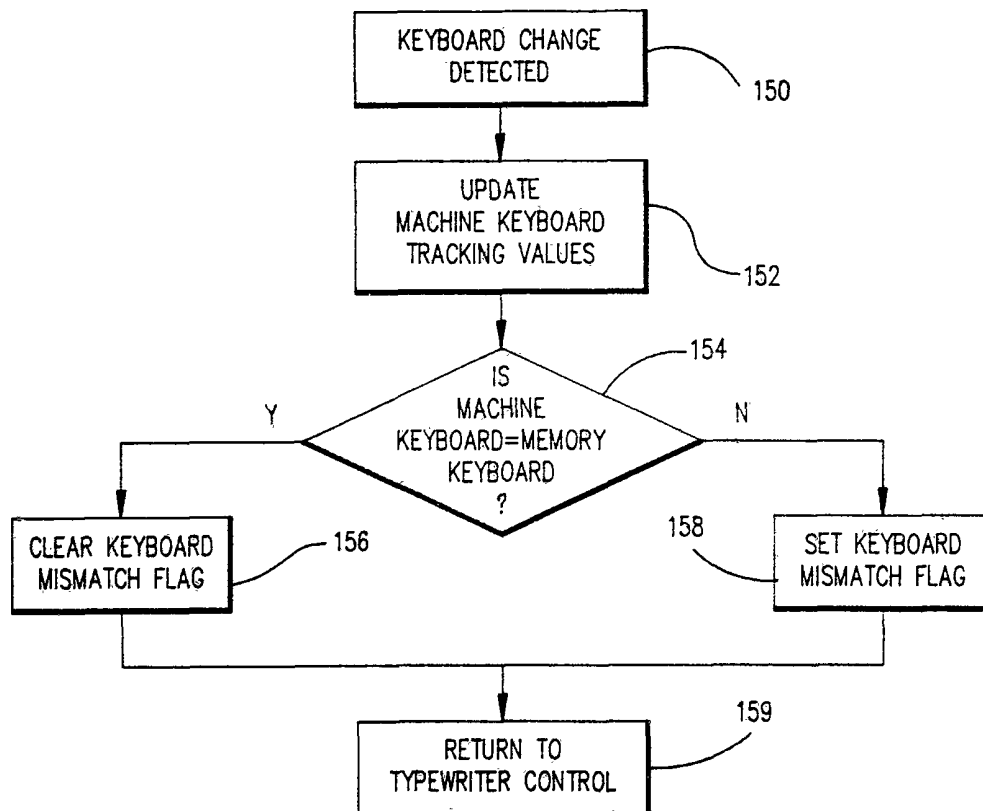


FIG. 9

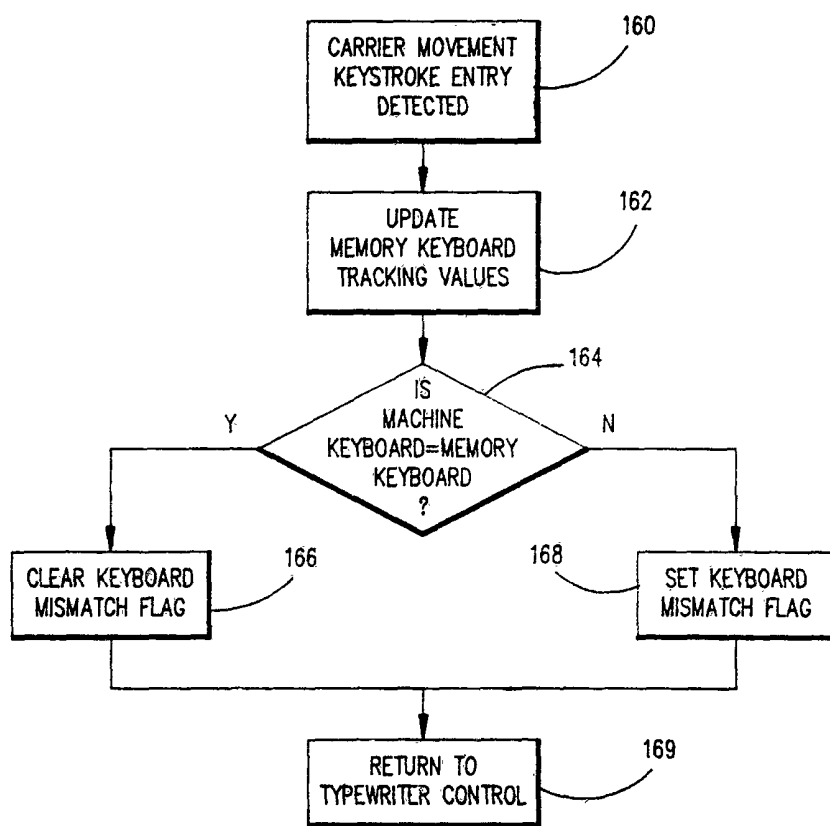


FIG. 10A

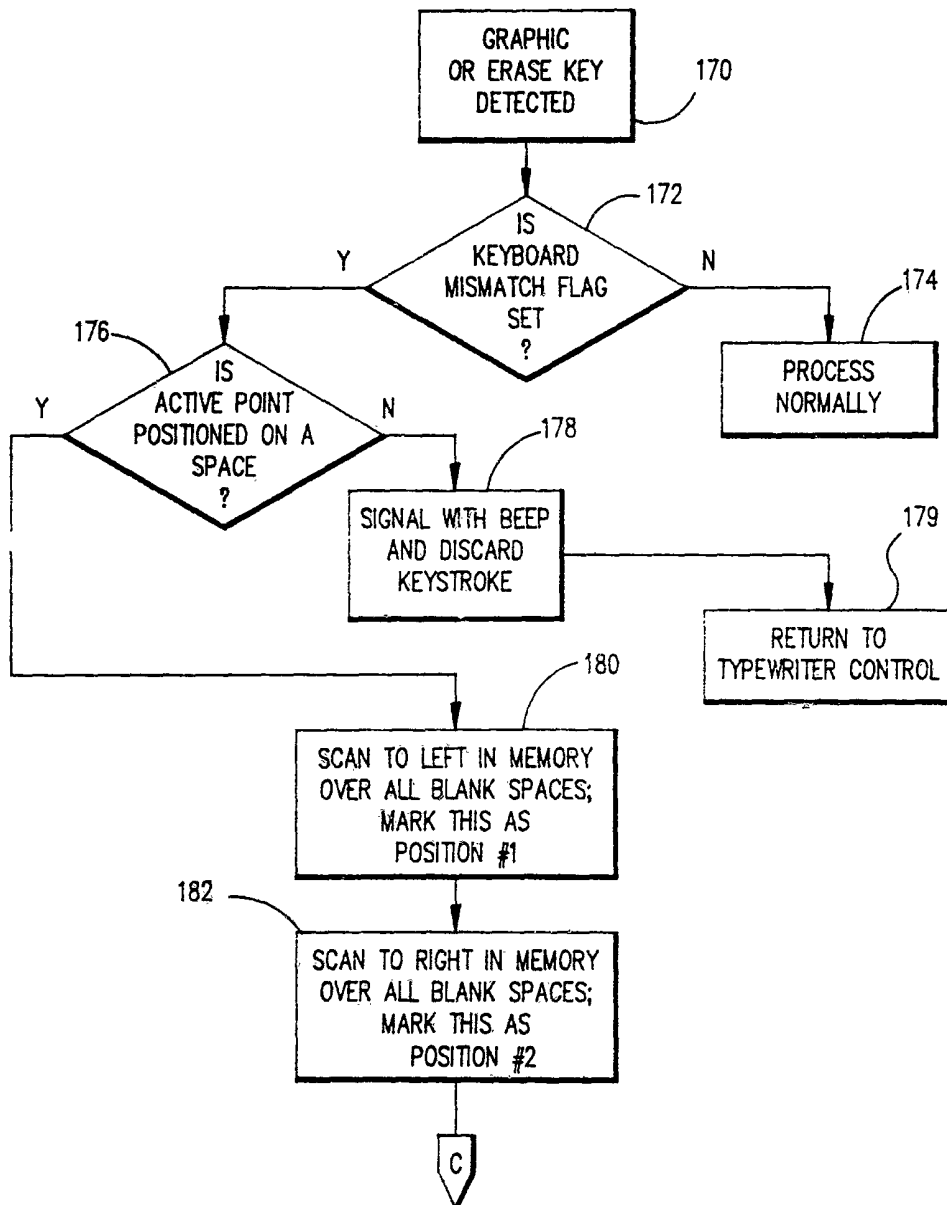


FIG. 10B

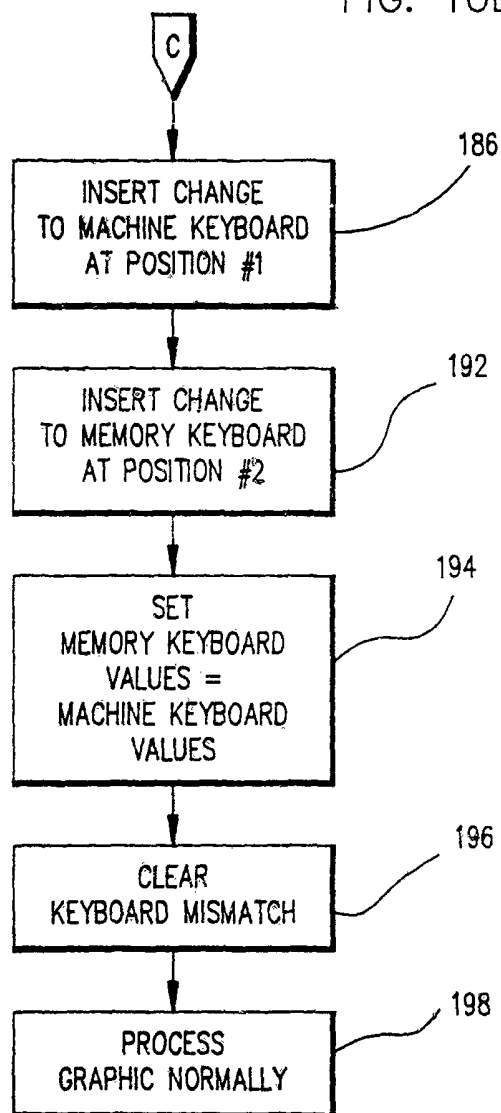


FIG. 11

