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Larew

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[54] **FONT SELECTING SYSTEM**

[72] Inventor: **John J. Larew,** Waynesboro, Va.

[73] Assignee: **General Electric Company**

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

[51] **Int. Cl.** **G06c 11/06**

[58] **Field of Search**.....340/172.5; 101/93 C, 111; 95/4.5

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Primary Examiner—Paul J. Henon

Assistant Examiner—Paul R. Woods

Attorney—Joseph B. Forman, Michael Masnik, Frank L. Neuhauser, Oscar B. Waddell and Melvin M. Goldenberg

[57] **ABSTRACT**

Characters to be printed by a multiple font printing apparatus are represented by discrete numbers, and the printable characters on the apparatus are represented by corresponding numbers. There is a particular indication associated with each font and this indication is added to the printable character number. In order to print characters from particular fonts, means are provided for modifying the input data representing the desired character with said particular indication.

22 Claims, 3 Drawing Figures

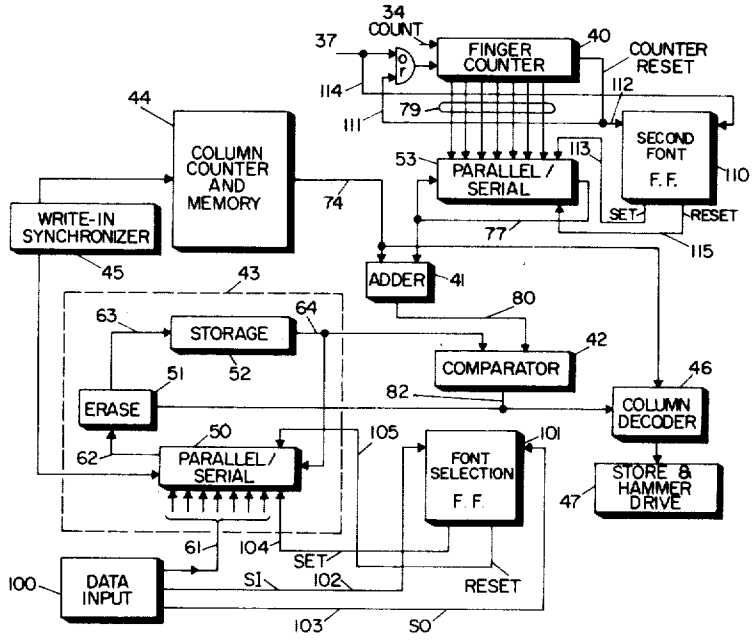


FIG. 1

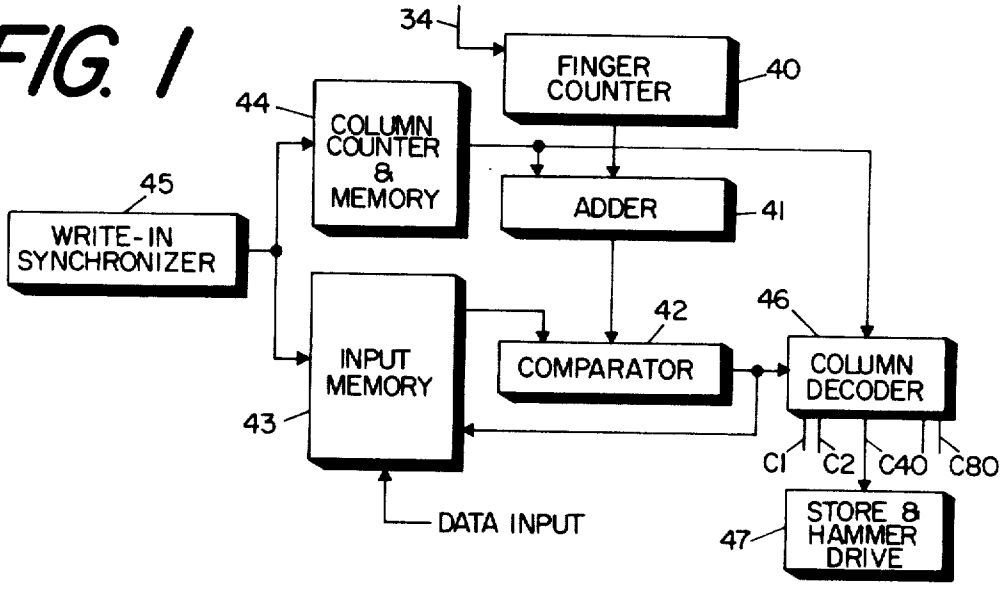
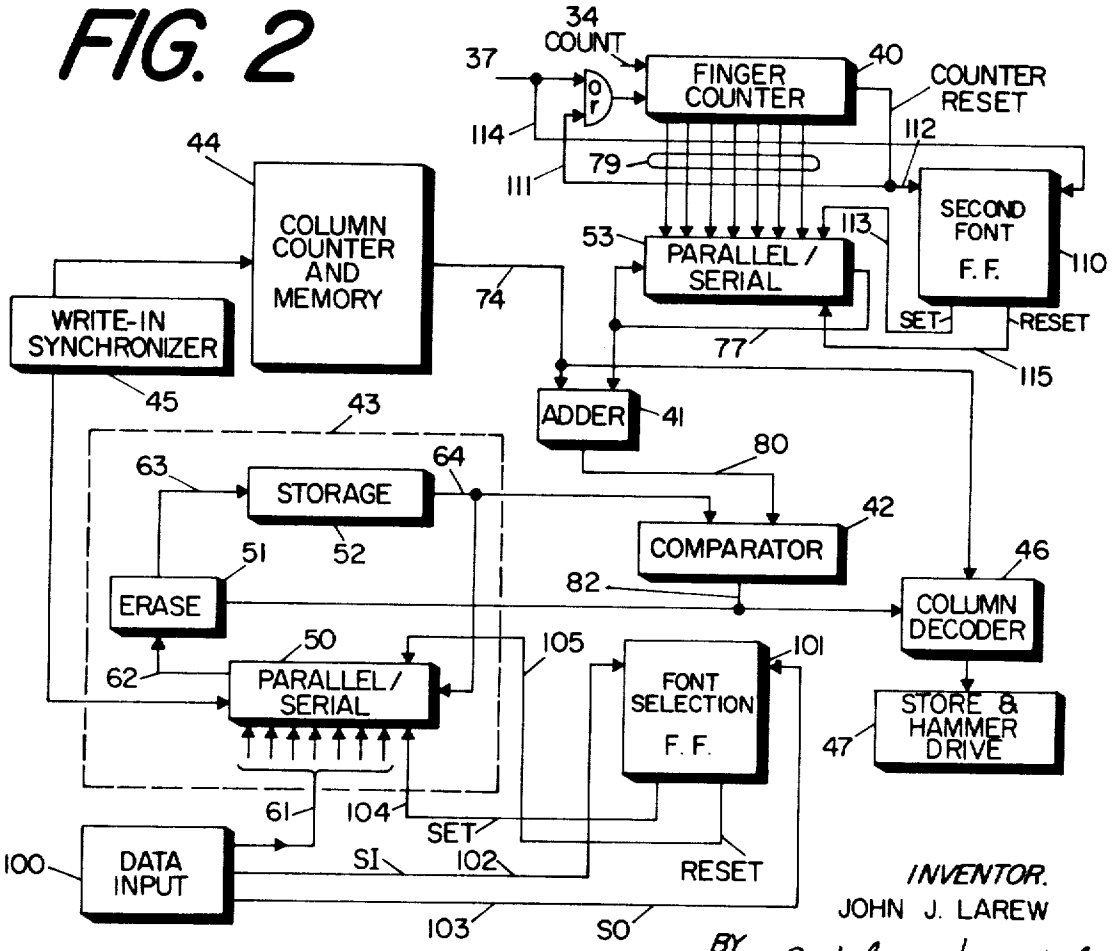


FIG. 2



INVENTOR.
JOHN J. LAREW

BY Michael Masnik

HIS ATTORNEY

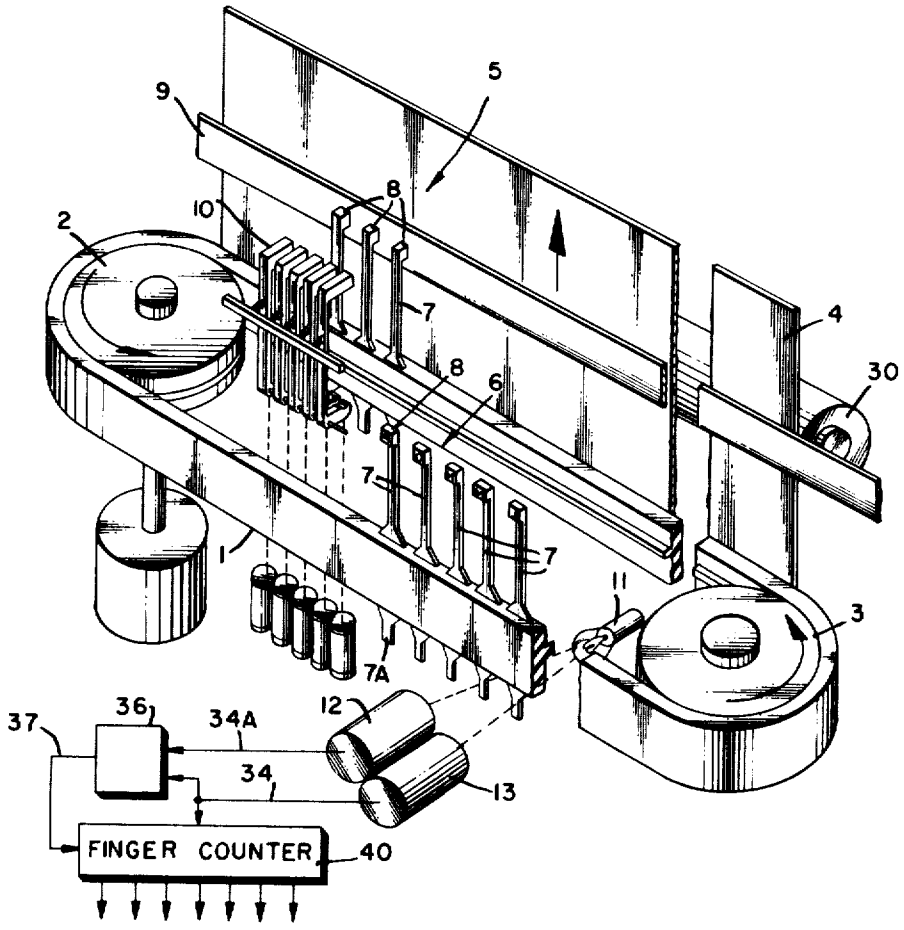


FIG. 3

FONT SELECTING SYSTEM

FIELD OF THE INVENTION

The present invention relates to print selection systems for printers; and, more particularly, it relates to improved print selection systems for printers having a plurality of selectable fonts of characters.

DESCRIPTION OF THE PRIOR ART

In the printing field generally, it is recognized that a variety of symbols, character styles, classes, or fonts of characters, may be advantageously used for composing particular printed matter. It has always been a problem to provide ready access to large numbers of distinct characters. Some systems partially solve the problem by providing a few optional characters within a standard font. Other systems provide for complete replacement of the printing element or elements in order to change the font. The first solution is inadequate because it does not provide a sufficient degree of flexibility in print style. The second solution is inadequate because it is too time-consuming for employment with present high speed printers.

The present invention is concerned with apparatus of the type for use in printing either a portion or an entire line at a time in response to signals received from a remote location. Such systems may include those responsive to manual keyboards and those responsive to more complex information handling units such as computers. There are now available printers, photocomposing apparatus, and the like, which have the capacity for storing large numbers of selectable characters. By employing rapidly moving cylinders or belts with the character forming elements disposed on the surface thereof, it is possible to print entire lines across a record medium within the time required for a single cycling of such units. In order to select the particular character to be printed, a signal discretely representative of that character is presented to and stored by the printing apparatus. Subsequently, when the corresponding character forming element is in the appropriate position, the apparatus is actuated and the character is printed.

It has been found that there is a maximum number of alphanumeric characters, ligatures, figures, punctuation marks, etc., normally in use. A complete set of such elements would constitute a font of characters as herein employed. Additional sets in different styles would constitute additional fonts. It is possible to provide a discrete command signal for the selection of each discrete character forming element; however, when it is recognized that the character forming elements may be assembled in corresponding sets, a reduction in the number of discrete command signals is made possible by using a two part command. Such a command involves a first part identifying the font and a second part identifying the character. This invention is concerned with plural font apparatus for responding to such command information.

The present invention is particularly compatible with the apparatus of the type disclosed in the copending U.S. Pat. application Ser. No. 91,160 filed Nov. 19, 1970, which is a full continuation of Ser. No. 734,501 which was filed June 4, 1968 by Earle B. McDowell and Clifford M. Jones, and assigned to the General Electric Company. The aforementioned patent application discloses an improvement over conventional line printing. It includes a data storage unit which stores less than all of the data received for an entire line; and yet accomplishes the printing of an entire line within a predetermined interval of time. One particular embodiment utilizes a type-carrying belt having a number of flexible arms, each of which has the type face for a particular character on one end thereof. The type-carrying belt is mounted upon drive devices which rotate about parallel axes in order to effect passage of the belt between the recording medium and a plurality of hammers that are disposed across the face of the recording medium along the line to be printed. The position of each character relative to a fixed point on the printer is determined by detecting the passage of a particular character past that point, and thereafter triggering a counting mechanism at a rate proportional to the rate of character movement. The recording medium may be considered to comprise a plurality of distinct columns, each of which is a possible character position. Each character is represented by a discrete number and the numbers corresponding to characters to be printed are stored as input data. As the characters on the belt move past each column position, circuitry compares the column position with the stored input data to determine whether or not a character is to be printed at that particular position. When the comparison indicates coincidence between the position of the character on the belt and the character to be printed in that position, the hammer of that column position is actuated and impacts the type face on the recording medium.

In order to effect control over this type of printing apparatus, it is necessary to develop binary signals which function in synchronism with the belt movement. In the apparatus of the aforementioned application, a binary counter is employed which is synchronized with the belt movement and registers successive integers at the same rate as that at which the characters pass successive columns. The integer registered in the counter at any particular time is the representative number of the character located at a predetermined column position at that time, and is used in conjunction with the input date to develop a control signal for actuating the appropriate hammer at an appropriate time to print selected characters in the desired column.

As fully described in copending patent application, Ser. No. 734,500, filed June 4, 1968, by Earle B. McDowell, Clifford M. Jones and Seymour M. DePuy, and assigned to the General Electric Company, the aforedescribed printer develops a special font start signal photoelectrically when the first character is in a particular position vis-a-vis the record medium. In the event more than a single font of characters would be provided upon a single belt, separate font signals would be generated via the photoelectric device when first characters in each font arrived at that particular position. The present invention eliminates the need for generating special font signals at the beginning of each font by detection of specially prepared fingers.

SUMMARY OF THE PRESENT INVENTION

The present invention relates to a printing system wherein preselected signals are utilized for effecting a change of font. A particular embodiment of the invention operates in conjunction with belt printers wherein

the belt contains at least two fonts of characters which are continuously presented to all possible printing positions on a recording medium. According to the present invention, the particular font currently being presented to the recording medium is indicated discretely and the particular font desired to be utilized is indicated discretely such that comparison of these discrete indications controls the actual character printing operation.

An object of the invention is to develop an improved multiple font printing system.

Another object of the invention is to provide an improved method for shifting from a first to a second font of printing data responsive to remotely generated signals.

Another object of the present invention is to provide a multiple font printing system wherein all characters received following the receipt of a particular signal will be printed from the font indicated thereby.

In accordance with the invention, there is provided a font selection system for a multi-font printing apparatus operative to selectively print characters from one of a plurality of fonts in response to signals identifying the font and character desired, comprising means for storing data representative of the character to be printed, font selection means responsive to said font selection signals to discretely modify said stored date to indicate the appropriate font, means for generating data representative of the printable characters and their positions at any particular point in time, and comparison means for comparing said stored data with said generated data to control printing of the desired character.

A more complete understanding and appreciation of the objects and features of the invention will be available from the following detailed description which is made in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of a printer employing the font selection system of the present invention; and

FIG. 2 is a more detailed block and schematic diagram of an embodiment of a font selection control system of the type contemplated by the present invention; and

FIG. 3 is a block diagram of a communication terminal including a belt printer carrying two sets of characters or type fonts.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 illustrates a print control system for the type of printer described in detail in the aforecited patent application, Ser. No. 91,160. This figure appears as FIG. 5 in the cited patent application and is reproduced here as a particular example of a print selection system with which the font selection system of the present invention may be employed. For ease in referring to the copending applications, wherever appropriate, the same numerical designations and components are used in this application.

The illustrated system includes an input memory 43 which receives character commands as input data in the form of a number representing each character to be printed. The input memory 43 stores the input character number for comparison with numbers representing characters on the printing belt. Column counter and memory 44 registers a numerical indication of the desired column position of each of the input characters stored in input memory 43, and in synchronizer 45 controls storage and utilization of the data in units 43 and 44.

The input data provided to such an apparatus may generally be classified as either information to be printed on the record medium, e.g., printable characters such as alphanumeric characters, punctuation marks; or special command signals, e.g., non-printable characters such as carriage return, line feed, shift out, or shift in. The special command signals are utilized to program the printed matter or to make the apparatus perform particular functions. The present disclosure is primarily concerned with the command signals "shift out" and "shift in, " which are utilized to select the particular font of characters to be printed. For purposes of discussion, one may consider use of the U.S.A. Standard Code for Information Interchange (ASCII), wherein binary numbers 1 through 32 represent the special commands or non-printable characters and binary numbers 33 through 126 represent printable characters. In the ASCII, binary 14 indicates shift out and binary 15 indicates shift in. It is assumed in the cited copending applications and in this application that the input data signal to the various units of the apparatus is received in binary coded form; for example, in a seven bit code wherein each bit is weighted.

Finger counter 40 registers a number representing the character appearing at a predetermined position on the apparatus. This is a binary counter that is initially set to the number representing the first character of a font, upon receipt of a start of font signal that may be generated once for each complete revolution or cycle of the belt. The characters on the belt are located in accordance with the code used so that each successive character is represented by a number one integer greater than that of its predecessor. Accordingly, finger counter 40 is counted up by one integer each time a new character appears at said predetermined position and the number registered therein always represents the appropriate character.

Input memory 43 and column counter and memory 44 are each capable of storing data representing a predetermined number of characters and their desired position. This data is continuously circulated and recirculated for comparison with the number registered in finger counter 40 in order to detect the appropriate juxtaposition of the character on the belt and the desired column. When this is detected, printing is effected and the input data is erased and replaced with new data.

As fully explained in the aforecited application, Ser. No. 91,160, the number registered in finger counter 40 and the number registered in column counter and memory 44 are applied to an adder 41 which arithmetically adds the numbers, character by character, serially, to produce a summation signal for comparison with the character number stored in input memory 43. A distinct summation signal is produced for each column number that is added to a particular finger count number, and each summation signal effectively provides character position information relating a particular character to a particular column position.

Comparator 42 serially compares one character at a time at a rate sufficiently high to effect comparison of all of the data characters stored in the circulating input memory 43 during the time it takes for a character on the belt to pass from any given column to an adjacent column. Upon detecting correspondence, a signal is generated and forwarded to the column decoder 46 which, in conjunction with an indication from the column counter and memory 44, causes the appropriate hammer on the print mechanism to print the desired character.

Referring to FIG. 1 in greater detail, input information in the form of an input character number from a keyboard or from a tape reader or an external source is applied to an input memory 43 over the DATA INPUT line. Input memory 43 stores the numerical representation of each of the input characters comprising the input information. The write-in of characters into memory 43 is controlled by a write-in synchronizer 45. Synchronizer 45 is responsive to the presence of an input character at the input to memory 43 and the availability of a storage capacity at the input position of this memory. When an input character is present and memory 43 is free to receive it, synchronizer 45 alerts or strobes the input memory to receive the character and also a second memory 44 which receives a number from its counter which corresponds to the column in which the input character simultaneously received is to be printed.

Another source of information to the system is over line 34, as from a photosensor as described in the aforementioned application, Ser. No. 734,500, which provides the stimulus to finger reference counter 40 to register a number corresponding to the print character at a reference position along the print line, e.g., the character adjacent column 1. Thus, memory 43 receives and stores the information which is desired to be printed, memory 44 stores information indicating where the input information is to be printed, and register 40 stores information indicating where the print characters are that must be actuated to print out the input information.

To obtain printout, each number in the column indicating memory 44 is added in an adder 41 to the number indicating the reference print character seriatim to obtain a series of sums, each sum being a number representing the print character at the print position represented by the value of the column indicating number from memory 44. To illustrate the significance of this calculation by example, let it be assumed that the reference print position is adjacent column 1. Thus, as will be described in greater detail below, finger counter 40 contains a number, such as 32, which is the value of the character about to align with column 1. The numbers stored in memory 44, which indicate the columns in which the input characters are to be printed, may begin with the number 0 for the character to be printed in the first column, and for an eight character capacity, the numbers stored for the first eight input characters will extend from 0 through 7. Thus the value of the first sum, 32 + 0, will be 32. Thus the value of the print character which can be printed in column 1 is 32. Since the number for each print character is greater than the number of the succeeding print character by an integral increment, such as 1 in a preferred embodiment, and since the same integral increment separates the numbers accorded to adjacent columns, the number 1 will indicate the next column and it is added to the reference number 32 to produce the number 33 which reference is the number representing the character which can next be printed in column 2. It can be observed from the above example that the column indicating number "zero" indicates the first column and the number "one" indicates the second column. This is a common practice where the system as here relies on binary numbers for its computation.

To repeat, the series of sums produced by adder 41 are numbers representing the print characters which can next be printed at the columns indicated by the column number forming a part of each sum. These print character numbers (the same) are compared by comparator 42 with the input character numbers in the input memory 43. It is to be noted that the comparison is on a bit-by-bit basis and is in synchronism with the circulation of memories 43 and 44 such that the sum which was produced by the column position number for the first input character is compared with the first input character number. If the print character approaching the first column has a number which compares with the input character number to be printed in the first column then there is a coincidence of numbers and an output is obtained from comparator 42.

The output of comparator 42 is applied to a column decoded 46 and also back to the input memory 43. The feedback path to input memory 43 enables the input character which resulted in the finding of a printable character to be erased. This enables memory 43 to receive another input character in the space left.

The column decoder 46 receives the coincidence indicating signal from comparator 42. Column decoder 46 also receives seriatim the columns indicating numbers from memory 44 as they are applied to adder 41. Thus, as each computation is being made in the adder and comparator 42, the channel of the column decoder 46 corresponding to the column position number applied to the adder is energized. Thus, for example, when the column 1 indicating number, "zero," is being applied to the adder, the column 1 output channel C1 of column decoder 46 is energized. If there is a coincidence detected by the comparator 42, then the print actuation means for channel 1 is energized. In FIG. 2 the print actuating means is shown as a block 47 for the column 40 position C40. There is a print actuation means for each of the output channels of column decoder 46, each one being connected to the hammer for the corresponding column. Block 47 represents a memory or store unit and a hammer drive. The memory is provided for each of the columns such that all coincidence indications obtained for one examination of the contents of the input memory 43 will be stored so that for the one position of the print characters all hammers will be simultaneously actuated for all the printable characters located. This simultaneous printout results in random or nonsequential printout within the storage capacity of the memories 43 and 44.

Looking again at FIG. 2, the system that is there shown can be better understood by a consideration of the algorithm that is explanatory of the operation of this system. If N represents the input character number,

C represents the column indicating number, i.e., number indicating the column in which the corresponding input character is desired to be printed; and if F represents the number indicating font position, i.e., the number of the print character in the font at a reference column; then the computation that is performed by the print selection system shown in FIG. 2 can be expressed by the algorithm

$$F+C\overset{?}{=}N$$

This algorithm for the system of FIG. 2 indicates that the number representing font position is summed with the number representing the column in which the input character is to be printed and compared with the input character numbers to detect equality.

Referring now to FIG. 3, there are shown portions of the printing mechanism preferred for the printer in the system of FIG. 1. There is shown a belt 1 supported and driven by pulleys 2 and 3. The direction of the motion of the belt is indicated by arrows, in a counterclockwise direction. Suitable pulley drive means such as a drive motor powers pulley 3 to provide the belt with a substantially constant speed drive. The direction of movement of character belt 1 relative to a record medium 4 is such that it traverses a line or proposed line on the record medium. Much like a picket fence, the belt 1 supports a plurality of fonts of type characters or sets of type symbols, which for purposes of simplicity is shown to consist of a first font or set of type 5 and a second font or set of type 6. Each font comprises a plurality of flexible fingers 7, each finger having on the uppermost face thereof a print character 8. The motion of the belt is such that the print characters move parallel to the proposed print line in front of a typing or inking ribbon 9 and a plurality of hammers 10. A recording medium 4 such as a piece of paper 4 is shown being supported against a platen or roller 30 for being driven in the vertical direction. Ink ribbon 9 passes between the paper and the print character bearing fingers. The hammers 10 when actuated by appropriate means such as solenoids strike the finger into the ribbon and thus into the paper. The paper moves perpendicular to the print line as shown by the arrow and the print characters move from column to column parallel to the print line. Since the fingers 8 are embedded in the belt, which preferably is of a resilient plastic material such as polyurethane polymer, they are thus fixed in a predetermined order. The belt 1 may carry several fonts of characters although only two fonts of characters are illustrated for simplicity.

FIG. 3 also shows photosensors 12 and 13 and a light source 11 placed on either side of the belt at a position to detect the passage of the fingers, and to provide a finger "count" signal and a change of "font" signal. The belt has two fonts of characters arranged in a predetermined sequence. The "font" and "count" signals are effective to indicate registration of the characters adjacent to a reference location. A counter 40, which is arranged to count within the range of the code of predetermined numbers representing the print characters is actuated by pulses from photosensor 13 indicating the passage of fingers. One standard code for printable characters may range from the number 32 to the number 127. Thus, counter 40 would begin its count at 32 and count to 127.

Also shown in FIG. 3 is a reset device 36 for applying a signal over lead 37 to counter 40 for resetting this counter at each indication of the beginning of a font of print characters. A change in font may be generated in any one of a number of ways. Here, a wide finger is used to indicate a change of font. For further details, reference may be made to U.S. Pat. No. 3,605,610. As explained in greater detail in the aforementioned copending application, Ser. No. 91,160, the counter 40 is reset by reset means 36 when a wide finger such as 7A is sensed by photosensors 12, 13. Wide finger 7A is positioned in the fonts at a point to be detected by the photosensors when the first print character of one of the fonts is approaching the first column. As shown in FIG. 2, the "count" signals are applied over lead 34 and the change of "font" signal over lead 37 to the finger counter 40.

The addition of the outputs from the finger counter 40 and the column counter and memory 44 will often result in numbers outside the range of the code for print characters, i.e., 33–126. For example, if it is desired to print the character coded 42 in column 70, and the print character adjacent the first column is coded 105, the addition of the outputs from finger counter 40 and column counter and memory 44 would be 175. FIG. 12 of the aforecited application and the corresponding descriptive text, illustrate the use of circuitry to modify all adder 41 outputs that are beyond the range of the print character codes in order to generate the appropriate corresponding numbers within the range.

FIG. 2 illustrates the elements of input memory 43 and finger counter 40 in somewhat more detail. In addition, it includes the storage and control elements employed in conjunction with the invention in order to control font selection and utilization. The input memory 43 comprises a parallel-to-serial shift register 50 and storage unit 52. These units are interconnected by lead 62, erase gate 51, lead 63 and lead 64. These interconnections permit the circulation of the contents of the memory in response to clock pulses (not shown). Finger counter 40 is shown as having its output supplied to a parallel-to-serial shift register 53 and it is the output of this register which is serially presented to adder 41 for addition to the output of the column counter and memory 44. The write-in synchronizer 45 and column counter and memory unit 44 are illustrated in the same manner as in FIG. 1.

At the lower central portion of FIG. 2, a data input 100 is shown supplying the printable character input data to input memory 43 via leads 61, and also supplying special command signals shift in (SI) and shift out (SO) on leads 102 and 103 respectively. It will be appreciated that data input 100 is a decoding unit which responds to the input data information and forwards data for the printable characters to the input memory while forwarding the special command data to the appropriate portions of the control apparatus. In this embodiment of the invention, the SI signal indicates that the primary font is to be employed for subsequently received characters and the SO signal indicates that the secondary font is to be employed for the subsequently received characters. Upon receipt of the SI signal on lead 102, a font selection flip-flop 101 is set. The "set" output from font selection flip-flop 102 over lead 104

sets an eighth stage of the parallel-to-serial shift register **50**. Accordingly, when the eighth parallel-to-serial shift register is in a "one" state, it is indicative of the fact that the SI signal has been received and the primary font should be used. When it is desired to employ the second font, the SO signal is transmitted and this operates over lead **103** to reset the font selection flip-flop **101**. The reset output of flip-flop **101** places the eighth stage of the shift register **50** in a "zero" state.

The font selection flip-flop **101** discretely modifies the character input data to indicate the desired font. It is also necessary to identify the fonts in printing position at any point in time. Attention is directed to the upper right quadrant of the figure where a second font flip-flop **110** is illustrated. Finger counter **40** is operative in response to count signals upon lead **34** to indicate the number representative of the character appearing at a predetermined column position. When utilizing the ASCII mentioned above, wherein the first **33** characters (including O) are not printing characters, finger counter **40** begins with a count of **33** upon receipt of a start font signal on lead **37**. Thereafter, for each pulse received over lead **34**, the finger counter counts up until it reaches a count of **126**, at which time it automatically resets to **33**. The outputs of the stages of finger counter **40** are fed in parallel to parallel-to-serial shift register **53**, which converts the information into a series of bits for submission over output lead **77** to adder **41**. The function of second font flip-flop **110** is to modify the finger counter output in order to indicate which font is in position for printing. This is effected by setting the second font flip-flop when the finger counter reaches a count indicative of the termination of the first font, i.e., upon reaching a count of **126**.

It will be recalled that in the systems heretofore presented, each font was identified by the generation of a special font start signal in response to detection of a special geometrical configuration on the finger starting each font. In accordance with the present invention, this is not necessary. Rather, when the finger counter **40** registers the number representing the last character of a font, it is automatically reset via lead **111** and simultaneously transmits a set signal over lead **112** to the set input of the second font flip-flop **110**. Thus, when flip-flop **110** is in a set condition it is indicative of the fact that the second font is available for printing. Upon being set, flip-flop **110** sets the eighth bit of parallel-to-serial shift register **53** via lead **113** in the same manner as was done in the parallel-to-serial shift register **50** of the input memory **43**. Thus, the data indicative of the characters in printing position has been modified to reflect font position in the same manner as the input character data has been modified. When comparison is subsequently effected in comparator **42**, only the character in the appropriate font will cause coincidence and generate the necessary hammer drive signal ultimately applied to storage and hammer drive unit **47**.

When the second font is completed and the start-of-font signal is again generated on lead **37**, this signal is applied via lead **114** to the reset input of second font flip-flop **110** effecting a reset of this flip-flop and simultaneously effecting a reset over lead **115** of the eighth stage in parallel-to-serial shift register **53**.

When the characters of the second font are in the reference, or first column position, and characters of the first font are in higher numbered column positions, or vice versa, means must be provided to modify the output of adder **41** for comparison purposes. The modifying circuitry will yield adder outputs for each font so that the various characters stored in input memory **43** can be appropriately compared. Attention is again directed to FIG. **12** of aforecited application, Ser. No. 734,500, for the type of circuitry required. Of course, one must establish two sets of adder outputs (one for each font), and the specific arrangements for accomplishing this may take numerous forms within the skill of the art.

It should be appreciated that there is no specific need for making each font of the same length. There is no limitation upon the number of characters in a font. Furthermore, it will be appreciated that the principles of this invention may be extended to cover use of more than two fonts at a time.

In addition to recognizing the fact that changes in the new material of this invention may become immediately apparent to those skilled in this art, it is also recognized that modifications in the basic system may have an effect upon the structural elements of this invention. Thus, it is known that "tags" or added numbers have been proposed for insertion into an eighth bit of the parallel-to-serial shift register **50** of the input memory for inhibiting the printing of characters received after receipt of an end-of-line signal and before the line is changed. When such modifications are incorporated in the basic system, the present invention may be inserted by the addition of a further stage to the shift register.

The present invention has been described and illustrated with particular reference to a belt-type partial line-at-a-time printing system. The invention itself is not restricted to this particular type of printing apparatus. In fact, drum-type printing units may partake of the advantages of the present invention. In addition, one should note that all applications of the invention will not be wedded to the utilization of binary counting devices and the like. The basic principles of the invention are applicable to other techniques utilizing other storage arrangements and other basic control systems.

All arrangements falling within the fair meaning and scope of the following claims are intended to be included within this invention.

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

1. A font selection system for multi-font printing apparatus operative to selectively print characters from one of a plurality of fonts in response to signals identifying the font and character desired, comprising: means for storing data representative of the character to be printed at particular positions along a print line, font selection means responsive to said font identifying signals to supplement said stored data to indicate the appropriate font, means for generating data representative of the selectively printable characters and their positions along said print line at any particular point in time, and comparison means for comparing said stored data with said generated data to control printing of the desired character and font.

2. A font selection system according to claim **1**, wherein each character is represented by a discrete

number, said means for storing data comprising means for storing numbers corresponding to the character to be printed, and said font selection means comprising means for adding a predetermined number to each stored number.

3. A font selection system according to claim 1, wherein the data representative of each of said characters is represented by a discrete number; means for cyclically presenting the characters in said fonts to all potential printing positions on a recording medium; said means for generating data representative of the printable characters and their positions comprising means for cyclically generating numbers corresponding to the character presented at a particular position with time; a source of an initiation signal; means for commencing the cycle of said number generation in response to said initiation signal and means for thereafter reinstituting said cycle of number generation upon the generation of a particular number by said generating means.

4. A font selection system according to claim 3, including means operative in response to said reinstitution of the cycle of number generation to add a predetermined number to each number generated during the succeeding cycle.

5. A font selection system according to claim 4, wherein said data input storage comprises means for storing numbers corresponding to the character to be printed at a particular position along a print line, and said font selection means comprises means for adding said predetermined number to each stored number.

6. A font selection system according to claim 1, wherein each character is represented by a discrete number, said data input storage comprises means for storing numbers corresponding to the character to be printed at a particular position along a print line, and said font selection means comprising means for modifying the numbers stored.

7. A font selection system for a printer having a plurality of fonts of type-faces which are cyclically brought into all potential printing positions along a printing surface, in which numbers discretely representing input characters desired to be printed at desired positions are stored for comparison with numbers discretely representing type-faces for corresponding printing positions, as said type-faces are cyclically brought into all potential printing positions, comprising: means for adding a predetermined number to each said stored character number which is indicative of the font from which type-faces are desired to be printed, and additional means for adding a corresponding predetermined number to said numbers discretely representing type-faces at the various printing positions in accordance with the font of type-faces available for printing at a particular point in time.

8. A font selection system as defined in claim 7, wherein the numbers representing said input characters to be printed are stored in a binary shift register, the numbers representing the type-faces are generated in a binary counter, and said means for adding the predetermined number to said stored input character numbers comprises a flip-flop responsive to said distinct signal to set one stage of said binary shift register.

9. A font selection system as defined in claim 8 further comprising means for generating a signal at the beginning of a first font, means for initially setting said binary counter by said signal generated at the beginning of a first font to a number representative of the character whose type-face appears at a predetermined location relative to the record medium, and means thereafter for modifying the content of said binary counter as successive type-faces appear at said location to represent the character thereof; and means for automatically resetting said counter to said number at the end of said first font.

10. A font selection system as defined in claim 9, wherein said additional means comprises a flip-flop responsive to said automatic resetting of said counter to add said predetermined number to each successive output of the counter until the end of the second font of characters occurs.

11. In a multifont printing apparatus operative to selectively print characters from one of a plurality of fonts of printable characters carried on a carrier across a printing surface in response to signals identifying the font and character desired, comprising: means for storing data representative of the character to be printed, font selection means responsive to said font identifying signals indicating a change in font to modify said stored data to indicate the appropriate font, means for generating data representative of the printable characters on said carrier and their positions at any particular point in time, and comparison means for comparing said stored data with said generated data to control printing of the desired character and font.

12. A font selection system according to claim 11, wherein each character is represented by a discrete number, said data input storage comprises means for storing numbers corresponding to the character to be printed, and said font selection means comprising means for adding a predetermined number to each stored number.

13. A font selection system according to claim 11, wherein the data representative of each of said characters is represented by a discrete number; means for cyclically presenting the characters in said fonts to all potential printing positions on a recording medium; said means for generating data representative of the printable characters and their positions comprising means for cyclically generating numbers corresponding to the character presented at a articular position with time; a source of an initiation signal movement of a given font of printable characters on the carrier to a predetermined location with respect to said printing surface; means for commencing the cycle of said number generation in response to said initiation signal and means for thereafter reinstituting said cycle of number generation upon the generation of a particular number by said generating means.

14. A font selection system according to claim 13, including means operative in response to said reinstitution of the cycle of number generation to add a predetermined number to each number generated during the succeeding cycle.

15. A font selection system according to claim 14, wherein said data input storage comprises means for storing numbers corresponding to the character to be printed, and said font selection means comprises means for adding said predetermined number to each stored number.

16. A font selection system for a printer having a plurality of fonts of character type-faces, in which numbers discretely representing characters desired to be printed are stored for comparison with numbers discretely representing said type-faces for corresponding characters, as said type-faces are cyclically brought into all potential printing positions, comprising: means for adding a predetermined number to each said stored character number following receipt of a first distinct signal, said predetermined number being indicative of the font from which the associated character should be printed, and additional means for adding a corresponding predetermined number to said numbers discretely representing type-faces for the characters, in accordance with the font of characters available for printing at a particular point in time.

17. A font selection system as defined in claim 16, wherein the numbers representing said characters to be printed are stored in a binary shift register, the numbers representing the type-faces are generated in a binary counter, and said means for adding the predetermined number to said stored character numbers comprises a flip-flop responsive to said distinct signal to set one stage of said binary shift register.

18. A font selection system as defined in claim 17 further comprising means for generating a signal at the beginning of a first font, means for initially setting said binary counter by said signal generated at the beginning of a first font to a number representative of the character whose type-face appears at a predetermined location relative to the record medium, and means thereafter for modifying the content of said binary counter as successive type-faces appear at said location to represent the character thereof; and means for automatically resetting said counter to said number at the end of said first font.

19. A font selection system as defined in claim 18 wherein said additional means comprises a flip-flop responsive to said automatic resetting of said counter to add said predetermined number to each successive output of the counter until the end of the second font of characters occurs.

20. In a printer which moves a plurality of fonts of type characters successively into printing position relative to a print line on a document for selectively effecting printing on the document by the type characters, a first recirculating memory for storing first coded representations of input characters to be printed on the document, a second recirculating memory for storing second coded representations of the columnar addresses corresponding to the print columns in which said input characters are to be printed, means for producing third coded representations of the type characters at different print positions, means for modifying said first coded representations in accordance with the particular font from which each of said stored input characters are to be printed, means for modifying said third coded representations in accordance with the particular font which has been moved into printing position, and means for comparing said modified third coded representations, said modified first coded representations and said second coded representations in a given manner to effect printing of input characters at desired columnar addresses in desired fonts.

21. An arrangement according to claim 20 wherein said means for modifying said third coded representations comprises means for producing a first control signal representative of a first font moving into printing position, means for modifying said third coded representations in response to said first control signal, means for counting each of the type characters included in said first font to derive a sum signal, and means responsive to said sum signal for modifying said third coded representations to indicate a change in font.

22. A system for selectively printing characters from a pair of sets of type characters which are moved in a predetermined sequence along a print line comprising means for storing data representative of characters desired to be printed at particular positions along a print line and data representative of the particular set of type selected from said sets of type to be associated with each of said last-named characters, means for generating first signals representative of the successive positions of movement of each of said type characters in said sets of type characters moving along said print line and a second signal representing movement of the beginning of one of said sets of type characters to a predetermined position with respect to a reference position, a counter, means for establishing a first count in said counter in response to said second signal, means for causing said counter to count to a second count in response to the pas-age of said type characters of said one of said sets of type to successive positions along said print line, means responsive to said second count counted in said counter for establishing said first count in said counter, means for causing said counter to count to a third count in response to the passage of said type characters of the other of said sets of type to successive positions along said print line, and means responsive to said stored data, said second signal and the count counted in said counter to control printing by said plurality of sets of type characters.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,697,958 Dated October 10, 1972

Inventor(s) John J. Larew

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

Column 4, line 4	cancel "and in" and insert -- and write-in --
Column 12, line 46	cancel "articular" and insert -- particular --
Column 14, line 41	cancel "pas-age" and insert -- passage --

Signed and sealed this 15th day of May 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents