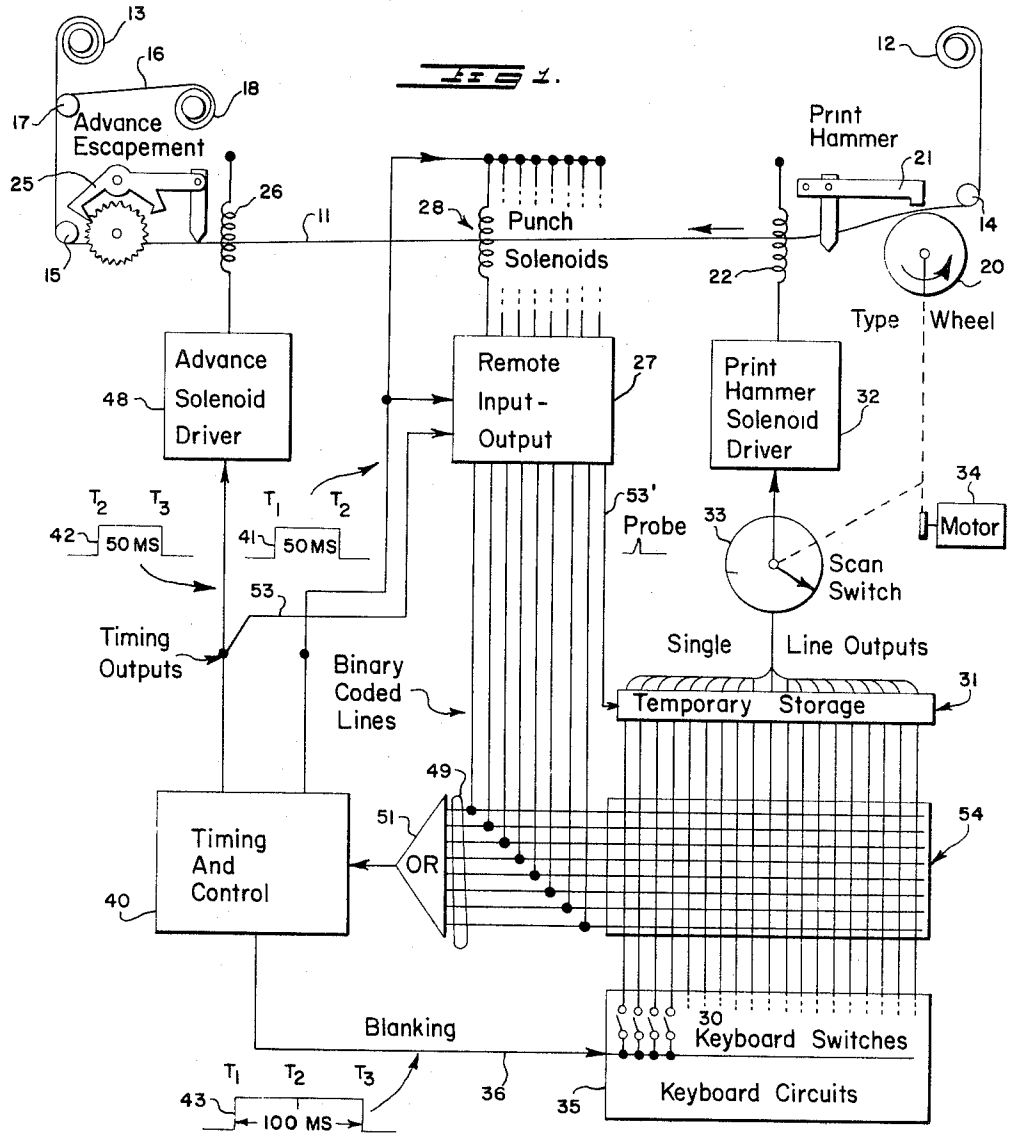
Feb. 1, 1966 J. P. JONES, JR 3,232,222

PRINTING SYSTEM HAVING STORAGE AND BLOCKING MEANS

Filed April 2, 1964 3 Sheets-Sheet 1



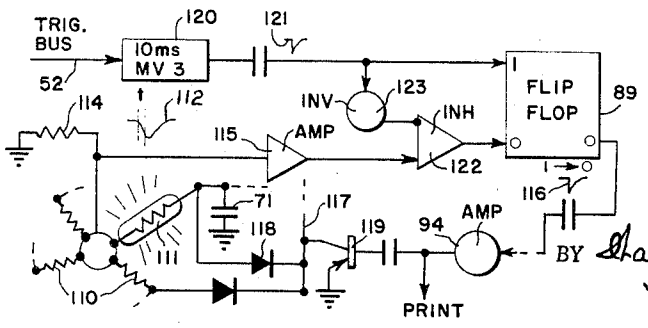


Fig 5.

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PRINTING SYSTEM HAVING STORAGE AND BLOCKING MEANS

Filed April 2, 1964 3 Sheets-Sheet 2

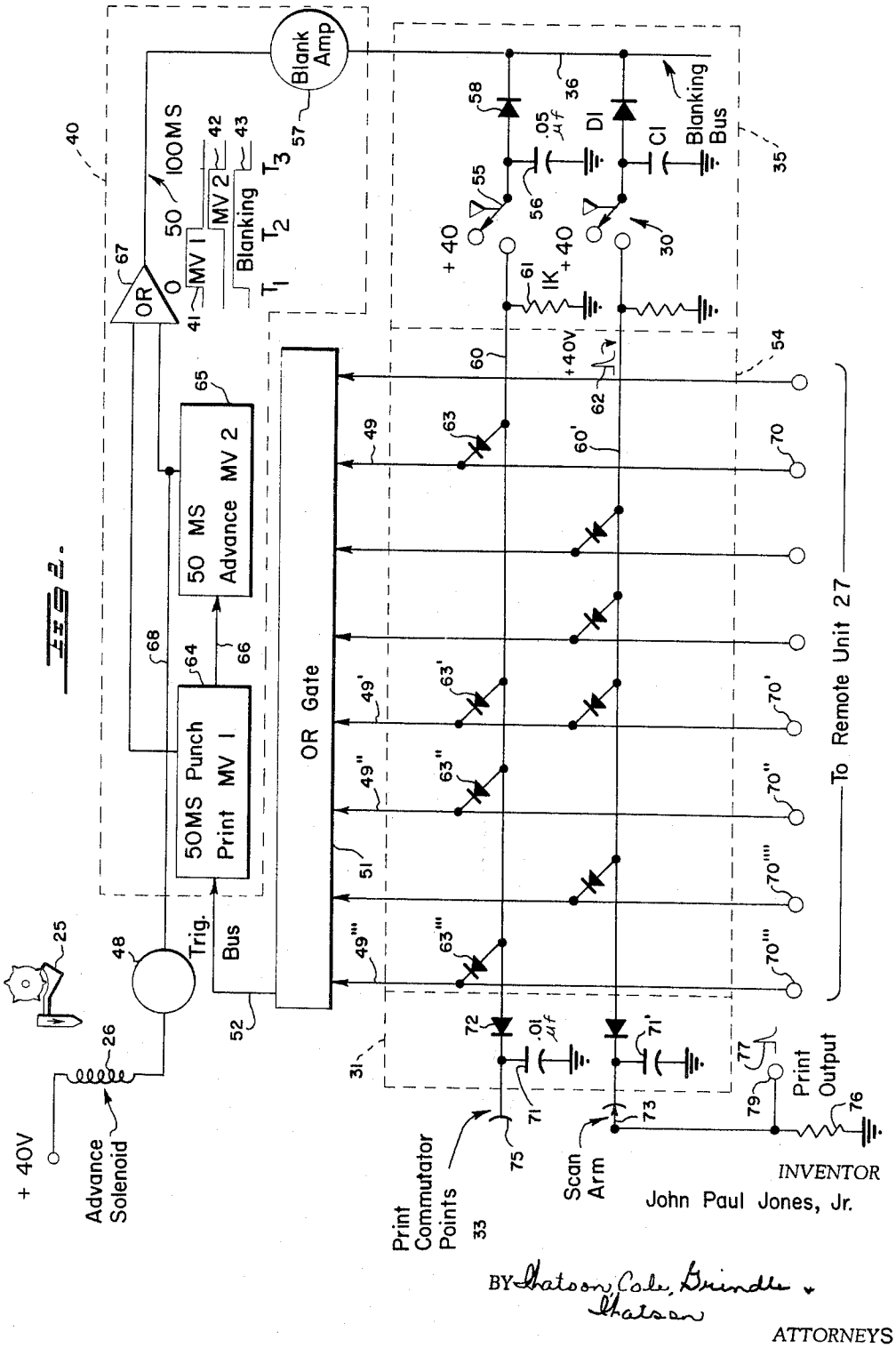

FIG. 2.

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PRINTING SYSTEM HAVING STORAGE AND BLOCKING MEANS

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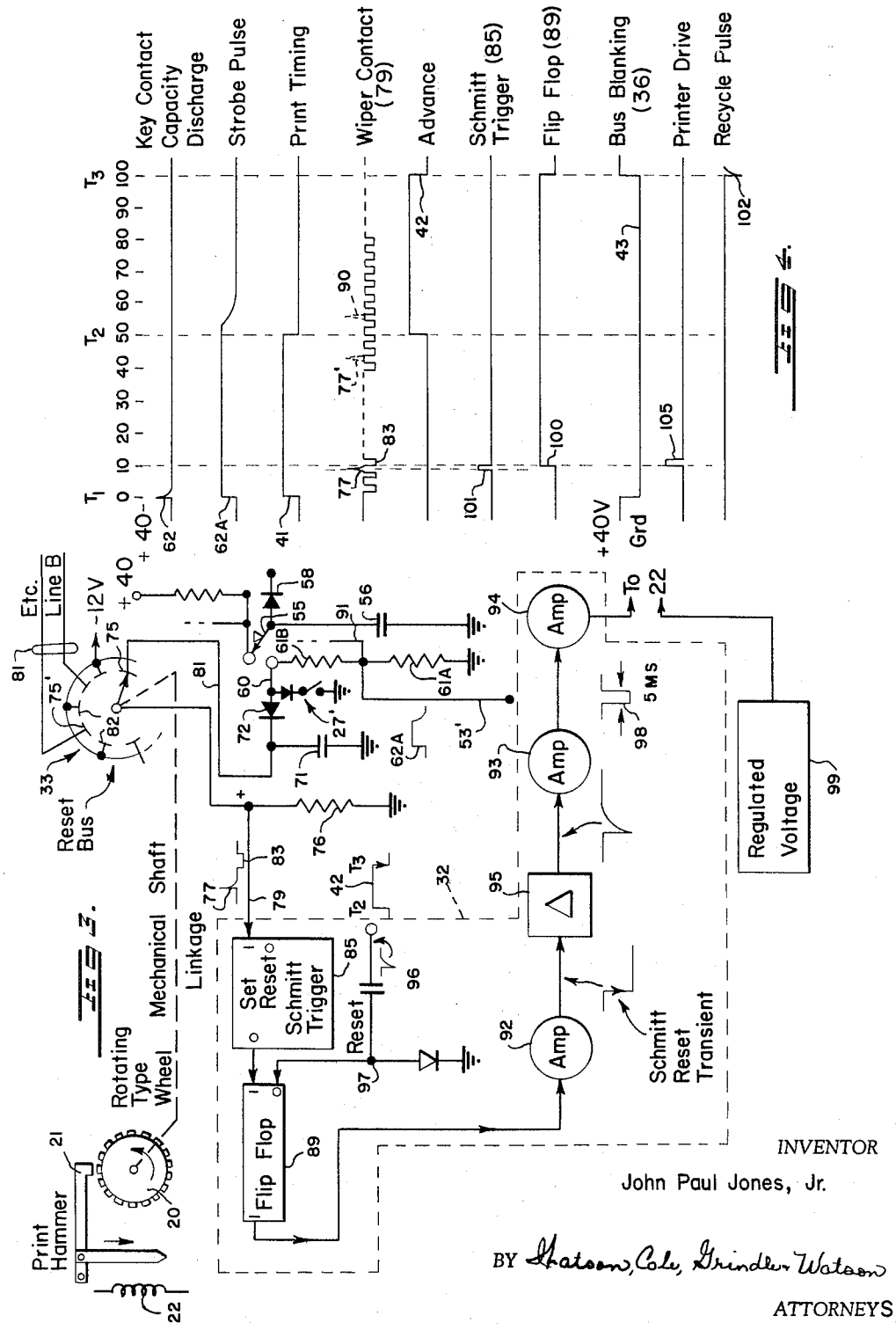

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United States Patent Office 3,232,222 Patented Feb. 1, 1966

3,232,222

PRINTING SYSTEM HAVING STORAGE AND BLOCKING MEANS

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Filed Apr. 2, 1964, Ser. No. 356,885
10 Claims. (Cl. 101—93)

This invention relates to keyboard operated printers and more particularly it relates to electronic typewriters adaptable for use with electronic data processing equipment.

Prior art typewriters with a primarily mechanical mode of operation need to undergo almost complete redesign and retooling in order to incorporate even modestly different features. For example, if a typewriter need be modified to provide remote input or output information for cooperation with a particular type of electronic data processing machine, it is desirable to accomplish this without significant redesign or retooling.

Accordingly, one object of the invention is to provide a versatile typewriter which is substantially electronic in operation, thereby affording a wide range of features readily adaptable to different environments.

In order to achieve this objective successfully, the electronic portion must be simple and reliable while performing most of the functions formerly accomplished by mechanisms. Electronic printers have not normally been simple enough to compete in price and ruggedness with a standard office typewriter. Neither have they been versatile, nor have they eliminated enough mechanical portions to improve maintenance problems encountered in mechanincally operated machines, which generally are so complex that disassembly and repair is costly and inconvenient. Thus, the electronic typewriter must be easily maintained, and should serve to improve the life expectancy by elimination of moving parts with critical tolerances, which must be cleaned and oiled frequently.

Thus, another objective of the invention is to provide a substantially maintenance free, long-life typewriter which has few moving parts.

While simplicity is important since it contributes to low cost and high reliability, many simple devices are possible only by eliminating important performance or quality features.

Accordingly, it is a further object of this invention to provide a simplified printer with improved performance, reliability and versatility.

Some of the requirements of quality include uniformity of print quality, without misalignment of characters, smear or jitter, and the provision of non-ambiguous printing without erroneous characters, "ghosting" or jamming. Thus, the operation of two keys substantially, simultaneously, should not result in damage, machine tie-up or erroneous printing.

Also, the machines should have an asynchronous mode of operation which may initiate internal cycling at any time so that it may be operated both manually and remotely with different types of equipment having various timing requirements where otherwise extensive timing buffing equipment need be employed. Printing speed capabilities sufficient to operate various types of external equipment without sacrifice of time and compatible with providing convenient manual performance at highest typing speeds, are desirable.

Accordingly, it is a general objective of the invention to produce a high speed keyboard operated printer improving the status of the art by resolving the foregoing problems.

Thus, the invention provides an electronic typewriter which essentially has only two moving elements supplementing the keyboard, namely a continuously running motor driven type wheel assembly and a character advancing escapement mechanism. Simplified electronic control circuits are actuated by either the keyboard or remote electrical input signals to engage the asynchronously operated print assembly and select the proper character during an operation cycle having a fixed efficient time cycle. Thus, even though a continuously rotatable type wheel presents characters at a random time respective to receipt of any input signal, no matter at what time the keyboard actuation time occurs with respect to the position of type on a type wheel, the cycle starts and is finished in the minimum fixed time period. The keys need not be operated at any particular timing related to the position of the type wheel by operation of a simplified switching commutator coupled for ganged rotation with the type wheel which receives the key-set information at the proper time from a temporary storage register.

Provisions are made in internal electronic timing circuits to prepare external signal sources for presentation of a further printing signal at optimum speed, so that the external signal sources may be either synchronously or asynchronously operable. Electronic codes to required external systems may be changed without redesign or retooling through a simple diode matrix assembly.

This electronic system facilitates incorporation of quality features not generally available in other machines, such as lock-out of keyboard operation during the printing cycle to permit only the first key operated during any print cycle to effectuate printing. This prevents machine jamming, and eliminates ghost printing when remote input signals are used. Also, electronic control of the printing impact operation serve to produce uniformity of print quality without misalignment of characters, smear or jitter to a degree difficult to attain and maintain in corresponding mechanical machines.

These and further features and objectives of the invention will be apparent from the following specification which refers to the accompanying drawing, wherein:

FIGURE 1 is a schematic representation of the printer system afforded by the invention;

FIGURE 2 is a schematic representation of keyboard control and encoding circuits as incorporated in the invention;

FIGURE 3 is a schematic representation of electronic timing and control circuits afforded by the invention;

FIGURE 4 is a series of waveforms typifying timing relationships in a printing system embodying this invention; and

FIGURE 5 is a schematic representation of a further embodiment of the invention for asynchronous selection of print characters.

With reference to the system concept displayed in FIGURE 1, the characters may be printed upon a paper tape 11, passed between feeding reel 12 and takeup reel 13 in a conventional manner around idle rollers 14 and 15. For simplicity assume the paper tape 11 is two ply with a layer of carbon paper 16 being separated around idler roller 17 onto carbon paper takeup reel 18. Thus, a series of characters presented about the periphery of the type wheel 20 may be printed by impact of the print hammer 21 when it is drawn momentarily into contact with the type wheel 20 through the two ply carbon and paper tape 11 by action of solenoid coil 22.

The paper tape 11 is advanced in the direction of the arrow after each character is printed by means of the advance escapement mechanism 25 operated by action of solenoid coil 26. Conventional means for punching the pape tape 11 could be introduced if desired in an intermediate tape position. Thus, the punching may be controlled from the remote input-output section 27 so that the printed tape may be punched when required. Optional

punch solenoids 28 are signified in an intermediate position in the path of the paper tape 11 for this purpose.

Manual printing operation (or typing) is afforded by way of keyboard switches 30 which may be arranged in a conventional typewriter keyboard configuration. These keyboard switches 30 work in conjunction with temporary storage means 31 to hold the keyset position of the selected characters until type wheel 20 presents that character and the print hammer solenoid driver 32 is operated. The interposed scanning switch 33 has a rotor arm coupled for common continuous drive by motor 34 along with type wheel 20 as signified by the dotted line. Thus, each type wheel character is synchronized in timing with a corresponding keyboard switch 30 by coupling one of the character identification contacts about scanning switch 33 to the selected key switch by way of intermediate temporary storage means 31.

In this manner, a selected key may be depressed at any time without regard to internal timing (asynchronously), and the temporary storage means 31 identifies the key closure to operate the print hammer whenever the selected character appears on the continuously rotating type wheel 20. As the print hammer operates, the storage means is cleared for the succeeding character presented by either the keyboard switches 30 or the remote input unit 27.

Keyboard circuit means 35 operate to energize a corresponding memory element in storage means 31 when each key is closed to thereby preserve the keyset data for any selected character line. However, by means of blanking lead 36, the keyboard circuit means 35 is deactivated immediately upon closing of any key switch, and is not reactivated until the printing operation cycle is completed. Whenever the printing operation is in progress, such as when a remote input is being used, the blanking signal deadens the keyboard, and the keyboard is locked out to prevent double printouts or jamming should a key be operated during the cycle.

Typically, the printout cycles can occur at ten per second, providing 100 milliseconds 43 for a complete printing cycle. In this case, the first 50 millisecond period 41 is used in printing and the second 50 millisecond period 42 is used for positioning the record to the succeeding character position, such as by pulling the paper tape 11 forward one space. Thus, the motor 34 is synchronous at 1200 r.p.m. so that each type font, which might consist of 35 characters on type wheel 20, is presented cyclically with accurate periodical timing each 50 milliseconds. Parallel hammers may be used if desired for selecting upper and lower case letters from two corresponding type wheel levels, as selected by a shift key energizing one of two corresponding solenoids from driver 32.

The timing and control circuits 40 are actuated at the beginning of each print cycle by the closure of a key switch 30 for example to generate the three waveforms 41, 42, and 43 having respective durations over the first 50 ms. period, the second 50 ms. period and the entire 100 ms. period. The latter waveform 43 appears at the blanking lead 36 to assure that the keyboard is locked out during both the printing and character or record advance periods.

Keyset information held in the temporary storage means 31 always is encountered during the first 50 ms. period 41 and the memory is cleared, so that it becomes inactive during the second period 42, and no further printout is possible until the expiration of the blanking period when the tape is in position to receive a further imprint, Where punching means 28 is provided, the printing period 41 during the first 50 ms. is used to operate the punches also, before the paper tape 11 is advanced by escapement means 25 during the second time period 42, when the advance solenoid driver 48 is actuated responsive to the leading edge of waveform 42 at time T_2.

To trigger the timing and control circuits 40 efficiently circuit-wise from keyboard switches 30, particularly when either the remote input or output facility is used through means 27, a grouping of eight binary coded leads 49 is coupled through the OR gate 51 to trigger the start of the timing control waveforms at time T_1 when a key board switch 30 is closed. Alternately, a remote signal from input-output means 27 may be used to initiate the timing control signals and initiate a printing cycle asynchronously whenever received. The input-output means 27 may be a remote punched paper tape reader, for example operating continuously to present character after character until a "stop" code is encountered. When signals are received therefrom the keyboard switches 30 are automatically disengaged by the blanking waveform 43 to prevent keyboard intervention until the remote unit operation terminates. For this purpose, the trailing edge T_2 of waveform 42 is used to cycle automatically the remote unit 27 at maximum printing speed by way of lead 53. This timing T_3 is transmitted under control of the remote unit 27 as an input probe pulse along line 53' to the keyboard control circuits for automatic actuation of the printer cycle at maximum speed. The remote unit need not be so controlled for operation if it cycles automatically with each operating cycle period being 100 ms. or greater. In this case, the strobe pulses at lead 53' are generated in the remote unit itself.

