

Aug. 18, 1970

R. C. PEYTON

3,524,528

PRINTER PAPER FEED CONTROL SYSTEM

Filed June 29, 1967

4 Sheets-Sheet 1

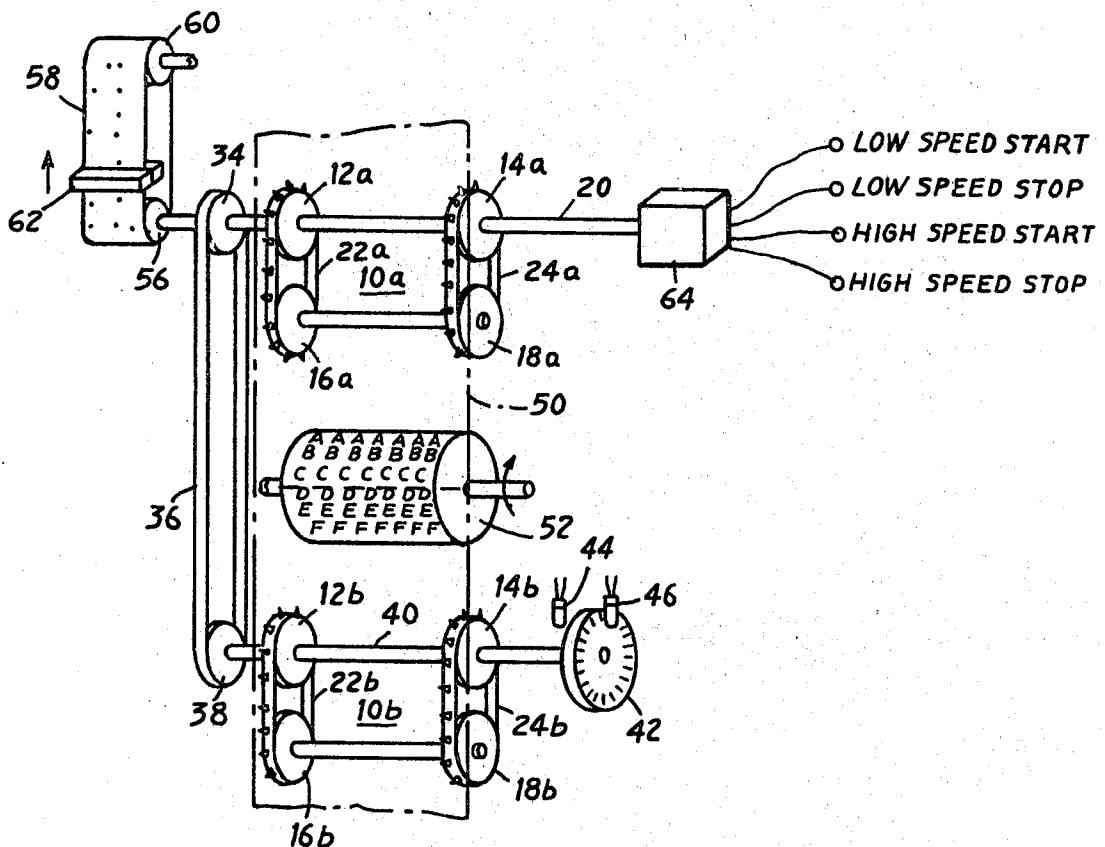


Fig. 1

INVENTOR

ROBERT C. PEYTON

BY *H. Christoffensen*

ATTORNEY

Aug. 18, 1970

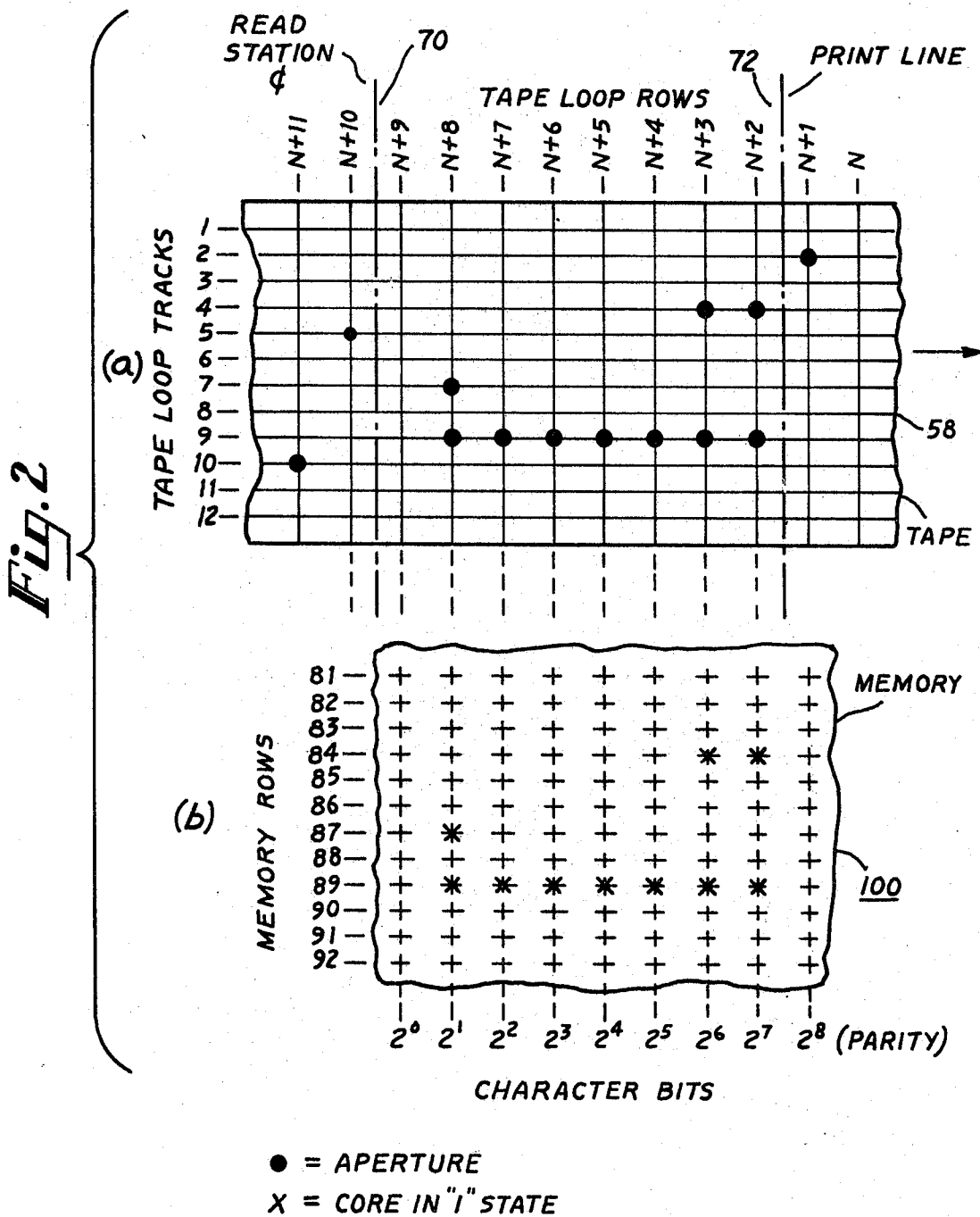
R. C. PEYTON

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4 Sheets-Sheet 2



INVENTOR

ROBERT C. PEYTON

BY *H. Christofferson*
ATTORNEY

Aug. 18, 1970

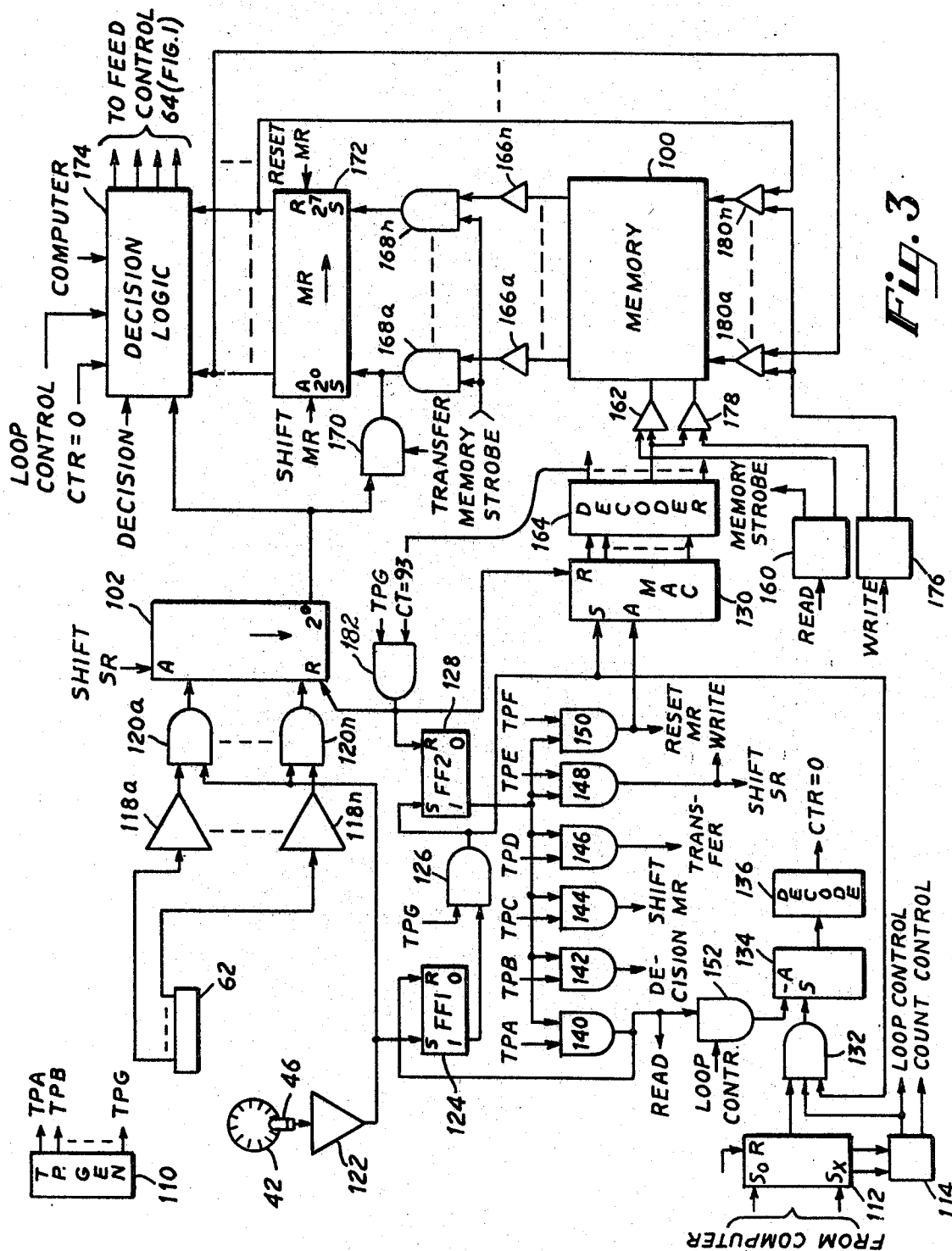
R. C. PEYTON

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PRINTER PAPER FEED CONTROL SYSTEM

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4 Sheets-Sheet 3



INVENTOR

ROBERT C. PEYTON

BY H. Christofferson
ATTORNEY

Aug. 18, 1970

R. C. PEYTON

3,524,528

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4 Sheets-Sheet 4

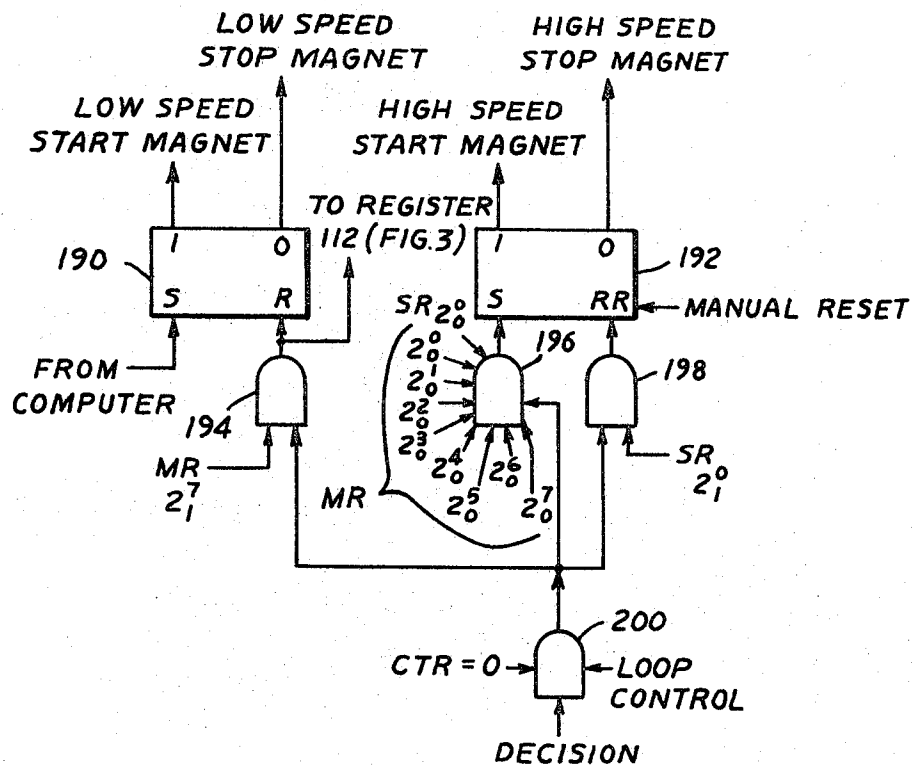


Fig. 4

INVENTOR

ROBERT C. PEYTON

BY H. Christoffersen
ATTORNEY

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3,524,528

PRINTER PAPER FEED CONTROL SYSTEM
Robert C. Peyton, North Palm Beach, Fla., assignor to
RCA Corporation, a corporation of Delaware
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U.S. Cl. 197-133 12 Claims

ABSTRACT OF THE DISCLOSURE

Disclosed herein is a system for controlling the feeding and positioning of paper, forms or the like in a printer. Information for controlling paper feed is recorded in rows on an endless belt, and the belt is moved past a sensing station in synchronism with the movement of paper through a print station. In general, each row on the belt corresponds to a different possible print line on the paper. The sensing station reads a row which is several rows in advance of the row corresponding to the line of the paper at the print station. The intervening several rows of belt information are stored in a memory, and the memory contents are changed and updated by the output of the sensing station. Signals for controlling both the speed of paper feed and the stopping thereof are generated in response to the information stored in the memory.

BACKGROUND OF THE INVENTION

Many printer systems make use of a pre-punched paper tape loop to control paper advance. Such a loop has several lengthwise tracks and a plurality of rows, perpendicular to the tracks. A perforation may be punched at the intersection of any row and track. The tape loop is fed through a perforation sensing station in synchronism with the advancement of the paper through the print station, and the paper advances an amount equal to the distance between two successive print lines as the tape moves an amount equal to the distance between two successive rows. Thus, the paper may be advanced to a preselected line by moving the paper until a hole punched in a selected track and in the corresponding row of the tape is sensed at the sensing station.

It often is desired to employ a two speed paper advance, e.g. a slow speed for advancing paper a short distance and a high speed for skipping a long section of paper. In that event, some type of "look ahead" technique must be employed to scan an advance section of the tape loop to determine if the paper is to be moved a sufficient length to allow feeding at the high speed rate. A second, advance sensing station often is used for this purpose. However, the use of a second station introduces complexities into the system and is not without certain inherent limitations.

Further, paper motion does not cease instantaneously upon receipt of a stop signal. Due to inertia, some small length of paper passes the print station during the stopping interval. In order to maintain this length constant, thereby to properly position the paper under all conditions, the paper always must be moving at the same velocity whenever a stop signal is received. In a two speed system, this requires that paper advance be switched from the high speed rate to the low speed rate sometime before the stop signal is generated. In turn, this requirement imposes an additional burden on the control system, and this burden is not easily met by the "look ahead" sensing station and its associated electronics.

BRIEF SUMMARY OF THE INVENTION

In apparatus embodying the invention, only a single sensing station is employed, and this station is located to read a row of the tape loop which is several rows in ad-

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vance of the row corresponding to the paper line present at the print station. Data representing the information contained in the several intervening rows on the tape loop are stored in a memory, preferably in an image form, and the output of the sense station updates the contents of the memory when the tape loop is advanced. Data in the memory corresponding to that in a selected track of the tape loop are sampled to determine whether the paper will be advanced at high speed or at low speed, and also to control the generation of the stop signal.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing, like reference characters denote like components; and

FIG. 1 is a perspective view of a portion of a printer system employing a tape loop for controlling the advancement of paper;

FIG. 2(a) is a view of a section of the tape loop, and FIG. 2(b) is a view representing a portion of a memory for storing the information contained in a section of the tape loop;

FIG. 3 is a logic diagram of the paper advance control system; and

FIG. 4 is a logic diagram of the Decision Logic employed in the control system.

DETAILED DESCRIPTION OF THE INVENTION

The mechanical portion of a representative printer system is illustrated in FIG. 1. This system includes two sets of paper tractors 10a, 10b. Tractor set 10a includes first and second wheels 12a, 14a mounted on a rotatable shaft 20 and arranged to drive idler wheels 16a and 18a, respectively, by means of sprocket belts 22a and 24a, respectively. Tractor assembly 10b is similar to assembly 10a, and like components therein are designated by the same reference numerals followed by the alphabetic character "b."

A pulley 34 is mounted on shaft 20 and drives a belt 36 when shaft 20 is rotated. Belt 36, in turn, drives a pulley 38 which is fixed on the lower tractor drive shaft 40. Thus, when shaft 20 is rotated, wheels 12a and 14a are driven directly, and shaft 40 is driven by way of the pulley assembly to rotate wheels 12b and 14b in the lower tractor assembly. Also mounted on shaft 40 is a timing disc 42 which has a ring of slots therein. A light source 44 is located on one side of the disc 42 and a photo-sensitive device 46 is located on the other side opposite the light source. Timing pulses are generated as the disc 42 rotates and the apertures or slots therein pass between the light source 44 and photosensitive device 46.

The paper 50 to be printed has a series of apertures along both side edges which are engaged by the sprocket teeth on the belts 22a, 22b, 24a, 24b and driven thereby as shaft 20 is rotated. The paper may be of the so-called "fan-fold" type and may be perforated at regular intervals in a direction normal to the sides thereof to define easily separable business forms or the like. The slots on timing disc 42 are spaced so that a different timing pulse is generated as each different possible print line on the paper is presented to the print station. The print station includes a type carrier, illustrated as a font drum 52, located between the tractor assemblies and on the rear side of the paper 50. On the front side of the paper is located the ribbon and hammer assemblies (not shown for clarity of drawing).

Also mounted on shaft 20 for rotation thereby is a first roller 56. A prerecorded web 58, which may be, for example, an endless paper tape loop having perforations therein, is driven by roller 56 and, in turn, drives an idler roller 60. A sensing station 62 is positioned to sense perforations (or other type of recording) in the tape loop 58 a row at

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a time. This sensing station may be, for example, a photo-sensitive electric reader having one photo-sensitive transducer for each recording track on the tape loop 58.

Rotation of the shaft 20, as well as the speed of rotation, is controlled by a mechanism illustrated by box 64. In the present system, it is desired that the paper be advanced at high speed whenever the paper is to be advanced more than a predetermined amount, and that it be advanced at low speed for shorter distances. One type of mechanism suitable for this purpose is a hydraulic drive mechanism such as that described in Pat. No. 2,880,838. Briefly stated, such a mechanism includes a hydraulic motor which may be connected to the shaft 20, and which mechanism has first and second hydraulic pumps controlled by a plurality of magnets. Such a mechanism for example may have a slow speed start magnet, a slow speed stop magnet, a high speed start magnet, and a high speed stop magnet. Shaft 20 is rotated at high speed when both the slow speed and high speed start magnets are energized and the slow speed and high speed stop magnets are de-energized. Shaft 20 is rotated at slow speed when the slow speed start magnet and high speed stop magnet are energized and the slow speed stop magnet and high speed start magnet are de-energized. No drive is imparted to the shaft 20 when the two stop magnets are energized and the two start magnets are de-energized. The source of signals for controlling these magnets will be described in detail hereinafter.

FIG. 2(a) is an enlarged view of a section of the tape loop 58, in which the tape loop is laid out with its recording tracks along the horizontal direction rather than along the vertical as in FIG. 1. The tape loop is illustrated as having twelve recording tracks parallel to the direction of tape movement. In addition, the tape has a plurality of equally spaced rows, normal to the tracks, of possible perforation or other recording positions. Generally, the number of rows is equal to the number of possible print lines on the paper form being printed, and the rows are so spaced that successive rows pass the sensing station at the same rate that successive print lines on the paper are presented to the printing station. An aperture may be punched at the intersection of any row and track, and it is these apertures which are used in controlling paper advancing and positioning.

A different tape loop may be used with each different type of print form, and the pattern of apertures is punched in accordance with the format of the form being printed. By way of example only, one track may contain an aperture located to indicate that the bottom of a form is approaching the print station. Another track may contain an aperture located to indicate that the top of a next form is moving into the print station, and a further track may contain a perforation to indicate where the first line is to be printed, etc.

In the present system, the sensing station is located so as to read a row which is several rows in advance of the row corresponding to the line on the paper present at the print station. In FIG. 2(a), line 70 is the centerline of the sensing station. If the sensing station were located so as to read the tape row corresponding to the line of the paper at the print station, the sensing station centerline would coincide instead with phantom line 72. Thus, it may be seen that the sensing station is located so as to read the tape eight rows ahead of the row corresponding to the line of the paper at the print station.

The information recorded in the intervening rows of the tape, i.e. rows $N+2$ through $N+9$ are stored in a high speed memory which may be, for example, a section of the printer memory. This memory is assumed to be one which is addressable a character at a time and in which the character length is nine bits, i.e. eight information bits plus a parity bit. It is the character length which determines the maximum number of tape rows by which the sensing station is advanced relative to line 72.

The memory section 100 allotted for storing tape loop

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data is shown in FIG. 2(b). This section has twelve rows 81, 82 . . . 92 of storage positions corresponding to tape tracks 1 . . . 12, respectively. In addition, there are nine columns, for normally storing eight bit characters plus parity. Here, however, each column of storage except the 2⁸ column stores the information for a different row of the tape loop, and the tape loop data preferably is stored in image form in the memory. An aperture in the tape loop is represented by a binary "1" bit stored in the memory. The 2⁸ column bits may be used for parity of the stored data, if so desired.

Assume that the tape loop 58 is at rest, having been stopped under control of the aperture in row $N+1$ and track 2 of the tape. As mentioned previously, the paper and tape loop cannot stop instantaneously due to inertia, hence the short overtravel condition indicated in FIG. 2(a). The sensing station has just read row $N+9$. Hence, it is the data in rows $N+2$ through $N+9$, inclusive, which must be stored in the memory 100, and the pattern of stored "1" bits for this position of the tape loop is illustrated in FIG. 2(b). Of course, the contents of this memory must be updated when the tape loop (and printer paper) is advanced so that the memory always stores the information in the last eight rows of tape read by the sensing station. The logic for accomplishing this and for using the memory data to govern paper advance and stopping is illustrated in FIG. 3.

In the upper left corner of FIG. 3 is a timing pulse generator 110 which has a plurality of output leads TPA . . . TPG which are energized successively and repetitively in non-overlapping fashion. These timing pulses may be generated, for example, by a crystal oscillator driving a tapped delay line, in which each of a plurality of two input coincidence gates has its different inputs connected to different taps on the delay line and has its output connected to a different one of the leads TPA . . . TPG. The sequences of timing pulses are generated at a much higher rate than the strobe pulses generated by the timing disc 42 (FIG. 1). In particular, at least twelve complete sequences of timing pulses must be generated for each timing pulse produced by the timing disc 42.

When it is desired to advance the paper, a computer or other printer controller (not shown) energizes the low speed start magnet in the paper drive mechanism 64 (FIG. 1) and also transmits a coded instruction to a register 112 (FIG. 3). This instruction includes a binary number which designates the track on the tape loop which is to be used for controlling the paper advance, assuming that the tape loop is to be used for this operation, and contains also information denoting whether paper advance is to be under tape loop control or under count control. This latter data is fed from register 112 to a decoder 114 which has two output lines. If paper advance is to be under loop control, the output lines labeled "loop control" is energized. This is the only type of control which will be described in detail here.

As the tape loop 58 passes through the sensing station 62, the next row of tape information (e.g. row $N+10$ of FIG. 2(a)) is sensed, amplified by a set of amplifiers 118a . . . 118n and applied to one input of each of a set of coincidence gates 120a . . . 120n. Since the paper also is being moved at this time, timing disc 42 is rotating. The first sensed slot in the timing disc causes the pickup device 46 to generate a signal which is amplified by amplifier 122. The output of this amplifier sets a first flip-flop 124 and also enables the second input of each of the set of gates 120a . . . 120n, whereby the row $N+10$ information is read into a shift register 102.

Once the flip-flop 124 becomes set, a sequence of events takes place as follows. The next occurring TPG timing pulse fully enables a gate 126, and the output thereof sets a second flip-flop 128. In addition, the output of this gate 126 sets a memory address counter 130 to the count or address of the first character in memory 100

which stores tape loop information. For the memory addresses indicated in FIG. 2(b), the memory address counter 130 is set initially to a count of 81. Further, the output of gate 126, together with the loop control output level of decoder 114 fully enables a set of coincidence gates (only one shown) 132 to transfer the selected track designating number from register 112 to a binary down counter 134. The output of this counter is fed to a decoder 136, which produces a signal on its single output lead when the counter 134 has been triggered down to a count of zero.

When second flip-flop 128 becomes set, its (1) output primes one input of each of a set of gates 140 . . . 150. The next occurring TPA timing pulse fully enables gate 140, and the output thereof then (1) resets first flip-flop 124, (2) enables a gate 152 to trigger the counter 134 one count in the downward direction and (3) sends a signal to a box 160 for initiating a memory read-out cycle. Box 160, which may be a pair of one shots has two outputs. The first output is applied to each of a set of read address strobe amplifiers 162, one for each row in memory 100. Each of these amplifiers 162 has a second input connected to a different output of an address decoder 164, whereby only the amplifier for the memory row designated by the address counter 130 passes a signal at this time. Since address counter 130 stores a count of 81 at this time, row 81 corresponding to tape track 1 is read out of memory 100. This row of data is amplified by amplifiers 166a . . . 166n and supplied to a set of gates 168a . . . 168n, which are strobed at the proper time by a second output of read control unit 160. The information then is gated into the stages of a shift type memory register 172.

The next timing pulse TPB fully enables gate 142, whereupon a signal is sent to a decision logic unit 174. This unit, illustrated in FIG. 4 and to be described in detail hereinafter, also receives the outputs from all of the memory register 172 stages, the loop control level from decoder 114, the output of decoder 136, and the output from the 2⁰ stage of shift register 102. The latter stage stores the information read from row N+10, loop track 1 at this time. The operation of the counter 134 described previously is such that the counter reaches a count of zero only when the row of data stored in the memory register 172 corresponds to the tape loop track which has been designated by the computer for control of paper advance, and the decision logic only is operative at that time to sample the data stored in the memory register for decision making purposes.

At the next timing pulse TPC, gate 144 becomes fully enabled, and the output thereof is applied to the advance (A) input terminal of the memory register 172 to shift the information therein one bit position to the right. At timing pulse TPD, gate 146 becomes fully enabled and its output fully enables a gate 170, which transfers the information in the 2⁰ stage of shift register 102 into the 2⁰ stage of the memory register 172. By this means, the original information stored in row 81 of the memory is shifted one place to the right (the 2⁷ bit is shifted out of the register 172) and the bit for row N+10, track 1 of the tape is read into the 2⁰ bit position. Thus, the information for memory location 81 has been updated in the 2⁰ bit position by the new information read from track 1 of the tape loop.

The TPE timing pulse fully enables a gate 148. The output thereof is applied (1) to the advance terminal of the shift register 102 to shift the information therein one place (the track information for row N+10, track 2 then is stored in a 2⁰ stage), and (2) to write control 176. One output of control 176 is applied to a set of write address strobe amplifiers 178 for memory 100, and a second output is applied to a set of strobed write-in amplifiers 180a . . . 180n. The updated contents of the memory register 172 then is passed through the strobe amplifiers 180a . . . 180n and written into the memory 100 in the row (81) designated by the count in memory

address counter 130. This is the same row from which the data originally was read out of the memory, since the counter 130 has not yet been advanced. At TPF, gate 150 becomes fully enabled and the output thereof advances the count in memory address counter 130 one count (to 82). The output of gate 150 also resets memory register 172.

The TPG timing pulse does not enable previously mentioned gate 126, inasmuch as the first flip-flop 124 is in the reset state at this time. The TPG pulse, however, is applied to one input to a further gate 182, the second input of which is enabled by the output of decoder 164 only when the address counter 130 is storing the count 93. Accordingly, this gate 182 does not become fully enabled at this time.

The timing pulse generator 10 runs continuously, and the sequence of events just described is repeated eleven more times. Each time, a new row of data is read out of the memory 100 to the memory register 172, sampled by the decision logic 174 if counter 134 is storing a count of zero, the contents of the memory register is shifted one position to the right, updated by the output of shift register 102, and the updated contents of the memory register 174 then is read back into the memory. At timing pulse TPF of the twelfth set of timing pulses (one set is allocated for each of the rows 81 . . . 92 of the memory 100) the memory address counter 130 is triggered to a count of 93. A first input to gate 182 then is enabled by the output of decoder 164. The following TPG timing pulse fully enables gate 182, whereupon the shift register 102 is cleared, memory address counter 130 is reset, and the second flip-flop 128 becomes reset. The priming signal for all of the gates 140 . . . 150 then is removed and no further operations are performed in the logic circuit until the first flip-flop 124 again becomes set, i.e. by the sensing of the next slot in timing disc 42.

At this time, the memory 100 contents have been completely updated by the row of information last read by the sensing station 62. By way of example, and referring to FIG. 2, if row N+10 was read by the reading station during paper and tape loop advance, memory 100 now stores in image form the information for tape loop rows N+3 through N+10, whereas prior to tape loop advance the memory stored the row information for rows N+2 through N+9. Thus, it may be seen that the memory always stores the information for the last eight rows which have been read by the sensing station.

If no decision has been made to stop the paper and tape loop advance, timing disc 42 continues to rotate and a second slot on the disc passes between the light source and a pickup device 46. First flip-flop 124 then becomes set again and a second series of events are generated which are the same as those described above. At the end of the second complete set of events, memory 100 will be storing the tape loop information for rows N+4 through N+11. This operation continues until such time as a decision has been made to stop the printer paper and paper tape loop advance.

Details of the Decision Logic unit 174 are illustrated in FIG. 4. This unit includes a first flip-flop 190 for controlling the low speed start and stop magnets in the drive mechanism 64 (FIG. 1), and a second flip-flop 192 for controlling the high speed start and stop magnets. Three multi-input coincidence gates 194, 196, 198 have their outputs connected at the reset input of flip-flop 190 and the set and reset inputs of flip-flop 192, respectively. In turn, each of these gates has one input connected to the output of a fourth coincidence gate 200. In addition, flip-flop 192 may be reset manually.

Flip-flop 190 is set directly by the computer or printer controller (not shown) whenever a decision is made to advance the printer paper. The low speed start magnet then becomes energized, and shaft 20 (FIG. 1) is rotated at the low speed rate. Note that paper advance always commences at low speed. Thereafter, the states of the

several magnets can only be changed by fully enabling one of the coincidence gates 194, 196, 198, and this requires, inter alia, that fourth gate 200 be fully enabled.

Fourth gate 200 has three inputs, and this gate is fully enabled only upon coincidence of (1) an output from decoder 114 (FIG. 3) indicating tape loop control operation, (2) an output from decoder 136 (FIG. 3) indicating that the memory register 172 is storing the row of memory 100 data for the tape track selected for control, and (3) an output from gate 142 (FIG. 3). The other inputs to any gate 194, 196, 198 also must be energized at this time in order for that gate to control its associated flip-flop, and these inputs are chosen in dependence upon the criteria established for high speed advances, etc.

By way of example, assume the following criteria for control. First, the tape loop and paper will be advanced at the high speed rate only if the paper is to be moved through at least ten lines. For the situation given in FIG. 2(a), this means that advance at high speed will be used only if there are no apertures in rows $N+2$ through $N+10$ of the selected tape loop track. It will be recalled that the data for rows $N+2$ through $N+9$ is stored in memory 100. However, once the paper and tape loop advance commences, the data for tape row $N+10$ is sensed and read into shift register 102 (FIG. 3). One output of each of the stages of memory register 172 and the 2⁰ stage of shift register 102 are applied to the inputs of gate 196 (FIG. 4). If all of these stages are in the reset state when gate 200 becomes fully enabled, gate 196 will be fully enabled and flip-flop 192 will become set. The (1) output thereof then will energize the high speed start magnet. For the conditions shown in FIG. 2(a), this high speed advance signal will be generated only if one of the tracks 1, 2, 3, 6, 8, 10, 11 or 12 is selected for control. If any of the other tracks 4, 5, 7 or 9 is selected, at least one binary "1" bit will be stored in a memory register 174 stage or in the 2⁰ stage of the shift register 102, whereby gate 196 (FIG. 4) will not become fully enabled to set the flip-flop.

As a second criterion, let it be desired to switch from high speed advance to low speed advance nine lines before stopping the paper. The memory 100 stores the first eight advance rows of tape data. Thus, the ninth row is the row next read at sensing station 62, and it is this row of data which is read into shift register 102 (FIG. 3) during paper advance. The output of the 2⁰ stage of this register is applied to gate 198 (FIG. 4). If this tape row contains an aperture in the selected track, gate 198 will become fully enabled when gate 200 becomes fully enabled, and flip-flop 192 will become reset. The high speed stop magnet thereupon becomes energized, the high speed start magnet becomes deenergized and paper advance is switched from the high speed rate to the low speed rate.

The last criterion for control is that paper advance shall terminate when the selected track of the tape loop has an aperture in the row corresponding to the line of the paper presented to the print station. For the conditions shown in FIG. 2(a), this means that paper advance shall terminate if the selected track has an aperture in row $N+2$. Note that the row $N+2$ data is stored in the 2⁷ column of memory 100 (FIG. 2(b)). Thus, the output of the 2⁷ stage of memory register 172 (FIG. 3) is applied as an input to gate 194 (FIG. 4). If this register stage is storing a binary "1" bit when gate 200 becomes fully enabled, gate 194 will reset flip-flop 190. Thereupon, the low speed stop magnet will become energized, the low speed start magnet will become de-energized, and paper advance will terminate. The output of gate 194 also may be used to reset the register 112 (FIG. 3).

From the foregoing discussion, it will be apparent that there is some flexibility in choosing the criteria for control, and it is only necessary to select the proper inputs to gates 194 and 196, consistent with the capabilities of the system, to satisfy the criteria established. Further, although the invention has been described as one for con-

trolling the advancing and positioning of paper relative to a print station, it should be understood that the invention also has application in systems wherein the recording medium is other than paper and the recording station is other than a printer.

Although only the loop control operation of paper advance has been described in detail, it should be mentioned that many printer systems intermix count control and loop control operations. That is to say, the paper may be advanced under count control at one time and under loop control at another time. Even when the paper is being advanced under count control, it is necessary to maintain an undated image of the tape loop section in the memory for later use when loop control operation is requested. It may be seen that the logic of FIG. 3 always performs this updating function unconditionally. In count control operation, however, no loop control level is supplied to the decision logic 174, and the contents of memory register 172, therefore, are not examined, since the decisions to slow and stop the paper are not under control of the tape loop data.

What is claimed is:

1. The combination comprising:

signal responsive drive means for selectively advancing, in synchronism, a recording medium and a control web having more than N parallel rows of possible information recording locations;

a read station for reading said web as said web is advanced;

memory means responsive to the outputs of said read station for recording, in its entirety, the information recorded in the N rows of the web last read at said read station, where N is an integer greater than one and less than the total number of rows on said web; and

means, including means for sensing a given portion of the information which is stored in said memory means, for supplying control signals to said drive means for slowing down said drive means immediately prior to the time the recording means reaches the position at which printing is to start and for then stopping the drive means when the recording means is at said position.

2. The combination comprising:

signal responsive drive means for selectively advancing a recording medium past a recording station;

means for advancing a prerecorded control web in synchronism with said recording medium, said web having a plurality X of tracks along the direction of web advance, and a plurality of more than N rows normal to said tracks, each intersection of a row and track defining a possible recording location for a bit of information and each row on said web corresponding with a different possible recording line on said recording medium;

a read station located to read a row on said web which is N rows in advance of the row corresponding to the recording line at said recording station, where N is an integer greater than one and less than the total number of rows on said web;

memory means responsive to the outputs of said read station for recording in its entirety, the N rows of information last read at said read station; and means including means for sensing a given portion of the information stored in said memory means for supplying control signals to said drive means for slowing down said drive means immediately prior to the time the recording means reaches the position at which printing is to start and for then stopping the drive means when the recording means is at said position.

3. In the combination as claimed in claim 2, said memory means comprising at least X rows and N columns of data storage elements in which is stored the information from the X tracks and last N rows of said control

web read at said read station, each row of memory elements storing the information read from a different track on the web and each column of memory elements storing the information read from a different one of said last N web rows.

4. The combination as claimed in claim 3, including: means for reading out the information stored in said memory elements a row at a time as said web advanced; means for updating each row of information read out in accordance with the information read by said read station from the corresponding track and next row of said web; and means for writing an updated information back into a row of said memory elements.

5. The combination as claimed in claim 4, further including means making said sensing means operative only after the said given portion of stored information which is stored in one memory row in read out of that row of memory elements and before it is written back into a row of memory elements.

6. The combination as claimed in claim 5, wherein said sensing means includes means for sensing that output of the read station for the next row and the track corresponding to the row of memory elements being read out.

7. The combination as claimed in claim 3, including a shift type memory register; means for reading out the information stored in said memory elements a row at a time to said register; means for shifting the information in said register one bit position toward one end of the register; means for reading that output of the sensing station for the corresponding track and next web row into the stage at the other end of the register; and means for transferring the information in said register back into the row of memory elements from which it was read out prior to the time another row of information is read out.

8. The combination as claimed in 7, including means coupling said sensing means to the outputs of at least some of the stages in said register, and further including means for rendering said sensing means operative only when a selected one of the rows of memory information is stored in said register.

9. The combination as claimed in claim 8, including means coupling said sensing means to that output of the read station for the web track which corresponds to the row of memory elements whose information is in said register.

10. In a printer, in combination:

a recording medium onto which information can be printed at the portion thereof in a print position; an endless web storing, along its length, information which may be employed to ascertain when the speed of movement of the recording medium is to be reduced and the locations on said recording medium at which it is desired to start to print successive lines of information;

means for driving, in synchronism, said recording medium and web;

solely a single read station for the entire web in operative relationship with said web;

a memory coupled to said read station for continuous-

ly storing, as said web and recording medium move, the information on a restricted region of said web, which region corresponds to a portion of the recording medium extending from the print position to at least several lines ahead of the print position; and means including means responsive to the information stored in said memory for slowing down said drive means when the desired portion of said recording medium reaches a point a predetermined distance from its print position and for stopping said drive means when said desired portion of said recording medium reaches said print position.

11. The combination as claimed in claim 10 including means for reading out the information stored in said memory as new information is read by said read station, means for temporarily storing said read out information, means for updating said temporarily stored information with the new information, and means for writing said updated information back into said memory.

12. In a printer:

a recording medium onto which information can be printed at the portion thereof in a print position; an endless web storing, along its length, information as the locations on said recording medium at which it is desired to start to print successive rows of information;

means for driving, in synchronism, said recording medium and web;

solely a single read station for the entire web for reading the information on said web corresponding to a portion of the recording medium several lines ahead of the portion of said recording medium in said print position;

a memory coupled to said read station for storing said information on said web located between the region of the web being read and the region of the web corresponding to the portion of the recording medium in said print position; and

means including means responsive to the information stored in said memory for slowing down the drive means when the desired portion of said recording medium reaches a position close to that at which printing is to start and, when the desired portion of said recording medium reaches the said printing position, for stopping said drive means.

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PAUL J. HENON, Primary Examiner

P. R. WOODS, Assistant Examiner

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197—20; 340—172.5

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,524,528

Dated August 18, 1970

Inventor(x) Robert C. Peyton

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 31, "is" should read ---in---. Column 6, line 16, the reference numeral "10" should read ---110---. Column 8, line 13, "undated" should read ---updated---. Column 9, line 8, after web insert ---is---; line 12, "a" should read ---the---; line 37, after in insert ---claim---. Column 10, line 24, after as insert ---to---.

SIGNED AND
SEALED
MAR 2 1971

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents