

United States Patent [19]

Jones

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[54] LINE FEED-PRINT INHIBIT SYSTEM

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[73] Assignee: General Electric Company

[22] Filed: Dec. 7, 1970

[21] Appl. No.: 95,967

Related U.S. Application Data

[63] Continuation of Ser. No. 734,468, June 4, 1968, abandoned.

[52] U.S. Cl. 340/172.5, 101/93

[51] Int. Cl. G06k 1/00

[58] Field of Search 340/172.5; 101/93, 93 C

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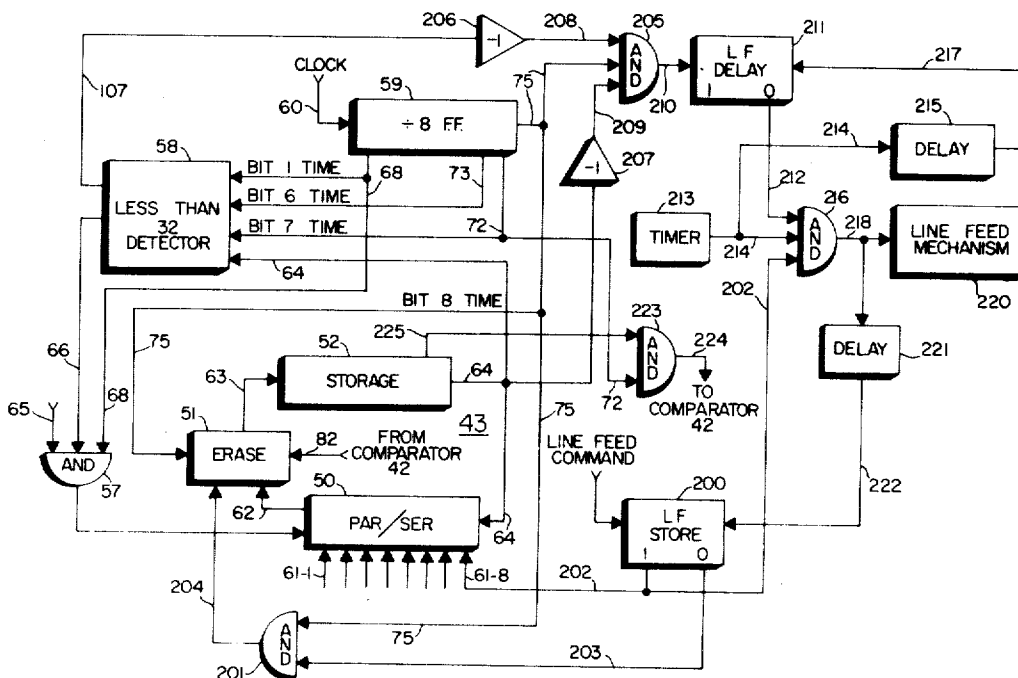
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[57] ABSTRACT

An end-of-line print control system for a printer identifies those characters received after receipt of a line change command and inhibits printout of the identified characters until previously stored characters are printed and line change is accomplished. The presence of characters to be printed on the old line is used to inhibit line change. After line change, an erase gate eliminates the identification of new line characters permitting their printout.

17 Claims, 4 Drawing Figures



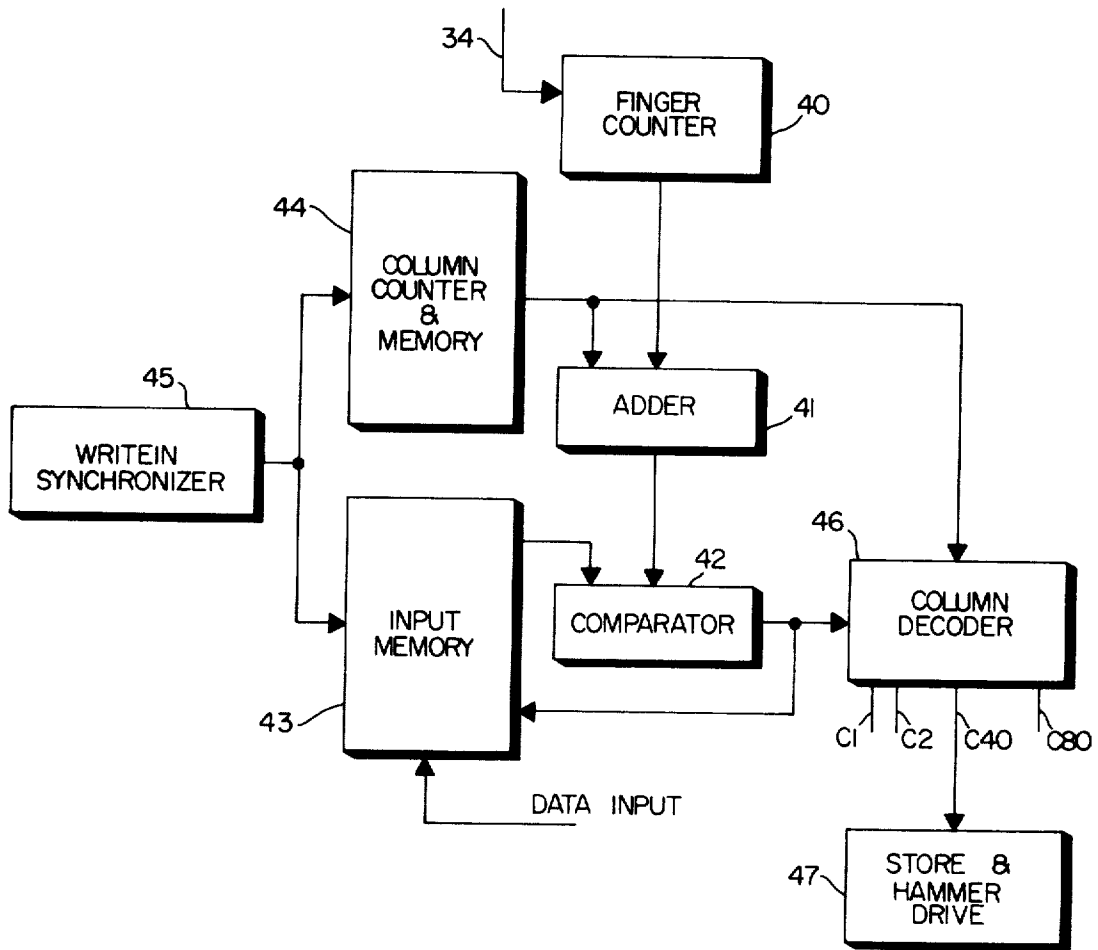
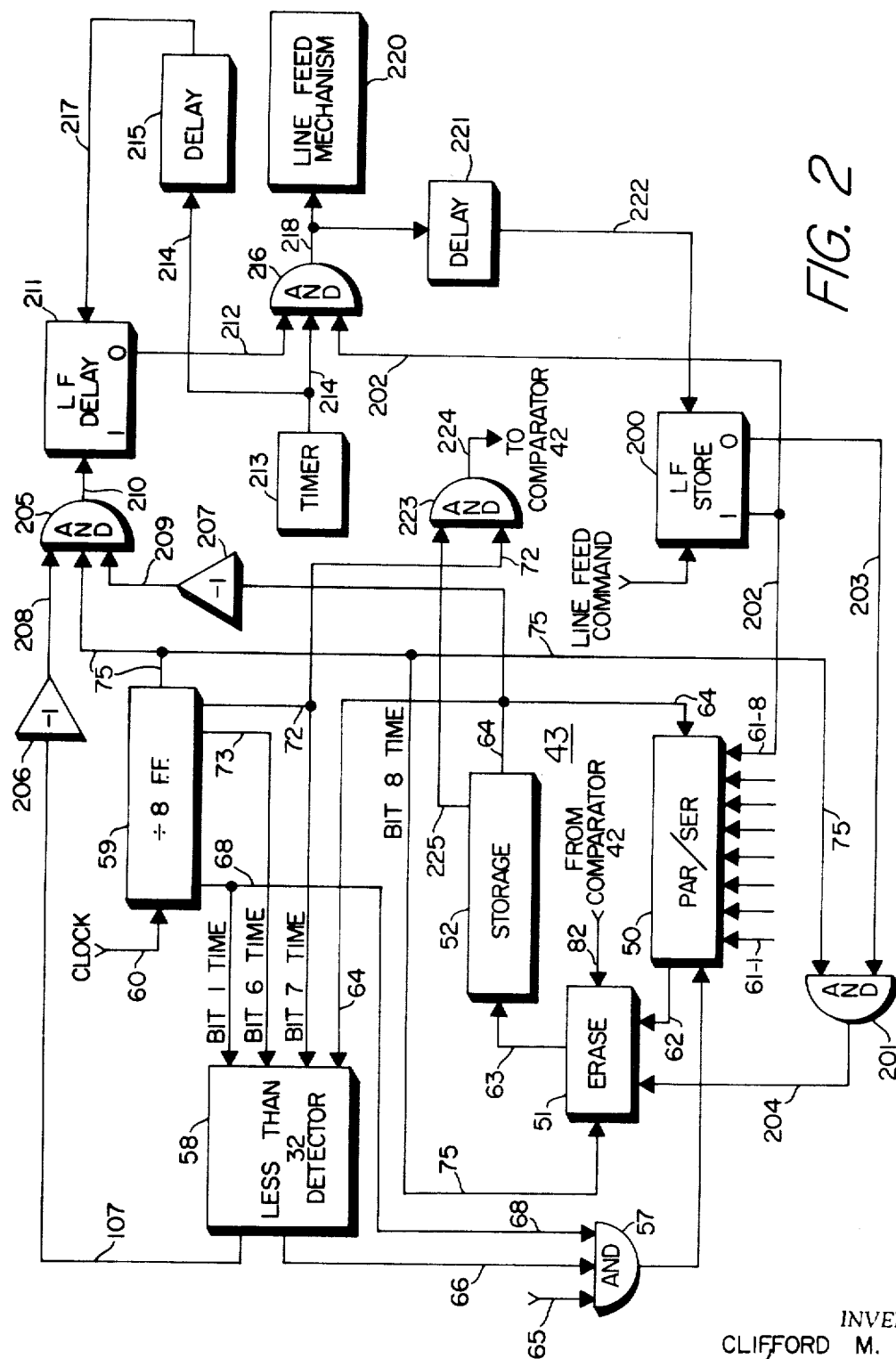