For code transition between the keyboard switches and OR gate 51 or the remote unit 27, a diode matrix array 54 is employed. This also serves to translate the binary coded input signals from remote unit 27 into the corresponding condition to select a single temporary storage element 31 for actuation by probe pulse line 53', so that the printing is initiated in the same general manner as from the keyboard signals.

The diode matrix array 54, which is described and claimed in my copending application for Electronic Recorder System Serial No. 335,641 filed January 3, 1964, is illustrated in more detail in FIGURE 2 together with the details of the keyboard and temporary storage circuits, etc. where corresponding portions of the circuit are identified with similar reference characters.

Consider first the operation of the keyboard circuit section 35, where individual key switch 55 is illustrative of general operation. In the inoperated rest position shown, key 55 is connected to a source of +40 volt D.C. potential, which charges capacitor 56, in the absence of a blanking signal on the line 36. Blanking signals 43 are amplified in amplifier 57 to produce enough power for discharging all the keyboard capacitors 56, etc. through corresponding isolating diodes 58.

When keyboard switch 55 is closed, the charge on capacitor 56 is quickly discharged through resistor 61 to give a single signal pulse 62 along line 60 for each switch closure. Thus, no matter how long the key is held in closed position, another print operation cycle from that key cannot be initiated. Resistor 61 provides a short time constant discharge path for capacitor 56 to develop the voltage pulse waveform 62, which is subsequently passed through OR gate 51 for use as a trigger pulse in the timing and control circuits 40. Thus, if any one of the matrix diodes 63 is coupled to the vertical binary coded lines 49, the OR gate 51 will trigger from pulse 62 at time T_1 the input timing control circuit multivibrator 64, which develops the first 50 ms. waveform 41. The trailing edge of waveform 41 at time T_2 is coupled to the second multivibrator 65 through lead 66 to cause the succeeding 50 ms. waveform 42 to be generated terminating at time T_3. These are mixed in OR circuit 67 to provide the 100 ms. blanking pulse 43. At the leading edge T_2 of waveform 42, the advance solenoid driver 48 is operated through lead 68 to complete the advance of the paper tape (or carriage) before time T_3 at the end of the 100 ms. overall printing cycle period.

At the binary coded lines 49, each keyboard switch line (60) is coded into a corresponding binary code by the matrix diodes 63. This permits a remote unit 27 to be

coupled to the binary coded vertical matrix leads 70 for either input of data from a tape reader or for output of data for operation of a tape punch, for example. A signal corresponding to the keyswitch waveform 62 at any one or more of the remote input terminals 70 will serve as a timing trigger in the same manner to initiate a control cycle in this extremely simple electronic timing control circuit.

To operate the printer, the keyswitch pulse 62 is communicated along line 60 to the capacitor 71 which is charged through high back resistance diode 72 to retain its charge until scanned by the scanning switch rotary arm 73. As the switch arm 73 contacts the appropriate scanning switch contact segment 75, the corresponding storage capacitor 71 is discharged through resistor 76 to provide a print command pulse 77. This storage capacitor 71 is a convenient inexpensive temporary storage element when used for a large number of keyboard switches 55, and is easily operable from remote input pulses at terminals 70 to store the selected character charge in the same manner as will later be shown in connection with FIGURE 3.

Accordingly, the diode matrix 54 serves together with the simplified timing control circuits 40 and asynchronous printer operation to provide a convenient adapter to various sorts of remote input-output devices 27, since the coding can be changed by simple replacement of diode positions without any tooling or redesign of the equipment or timing controls. Thus, the typewriter constructed in accordance with this invention may be used advantageously for communication with various sorts of data processing devices, either by producing input signals as a by-product of normal typing, or by printing responsive to electrical signals received from external equipment. Similarly, the printer may be used conveniently in conjunction with a tape punch and a tape reader for automatic production of form letters in the well known manner, whether teletype code, IBM code or some other form of binary coded data is employed.

Provision of the common print output signal at terminal 79 for all keyboard switches, considerably simplifies the requirement for printing control circuitry, which is exemplified in FIGURE 3. A single operating keyboard switch 55 and associated line 60 is illustrated as formerly described. The scanning switch 33 is shown in more detail with a group of alternate identification switch segment contacts 75, etc. leading to various keyboard lines 81. Also provided is a set of intermediate alternate contacts 82, which are coupled together to a −12 volt potential source. This serves to follow the positive print waveform 77 with a negative pulse 83 as developed at output lead 79 through resistor 76.

The positive print command pulse 77 serves to set the Schmitt trigger circuit 85, or equivalent bistable state device, into its set state (1). Conversely, the negative reset pulse 83 serves to reset the Schmitt circuit 85 to its 0 state. A Schmitt trigger circuit is a well known regeneratively operating amplifier, which saturates quickly when triggered by a current of appropriate polarity then quickly reverts to non-energized state regeneratively when receiving a current of opposite sense.

The scanner pulse utilized for printing is that at the reset operation of the Schmitt trigger circuit. This permits asynchronous input timing without the possibility of jitter should the keyboard switch 55 be closed when the scanning arm 73 is already upon the corresponding scanning switch identification contact 75. This would cause the print solenoid to be operated after optimum timing and established as the wiper arm engages the switch segment, and would result in a misplaced and possibly smeared character. Thus, by using the intermediate contacts 82, and the corresponding reset pulse of the Schmitt circuit 85 for generating the print command signal, the timing is always controlled by the fixed timing of the commutator switch and never by the variable timing of the keyboard switch. In this manner asynchronous operation without jitter is obtained, because the scanning switch can be precisely manufactured within close tolerances, and it is coupled for rotation with the typewheel 20 so that it is always in proper time position.

A further complication can be introduced when the printer is remotely controlled from an external device. Obviously, it is desirable to prevent restrictions such as requiring input timing control or strobe pulses of precise amplitude and duration from external equipment. Thus, the present circuit is made non-critical in this respect by the control flip-flop 89. Consider an input strobe pulse 62A of uncontrolled duration arriving at the keyboard circuit resistors 61 through lead 53' for initiating the start of a further printing timing cycle. This strobe pulse may be used for causing static switch closures such as available in punched paper tape reading units, to be processed in the diode matrix as presented at leads 27 of FIGURE 1. Should the matrix lines 60 not be grounded (as shown by simulated circuit 27') by external signals at matching circuit diode positions, the strobe pulse 62A is transformed into a charge on the selected storage capacitor 71. Thus, all print lines are strobed simultaneously through lead 53' and the comon resistor 61A for all capacitors 71, which have separate resistive segments 61B leading to all the other print lines 81 by way of lead 91.

In such operation there might be a strobe pulse 62A extending into the second 50 ms. revolution of the scanning switch. This would serve to recharge partially the capacitor 71 after the first print out and might cause the Schmitt trigger circuit 85 to refire as the paper was being advanced, thus causing a "ghost" character. Any danger of such action is removed by the "once only" action of flip-flop 89, which advances a pulse into the shaping amplifiers 92, 93, and 94 as it is set into its (1) state by the Schmitt reset transient (0). The flip-flop 89 is not responsive during the second 50 ms. period 42 to any possible signals at the Schmitt trigger circuit, but is reset by pulse A6 time T_3 at the end of the print cycle period to its "0" state through circuit 97 to ready it for a further print cycle operation.

If the keyswitch closure is advanced far enough in time along a corresponding scanning switch segment so that only a partial coincidence occurs at the trailing edge of the scanning switch contact, it either discharges capacitor 71 with enough energy to fire the Schmitt circuit, which has a threshold rejecting low noise level, or it rotates back to the same scanning switch contact at the end of the 50 ms. period to fully discharge the capacitor 71 on the next contact and fire the Schmitt circuit. Thus, there can be no inoperative timing coincidence with this simple operational circuit configuration.

Shaping amplifiers 92, 93, 94, and delay line 95 serve to shape the Schmitt reset transient into an idealized waveform 98 of about five milliseconds in duration to operate the printing hammer while the type wheel is continuously rotated at 1200 r.p.m. to provide clean smearless imprint quality. The print hammer solenoid 22 is supplied through regulated voltage source 99, so that the pulse 98 always serves to provide the same energy. In this manner, jitter and misalignment is avoided because the printing hammer parameters such as inertia, etc. do not change, and the print wheel type is always met by the hammer 21 at the same place and at the same timing for each character.

Overall operation of the printing cycle may be reviewed with reference to the timing diagram of FIGURE 4, which displays the various operational functions and their relationship to the 100 ms. printing cycle. Some of the waveforms are exaggerated in duration to show the timing sequence better.

Thus, the operation cycle begins at time T_1 in response to the key contact capacity discharge pulse 62. The relationship of an uncontrolled duration strobe pulse 62A is also shown to extend beyond time T_2 at 50 ms. which in-

dicates the end of the first revolution of the type wheel and thus extends after the end of the printing time period 41.

Relationship of the scanning switch wiper contact waveform (not to scale) with the selection of a particular capacitor is shown by waveform 77 in relation to the repetitive reset waveforms 83. It is to be recognized that dependent upon which character is selected, the print selector waveform may be at another location such as represented by dotted waveform 77'. Also, the unwanted waveform 90 may be generated by strobe pulse 62A during the advance period 42, which is not effective to cause printing because of the action of the "once-only" flip-flop 89 previously described, which is in sit position during the duration of waveform 100. Thus, the flip-flop 89 is set responsive to the trailing edge of the Schmitt trigger waveform 101 and is reset at time T_3 by the recycle pulse 102. As may be seen, the Schmitt trigger pulse 101 starts responsive to the print pulse 77 and stops responsive to the scanner contact reset pulse 83. The printer driving pulse 105 (not to scale) is initiated at the setting of flip-flop 89 occurring substantially simultaneously with the leading edge of the scanning switch reset pulse 83' which corresponds to the trailing edge of the Schmitt trigger pulse 101. Thus, all the operating functions are accomplished within the first allocated 50 ms. period allowing ample time for printing before advance of the next character during the second 50 ms. period.

However, for operation of the embodiment shown in FIGURE 5, the allocated scanning period is preferably increased to 60 ms. while the advance period is decreased to 40 ms. In this embodiment, which is related to the system show in FIGURES 2 and 3 by corresponding reference character, photoelectric scanning techniques are employed. Thus, photo resistors 110 are arranged for scanning by a light spot 111 replacing the rotary contact switch arm hereinbefore described.

In physical construction the light source may be a rotatable thin slit closely positioned to the photo resistors for timing accuracy. The photo-resistors 110 are carefully dimensioned to give accurate position information when the light impinges upon the photo resistor. This produces a waveform 112 with a steep rising waveform at the leading edge during time *t* as developed at resistor 114 only when a charge on the capacitor 71 is encountered as the supply voltage. The photo-resistor 110 plus resistor 114 comprises a voltage divider across the charged capacitor 71 to produce a detectable signal 112 as the resistance of the photo-resistor 110 is lowered by light beam 111. The tail portion of the waveform is ignored, and the leading edge is shaped in amplifier 115 to reset flip-flop 89' to "zero" and produce output pulse 116 upon the "one to zero" transition. This is the print timing pulse which via amplifier 94 operates the print hammer.

Variations of operation encountered in the use of the photocell scanner are illustrated by employment of a discharge bus 117 and diodes 118. As before indicated, capacitors 71 are charged until the printing occurs, and then are discharged for receiving and storing the next character selection. However, the photo-resistors are high in impedance, and thus the transistor 119 is responsive to the printing pulse to discharge capacitors 71 etc. through low resistance of diodes 118 after each printout.

Each scanning cycle is initiated by setting flip-flop 89' to its "one" state. A start pulse is derived from the trigger bus 52 at the start T0 of the timing cycle, but is delayed 10 ms. at multivibrator 120. This delay plus the 50 ms. timing cycle per revolution of scanning provides the preferred 60 millisecond timing period of this embodiment.

In order to prevent ambiguity in the event of exact coincidence of the delayed flip-flop set pulse 121 and the leading edge of waveform 112 when the stored character is scanned, the inhibit circuit 122 is provided. Thus, the pulse 121 is inverted in amplifier 123 and serves to inhibit the trigger zero pulse to flip-flop 89'. Therefore, no output pulse 116 occurs and the capacitor 71 remains charged (because of the high resistance of photo-resistor 111) for the full 50 ms. revolution to provide a print cycle without ambiguity when next encountered. Accordingly, this circuit functions in printout without contact wear, and operates the printer system in an equivalent manner to the scanning switch formerly described.

It is evident from the foregoing description that a simple yet reliable electronic printing device is afforded by this invention which provides flexibility for employment with various requirements of specific input-output equipment without redesign, engineering or tooling. Also, the minimization of mechanical moving parts required assures optimum performance with little maintenance and easy accessibility to all parts. Having thus improved the state of the art, I claim the novel features representative of the invention as defined with particularity in the following claims:

1. An electronic printing system comprising in combination a continuously operable motor, a type wheel continuously rotated by said motor having a plurality of character indicia about its circumference presented at a fixed record location, with a rotor arm coupled to and continuously rotated with said print wheel to scan separate character identification switch sections presented in a fixed timing relationship with each of the sectors of the type wheel upon which the character indicia are placed, electronic means coupled to the rotor arm for initiating a print cycle when the switch sections are encountered, asynchronous switching means for each character energizing a single one of the switch sections responsive to a character selection operation for a single presentation of the selected character by said wheel, electronically operated impact means operable as the rotor arm engages the latter said switch section to strike the selected type wheel character, means interposing a recording medium between the impact means and the type wheel to record the character, and electronically operated advancing means to advance the relative positions of the recording medium and the type wheel subsequent to each impact, an electronic timing generator to produce separate signals during two sequential timing periods defining respectively the impact operation period and the advancing operation period, means operating the advancing means responsive to its sequential signal, wherein the means for energizing the switch sections operates momentarily and is thereafter disabled by means operable from both said separate signals throughout the remainder of both said operation periods, wherein the means energizing the switch sections is a keyboard with each key on the keyboard comprising a manually operated switch coupled in rest position to charge an accompanying capacitor and coupled in operated position to release the charge on the capacitor thereby actuating said impact means, means responsive to the key switch operation serving to generate a timing pulse lasting for the duration of the print cycle, and means responsive to the timing pulse provided for discharging the keyboard capacitors, thereby preventing operation for a further printing cycle prematurely.

2. An electronic printing system comprising in combination a continuously operable motor, a type wheel continuously rotated by said motor having a plurality of character indicia about it circumference presented at a fixed record location, with a rotor arm coupled to and continuously rotated with said print wheel to scan separate character identification switch sections presented in a fixed timing relationship with each of the sectors of the type wheel upon which the character indicia are placed, electronic means coupled to the rotor arm for initiating a print cycle when the switch sections are encountered, asynchronous switching means for each character energizing a single one of the switch sections responsive to a character selection operation for a single presentation of the selected character by said wheel, electronically op-

erated impact means operable as the rotor arm engages the latter said switch section to strike the selected type wheel character, means interposing a recording medium between the impact means and the type wheel to record the character, and electronically operated advancing means to advance the relative positions of the recording medium and the type wheel subsequent to each impact, an electronic timing generator to produce separate signals during two sequential timing periods defining respectively the impact operation period and the advancing operation period, means operating the advancing means responsive to its sequential signal, wherein the means for energizing the switch sections operates momentarily and is thereafter disabled by means operable from both said separate signals throughout the remainder of both said operation periods, wherein the means energizing the switch sections is a keyboard with each key on the keyboard comprising a manually operated switch coupled in rest position to charge an accompanying capacitor and coupled in operated position to release the charge on the capacitor thereby actuating said impact means, wherein the electronically operated impact means comprises a print hammer, a solenoid for operating the print hammer to impact the type wheel, and a pulse shaping circuit responsive to the capacitor charge received through a selected identification switch section to produce a solenoid actuating pulse of such amplitude and shape that the type wheel is impacted briefly while in continuous motion to produce a clean print character on said recording medium, and wherein a timing generator is provided to produce separate signals during two sequenital timing periods defining respectively the impact operation period for printing a character and the advancing operation period during which the record is displaced relative to the type wheel, and including means operating the advancing means responsive to its sequential signal, wherein the pulse shaping circuit includes gating means operable to disable the pulse shaping circuit during the advancing operation period.

3. An electronic typewriter comprising in combination a keyboard having a plurality of switches for corresponding characters, record advancing means, a continuously rotatable type wheel presenting said characters at a fixed location on the record, type sector multiple position selection switch means having a rotor arm coupled to rotate with said wheel and having switch sections presented for each character on the type wheel, separate capacitors storing a charge responsive to actuation of corresponding keyboard switches, means coupling the capacitors to separate selection switch sections, means coupled to the rotor arm to establish a print signal responsive to a charge on said capacitors, means impacting the type wheel responsive to the print signal, and means presenting a recording medium between the impacting means and type wheel, wherein the selection switch comprises a set of photo-resistors scanned by a light beam on said rotor arm, wherein the charge on one of said capacitors is the sole potential applied to said photo-resistors, and said means to establish a print signal comprises voltage divider means coupled to the charged capacitor for detecting a change of potential as the photo-resistance is changed by encountering the light beam.

4. An electronic typewriter comprising in combination, a continuously rotatable type wheel having a plurality of characters disposed about is circumference for cyclic presentation at a fixed location, means moving a record for printing past the fixed location after each character is printed, a rotatable scanning switch having a plurality of identification contacts scanned by a rotary arm coupled for synchronous rotation with the type wheel to identify the position of each type character with a corresponding contact, a keyboard comprising a plurality of manually operated switches corresponding to characters on the type wheel, individual temporary electronic storage devices for each key retaining keyset information upon closure of any one of said switches only until the corresponding character is presented by said type wheel, electrically actuated impact means for striking characters on the type wheel at said fixed location, means connecting each storage device through its corresponding manually operated switch to the respective scanning switch contaact corresponding to characters identified by keyboard switch designations, electronic impact initiating means coupled through the scanning switch rotary arm to said impact means to cause it to impact the type wheel responsive to the keyset information held in said storage means, whereby the scanning switch times the printing of the character corresponding to the keyset information, and timing control means for producing a timing signal for the duration of the printing operation cycle as initiated by the closure of the first one of said keyboard switches, and including blanking means responsive to the timing signal operable to clear the stored condition of all storage devices and prevent any further signals through an operated key switch during the remainder of the operation cycle.

5. A typewriter as defined in claim 4 including a remote input device presenting sequential character selections in multiple bit coded form, and a diode matrix circuit interposed between the remote input device and said switch contacts to convert the coded character selections to a single scanning switch contact selection.

6. An electric typewriter comprising in combination, a continuously rotatable type wheel having a plurality of characters disposed about its circumference for cyclic presentation at a fixed location, means moving a record for printing past the fixed location after each character is printed, a rotatable scanning switch having a plurality of identification contacts scanned by a rotary arm coupled for synchronous rotation with the type wheel to identify the position of each type character with a corresponding contact, a keyboard comprising a pluarlity of manually operated switches corresponding to characters on the type wheel, individual capacitors serving as temporary electronic storage devices each connected to one of said switches for attaining an electronic charge with the switches unoperated and for releasing the charge and emitting a representative signal through a corresponding one of the switches upon operation thereof, electrically actuated impact means for striking characters on the type wheel at said fixed location, means connecting each storage device through its corresponding manually operated switch to the respective scanning switch contacts corresponding to characters identified by keyboard switch designations, electronic impact initiating means coupled through the scanning switch rotary arm to said impact means to cause it to impact the type wheel responsive to the release of the charge held in said capacitors to time the printing of the character corresponding to the keyset information by means of the scanning switch and including a bistable state device, with the scanning switch having reset contacts intermediate each type character identifying contact, circuit means coupling the charge on the capacitor through the identifying contacts on the scanning switch to the bistable state device to set it into one stable state of operation, circuit means coupling the reset contacts to the bistable state device to reset it into its other stable state of operation and circuit means connecting the impact means for operation responsive to the reset of the bistable device thereby to avoid timing jitter which might occur if the keyboard switch were closed during the time the corresponding identification contact is being scanned.

7. An electric typewriter comprising in combination, a continuously rotatable type wheel having a plurality of characters disposed about its circumference for cyclic presentation at a fixed location, means moving a record for printing past the fixed location after each character is printed, a rotatable scanning switch having a plurality of identification contacts scanned by a rotary arm coupled

for synchronous rotation with the type wheel to identify the position of each type character with a corresponding contact, a keyboard comprising a plurality of manually operated switches corresponding to characters on the type wheel, individual capacitors serving as temporary electronic storage devices each connected to one of said switches for attaining an electronic charge with the switches unoperated and for releasing the charge and emitting a representative signal through a corresponding one of the switches upon operation thereof, electrically actuated impact means for striking characters on the type wheel at said fixed location, means connecting each storage device through its corresponding manually operated switch to the respective scanning switch contacts corresponding to characters identified by keyboard switch designations, electronic impact initiating means coupled through the scanning switch rotary arm to said impact means to cause it to impact the type wheel responsive to the release of the charge held in said capacitors to time the printing of the character corresponding to the keyset information by means of the scanning switch, timing control means coupled for producing a timing signal for the duration of the printing operation cycle as initiated by the closure of the first one of said keyboard switches, and blanking means responsive to the timing signal operative to prevent storage of any further keyset information during any operation cycle by discharging all of said capacitors.

8. A system, as defined in claim 5, wherein an initiation pulse is derived responsive to the end of the print cycle to permit the remote input device to feed the sequential characters automatically.

9. A typewritter, as defined in claim 3, wherein a capacitor discharge circuit is provided responsive to the print signal.

10. A typewriter, as defined in claim 3, wherein a print cycle timing circuit is provided for initiating a cycle at time T_0, and delay means is provided delaying response of the system to the print signal generated at said voltage divider.

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