

June 7, 1960

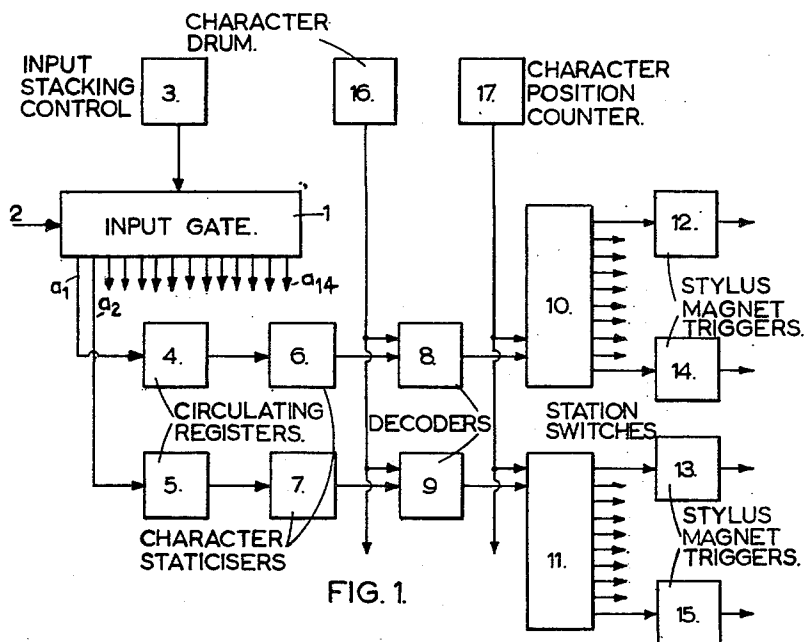
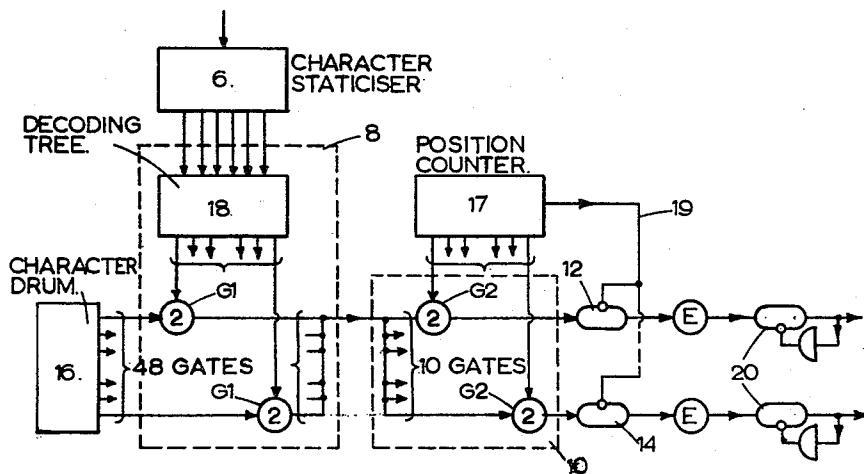
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2,939,388

ELECTRICALLY CONTROLLED MULTIPLE CHARACTER PRINTERS

Filed July 19, 1957

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

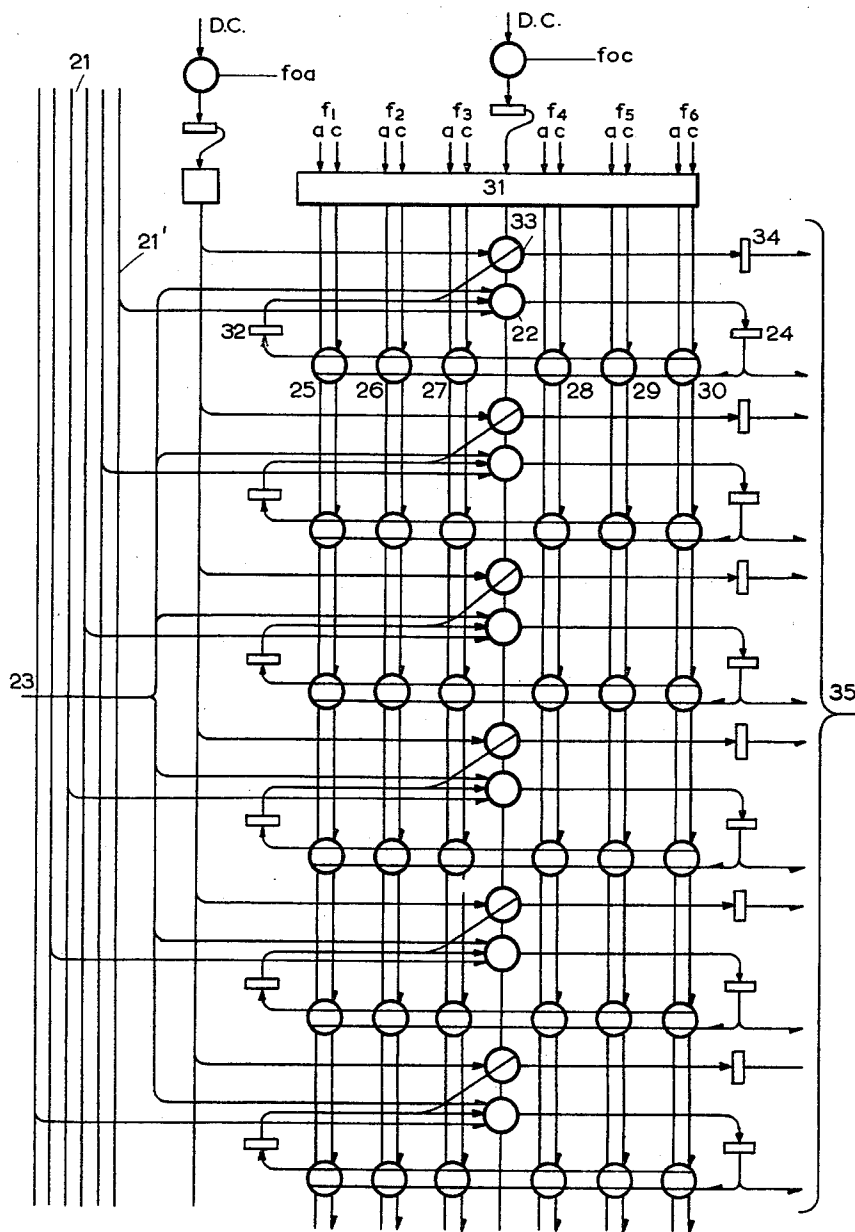


FIG. 4a.

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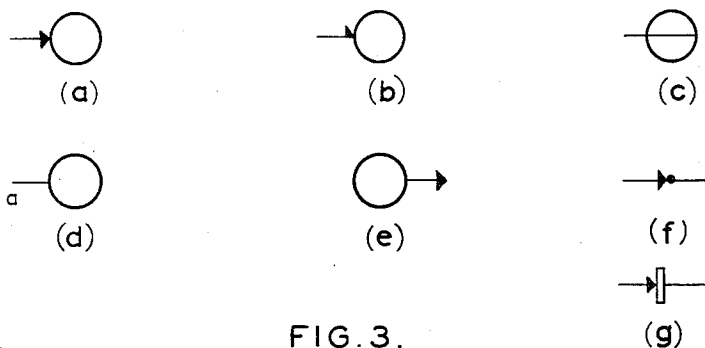


FIG. 3.

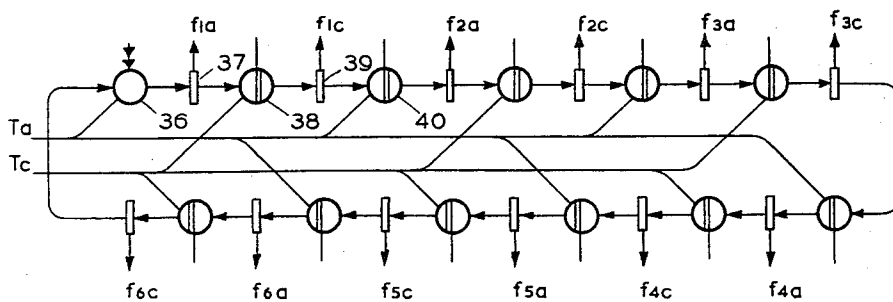


FIG. 4(b).

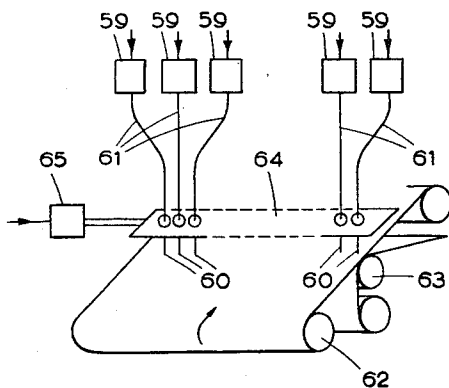


FIG. 4(d).

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ELECTRICALLY CONTROLLED MULTIPLE CHARACTER PRINTERS

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Filed July 19, 1957, Ser. No. 673,023

Claims priority, application Great Britain July 21, 1956

8 Claims. (Cl. 101—93)

This invention relates to electrically controlled multiple character printers especially though not exclusively to electrically controlled line printers.

In data handling apparatus, computing and such like, printing of the output information is a matter of some difficulty, having regard to the speed at which output information may be generated. One approach to the solution of this problem is to provide a multiple character printer, for example, one capable of printing, in each printing cycle a line of characters in the form of dot patterns. Such a line printer for printing 140 characters simultaneously in a line may employ 140 styli, one to each character position along the line, each stylus oscillating in the direction of the line during the printing of a character as hereinafter described, so that in effect each stylus scans the respective character position in a horizontal line. The movement of the paper is moreover arranged to provide a scan in a lateral direction to the movement of the styli. The printing cycle, that is the printing of a line (or character) may be divided into 360° and it is proposed that the printing of individual dots be effected by energizing magnets controlling the styli concerned at any time for 1° only, energization of a magnet causing the respective stylus to move forward and press the paper and a printing medium into contact, to print a single dot. Thus if the effective path of the stylus is divided into 360 sections a dot can be printed in any of these sections, but dots will only be printed where required to delineate the character concerned, by selectively energizing the magnet associated with said stylus in said 360 sections. However, though such a printer is capable of operating at a very high speed, the provision of means for controlling the energization of the styli magnets which is not unduly complex and costly remains a severe problem, bearing in mind that each of 140 styli may have to be controlled simultaneously in any one of 48 different ways, assuming the printer has an "alphabet" of 48 characters (including letters and numerals).

The object of the present invention is to provide an economic arrangement for controlling the operation of a line printer, such as described above, for example.

According to the present invention there is provided an electrically controlled multiple character printer comprising a plurality of styli, a platen, means for displacing said styli simultaneously with respect to said platen, storage means for storing signals representing characters to be printed, decoding means, means for cyclically applying said signals to said decoding means and means responsive to the outputs of said decoding means for applying energizing signals selectively to said styli, the cycle time of said decoding means being short compared with the description time of a character whereby a multiplicity of energizing signals may be applied to each stylus during a character description time.

In order that the invention may be clearly understood and readily carried into effect, the invention will be described with reference to the accompanying drawings in which:

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Figure 1 illustrates one example of control mechanism for a line printer according to the present invention, the printer operating generally in the manner above described, and

5 Figure 2 illustrates in more detail part of Figure 1. Reference will also be made to the figures of the accompanying drawings denoted for convenience by Figures 3 and 4 and in which:

10 Figure 3 illustrates symbols employed in Figure 4, and Figure 4, having parts (a), (b), (c) and (d), illustrates a preferred embodiment of a printer according to the present invention.

Reference 1 of Figure 1 indicates an input gate with an input 2 and a further input from an input stacking control 3. The gate 1 has 14 outputs a_1 to a_{14} to separate channels, two of which are shown, commencing with circulating registers 4 and 5 which are connected to character staticisers 6 and 7 which are in turn connected to decoders 8 and 9 and thence to station switches 10 and 11, the latter having ten outputs which are respectively applied to stylus magnet triggers, two of which are shown in each channel, namely 12, 14 and 13, 15. There is also shown a character drum 16 and character position counter 17 which are respectively connected to the decoders and station switches of each channel.

The operation of the example of Figure 1 will be described with the aid of Figure 2 which shows one channel of Figure 1 in more detail and employs the same references where suitable.

30 The information required to determine the line of characters to be printed is derived from a computer in the form of a binary code whereby each character is represented by a 6 digit word or coded character, thus allowing for a maximum representation of 64 different characters (although only 48 are used in the present case). This information is applied via input lead 2 to the input gate 1 wherein the information is directed sequentially, under the control of input stacking controls 3, to fourteen circulating registers such as 4 and 5, one for each output a , such that each register receives 60 digits, that is 10 words or coded characters, which digits are circulated until required. The 10 coded characters are applied in turn from each register to character staticisers wherein the coded characters are staticised one at a time and cause 6 signals, in each case, representative of the character to be fed to a decoding tree (reference 18, Figure 2) which generates an output in one of 48 leads dependent on which character is represented by the 6 digit word in question. This decoding tree may be of any suitable construction, such as described in U.S. patent specification No. 2,682,814, for example. These 48 leads form one set of inputs to 48 gates (reference G1, Figure 2) of threshold 2, the other set of inputs being derived from the character drum, so that if there are signals in both inputs to a gate G1 an output pulse is generated in the output leads of the gate G1. The drum is arranged to have 48 commutators along its length, each comprising conductive studs angularly disposed around the drum. Each commutator corresponds to a different character and has its conducting studs positioned to correspond to dots required for the corresponding character. The drum is rotated once during each printing cycle, that is the printing time of one line of characters or the description time of a character, and at such a rate that the 10 characters in each register may be staticised before the end of a degree of rotation of the drum. Thus, in any one degree, ten signals will be sequentially applied from the decoding tree 18 to ten of the gates G1 and if during this degree there is a conducting stud on any of the commutators connected to these gates G1 an output from the gate or gates G1 will be generated. Each degree of rotation of the drum 16, is subdivided into ten sections

each of six minutes duration (measured in terms of said rotation) since the ten characters from the staticiser 6 are applied sequentially to the gates G1. Hence in one degree if a dot is required for each of the ten characters, for example, ten outputs from gates G1 will be derived sequentially at intervals corresponding to the time of rotation of drum 16 through six minutes. The ten outputs are applied sequentially through a common lead, as shown in Figure 2, to 10 further gates (reference G2, Figure 2) of threshold 2 forming a station switch. These gates G2 are operated in conjunction with the character position counter 17 which has an input connection to each gate G2 such that the gates G2 may be selectively opened so as to direct the sequential outputs from the gates G1 to energize sequentially appropriate ones of the ten different stylus magnet trigger circuits; of which only 12 and 14 are shown, in accordance with the order in which they are derived. When all the appropriate trigger circuits in a channel have been energized; that is, after the time of one degree of rotation of drum 16, a pulse from the character position counter is applied to the lead 19 (Figure 2) so as to reset the energized trigger circuits, which resetting causes pulses to be derived from the appropriate end elements E and fire the corresponding monostable triggers 20 which energize the stylus magnets. It will be noted that the stylus magnets are energized in the degree after selection of characters and printing is thus delayed by one degree measured in terms of the rotation of the drum 16.

While printing is taking place, the stylus magnet triggers, corresponding to those of the 10 characters in the channel whose patterns necessitate dots in the following degree; are being energized. Clearly, account may be taken for this 1° delay in printing a dot when forming the drum commutators. The path of any one stylus relative to the paper on which it is required to print will be a zig zag path across that portion of the paper allocated to one character which the stylus is to print, it being arranged that the speed of vibration of the stylus relatively to the speed of movement of the paper is sufficiently great to ensure that each line of the zig zag path is only slightly inclined to the horizontal. Each zig zag path is effectively divided into 360 sections (related to the 360° of rotation of the drum 16) in each of which sections a dot can be printed if required for the delineation of the character concerned. Each line of the zig zag is arranged to contain several sections so that if a character having a horizontal limb, such as an E for example, is required to be printed a dot will be printed in most or all of the sections along one line of the zig zag to delineate the aforesaid horizontal limb. It will be appreciated that if a dot is provided in each of the 360 sections an effectively totally black area will be formed, and that considerably less than 360 dots will be required for any one character. However it is found that by allocating 360 sections in each of which a dot can, if desired, be printed any required character can be adequately delineated, and furthermore conveniently each degree of rotation of the drum 16 corresponds to a possible dot position.

It will be understood that only one channel of fourteen similar channels is described above with reference to Figure 2, each of said fourteen channels controlling the printing of 10 characters so that altogether 140 characters are printed simultaneously in each line or during each so-called printing cycle. Furthermore the ten characters in each of the circulating registers are continuously sampled by the character staticisers during each of the 360° of revolution of the drum 16 so that the ten signals, representative of ten characters applied to gates G1 in any one channel are repeatedly applied thereto, that is once in every degree of rotation of the drum 16 until said drum 16 has executed a complete revolution. After a complete revolution of the drum 16, when the complete ten characters in each channel have been printed

the circulating registers are cleared, the staticisers are restored to a datum condition and the next 140 characters are fed to the input gate 1.

In an alternative arrangement the 14 circulating registers may be replaced by a magnetic drum having one writing head and 14 reading heads, thus affording some economy in apparatus.

The embodiment of the present invention just described has the advantage that in each channel the characters to be printed are derived sequentially from the staticiser such as 6 and drum 16, thus only 14 characters are in demand at any time.

Figure 3 illustrates symbols which are employed in Figure 4, which illustrates a preferred embodiment of the invention, of which symbols:

(a) represents a magnetic core with a full strength input winding,

(b) represents a magnetic core with a half strength input winding,

(c) represents a magnetic core with a full strength inhibit winding,

(d) represents a magnetic core which is driven by an "a" pulse and

(e) represents a magnetic core with an output winding.

Naturally any combination of the above windings may be used on a single core

(f) represents a shunt combination of a register and a condenser connected between the line and a point of reference potential. The input to the arrangement is via a diode. This circuit is employed as a pulse lengthening circuit and is more fully described in co-pending United States patent application Serial No. 731,735, filed by G. N. Hounsfield on April 29, 1958. A number of input arrows to the "shaded circle" indicates a number of inputs to the circuit via separate diodes.

(g) represents a transistor amplifier operating with grounded emitter and with the output taken from the collector. The drive to this transistor is limited so that no appreciable hole storage effect is obtained.

Figure 4(a) illustrates diagrammatically an example of a store which can be used as a circulating register and staticiser in a printer in accordance with the invention. The input to the register is via six leads 21 each of which transmits one binary digit of each character, the six binary digits of one character being applied to said leads 21 simultaneously whilst all characters to be printed in one line are applied to the leads 21 sequentially during the interval corresponding to the first degree of a printing cycle. Each binary digit of a character is applied as a half strength pulse to a core. Thus considering only one of the leads, 21, that is the lead labelled 21', the digit in this lead 21' is applied to a core 22 as a half strength pulse. A second input in the form of a half strength pulse is applied to core 22 and each corresponding core from input lead 23. The pulses applied through lead 23 are denoted by f_{0a} , and consist of a repeating series of pulses $f_{1a}, f_{2a}, \dots, f_{6a}$. However as will appear from the description of Figure 4c, only one series of pulses $f_{1a} \dots f_{6a}$ is applied by the lead 23 to the cores 22 of any particular register and staticiser during any one printing cycle and namely during the first degree of that cycle. The core 22, and other corresponding cores, is driven by pulses f_{0c} , applied via a valve gating circuit 31, which consist of a repeating series of pulses $f_{1c}, f_{2c}, \dots, f_{6c}$ 180° out of phase with respect to pulses f_{0a} . Thus after the incidence of a pulse f_{0a} and a binary digit in lead 21' the core 22 produces an output when driven by the succeeding f_{0c} pulse, which output is applied at full strength to a transistor amplifier 24, one half strength output of which is laced through each of six cores 25 to 30. The pulses f_{0c} are also applied sequentially to the cores 25 to 30 via a valve gating circuit 31 so that the half strength output is stored in whichever one of the cores 25 to 30 is energized with a pulse f_{0c} . It will be appreciated that corresponding digits of

six consecutive characters will be stored in consecutive ones of the cores 25 to 30. Thus the digit in lead 21' of the first character is stored in core 25, the digit in lead 21' of the second character is stored in core 26 and so on for six characters. Likewise the digits of the same six characters in the lead 21 adjacent 21' will be stored in the next row of stores corresponding to cores 25 to 30, and so on.

The cores 25 to 30 are also driven sequentially by the pulses f_{0a} via gating circuit 31 so that during the second sequence of pulses f_{0a} and f_{0c} the digits stored in the cores 25 to 30 are sequentially applied via a transistor amplifier 32 to the core 22 at full strength and thence to transistor amplifier 24 after which they are re-stored at half strength in the same cores 25 to 30 during the pulse intervals f_{0c} and further applied to the half strength output lead of amplifier 24.

The embodiment of Figure 4 is employed in practice with phase modulated digit representation so that a "1" is a pulse during the "a" intervals and a "0" is a pulse during the "c" intervals. Clearly, as so far described, only the "1's" will be temporarily stored in core 22. As a result of this full strength f_{0a} pulses are applied to a further core 33, which core is inhibited whenever a "1" digit pulse is applied from amplifier 32 to core 22 and is set to "0" by the f_{0a} input pulse in the absence of such an inhibit input. This core 33 is driven by the f_{0c} pulses as is the core 22 to generate a "0" output digit whenever the digit is not a "1" and so no inhibit pulse is applied, said "0" output being in phase with the corresponding "1" output digit interval. The "0" output pulses are applied to a transistor amplifier 34, which amplifier produces a half strength output pulse. The remaining five leads of the leads 21 are applied to similar core arrangements as that just described so that binary digits of the first six characters are successively set up in columns of cores and applied to the cores corresponding to 22 and 33 in the similar arrangements to be re-stored and fed to the twelve store output leads denoted generally by 35, six of which leads are output leads for pulses representing "0" digits and six of which are output leads for pulses representing "1" digits. It will be appreciated that in the arrangement of Figure 4a only six characters are stored in each circulating register whereas in the embodiment described with reference to Figures 1 and 2 ten characters are stored in each such register. The circuit arrangement of Figure 4a can, of course, readily be designed to accommodate ten characters at a time if required.

The trigger pulses f_{0a} and f_{0c} may be derived in any suitable manner, such as from the circuit arrangement illustrated in Figure 4(b), for example. In Figure 4(b) clock pulses T_a and T_c , derived from the binary coded character generator, say, are applied to drive alternate ones of a closed ring of cores having transistor amplifiers intermediate each pair of adjacent cores. In the drawing three consecutive cores, namely 36, 38 and 40, are labelled and the two transistor amplifiers connected therebetween are denoted by references 37 and 39. A double strength pulse C_{LL} generated at the beginning of each line of printing, or so called printing cycle, is applied to the core 36 which is driven by a clock pulse T_a to inject a pulse into the closed ring. The core 36 is set in a pulse generating condition by C_{LL} so that when said core is driven by a clock pulse T_a it applies an output pulse of short duration equal to the duration of pulse T_a to the succeeding amplifier 37 which amplifies the output pulse to produce the pulse f_{1a} and coincidentally apply a full strength pulse to the next core 38 to set said core 38 to a pulse generating condition. The core 38 is connected to the source of clock pulses T_c and so is driven when the next pulse T_c occurs, and caused to generate an output pulse of duration equal to the duration of T_c , which output pulse is applied to the next amplifier 39 which amplifies said output pulse to produce the pulse

f_{1c} and a full strength pulse input to the following core 40 to set said core 40 to a pulse generating condition whereby a pulse is generated thereby when said core 40 is driven by the next pulse T_a , and so on around the ring. The pulses T_a and T_c are applied to alternate cores of the ring so that pulses f_{0a} and f_{0c} will be alternately generated, the series of the pulses f_{0a} being 180° out of phase with the series of pulses f_{0c} . This process is continued sequentially around the ring the pulses f_{1a} to f_{6a} and f_{1c} to f_{6c} being repeatedly generated the requisite number of times for the characters stored in the circulating registers to be staticised, decoded and applied to control the stylus magnet triggers for the printing of the whole of said characters. Thus in the embodiment of the invention described with reference to Figures 1 and 2 it will be appreciated that said characters are each required to be staticised 360 times, that is once during each one degree of rotation of the character drum 16. Hence in this example the process of generation of pulses f_{0a} and f_{0c} will be continued around the ring shown in Figure 4b 360 times after which all of the six characters stored in the stores of Figure 4a will have been printed and are required to be cleared so that a further six characters can likewise be stored during the printing of the next line. Clearing of the store is effected by arresting the application of pulses f_{0a} and f_{0c} . For this purpose the generation of pulses around the ring of Figure 4b is stopped by applying a further pulse C_{LL} which acts as a double strength inhibit pulse to all of the cores in the ring except the core 36 which it sets in its pulse generating condition and so will cause the cycle to be recommenced at the incidence of the next clock pulse T_a .

Figure 4(c) illustrates the preferred embodiment of the invention employing thirteen stores, or combined circulating registers and character staticisers, such as described with reference to Figure 4(a). The first of these stores, denoted by reference 41, is employed to store the first six characters in response to inputs from the leads 21 and 23 of Figure 4(a), timing pulses f_{0a} and f_{0c} denoted generally by the wire 42, and the "0" input pulses applied via lead 43.

The decoding of these six characters is achieved by the use of a core matrix 44 having six rows of forty eight cores all of which cores are normally set to a state termed "-1." In operation, the cores of the matrix 44 may assume one of three states termed "-1," "0" and "+1" respectively. The rows are also successively laced, as shown, with leads applying half strength pulses f_{1c} to f_{6c} and each row of cores is laced by all of the twelve output wires 35 from the store 41 selectively in such a manner that for any particular one of the 48 possible patterns of pulses appearing at one time in the twelve wires 35, one and only one of the cores in each row receives a resultant energization equivalent to a half strength pulse whereby each core in a row of cores may be considered as representing one character and the cores in each column represent the same character. This selective lacing is represented in Figure 4(c) by a single "snaking" lead passing through the cores of each row. When the pulses representing a character in six of the twelve wires 35 are applied to the rows of cores 44 only one core of each row will receive a half strength pulse and only one row of cores will have an f_{0c} pulse applied thereto at the time. Hence only one core will be changed in state, the change of the selected core being from "-1" to "0." The signals representing the six characters from the store 41 will be sent in succession to the matrix of cores 44 their period being, of course, synchronized with the period of the pulses f_{0c} which are sent in succession to the six rows of the matrix. Thus each character will cause one core in a different row to be set to "0," that is the first character will set the core corresponding thereto in the first row of cores, the second character will set the core corresponding thereto in the

second row of cores and so on until one core in each of the six rows is set to "0."

Applied to each column of cores 44 is an output lead from a character drum 45. The drum is provided with forty eight commutators along its length, each associated with one output lead and each having conducting studs thereon arranged to represent the relative positions of the dots required for the character represented by the matrix column with which that commutator is associated. As the drum 45 is rotated a pulse is applied to a column of the cores 44 whenever a conducting stud comes into line with one of the forty eight output leads from said drum 45. If any of the cores in the column to which such a pulse is applied is already set to "0" by pulses from the leads 35 these cores will be set to "1" by the pulse from the drum and will then be in a condition to generate an output pulse. The rows of the matrix 44 are driven by inputs $f_{2a} \dots f_{6a}, f_{1a}$ respectively as shown so that an output pulse from a core set to "1" is generated at the incidence of the next f_{0a} pulse applied to the row in which the core is located. Thus if a core in the first row is set to "1" an output pulse will be derived 180° measured in terms of the period of f_{0a} and f_{0c} after such setting and so on for all rows of the matrix since f_{0c} is 180° delayed relatively to f_{0a} . It will be understood that as in the arrangement of Figure 2 the cores representing the six characters will be set to "0" during each one degree of rotation of the drum 45 for which purpose the digits of these six characters are fed 360 times to the core matrix 44. However it will be set to "1" only for each degree of the drum in which there is a stud in the respective commutator.

The second group of six characters is applied to a further store 46 which operates in the same manner as the store 41 and has its twelve outputs connected to a core matrix 47 similar to the matrix 44, and so on for thirteen stores and their matrices. The successive operation of the stores and thus the setting up of the matrices is achieved by the application of a half strength pulse along a wire 23 and corresponding wires for the other stores in successive periods defined by a series of pulses f_{0c} . For this purpose double strength pulse C_{LL} which initiates the circuit of Figure 4(b) is applied to a core 48 which when driven by the f_{0c} pulses, commencing with pulse f_{1c} , generates a half strength output pulse via two parallel transistor amplifiers 49 and 50 and a pulse lengthening circuit 51, this half strength output pulse being applied to store 41 along the wire 23. This output pulse is also fed back to the core 48 as a full strength input pulse to set up the core again so that it is driven on the incidence of f_{2c} pulse to generate a second output, this being continued until an output pulse is generated in response to the f_{5c} pulse. The f_{6c} pulse is also applied to core 48 through a core 52 and via a pulse lengthening circuit 53 and transistor amplifier 54 such as to inhibit core 48 when the output pulse initiated by f_{6c} is fed back from the amplifiers 49 and 50. The pulse from the amplifier 54 is also applied as a half strength pulse to set up a further core 55. The output along wire 23 is also applied to core 55 so that this core is set up as a result of pulse f_{6c} in the first series of f_{0c} pulses. The core 55 is driven by the f_{0c} pulses in the next series, initially f_{1c} , and applies an output pulse to a pulse lengthening circuit 56 corresponding to circuit 51 but associated with the next store 46 whereby a similar sequence of six half strength pulses is applied to store 46, and so on for the thirteen successive groups of six characters. The pulse C_{LL} is applied as a double strength inhibit to the cores corresponding to 48 of each of these devices other than the first so that the printing cycle is stopped on the end of a line. This pulse C_{LL} is also applied to inhibit all the cores of the stores such as that shown in Fig. 4a, to reset amplifiers after printing of a line of characters and to condition the apparatus for initiation of a new line or printing cycle.

It will be appreciated that the characters are decoded cyclically in each core matrix, but it is arranged that the rate at which each group of characters to be printed in one line is decoded is very much faster than the rate of rotation of the character drum. Conveniently for example, it can be arranged that the characters to be printed in one line are decoded at the rate of 100,000 per second, whilst the drum is rotated at the rate of five revolutions per second. Thus in one dot printing time which is the time of 1° of rotation of the drum the characters in one line are effectively simultaneously decoded. The matrix outputs are applied to a layout switching circuit 57 via amplifiers 58 which are arranged to amplify and integrate the output pulses to form the styli energization signals required for the character dots. The circuit 57 may be arranged in any suitable manner to apply the character outputs to the styli in dependence upon the particular use of the line printer, which may include predetermined repetition of characters or groups of characters at the styli. For example if in the printing of output information it is required to print two columns of identical characters the dot printing outputs for these characters will be applied to energize two groups of styli, that is each output pulse relating to one character will be applied simultaneously to energize two different styli. The printer will, of course, previously be set up so that this or any other repetition of characters is effected. In the arrangement disclosed in Figures 4a, 4b and 4c only 78 character outputs would be produced, but obviously the number may be different, for example 140 as in Figures 1 and 2.

Figure 4(d) illustrates the operation of the styli of the printer. When a dot is required in a particular character position in a line, a control pulse is applied to the appropriate stylus control, which may be a moving coil transducer. By way of illustration five styli controls are shown, denoted by reference 59. Beneath the styli 60 a sheet of carbon paper is caused to pass from a roller 62, and beneath this carbon paper a paper sheet passes over a platen 63 immediately below the styli 60. Thus a transducer, when energized by a control pulse, displaces the associated stylus 60 downwardly, via a flexible cable connection 61, so as to impress the element of the carbon paper passing immediately below said stylus on to the paper sheet to print a dot on said paper sheet. As described above, the motion of the paper produces a scanning motion or relative transverse displacement between the paper and the individual styli in one direction (perpendicular to a line) and another scanning motion (along the line) is achieved by oscillating a guide plate 64 through which the styli pass. The oscillation may be cam operated as indicated diagrammatically at 65 and is synchronized in response to the rotation of magnetic drum store 45 so as to produce a convenient number of oscillations during the printing time for one line of characters. It has been found that 17 is a convenient number of oscillations of the styli during the printing of one line of characters having regard to the fact that the characters are required to be clearly delineated by means of dots which may be printed in any of 360 sections of the scanning line of each stylus over a character. Provision must also be made for blank spaces between lines of characters, and this is arranged to occupy a duration equal to a further 5 oscillations of the guide plate 64. Clearly, the rate of the paper feed is also synchronized in response to that of the drum 45. Furthermore it will be understood that the invention is not restricted in its application to multiple character printers in which scanning motion between the paper and the styli is achieved partly by moving the paper and partly by operating the styli. For example in some printers, a plurality of styli are provided arranged across the character positions and are fixed as to their lateral position, and relative transverse displacement between the paper and the styli is produced solely by movement of the paper. Furthermore the invention is applicable to other types of printers in which

energization of the styli is effected otherwise than by imparting a longitudinal movement to the styli. For example in some printers energization of styli is achieved by applying electrical pulses thereto.

Although the invention has been described in relation to line printers, clearly it is not limited thereby and may be applied to any electrically controlled printer for printing multiple character lay-outs.

What I claim is:

1. An electrically controlled multiple character printer comprising a plurality of styli, a platen for supporting a medium on which characters are required to be printed, means for producing relative displacement between said styli and said medium simultaneously, storage means for storing signals representing characters to be printed, decoding means, means for applying said signals to said decoding means in a repetitive cycle, and means responsive to the outputs of said decoding means for applying energizing signals selectively to said styli, the cycle time of said decoding means being short compared with the description time of a character whereby said signals representing characters to be printed are applied to said decoding means a plurality of times during a character description time.

2. A printer according to claim 1, comprising individual means for each stylus for moving the respective stylus longitudinally towards said platen in response to an energizing signal, the stylus being normally withdrawn from the platen in the absence of an energizing signal.

3. A printer according to claim 1 wherein said decoding means comprises a magnetic core matrix.

4. A printer according to claim 1 wherein said storage means comprises a static magnetic core register.

5. A printer according to claim 1 in which said storage means comprises a plurality of individual group stores for storing in groups signals representing characters to be printed in a line, means for sequentially applying to said group stores signals representing characters to be printed in a line, and said decoding means comprises a character store for storing representations of a plurality of predetermined characters, and a plurality of decoding elements, one for each group store and includes means to select bits of character representations from said character store in response to signals from the respective group store, and temporary stores for storing said bits before energisation of said styli.

6. A printer according to claim 5 wherein said character store comprises a magnetic drum store.

7. An electrically controlled multiple character printer comprising a plurality of styli, one for each character position, a platen for supporting a medium on which characters are required to be printed, means for producing relative displacement between each stylus and said medium simultaneously in two directions to cause each stylus to scan the respective character position, storage means for storing signals representing characters to be printed, decoding means, means for applying said signals to said decoding means in a repetitive cycle, and means responsive to the outputs of said decoding means for applying energizing signals selectively to said styli, the cycle time of said decoding means being short compared with the description time of a character whereby said signals representing characters to be printed are applied to said decoding means a plurality of times during a character description time.

8. An electrically controlled multiple character printer comprising a plurality of styli, a platen for supporting a medium on which characters are required to be printed, means for producing relative displacement between said styli and said medium simultaneously, storage means for storing signals representing characters to be printed, a plurality of staticising means each corresponding to a different stylus, decoding means associated with said staticising means, means for sequentially conditioning said staticising means in response to said storage means during a cycle of said decoding means to apply said signals to said decoding means in a repetitive cycle, and means for restoring said staticising means simultaneously to a datum condition before the next cycle of said decoding means to produce the energizing signals for said styli, the cycle time of said decoding means being short compared with the description time of a character whereby said signals representing characters to be printed are applied to said decoding means a plurality of times during a character description time.

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