

Sept. 10, 1968

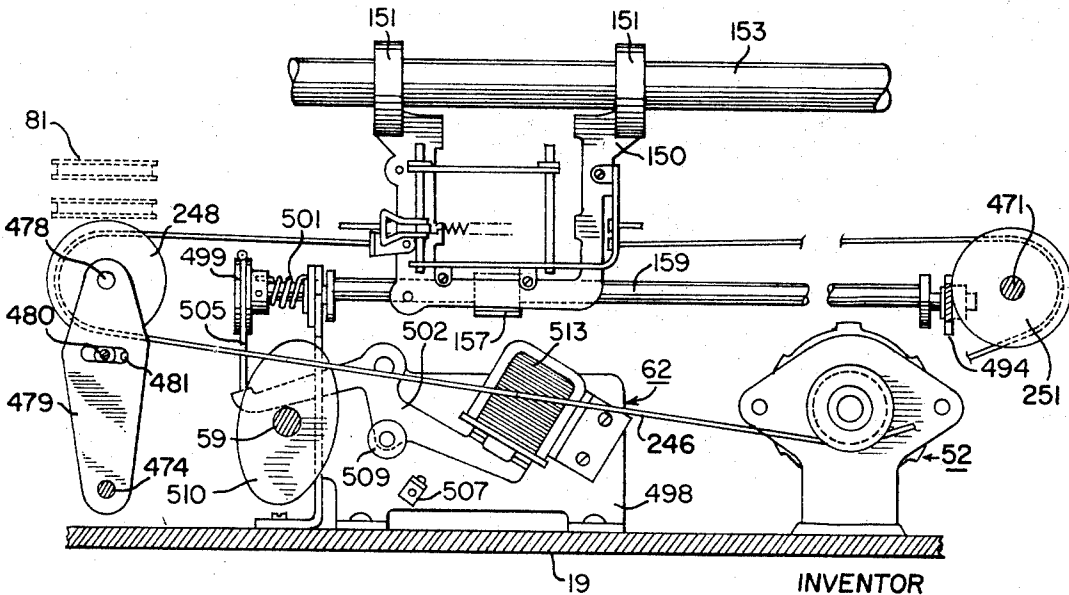
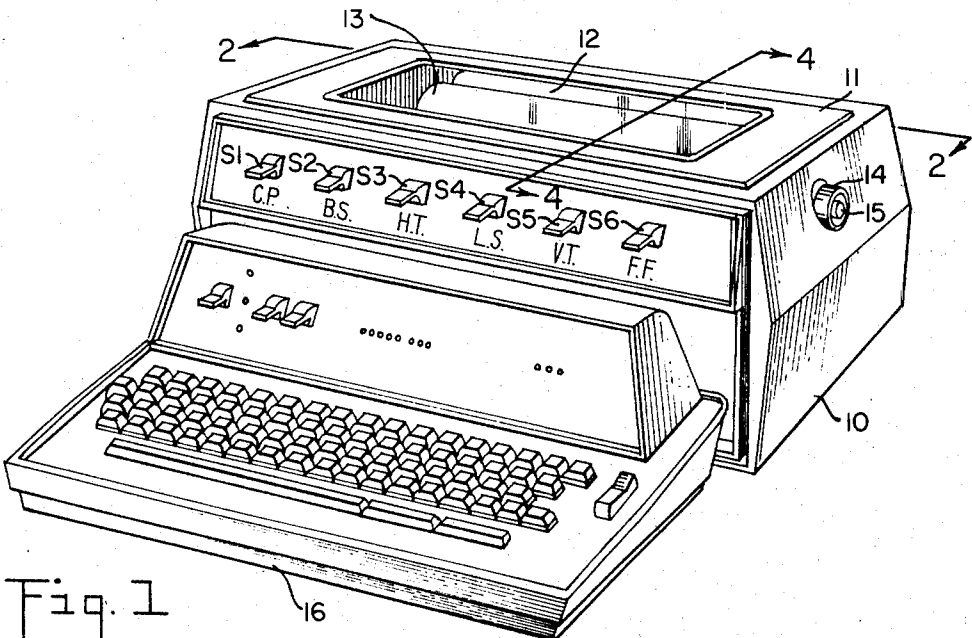
H. E. SMITH

3,400,798

LAST CHARACTER VISIBILITY MECHANISM FOR A MARTIX PAGE PRINTER

Filed Aug. 21, 1967

4 Sheets-Sheet 1



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Sept. 10, 1968

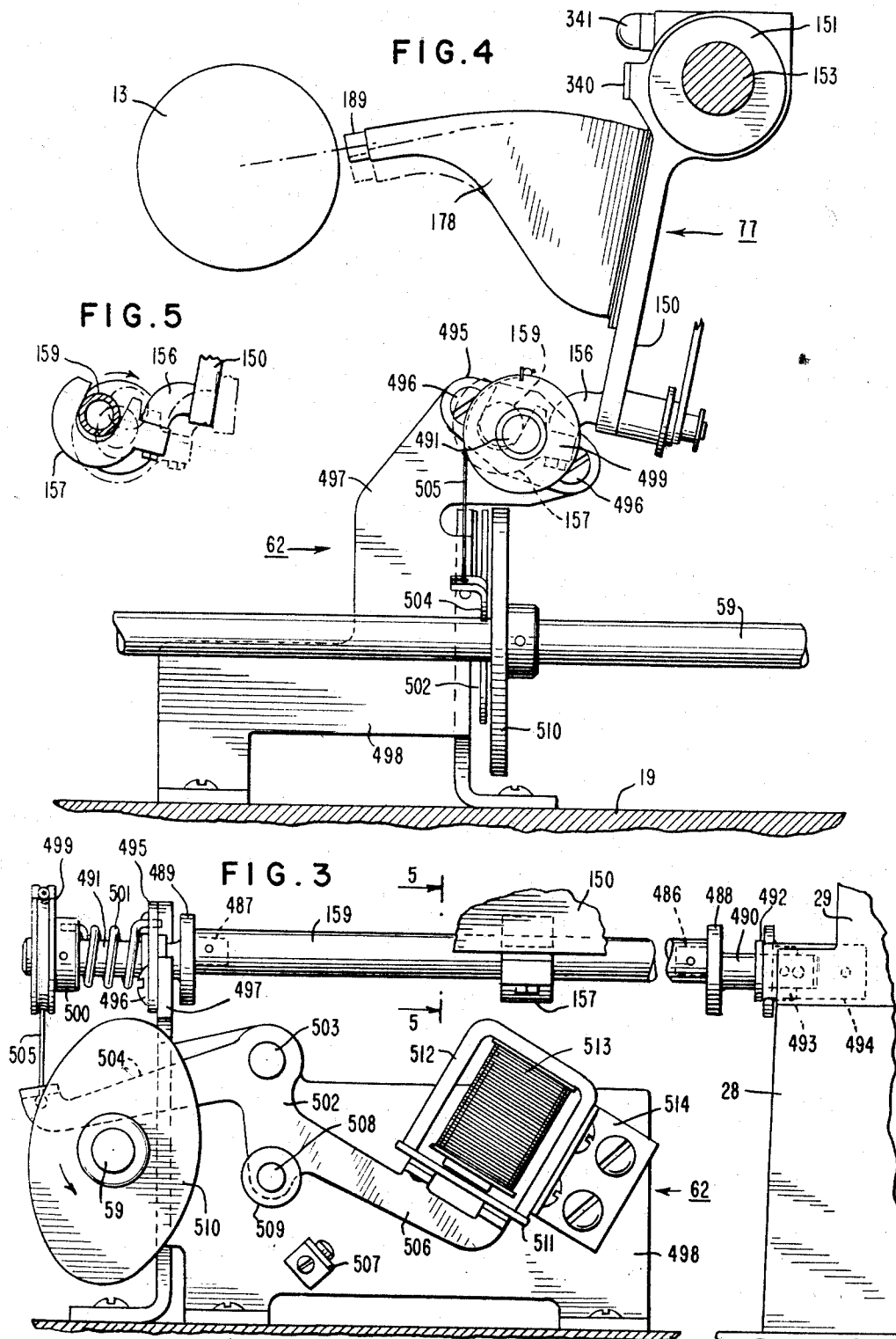
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LAST CHARACTER VISIBILITY MECHANISM FOR A MARTIX PAGE PRINTER

Filed Aug. 21, 1967

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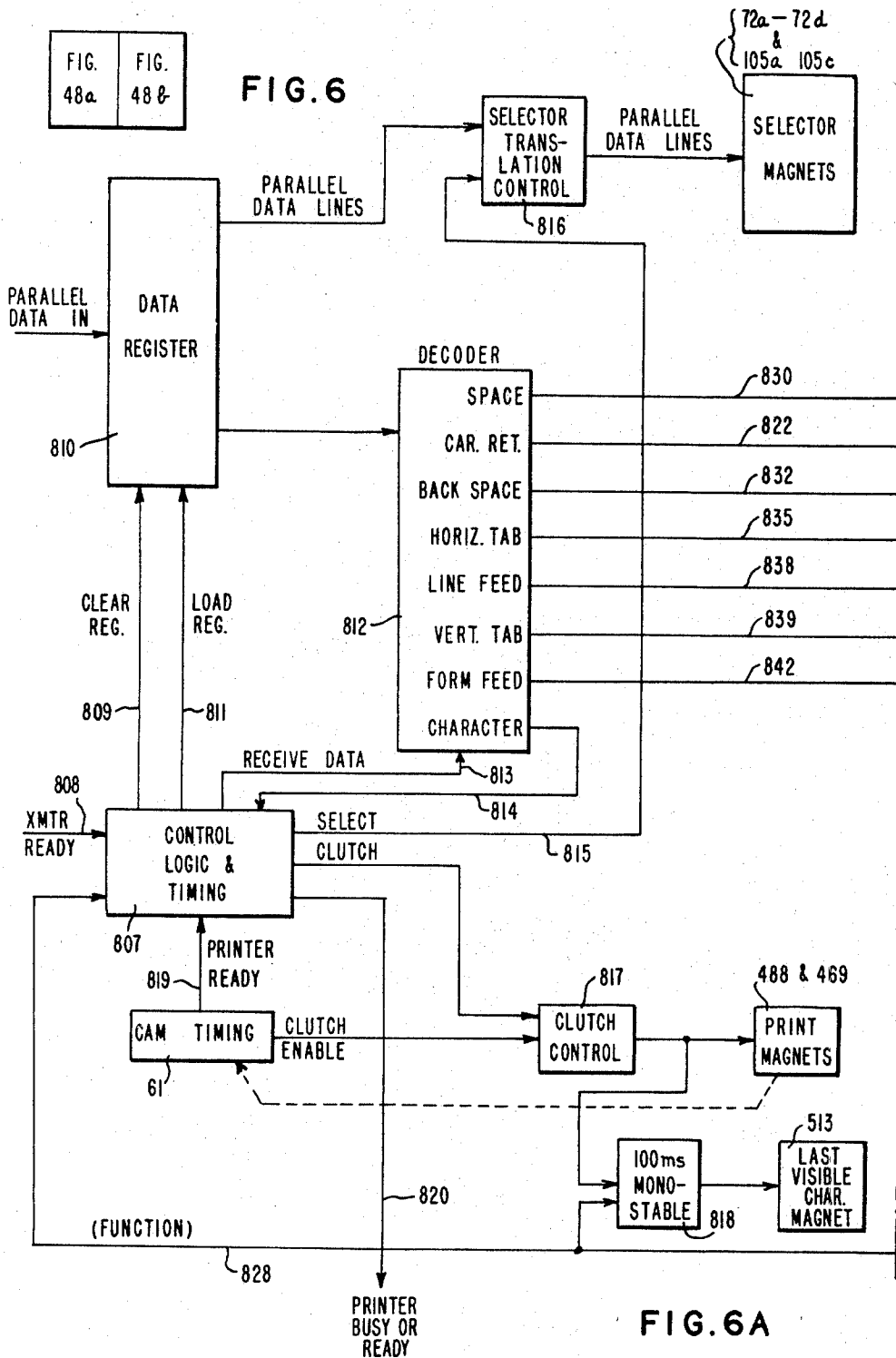
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LAST CHARACTER VISIBILITY MECHANISM FOR A MARTIX PAGE PRINTER

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Filed Aug. 21, 1967

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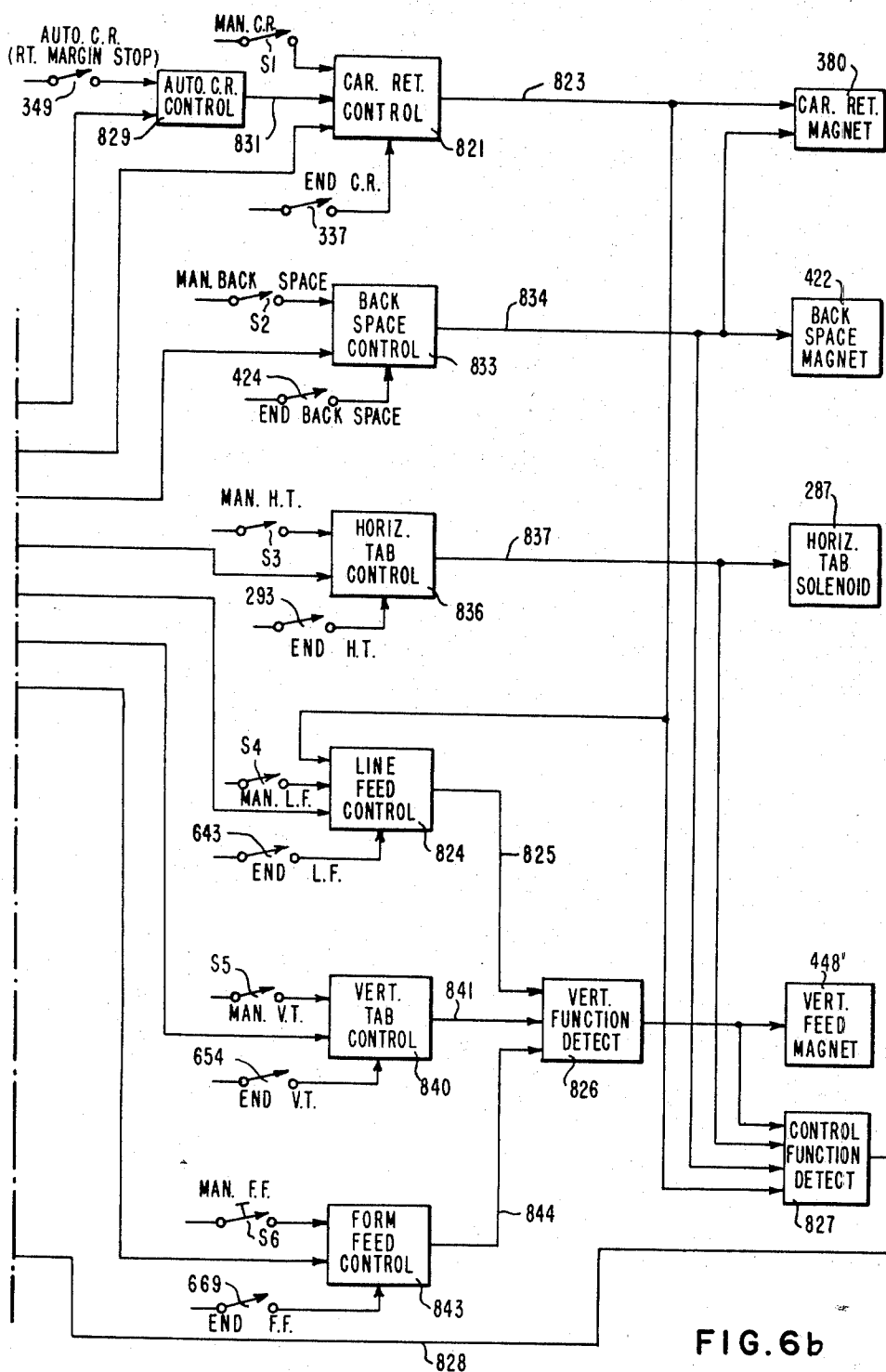


FIG. 6b

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LAST CHARACTER VISIBILITY MECHANISM FOR A MATRIX PAGE PRINTER

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Filed Aug. 21, 1967, Ser. No. 661,915

7 Claims. (Cl. 197—1)

ABSTRACT OF THE DISCLOSURE

A last character visibility mechanism for a serial character matrix page printer wherein a print head carrier structure is linearly movably guided along a longitudinal platen for character printing in a printing position in response to character signal pulses and the character structure is depressed to a last character visibility position after each character printed in the event that the time period between character signal pulses exceeds a given time period.

The present invention relates to power-operated printers which respond to data presented in code form and automatically print such data in serial character form at desirably high printing rates and, more particularly, to a last character visibility mechanism for such printers.

In copending application Ser. No. 630,904, filed Apr. 14, 1967, on behalf of Edwin O. Blodgett, and assigned to the same assignee as the present application, the complete details of a high speed serial character matrix page printer are given.

A serial character matrix page printer has a stationary platen and a wire-matrix print-head carrier supported and guided by a rail for movement longitudinally of the platen in printing a line of copy. The print head has a print-wire character-selection plate actuatable between wire-print and wire-selection positions by a pressure plate structure, and the carrier includes a first spring-biased member for actuating the pressure plate structure between print and non-print positions and additionally includes a pair of spring-biased actuating members for actuating the selection plate in individual ones of two perpendicular directions to print-wire character-selection positions thereof.

Wire-matrix print heads have for some years been used in limited substitute for printing type mounted on type bars or the like, the complexity of print head control to effect print wire character selection and print impression has generally limited their use to applications other than page printers. In particular the application of such print heads has usually been limited to printers of the form wherein the print head remains stationary and the paper stock to be printed upon is moved past the stationary print head as in interpretive printing of characters along the edge of a tabulating card or paper tape which records the characters in punch-coded form. Typical of such applications is that disclosed in the Blodgett et al. United States Patent No. 3,082,687.

One of the major problems of prior art matrix printers is that the print head and print-head carrier structure obstruct the viewing of the last character printed and may, in fact, even obstruct one or more characters. Thus, corrections on the last character printed generally require movement of the printed copy or carriage and thus require a relatively long period of time to make the necessary correction or verification.

Accordingly, it is an object of the present invention to provide a novel serial character matrix page printer having a substantially high serial character printing rate and wherein the last character printed is visible.

It is another object of the present invention to provide a new serial character matrix page printer wherein a wire-matrix print head longitudinally transverses a stationary

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platen, prints on a line and the last character printed thereon is easily and readily viewed.

Briefly, the present invention accomplishes the above and other objects in one embodiment of the invention in a last character visibility mechanism in a matrix page printer which includes a platen and a print-head carrier structure having a wire-matrix print head for selectively printing characters longitudinally of the platen in response to signal character pulses of a given duration. The last character visibility mechanism comprises a guide rail disposed parallel to the platen for pivotally and slidably mounting a print-head carrier structure between a print position and a last character visibility position. Also included is a spring biasing means for yieldingly urging the structure to a last character visibility position. A signal pulse responsive means shifts the carrier structure to the print position in response to the signal character pulse. The signal pulse responsive means includes an electromagnet which, when energized latches the carrier structure into the print position. The last character visibility mechanism also includes a circuit for energizing the electromagnet for a given time period after the signal character pulse is applied thereto so that the carrier structure remains in the print position for a given time period after the signal pulse is applied thereto. Thus, if the signal character pulses occur at a time period less than the given time period, the carrier structure will remain in the print position. However, if the carrier signal pulses are spaced for a time period greater than the given time period, the carrier structure will return to the last character visibility position.

Other objects and advantages of the invention will appear as a detailed description thereof proceeds in the light of the drawings forming a part of this application and in which:

FIG. 1 illustrates the appearance of a unitary, self-contained serial character matrix page printer embodying the present invention and shown by way of example as electrically controlled by a manual keyboard which conventionally is fabricated as a unit separate and apart from the printer.

FIG. 2 is taken along line 2—2 to illustrate the last character visibility mechanism in accordance with one embodiment of the invention for controlling a print-head carrier structure to obtain visual inspection of the last character printed.

FIG. 3 is a partial enlarged view similar to FIG. 2 to show details of the last character visibility mechanism.

FIG. 4 is a view taken along line 4—4 showing a fragmentary view of the last character visibility mechanism of FIG. 2.

FIG. 5 is a partial fragmentary view of some of the details of the last character visibility mechanism.

FIG. 6 shows the arrangement of FIGS. 6a and 6b; and FIGS. 6a and 6b arranged as in FIG. 6 show in schematic form an electrical control system embodied in the printer.

In the following description of a last character visibility structure for a matrix page printer embodying the present invention in a particular form, and in the appended claims, reference is made to the selection and printing of characters. The term "character" is used in the present specification and claims in its generic sense as connoting signs, marks and symbols of graphic form and hence will be understood to include alphabetic symbols, such as employed in the recording of a language, numerals, punctuation, and other general symbols useful in the graphic expression of information.

Only the structure necessary to teach the invention has been shown in the drawings. Reference may be made to copending application Ser. No. 630,904 hereinbefore men-

tioned, for a more complete description of the matrix page printer embodying the invention.

Referring now more particularly to FIG. 1 of the drawings, the printer structure hereinafter described is enclosed within a housing 10 having a rearwardly hinged cover 11 provided with a glass window 12 to permit visual observation of the progress in printing each line of copy. The cover 11 is manually raised to insert and wrap paper about a platen 13 by manual manipulation of a line spacing knob 14 and interline spacing button 15. A narrow horizontal slot (not shown) extending across the top of the rear wall of the housing permits the supply to the platen of a continuing connected series of duplicate paper forms for successive form printing operations. The print operations of the printer are controlled by plural code electromagnets (not shown) and functional operations of the printer are controlled by control electromagnets (not shown) energized by an electrical control circuit shown in FIGS. 6a and 6b. The code electromagnets and functional electromagnets may be electrically energized alone and in permutational code combinations by various types of code-recorded information sources, such as a punched tape reader of the type shown in the Blodgett U.S. Patent No. 2,927,158, or, as shown in FIG. 1, by a manual keyboard 16 which is electrically connected to the printer and may be of the type disclosed and claimed in the Dan-natt pending application Ser. No. 522,873, assigned to the same assignee as the present application. The front panel of the housing 10 supports a plurality of manually operable spring-return switches S1-S6 for manual control of printer functions such as carrier return, carrier backspace, carrier horizontal tabulation, line spacing and vertical tabulation spacing of the platen 13, and form feed of the platen 13 by which after completion of printing of one form a new form is moved into printing position on the platen.

Referring to FIGS. 2-5, a print head and print-head carrier 77 is illustrated. The carrier 77 includes a rigid metal base casting 150 of rectangular O-frame configuration, providing a central rectangular aperture, and terminates at its upper end in integrally cast spaced flanges 151 each having an aperture 152 for slidably and pivotally supporting the base casting 150 upon a support and guide rail 153. The lower end of the base casting 150 has an integral depending arm 156 to the end of which a U-shaped yoke 157 (FIG. 5) is secured by a machine screw. For reasons more fully explained hereinafter, the yoke 157 engages an eccentrically supported shaft 159 pivotally to move the print-head carrier to either of two angular positions on the guide rail 153 according to the prevailing one of two eccentric positions of the shaft 159, namely, a print position and a last character visibility position. This angular positioning of the print-head carrier takes place independently of longitudinal positioning of the carrier along the guide rail 153.

The print head is of the wire-printer type and includes a funnel housing 178 of U-shaped transverse cross-section open at the bottom and which is affixed by brazing or solder to a plate (not shown) secured by machine screws to a mounting plate. The latter is positioned in the central rectangular aperture of a base casting and is provided with edge flanges (not shown) which are secured to a base casting 19 by machine screws. The plate has rows and columns of equally spaced apertures slidably to receive a plurality of print wires. The latter are guided by hollow tubes which are generally of S-shape along their lengths and have a terminal length of the remote end of each tapered in wall thickness to converge to a compact cluster of parallelogram cross-section with the side of their distant ends ultimately engaging one another in parallel relationship. The tubes (not shown) thus cause the print wires to converge to a similar cluster of parallelogram cross-section engaging one another over a short end length and projecting through a converging aperture of parallelo-

gram cross-section provided longitudinally of a metal nose block 189 which is soldered in place within the remote open end of the funnel housing 178. The tubes have one end soldered to the plate and have their opposite ends soldered together as a converged cluster of tubes and also soldered or similarly affixed in like manner at the rear or non-printing end of the nose block 189.

A cable and pulley bidirectional spring motor drive the carrier 77 longitudinally of the rail 153 as illustrated structurally in FIG. 2. It includes the drive pulley 249 of the drive subassembly 52 and provides for rotational support of the pulley 248 on a stud 478 of an arm 479 positioned on the rear face of a base bracket and pivoted on the stud 474 of the latter. The arm 479 has pivotal adjustment to provide adequate drive tension on the cable 246, and is locked in its adjusted position by a machine screw 480 which projects through a slot 481 of the arm 479 and is threaded into a base bracket. The pulley 251 is positioned at the rear of the pedestal 29 and is rotationally supported on the rearwardly projecting stud 471 thereof. FIGS. 2-5 illustrate the subassembly structure 62 for pivotally moving the printhead carrier 77 about the axis of the support rail 153 between a position at which the nose block 189 of the print head is in normal line printing position, viz. print position shown in full lines in FIG. 4 and a position at which the nose block is dropped viz. last character visibility position as indicated in broken lines to enable visual inspection by an operator of the last printed character. The structure includes the shaft 159 which may be of hollow tubular configuration and is eccentrically supported at its ends by coaxially aligned opposing studs 486 and 487 formed on respective flanges 488 and 489 of respective shafts 490 and 491. The shaft 490 is rotationally supported and positionally located, by means of a flanged bushing 492 and collar 493, on an end-apertured L-shaped bracket 494 secured on the rear face of the cast pedestal 29 as shown in FIG. 3. The shaft 491 is similarly rotationally supported and positionally located by a bearing structure 495 secured by machine screws 496 on the upper end of a projecting arm 497 of an L-shaped bracket 498 affixed by outturned feet to the baseplate 19 as shown. A pulley 499 having a hub 500 is secured on the end of the shaft 491. A helical wire spring 501 having ends anchored by the bearing structure 495 and bushing 500 rotationally biases the eccentric shaft 159 toward a position shown in broken lines in FIG. 5 at which the yoke 157 pivots the base casting 150 of the carrier 77 about the axis of the rail 153 to drop the nose block 189 of the print head to the broken line position in FIG. 4. A bell crank 502 pivotally supported by a stud 503 on the bracket 498 establishes the two limits of pivotal movement of the carrier 77.

For this purpose, the bell crank 502 has a first arm 504 which is connected by a cable 505 to the pulley 499 as shown and has a second arm 506 that moves to engage a stop member 507, supported on the bracket 798, when the carrier 77 has been pivoted as last described to drop the nose block 189 a sufficient amount to enable visual inspection of the last printed character. The arm 506 has a stud 508 for rotational support of a cam follower roller 509 which, upon engagement of the arm 506 with the stop member 507, is spaced a small distance from the peripheral surface of a double-lobed cam 510 secured on the print-control shaft 59. Upon each driven half revolution of the latter, the cam 510 engages the cam roller 509 and pivots the bell crank 502 counterclockwise as seen in FIG. 3 and against the bias force of the spring 501. This pivotal motion of the bell crank 502 positions an armature 511 carried by the end of the bell crank arm 506 in close proximity with the magnetic yoke 512 of an electromagnet 513 the yoke 312 being supported by an L-shaped bracket 514 on the bracket 498 as shown. The energized state of the electromagnet 513 attracts the armature 511 and, during further rotation of the cam 510, maintains the bell crank 502 in the pivoted position shown in FIG. 3. This position of the bell crank 502 is

such that the eccentrically supported shaft 159 pivots the carrier 77 to a position at which the nose block 189 of the print head is in proper line print position shown in solid lines in FIG. 4. Such positioning of the nose block 189 begins, under control of the cam 510, at the initiation of a half revolution of the print-control shaft 59 and is completed just prior to the 115° or 295° rotational positions of the latter at which time a character print impression is made by the print wires in the manner earlier described. An electrical control system hereinafter described maintains the electromagnet 513 energized during printing of successive alphanumeric characters, symbols and punctuation, but deenergizes the electromagnet 513 after a short time delay, for example 100 milliseconds, following a character print operation accompanied by a succeeding pause longer than that required to print two successive characters. Such deenergization of the electromagnet 513 permits the helical wire spring 501 relatively rapidly to pivot the bell crank arm 506 against the stop member 507 and thereby quickly drop the nose block 189 of the print head for visual inspection of all printed characters including the last one printed.

The electrical control system of the printer is schematically represented in block diagram form in FIGS. 6a and 6b arranged as in FIG. 6. The control system includes a control logic and timing unit 807 which is controlled by a signal applied to an input circuit 808 indicative of the readiness of the data source to supply an item of data information such as an alphanumeric character, symbol, or punctuation mark for printing or a functional control information item. Upon receipt of such signal, the unit 807 operates through the control circuit 809 to clear an information item previously supplied in binary coded form and by parallel-presented binary code bits from the data source and stored in binary coded form in a data register 810. Having cleared the register 810, the unit 807 through a control circuit 811 causes the data register 810 to receive and store a further information item supplied by the data source for printing or functional control. The information item stored in the register 810 is thereupon supplied in binary coded form and by parallel-presented binary code bits to a decoder unit 812, which is briefly controlled by the unit 807 through a control circuit 813 to receive and decode the item to ascertain whether the stored item is a character to be printed or a functional control information item.

If the information item stored in the register 810 is a character to be printed, the decoder 812 supplies a signal through a control circuit 814 to the control unit 807 which thereupon through a control circuit 815 causes a selector translator control unit 816 (which, for example, may be comprised by individual code-bit input AND gates, all conditioned by the control circuit 814, and individual cathode followers) concurrently to translate the individual binary code bits representing the information item stored in the register 810 to corresponding energizations of individual ones of the character selector magnets 72a-72d and 105a-105c of the code selector assembly. The control unit 807 under control of the control circuit 814 also controls a clutch-control unit 817 of AND gate form to energize a print clutch control magnet (not shown) and the print-head pressure plate actuation magnet (not shown) for a short interval, such interval being defined by energization supplied to the unit 817 by one of the cam-actuated electrical contacts each time the printer has completed one print cycle and is ready to initiate a further print cycle. The printer prints successive characters at less than 100 millisecond intervals, and the energization supplied to the print electromagnets is also supplied as a control potential pulse to control a monostable multivibrator 818. If the latter is OFF at this time, the control potential pulse turns it ON and it remains ON for 100 milliseconds; if the multivibrator 818 is ON at this time, the control potential pulse effects recharging of the multivibrator to start a new 100 millisecond time

cycle. The ON state of the multivibrator 818 effects energization of the electromagnet 513 of the last character visibility structure to maintain the print head elevated to character print position as previously described. Should a pause in the printing of successive characters permit the multivibrator 818 to complete its cycle and turn OFF, the resulting deenergization of the electromagnet 513 drops the print head to permit visual inspection of all printed characters. As a print cycle progresses after energization of the print electromagnets as just described, another of the cam-actuated electrical contacts 61 operates through a control circuit 819 and causes the control unit 807 to supply a signal to an output circuit 820 informing the data source that the printer is executing a print cycle. At the end of the printing operation, a further one of the cam-actuated electrical contacts causes the control unit 807 to supply to the output circuit 820 a signal indicating to the data source that the printer is ready to accept a further information item.

If the decoder 812 ascertains that the information item stored in the register 810 is a functional control information item, the control unit 807 and the control unit 817 are not then controlled through the control circuit 814 and the print electromagnets are not energized.

Should the decoder 812 ascertain that the stored information item of the register 810 is a carrier return information item, a carrier return control unit 821 through an OR input circuit thereof is energized through a control circuit 822 of the decoder 812 to turn ON a bistable multivibrator included in the unit 821. The ON state of the multivibrator effects energization of an output circuit 823, as by use of a cathode follower stage, which energizes the carrier return clutch electromagnet 380 and initiates a carrier return operation. The energization of the output circuit 823 is also supplied to a line feed control unit 824 to turn ON a multivibrator included therein and thereby effect energization, as by use of a cathode follower stage, of a vertical feed clutch electromagnet (not shown) through an output circuit 825 of the unit 827 and through a vertical function detector unit 826 of the OR form. The line feed operation is terminated in a manner hereinafter described in connection with the line feed functional operation. The energization of the output circuit 823 of the unit 821 is also supplied to a control function detector unit 827 of the OR form and having an output circuit 828 which is thereupon energized to turn OFF the monostable multivibrator 818, and thus deenergize the last visible character electromagnet 513 to drop the nose of the print head for visual inspection of all characters last printed, and so to control the control unit 807 as to supply a signal to the output circuit 820 indicating to the data source that the printer is not ready to accept a further information item. When the carrier has returned to the left-hand margin to close the contacts of a microswitch (not shown), the multivibrator of the control unit 821 is turned OFF to deenergize the output circuit 823 and carrier return clutch electromagnet 380 and thereby terminate the carrier return operation. When this occurs, and upon completion of the line feed operation under control of the unit 824, the platen has been rotated one line space by the previous energization of the vertical feed clutch electromagnet and the output circuit 820 now supplies a signal to the data source indicating that the printer is ready to accept a further information item.

The carrier return operation just described may also be manually initiated for any prevailing position of the print-head carrier by brief manual actuation of a panel switch S1 (FIG. 1) to close its contacts and thereby, through an OR input circuit of the control unit 821, cause the latter to turn ON the multivibrator thereof with resultant energization of the output circuit 823 of this unit.

An automatic carrier return zone of operation is established when the right-hand margin-control microswitch electrical contacts are briefly closed in the manner earlier

described. The closure of these contacts turns ON a bistable multivibrator included in an automatic carrier control unit 829 to condition one input leg of a double-leg AND gate of this unit. The next word space code causes the decoder unit 812 to energize an output circuit 830, and this energization conditions the second input leg of the AND gate of the unit 829 and thereby causes the output circuit of the AND gate to energize an output circuit 831 of this unit. The energization of the output circuit 831 is translated through an OR input circuit of the unit 821 to turn ON the multivibrator of the unit 821. The carrier return operation is thereupon initiated and completed in the same manner as described just above in relation to the energization of the decoder output circuit 822 by a carrier return function code.

Should the decoder 812 ascertain that the information item stored in the register 810 is a backspace information item, an output circuit 832 of the decoder 812 conditions an OR input circuit of a backspace control unit 833 to turn ON a bistable multivibrator included therein. This effects, as by use of a cathode follower stage, energization of an output circuit 834 of this unit. The energization of the output circuit 834 concurrently energizes the carrier return clutch electromagnet 380 and the backspace electromagnet 422 to initiate a backspace operation. When the carrier has moved to the left one character space the electrical contacts of the microswitch close to turn the multivibrator of the unit 833 OFF and thus deenergize the output circuit 834 with resultant deenergizations of the electromagnets 380 and 422. Upon energization of the output circuit 834 of the control unit 833, the control function detector 827 through its output circuit 828 turns OFF the monostable multivibrator 818 for last character visibility, and during the period of energization of the output circuit 834 and for a short delay interval thereafter causes the output circuit 820 to indicate to the data source that the printer is not ready to accept a further information item. The backspace operation may also be initiated by brief manual actuation of a panel switch S2 to close its contacts and thereby effect through an OR input circuit of the unit 833 turn ON of the multivibrator of this unit with resultant energization of its output circuit 834.

When the decoder 812 ascertains that the information item in the register 810 is a horizontal tabulation information item, the decoder unit 812 energizes an output circuit 835 to cause an OR input circuit of a horizontal tabulation control unit 836 to turn ON a bistable multivibrator included in this unit and thereby effect energization (as by use of a cathode follower stage) of an output circuit 837. Energization of the latter circuit energizes the horizontal tabulation solenoid electromagnet 287 to initiate a horizontal tabulation operation, and through the detector unit 827 effects immediate turn OFF of the monostable multivibrator 818 and the supply of a signal through the output circuit 820 informing the data source that the printer is not ready to accept a further information item. When the carrier strikes a tab stop to close the electrical contacts of the microswitch, the multivibrator of the control unit 836 is turned OFF to deenergize the output circuit 837 and thereby supply a signal through the output circuit 820 to the data source that the printer is ready to accept a further information item. The tabulation operation just described may also be manually initiated by brief manual operation of a panel switch S3 to close its contacts and through an OR input circuit of the unit 836 effect turn ON of the multivibrator of this unit with resultant energization of the output circuit 837.

When the decoder unit 812 ascertains that the information item stored in register 810 is a line feed information item, the decoder unit 812 energizes an output circuit 838. This energization applied through an OR input circuit of the line feed control unit 824 turns ON the multivibrator of this unit, and the latter thereupon energizes the vertical feed clutch electromagnet through the verti-

cal function detector 826. The function detector 827 is concurrently energized and through its output circuit 828 turns OFF the monostable multivibrator 818 and supplies a signal through the output circuit 820 to the data source indicating that the printer is not ready to accept a further information item. After the line feed operation has progressed to 50% of completion, a lobe of the cam 609 (not shown) causes the line feed control electrical contacts 643 to close. Upon closing, these contacts cause a differentiated electrical pulse to be supplied to the turn-OFF circuit of the multivibrator of the control unit 824 to turn the multivibrator OFF and thus deenergize the vertical feed clutch electromagnet 448'. The clutch 56' continues drive of the structure 48 for an additional 45° of its driven shaft 598 and thus completes the line space operation. When this occurs, the cam 609 (not shown) has once more operated the electrical contacts 643 to open contact position in readiness for another line feed operation. While the line feed operation is continuing to completion after the multivibrator has been turned OFF, and thus has removed energization from the output circuit 828 of the detector unit 827, the control unit 807 operates for a preselected delay interval to provide a continuing signal to the output circuit 820 informing the data source that the printer is yet busy. At the end of the delay interval, the control unit 807 supplies a signal through the output circuit 820 informing the data source that the printer is now ready to receive a further information item. A line feed operation may also be initiated by brief manual operation of the panel switch S4 to close its contacts and through an OR input circuit of the unit 824 similarly turn ON the multivibrator of this unit.

A vertical tabulation information item stored by the register 810 causes the decoder 812 to energize an output circuit 839 and an OR input circuit of a vertical tabulation control unit 840 effect turn ON a bistable multivibrator included in this unit. The ON state of the multivibrator effects energization, as by use of a cathode follower stage, of an output circuit 841 of the unit 840 and thereby supplies energization through the detector unit 826 to energize the vertical feed clutch electromagnet 448' and initiate a vertical feed operation. Also and as previously described, such energization effects turn OFF of the monostable multivibrator 818 and the supply of a signal through the output circuit 820 indicative to the data source that the printer is busy and accordingly not ready to accept a further information item. The vertical tabulation operation is terminated when the vertical tabulation electrical contacts 654 close to cause a differentiated electrical pulse to be supplied to a turn-OFF circuit of the multivibrator of the unit 840 and thus by turn OFF of the multivibrator deenergize the output circuit 841 and the vertical feed clutch electromagnet 448'. As before, the control unit 807 operates for a preselected interval to provide a continuing busy signal to the output circuit 820 until the vertical tabulation operation is completed and thereafter supplies a signal through the output circuit 820 informing the data source that the printer is ready to accept a further information item. The vertical tab operation just described may also be initiated by brief manual operation of a panel switch S5 to close its contacts and through an OR input circuit of the unit 840 effect similar turn ON of the multivibrator of this unit.

A form feed information item stored in the register 810 causes the decoder 812 to energize an output circuit 842 and thereby cause an OR input circuit of a form feed control unit 843 to turn ON a bistable multivibrator included therein. The latter through an output circuit 844 and the detector 826 effects energization of the vertical feed clutch electromagnet 448' and initiates a vertical feed operation. This energization likewise causes the detector 827 through its output circuit 828 to effect immediate turn OFF of the monostable multivibrator 818 and the supply of a signal through the output circuit 820 informing the data source that the printer is not ready

to accept a further information item. The form feed operation is completed when the form feed electrical contacts 669 close to cause a differentiated electrical turn OFF pulse to turn OFF the multivibrator of the unit 843 and thus deenergize the vertical feed clutch electromagnet 448'. There is concurrent supply of a signal by the control unit 807 to the output circuit 820 informing the data source that the printer is busy until the form feed operation has been completed, and thereafter the supply of a signal indicating that the printer is ready to accept a further information item. The form feed operation may also be initiated by brief manual operation of the panel switch S6 to close its contacts and through an OR input circuit of the unit 843 similarly turn ON the multivibrator of this unit.

While there has been described for purposes of illustration a specific form of the invention, it is contemplated that numerous changes may be made without departing from the spirit of the invention.

What is claimed is:

1. In a matrix page printer including a platen and a print head carrier structure having a wire-matrix print head for selectively printing characters longitudinally of said platen in response to signal pulses of a given duration, a last character visibility mechanism comprising:
 - (a) a guide rail disposed parallel to said platen for pivotally mounting said print-head carrier structure thereon for movement between a print position and a last character visibility position;
 - (b) spring biasing means for yieldingly urging said structure to said last character visibility position;
 - (c) camming means including an electromagnet positioned in cooperative relationship with said carrier structure and said spring biasing means for pivoting said structure into said printing position in response to said signal pulse; and
 - (d) circuit means for energizing said electromagnet for a given time period after said signal pulse is applied thereto, said time period having a duration such that said print-head carrier structure remains in said print position during continuous and uninterrupted printing of a plurality of characters and returns to said last character visibility position only upon an interruption in printing which lasts longer than said given time period.
2. The invention defined in claim 1 wherein said print-head carrier structure is also slidably disposed on said guide rail.
3. The invention defined in claim 1 wherein said camming means includes a shaft eccentrically disposed in cooperative relationship with a yoke on said carrier structure and slidable thereon for displacement of said carrier structure between said print position and said last character visibility position.
4. The invention defined in claim 3 wherein said camming means includes a pulley at one end of said shaft and

cable means responsive to the energization of said electromagnet for holding said carrier structure in said print position.

5. The invention defined in claim 4 further including assisting means connected to said camming means for shifting said carrier structure to said printing position in anticipation of a signal pulse for assisting said electromagnet when said electromagnet is energized.

6. The invention defined in claim 4 wherein said assisting means includes a continuously relating cam having at least one lobe.

7. A last character visibility mechanism for a serial character matrix page printer having a longitudinally stationary platen and a print-head carrier structure including a wire-matrix print head, said mechanism comprising:

- (a) carrier means including a guide rail for linearly movably guiding said carrier structure longitudinally of said platen in response to a signal pulse from a source,

- (1) said carrier structure being pivotally mounted on said guide rail between a print position and a last character visibility position;

- (b) spring biasing means including an eccentrically mounted shaft disposed substantially parallel to said guide rail and said platen for yieldingly urging said structure to said last character visibility position;

- (c) signal pulse responsive means including an electromagnet for shifting said carrier structure to said print position in response to said signal pulse; and

- (d) circuit means for energizing said electromagnet for a given time period after said signal pulse is applied thereto so that said carrier structure remains in said print position for a given time period after said signal pulse is applied thereto, said time period having a duration such that said print-head carrier structure remains in said print position during continuous and uninterrupted printing of a plurality of characters and returns to said last character visibility position only upon an interruption in printing which lasts longer than said given time period.

References Cited

UNITED STATES PATENTS

2,771,025	11/1956	Kistner et al.	101—93
2,907,270	10/1959	Furman et al.	101—93
2,909,994	10/1959	Furman et al.	101—93
3,018,722	1/1962	Saltz et al.	101—93
3,200,928	8/1965	Moore	197—55
3,236,351	2/1966	Fitch et al.	101—93 XR
3,300,017	1/1967	Yazejian et al.	197—1

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