FIG. 1

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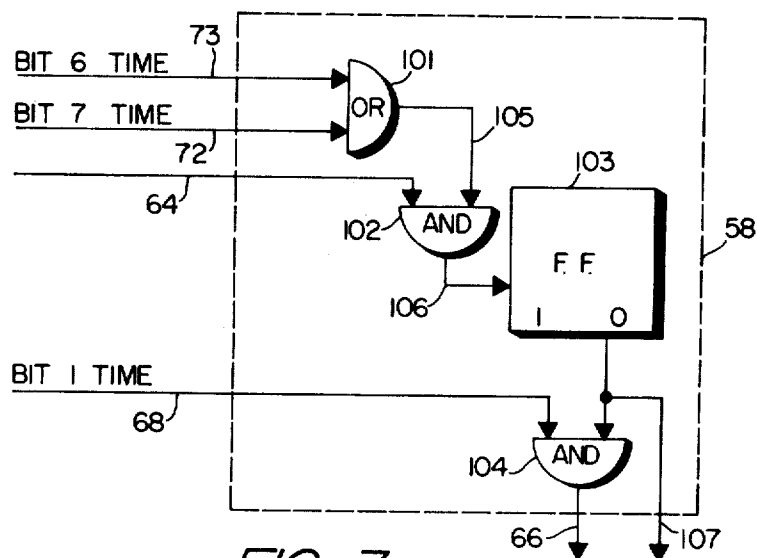


FIG. 3

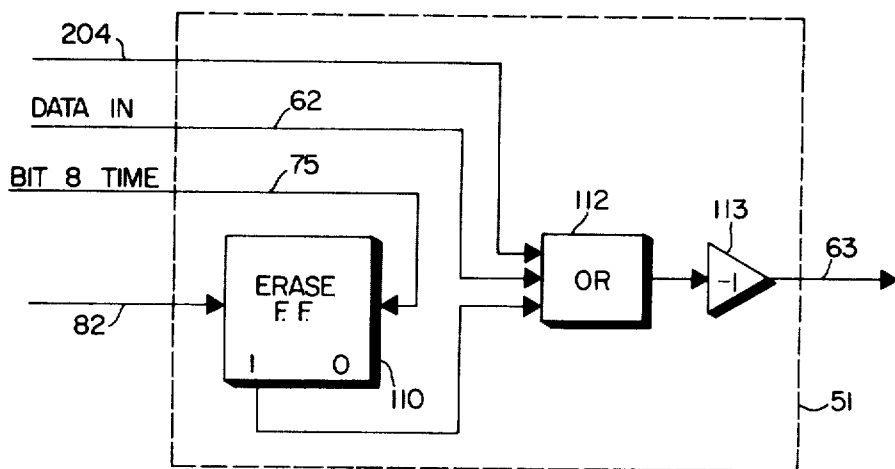


FIG. 4

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LINE FEED-PRINT INHIBIT SYSTEM

The present invention is a continuation of my copending application Ser. No. 734,468, filed June 4, 1968, now abandoned, and assigned to the same assignee as the present invention.

FIELD OF THE INVENTION

This invention relates to improvements in print selection systems for printers. More particularly, this invention relates to a system for managing character printout at the end of one print line and the beginning of the next print line.

HISTORY OF THE ART

Print selection systems are systems which control the printing of information received from a transmission line. The print selection system recognizes the coincidence of input characters received from the transmission line or data source and the instantaneous column position of and print characters of the printer to enable the printout of the information corresponding to the input characters the proper position on the print line. Such print selection systems utilize storage units for storing the input characters until the comparison with print characters can be made. If, for some reason printout is delayed and input information is not accordingly delayed the storage unit capacity is soon reached and data is lost. Such a problem is presented at the end of each print line when the line change operation takes place. Line change takes a finite amount of time and printing must cease during this time. The normal procedure for accommodating the line feed delay in printing is to program the transmission line from which data is received to supply fill characters, i.e., characters which are not to be printed and therefore not to be stored in the print character memory, to take up time for the line feed operation to take place. Fill characters therefore fill in the transmission line to delay the intelligence being transmitted so that no intelligence is lost during the line feed operation.

The difficulty with using fill characters to accommodate line feed is that additional programming is necessary to tell the remote source of information how many fill characters are needed. In addition, fill characters contain no intelligence and only serve to take up transmission time. Also because fill characters are being transmitted when line change is taking place, no subsequent line information has been put into the memory and a delay is thereby realized at the beginning of the subsequent print line.

FEATURES OF THE INVENTION

It is accordingly an object of the present invention to provide an end of the line print control system which does not rely on fill characters to accommodate line change.

Another object of the present invention is to provide an improved printer control system for controlling printing before and after line change.

Another object of the present invention is to provide a printer control system for recognizing and selectively controlling characters to be printed at the end of one print line and those to be printed at the beginning of the subsequent print line.

A further object of the present invention is to provide a line feed control for a printer for accommodating the receipt of subsequent line print commands and selectively printing only old line print commands prior to activating line feed.

In general these objects are realized by an end-of-line print control system which uses the presence of the line feed command to tag each input character received after receipt of the line feed command. All input characters are then examined and the presence of untagged characters inhibits line feed from taking place. Untagged characters continue to be printed on the old print line and tagged characters are inhibited. When all untagged characters have been printed line feed takes place and the tags are removed from the new line characters permitting their eventual printout.

The objects and features of the present invention will be better understood from the following detailed description of an exemplary embodiment of the invention shown in the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a print selection system;

FIG. 2 is a partial block and partial schematic diagram of a line feed print control system according to the invention;

FIG. 3 is a detailed logic diagram of the less than 32 detector shown in FIG. 2; and

FIG. 4 is a detailed logic diagram of the erase gate shown in FIG. 2.

Referring now to FIG. 1, there is shown a print selection and control system for a printer which is described in detail in copending application Ser. No. 734,501, Filed June 4, 1968 by the assignee of the present application, and now abandoned. FIG. 1 appears as FIG. 5 in the copending application. This FIG. is reproduced here to show one example of a print selection system with which the line feed and print control system of the present invention may be used. The print selection system includes an input memory 43 which receives input characters from the data line in the form of a numerical representation of each character to be printed. The input memory 43 stores the input characters so that they may be compared with the numerical representation of print characters used to effect printing to determine which input characters constitute printable input characters for purposes of printing. Column counter and memory 44 provides an indication of the position that each input character received by memory 43 is to be printed in along the print line. To insure that the numbers in memories 43 and 44 are entered at the same time there is provided a writein synchronizer 45. Thus, each print command has a location command stored therewith.

The print selection system of FIG. 1 receives an indication of the position of the moving print characters of the printer on line 34. Finger counter 40 registers the number of the print character at a reference position along the print line. Thus, for example, where the print characters move parallel to the print line, such as is illustrated in FIG. 2 of said copending application, the number corresponding to the print character approaching the first column is stored in finger counter 40. The input on lead 34 is a pulse generated by a sensor such as a photosensor each time the print charac-

ters advance one column. This pulse activates the finger counter 40 to the next highest count. Counter 40 is reset to the first number of the code of numbers representing the print characters and input commands when the first character in the font of print characters is ready to be printed in the first column. Thus, where the code for printable characters ranges from 32 to 127, counter 40 is reset to 32 when the first character, e.g., A, is adjacent column one.

From the foregoing, it is seen that the information available for determining a printable input character is the print character numerical representation or numerical representation or number, the number for the column position at which the input character is to be printed, and the number for the print character adjacent the first column. To detect when there is a print character is to be printed, the column position number for an input character is added in the adder 41 with the number for the print character adjacent the first column. Thus, for example, if 32 is adjacent the first column and 5 is the column position of the input character which is being considered, the sum 37 is obtained. This sum indicates that at the fifth column, the print character having the number 37 is approaching the fifth column and can there be printed. This number is then compared in the comparator 42 with the input character number for the fifth column. If this is 37, then a coincidence is obtained and an output from the comparator is used for energizing the print actuator for the fifth column.

FIG. 1 shows that the column number being considered by the adder 41 is also applied to a column decoder 46. The column decoder has an output channel for each column. The column indicating number enables the output channel of the column decoder which corresponds to that column number, e.g., the number 5 which is applied to adder 41 is also applied to column decoder 46 and the fifth channel is enabled. Thus, the coincidence indication from comparator 42 which is also applied to column decoder 46 energizes the fifth channel and a print command is applied to the store and hammer drive unit 47.

The hammer drive and storage unit 47 stores the printout indication from the column decoder long enough for each of the input characters in the input memory 43 to be examined and all printable characters recognized for the one position of the print characters to be printed at the same time. The hammer drive portion of this unit may comprise the solenoids connected to the hammers which strike the print characters into the inked ribbon and paper for printing.

It is recognized that in the print selection system described, a plurality of input characters are received by the printer and stored for comparison with numbers indicating the print characters of the printer for the possible recognition of printable characters. To accomplish this, the memory must be completely scanned for each different position of the print characters. Because the computation of addition and comparison is a serial operation and since the information stored in the memory units 43, 44 and 40 are stored seriatim, a clock is applied to each of the memory and computation units to synchronously circulate the information at a rate calculated to permit complete scanning of the memory contents within the time it takes one print character to

move one column position. Signals C1, C2, C40 and C80 are representative column hammer actuating signals indicating printout is desired at these columns, i.e., columns 1, 2, 40 and 80. For further details, reference may be made to the aforementioned application.

A system for maintaining control of the print selection system during the transition period between the end of one line of printing and the beginning of the next line of printing is shown in FIG. 2. Here input memory 43 is again shown as comprising parallel to serial shift register 50 and storage unit 52. These two storage units are interconnected by lead 62, erase gate 51, lead 63 and lead 64 to provide for the circulation of the contents of the memory. The writein synchronizer 45 is also shown in the form of the less than 32 detector 58 and AND gate 57. The less than 32 detector examines the contents of memory 43 to find spaces where new characters can be written in and provides an input to AND gate 57 over lead 66 at such time. AND gate 57 is also responsive to the presence of an input character strobe signal on lead 65 indicating that data is to be entered into memory and the bit 1 time pulse on lead 68. The output of AND gate 57 is also applied to memory unit 44 which is not shown in FIG. 2.

The line feed or line advance signal or command is applied as shown to the line feed storage unit 200 which may comprise a flip-flop. The set output of the shift unit 200 is applied to the eighth bit position of the parallel to serial shift register 50 operating as the input unit of the memory 43. This register is shown with input leads 61-1 through 61-8. Thus lead 202 interconnects the line feed storage unit 200 with input line 61-8 of the parallel to serial shift register 50 so that a logic 1 is entered into the eighth bit position of the writein unit 50 for each character received after the receipt of the line feed command. By this means a logic 1 in the eighth bit position of a number in the memory identifies that character for printout in the next line.

It is noted that the reference numerals in FIGS. 2, 3 and 4 of the drawings are grouped into two ranges, those below the number 200 and those above. The numbers referencing elements of the end of print line control system of the present invention begin with the number 200. Those numbers less than 200 are the same numbers used in said copending application to reference like parts.

Referring again to FIG. 2, it is shown that input characters received after the line feed command are inhibited from being printed until the old line of print has been completed and line change or feed has occurred. In addition, line feed is delayed until all the character commands stored in memory 43 prior to the line command have been printed in the old line. Thus, memory 43 is examined to determine how long line feed must be delayed and which characters are to be printed in the old line.

The line feed delay unit 211, which again may comprise a flip-flop, has at its input an AND gate 205. The output of this AND gate 205 indicates that there is a character in the input memory which does not have the added logic one in the eighth bit position. When this condition is present, signifying that input characters received before the line feed signal still remain to be printed, the output on line 210 from AND gate 205 sets

the line feed delay flip-flop 211 and the output from this flipflop taken at the reset side on line 212 indicates to AND gate 216 that the condition is not right for the line feed command from flip-flop 200 to be passed through to the line feed mechanism 220 via line 202 and AND gate 216.

AND gate 205 receives three inputs. It receives an inverted indication from the less than 32 detector over lead 208 that a character is present, i.e., the number scanned in memory 43 is greater than 32. It also looks at the character being examined by the less than 32 detector to see if it is flagged for printout in the next print line, i.e., that it was received after the receipt of a line feed signal. Thus AND gate 205 receives bit 8 time on lead 75 and an inversion of the character itself on leads 64 and 209. The character is inverted by the inverter 207 because AND gate 205 responds to the presence of an input character not having a logic 1 in the eighth bit position. Because of the bit 8 time signal input AND gate 205 only sees the eighth bit of the character from the memory.

A timer 213 generates a pulse at the end of timed periods sufficient to permit memory unit 43 to circulate its information one time. The output pulse from the timer is delayed a time at least equal to the duration of timer 213 output pulse by delay unit 215 available over lead 214 and applied over lead 217 to reset the line feed delay flip-flop 211. Thus a character must be present in the memory without a next line flag to continue to inhibit. This indication is applied to the inhibiting flip-flop 211 by AND gate 205 over lead 210. The timing pulse from timer 213 is also applied to AND gate 216 over lead 214. This insures that only at the next timing pulse, which permits the complete memory to be scanned, will AND gate 216 again be enabled. If at this next timing pulse the line feed delay has not been set, the reset output on lead 212 will be a logic 1 and AND gate 216 will permit the line feed command which has been stored in the line feed store flip-flop 200 to pass through to trigger the line feed mechanism 220.

The output of AND gate 216 is also applied via lead 218 to delay means 221. Thy delay device 221 could be a timer or other delay means such as a delay line having a period substantially equal to the period it takes for line feed to take place. When delay means 221 times out, the line feed store flip-flop 200 is reset over lead 222 and the flip-flop reset output is applied via lead 203 to AND gate 201 which also receives the bit 8 time pulse from the divide by 8 flip-flop 59. The pulses from 59 are derived by dividing clock signals available over lead 60. The clock pulses insure system synchronization. Thus, at each bit 8 time AND gate 201 applies a logic 1 to the erase gate 51 such that each character received by the erase gate from storage unit 50 has the eighth bit flag removed therefrom. Details of the erase gate 51 are described below with reference to FIG. 4.

While the line feed command is being delayed to permit printout of characters along a first line, those print commands tagged for printout along a second line must be inhibited. AND gate 223 is accordingly provided. This AND gate looks at the characters in memory 43 over lead 225 and at bit 7 time over lead 72. AND gate 223 scans the characters in memory from the second to last position of storage unit 52. This permits the AND

gate to view the character one bit early so that the inhibit output is applied to the comparator 42 over lead 224 at bit 7 time. Thus, although AND gate 223 looks only at the eighth bit of each character, it receives the character one bit ahead of comparator 42 so that its inhibit signal is present at the comparator prior to the completion of the comparison.

Another scheme for inhibiting character commands identified for the next print line is available without the addition of AND gate 223 to the print selection system shown in FIG. 1. Since those character commands intended for the next print line are identified by a logic 1 in the eighth bit position, all tagged numbers are greater than 127. Thus, if the comparator 42 compares on an 8 bit basis there can be no coincidence of tagged numbers with the numbers representing the print characters and printout is inhibited until the tags are removed after line feed by erase gate 51.

FIG. 3 shows a detail of the less than 32 detector 58. This less than 32 detector is shown in FIG. 8 of the aforementioned copending application with the exception that FIG. 3 shows lead 107 is brought out to be applied to the end-of-line print control circuit shown in FIG. 2. This less than 32 detector looks at each character in the input memory on lead 64, at bit 6 time on lead 73, and bit 7 time on lead 72 to determine if the number is less than the range of 32 to 127, the range of numbers reserved for print characters. The bit 6 time and bit 7 time inputs are applied to OR gate 101, the output of which is applied to AND gate 102 over lead 105 along with the character information from the memory over lead 64. The output of AND gate 102 indicates that there is a printable input character which is being entered into the parallel to serial shift register 50 on line 64. This information causes flip-flop 103 to be set over lead 106 thereby providing a zero output on lead 107. The zero output is applied to inverter 206 and also to AND gate 104. AND gate 104 is also responsive to bit 1 time so that a bit 1 time there is recognition that an input character is already present and writein control AND gate 57, as shown in FIG. 2, does not permit a new input character to be received by memory 43. As shown in FIG. 2, inverter 206 inverts the logic zero received on line 107 to a logic 1 indicating that an input character is present in the memory unit.

FIG. 4 is a detail of the erase gate 51. This FIG. is the same as FIG. 9 of the aforementioned copending application with the exception that lead 204 from AND gate 201 is here shown being applied as an input to this gate. Lead 204 conveys a logic 1 to the erase gate at each bit 8 time when the line feed storage unit 200 is reset after line feed. Thus, regardless of the normal operation of the erase the printed gate 51 which is to erase executed input characters from the memory to provide space for the receipt of new input characters, all bit 8 information will be erased from all input characters in the memory. The logic 1 applied by lead 204 to the inverter 113 creates a zero on line 63 at each bit 8 time.

As is described in detail in the copending application, the erase gate flip-flop 110 receives an indication from comparator 42 via lead 82 that the inputs character now in memory input unit 50 has resulted in a coincidence of numbers indicating a printable input character. This coincidence indication sets flip-flop 110 so that a logic 1 is applied to OR gate 112 and ap-

pears as a logic zero at output lead 63 due to inversion by inverter 113. It can be seen that the normal operation of the erase gate 51 is to erase only when a printable input character has been detected, whereas with the addition of lead 204, the eighth bit or flagged position of all the numbers in the memory unit 43 have the eighth bit erased by this gate.

The invention that is described by the foregoing discussion of one exemplary embodiment is an end-of-line print control system which enables a printer to receive input characters from a transmission both before and after line feed. The invention described herein eliminates the use of fill characters in the transmission line to accommodate the time that it takes to change lines. Although a single embodiment of the invention is shown to describe the invention, various obvious alternatives are available. For example, while the line feed storage flip-flop is shown having its set output connected to the input memory unit 50 so that input characters received after receipt of the line feed command have an extra number added thereto, this is merely a matter of design choice and the reset output of line feed store flip-flop 200 could have been used to supply a number to all input characters except those received after receipt of the line feed command. The purpose of identifying the input characters to be printed on the next print line is accomplished either way.

It is also to be understood that memory 44, which stores the printout position number for each input character, can be an identical unit to memory 43. It comprises a serial to parallel shift register input unit having a single eight bit character storage capacity identical to unit 50 of memory 43 and a seven eight bit characters storage unit, identical to unit 52 of memory 43. This is shown in the aforementioned copending application. By connecting an equivalent of erase gate 51 to these units it is possible to identify input characters to be printed on the next print line by flagging the printout position numbers stored in memory 44. It can be seen that many changes can be made in the particular embodiment described. It is therefore intended that this description should be taken merely as an illustration of the features of the invention and not in a limiting sense. Only the claims which follow should govern the scope of the invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A line feed-print inhibit system for a printer wherein said printer has a storage unit for storing a plurality of received input characters prior to printing such characters along lines on a record medium and is responsive to receipt of a line feed signal to change the line along which printing is to take place;

means responsive to receipt of a line feed signal for identifying input characters stored by said printer after receipt of said line feed signal;

first means responsive to input characters stored by said printer before receipt of said line feed signal to inhibit printing of said identified input characters;

second means responsive to input characters stored by said printer before receipt of said line feed signal to inhibit said printer from responding to receipt of said line feed signal until input charac-

ters stored by said printer before receipt of a line feed signal have been printed;

and means to remove the identification from said input characters after said printer has responded to said line feed signal to permit printing of said last-named input characters.

2. A line feed-print inhibit system as recited in claim 1 wherein said means for identifying input characters is operative during the period the printer is inhibited from responding to receipt of said line feed signal.

3. A line feed-print inhibit system for a printer in which the numerical representations of received input characters to be printed along lines on a print medium are stored for comparison with the numerical representations of moving print characters to recognize and print the proper print characters when they are in the proper position for printing characters corresponding to said input characters and where the printer responds to receipt of a line feed signal to change the line of print, comprising:

means for adding a numerical representation to each input character numerical representation received by said printer subsequent to receipt of a line feed signal;

print inhibit means responsive to input character numerical representations having said added numerical representation to inhibit printing of the corresponding input characters;

line feed inhibit means responsive to input character numerical representations without said added numerical representations to inhibit said printer from responding to said line feed signal so long as characters corresponding to input character numerical representations without said added numerical representations still remain to be printed;

and means to remove said added numerical representations from input character numerical representations after said printer has responded to said line feed signal.

4. A line feed-print inhibit system as recited in claim 3 wherein said line feed inhibit means includes means for continually examining said input character numerical representations for detecting said added numerical representations and providing an inhibit signal to prevent printer response to said line feed signal so long as input character numerical representations without said added numerical representations are detected.

5. A line feed-print inhibit system as recited in claim 4 further including delay means marking a period of time sufficient for the printer to respond to a line feed signal, said delay means being energized by said line feed inhibit means at the detected absence of input character numerical representations without said added numerical representations;

said means to remove responding to the end of said marked period of time to remove added numerical representations.

6. A line feed-print inhibit system as recited in claim 5 wherein input character numerical representations having said added numerical representation are different from the numerical representations for said print characters, and said print inhibit means is the comparator for comparing input character numerical representations with print character numerical representations, said comparator responsive to noncoincidence of input

and print character numerical representations to prevent printout of characters corresponding to those input characters having numerical representations including said added numerical representations.

7. A line feed-print inhibit system as recited in claim 6 further including storage means for storing said line feed signal during the period of printing of characters corresponding to input character numerical representations stored prior to receipt of said line feed signal, and means for clearing the line feed signal storage means in response to the end of said marked period of time.

8. An end-of-line print inhibit for a printer which produces output signals along lines on a record medium in response to received input signals, comprising:

means for identifying input signals being received by said printer after sufficient input signals have been received for producing one line of output signals;

means responsive to input signals for inhibiting production of output signals corresponding to such identified input signals;

means responsive to input signals for initiating a line change when all output signals corresponding to unidentified input signals have been produced;

and means responsive to said line change to remove the identification from input signals received after said line of output signals has been produced.

9. A print line transition control system for a printer in which received input characters and the column information for printing such input characters are stored in memory for comparison with signals representing moving print characters in order to detect and print out those print characters in proper position for printing desired input characters along a print line on a record medium and where the print line is changed from a first to a second line in response to a received line feed signal, comprising:

means coupled to said memory to inhibit printer response to said received line feed signal so long as input characters remain to be printed on a first print line;

means for providing an identification for input characters received by said printer after receipt of a line feed signal which are to be printed on a second print line;

second means coupled to said memory to inhibit printout of said input characters provided with an identification;

and means to remove said identification upon the changing of a print line in response to said received line feed signal.

10. A first-second print line transition control system as recited in claim 9 wherein said means for providing an identification for input characters comprises means for adding an identification signal to each input character received after receipt of said line feed signal.

11. A first-second print line transition control system as recited in claim 9 wherein said means for providing an identification for input characters comprises means for adding an identification signal to the column information.

12. A control system for a printer in which normally unmodified input signals received by the printer are stored for comparison with signals representing print characters to be printed for purposes of printout of

print characters comprising means for providing a given printer command signal to the printer for causing said printer to execute said command, means for modifying those input signals received by the printer subsequent to the time of providing said given printer command signal, means to inhibit printout of print characters corresponding to those input signals which have been modified, and means responsive to unmodified input signals to inhibit printer execution of said given command signal so long as any unmodified input signals remain to be printed.

13. A printer system comprising a source of a command signal, a source of first signals representing print characters, a source of normally unmodified second signals, means for comparing said first and second signals, means responsive to a given comparison of said first signals and said second signals for controlling printing by said print characters of characters corresponding to said input signals, means for modifying input signals occurring subsequent to the time of occurrence of said command signal, means for inhibiting printing of modified input signals, and means responsive to unmodified input signals to inhibit printer response to said command signal so long as characters corresponding to said signals remain to be printed.

14. A control system for a printer in which a plurality of signals representing print characters are circulated and compared with corresponding input signals to be serially received by the printer to effect printout of print characters corresponding to said input signals along a line comprising means for receiving a line change signal for causing said printer to execute a change in the line of printing by said printer, means for modifying those input signals received by said printer subsequent to receipt of said line change signal, means to inhibit printout of characters corresponding to those input signals which have been modified, and means to inhibit the printer executing said line change signal so long as characters corresponding to said unmodified input signals remain to be printed.

15. A line feed-print inhibit system for a printer wherein said printer has a storage unit for receiving and storing input characters for subsequent printout along selected lines on a record medium in response to receipt of line feed commands, comprising:

means for distinguishing between input characters received by said storage unit before and after receipt of a line feed command by said printer;

first means responsive to said means for distinguishing for inhibiting printout of input characters received after receipt of a line feed command;

second means responsive to said means for distinguishing to inhibit printer response to said line feed command in the presence of unprinted input characters received before receipt of a line feed command;

and means to remove said distinction between input characters after a line feed command has been effected to permit printing of input characters to proceed without distinction until a subsequent line feed command is received by the printer.

16. A line feed-print inhibit system for a printer wherein said printer has a storage unit for storing a plurality of input characters prior to printing along lines on a record medium and is responsive to receipt of line

feed signals to control printing of said stored input characters along different lines on a record medium, comprising:

- means for identifying input characters stored by said printer after receipt of a line feed signal by said printer; 5
- first means responsive to input characters to inhibit printing said identified input characters;
- and second means responsive to input characters to prevent said line feed signals from executing a line feed until input characters received by said printer before receipt of a line feed signal have been printed. 10
- 17. A printer comprising a plurality of type characters movable along the lines of a record medium; 15
- means for providing first signals corresponding to the instantaneous column location of said moving type characters;
- a source of a line change signal;
- means for receiving said line change signal; 20
- a source of second signals representing a plurality of input characters received in time before the receipt of said line change signal;
- a source of third signals representing a plurality of input characters received in time after the receipt 25 of said line change signals;
- a source of fourth signals representing column information associated with each of said second and third signals;
- first and second synchronized circulating memories; 30
- means for circulating said second and third signals in

- said first memory;
- means for circulating said fourth signals in said second memory;
- means for comparing said second, third and fourth signals circulating in said memories and said first signals to obtain control signals;
- means responsive to said control signals to cause said type characters to print characters corresponding to said second and third signals along lines on said record medium;
- means for removing from said memories second and third signals and corresponding fourth signals after printing of characters corresponding to said second and third signals;
- first means responsive to said line change signal to change the line of printing by said type characters from a first to second line;
- second means responsive to receipt of a line change signal for inhibiting printing of characters corresponding to said third signals; 20
- third means responsive to second signals circulating in said first memory for delaying the response of said first means to said line change signal until characters corresponding to all of said second signals have been printed;
- and fourth means responsive to the response of said first means to said line change signal for enabling the printing of characters corresponding to said third signals. 25

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,716,841 Dated February 13, 1973

Inventor(s) Clifford M. Jones --1--

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 24	after "characters" insert -- at --
Col. 3, line 28	after "this" insert -- input character number --
Col. 5, line 2	cancel "flipeflop" and insert -- flip-flop --
line 27	cancel "pulse" and insert -- pulses --
Col. 6, line 63	cancel "inputs" and insert -- input --
Col. 7, Claim 1, line 53	before "characters" insert -- signals representing --
line 58	cancel "identifying" and insert -- providing an identification for --
	cancel "characters" and insert -- signals --
line 60	cancel "characters" and insert -- signals --
line 62	cancel "said identified input"
lines 62 and 63, after "characters" insert -- corresponding to input signals provided with an identification; --.	

UNITED STATES PATENT OFFICE
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Patent No. 3,716,841 Dated February 13, 1973

Inventor(s) Clifford M. Jones --2--

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 7, Claim 1, line 64	cancel "characters" and insert
	-- signals --
line 67	cancel "input"
Col. 8, Claim 1, line 1	before "stored" insert -- corres-
	ponding to input signals --
line 3	cancel "said"
line 4	cancel "characters" and insert --
	signals provided with an identifica-
	tion --
lines 5	
& 6	cancel "said last-named input
	characters." and insert -- characters
	corresponding to said last-named
	input signals.--
Claim 2, line 8	cancel "identifying input characters"
	and insert -- providing an identifi-
	cation for input signals --
Col. 9, Claim 9, line 29	after "A" insert -- first-second --
line 30	after "input" insert -- signals
	representing --
line 31	cancel "such input" and insert --
	the corresponding --
line 35	cancel "desired input" and insert
	-- such corresponding --

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CERTIFICATE OF CORRECTION

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Patent No. 3,716,841 Dated February 13, 1973

Inventor(s) Clifford M. Jones --3--

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 9, Claim 9, line 41	cancel "input" and after "characters" insert -- corresponding to received input signals --
line 45	cancel "characters" and insert -- signals --
line 46	cancel "which" and insert -- where characters corresponding to said last-named input signals --
line 49	cancel "said input" and after "characters" insert -- corresponding to input signals --
Claim 10, line 56	cancel "characters" and insert -- signals --
line 58	cancel "character" and insert -- signal --
line 61	cancel "characters" and insert -- signals --
Col. 10, Claim 13, line 20	cancel "input" and insert -- second --
Claim 15, line 45	after "input" insert -- signals representing --
	after "printout" insert -- of corresponding characters --
line 48	cancel "characters" and insert -- signals --

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

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Patent No. 3,716,841 Dated February 13, 1973

Inventor(s) Clifford M. Jones

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 10, Claim 15, line 52 cancel "input"

after "characters" insert -- corres-
ponding to input signals --

line 57 after "characters" insert -- corres-
ponding to input signals --

line 59 before "input" insert -- received --

line 60 cancel "characters" and insert --
signals --

line 61 cancel "input"

after "characters" insert -- corres-
ponding to such input signals --

Claim 16, line 66 after "of" insert -- received --

before "characters" insert -- signals
representing --

after "printing" insert -- such
characters --

Col. 11, Claim 16, line 1 cancel "said stored input"

line 2 after "characters" insert -- corres-
ponding to said stored input signals -

line 2 cancel "on" and insert -- of --

line 4, cancel "characters" and insert
-- signals --.

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CERTIFICATE OF CORRECTION

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Patent No. 3,716,841 Dated February 13, 1973

Inventor(s) Clifford M. Jones

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 11, Claim 16, line 7	cancel "characters" and insert -- signals --
line 8	after "printing" insert -- of characters corresponding to --
	cancel "characters" and insert -- signals --
line 9	cancel "characters" and insert -- signals --
line 10	after "said" insert -- printer from responding to --
	cancel "from executing" and insert -- to execute --
line 11	cancel "input"
	after "characters" insert -- corresponding to input signals --

Signed and sealed this 20th day of November 1973.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents