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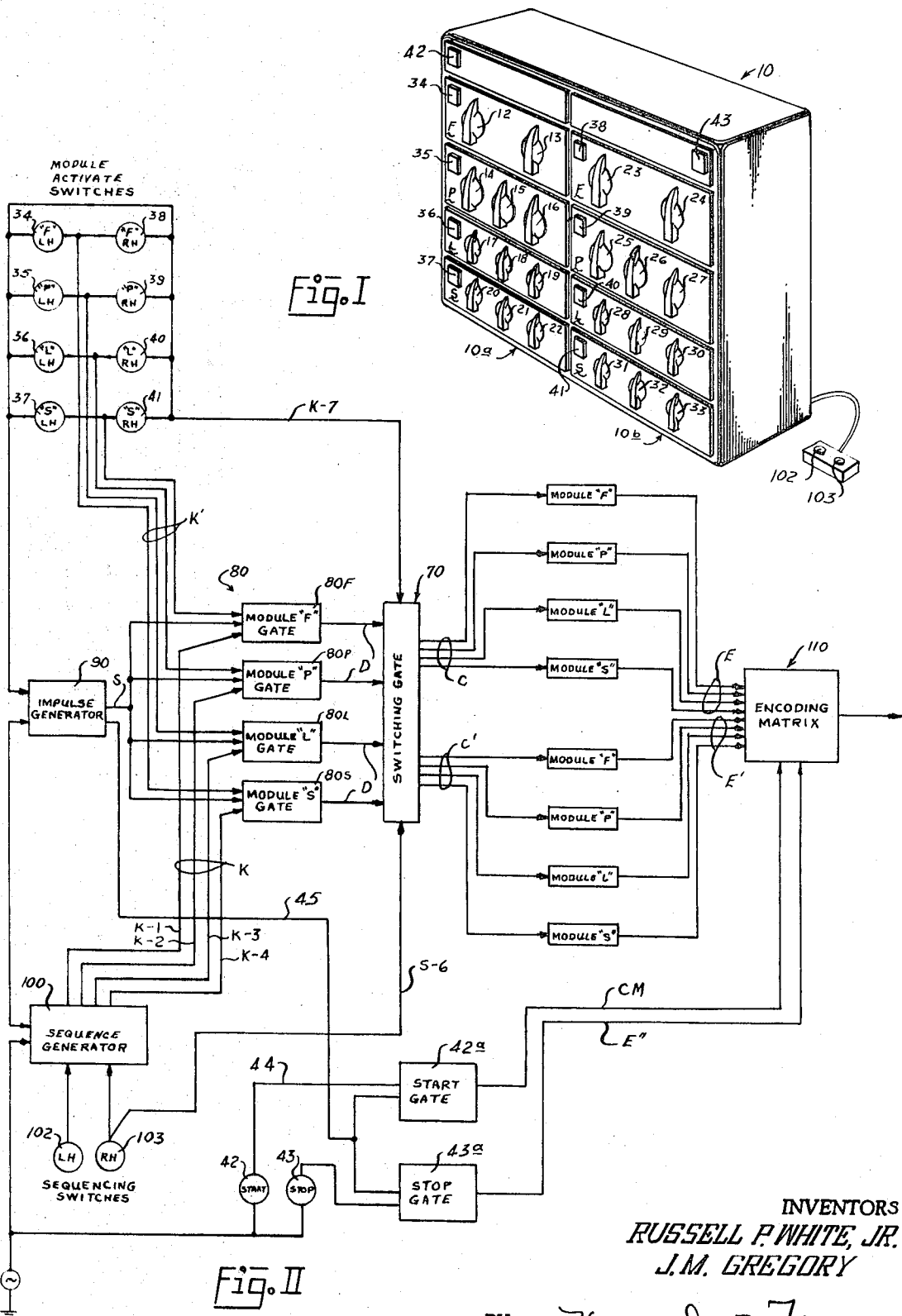
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SEQUENCING COMMAND ENCODING GENERATOR

Filed Oct. 28, 1968

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

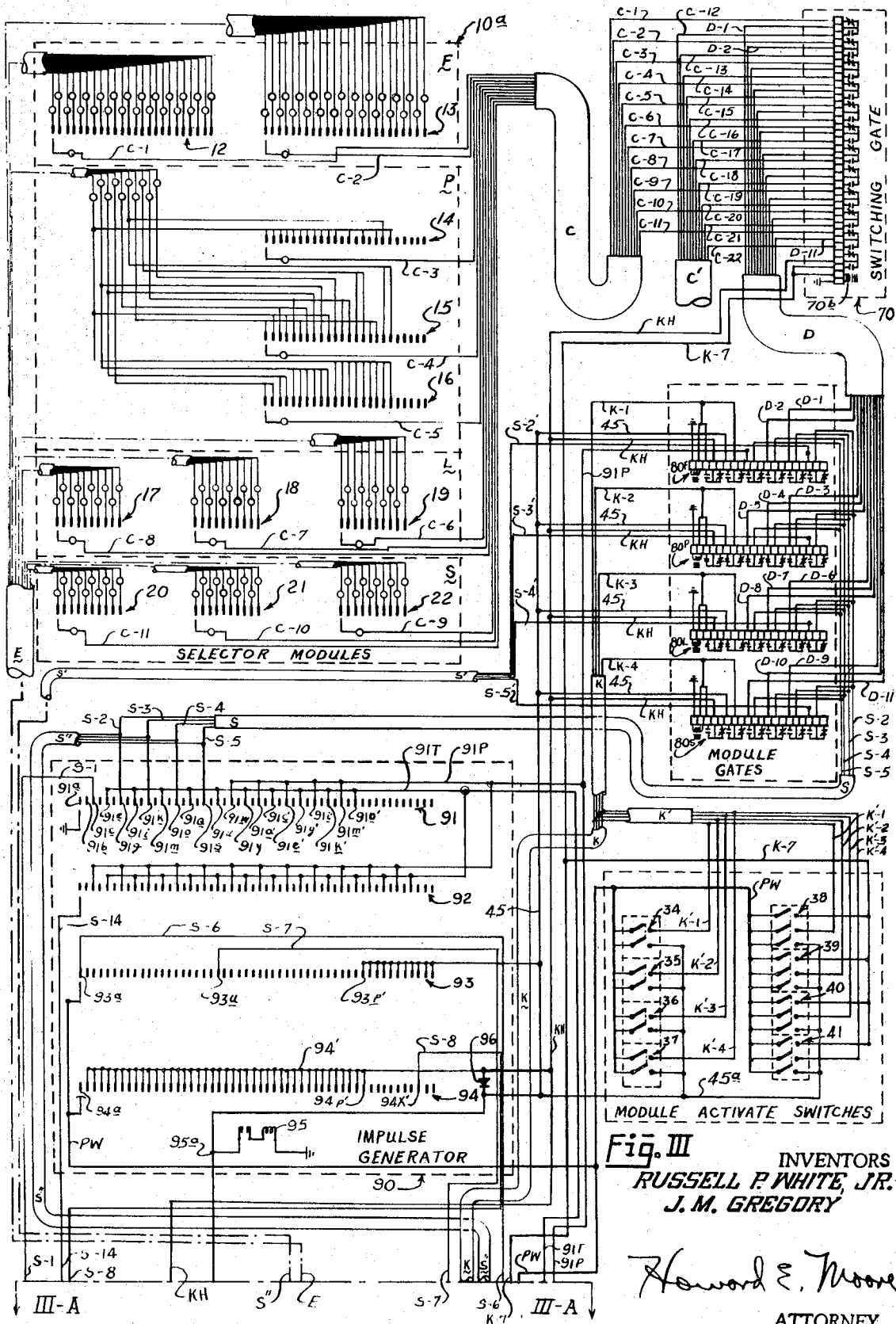


Fig. III

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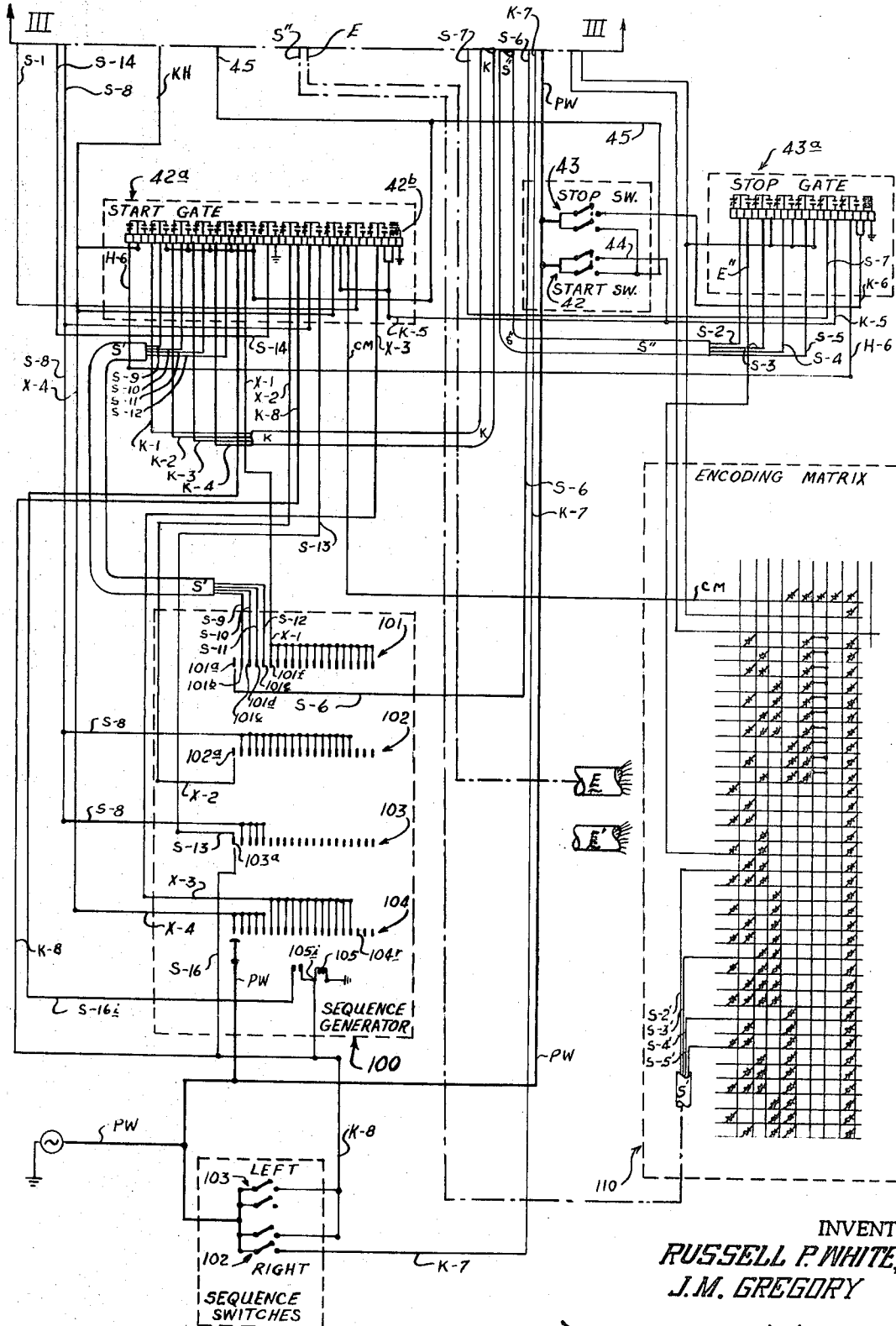


Fig. III-A

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SEQUENCING COMMAND ENCODING GENERATOR

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11 Claims

ABSTRACT OF THE DISCLOSURE

An encoding system into which parameters used in computerized type setting such as style of type, size of type, line spacing, line length, and in the case of photo composition, the amount of space between lines of type, may be preset and punched into a tape by a single key-stroke.

BACKGROUND OF THE INVENTION

In order to define parameters concerning type-setting functions involving the use of a computer, certain instructional codes must be initiated by the perforator operator. In order to set 10-point Bodini type, 30 picas wide and with 12-point line spacing, the perforator operator has heretofore been required to make a total of 39 keystrokes. These conditions are perforated into a one-inch wide control tape.

To know what the established conditions are has been a matter of the operator remembering or reading the perforations in the tape. This is impractical due to the unusual number of codes in a tape and the lengths of the tapes.

We have found that a substantial number of keypunch operators is required in a type setting operation to perforate tapes and that an undue portion of the time required for perforating a given tape is devoted to establishing the parameters such as type style, line length, line spacing and point size. These parameters are frequently changed in certain printing operations, such as printing yearbooks for schools, and therefore, require repetitious tasks which are both time-consuming and boring for the keypunch operator. This consequently reduces the efficiency of the operator due to fatigue and prevents maximum utilization of keypunch equipment.

We have also found a shortage of highly skilled keypunch operators which are capable of performing the tasks to be performed in computerized type setting thereby resulting in excessive labor costs which the highly competitive printing industry cannot bear as exemplified by the recent closing of several very old and well known newspapers in this country.

The printing industry for many years has used very inefficient stereotyped equipment. This long felt inability to advance with the times has left the printing industry far behind the developments in technology which have been realized in other industries.

While the sequencing command encoding generator which we have developed has many applications for programming inputs of information for computer controlled operations, the detailed description herein will be limited to a suitable embodiment to be used in computerized type-setting utilizing perforated control tapes.

The embodiment of the encoder, herein after described, has particular application in computerized typesetting for example in operations requiring headings or titles utilizing a set of parameters defining type style, line length, line spacing and point size and requiring a different set of parameters for the body of the text wherein the body of the text under each heading is relatively short and numerous headings are required. An inspection of a page from a

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dictionary, newspaper, school textbook or law book reveals the extensive use and numerous repetitious changes in printing on each page.

SUMMARY OF THE INVENTION

The invention pertains to an auxiliary encoding system which may be preset and utilized when required to provide for greater efficiency of operation and increased flexibility and efficiency of use of conventional equipment used in perforating computer tapes.

The output of a sequence generator is directed to an impulse generator and module gates to cycle the impulse generator and the module gates in synchronization.

An impulse is carried from the impulse generator through the module gates, through a switching gate to appropriate control selector switches. The impulse is then conducted through the selected contact of the selector switch to an encoding matrix.

When the impulse has been fired to the encoding matrix, the impulse generator triggers a transport and punch signal which activate conventional tape punch equipment to cause the code to be punched.

A plurality of banks of selector switches are provided. It should be appreciated that the tape punch operator can establish one set of parameters upon one bank of the encoder and a different set of parameters upon another bank and punch the desired parameters by pressing a sequencing switch associated with the desired bank causing the switching gate to route the impulses from the impulse generator to the bank into which the desired parameters have been preset.

After the code representing a given set of parameters has been punched in the tape, a single parameter, such as line spacing, may be changed by pressing an activate switch on a single module to cause the code for the single parameter to be punched without repunching the code for the parameters which are unchanged.

It is therefore, a primary object of the present invention to provide a typewriter auxiliary control whereby the task of the perforator operator will be greatly simplified.

It is a further object of the invention to provide a system whereby error by the perforator operator will be reduced thereby reducing illegal commands to the computer.

It is a further object of the invention to provide a system whereby the time required to perforate a given tape will be substantially reduced.

It is a further object of the present invention to provide a system with numerous banks whereby the perforator operator will have primary and secondary parameter conditions that can be switched as needed.

It is a further object of the invention to provide a system with physical indication as to current established conditions for more frequently changed items.

It is a further object of the invention to provide an encoding system which will reduce the number of highly skilled tape perforating personnel thereby easing the labor shortage problem long felt in the printing industry.

A still further object of the invention is to provide an encoding system which will reduce fatigue of tape punch operators by eliminating the necessity for punching repetitious parameters individually by single keystrokes.

A still further object of the invention is to provide an encoding system which will automatically punch a lead and tail for the computer tape.

Another object of the invention is to provide an encoding system which allows the changing of less than all of the parameters thereby shortening the length of tape required for a given operation.

Other and further objects and features of this invention, as well as the means for achieving them, will be apparent

from the following detailed description read in light of the accompanying drawings and claims.

DESCRIPTION OF THE DRAWING

The accompanying drawings of the present invention are provided so that the invention may be better and more fully understood, in which:

FIG. I is a perspective view of the sequencing command encoder showing two banks of four modules each with control selectors for presetting desired conditions;

FIG. II is a simplified schematic diagram of the sequencing command encoder;

FIG. III is a schematic diagram illustrating details of one bank of the sequencing command encoder showing the wiring of the individual components of a portion of the encoder; and

FIG. III-A is a second portion of the schematic diagram shown in FIG. III.

Numeral references are employed to indicate the various parts shown in the drawing and like numerals indicate like parts throughout the various figures of the drawing.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to FIG. I of the drawing, the numeral 10 generally designates the auxiliary sequencing command encoder consisting of two banks, a left bank 10a and a right bank 10b with each of said banks consisting of four modules designated F, P, L and S.

Selector module F consists of a group of control selector switches 12 and 13 for the selection of a specific type style.

Selector module P consists of control selector switches 14, 15 and 16 for the selection of specific point size codes.

Selector module L consists of control selector switches 17, 18 and 19 for the selection of a specific line length.

Selector module S consists of a group of control selector switches 20, 21 and 22 for the selection of specific line spacing.

The right bank 10b is identical to the left bank 10a. However, the right bank 10b operates separately and independently of left bank 10a. The right bank 10b consists of selector module F with control selector switches 23 and 24; selector module P with control selector switches 25, 26 and 27; selector module L with control selector switches 28, 29 and 30; and selector module S with control selector switches 31, 32 and 33. The right bank of selector modules 10b may have a separate and independent selection of point size, line spacing, line length, and type style from that which is preset upon left bank 10a.

Each selector module F-S of each bank 10a and 10b has an individual module activate switch designated by the numerals 34 through 41 which enables the operator to select only parameters that need changing instead of the entire bank of parameters where this is more desirable as will be hereinafter explained.

The sequencing command encoder 10 has a start switch 42 and a stop switch 43. Closing the start switch 42 causes a lead to be automatically punched in the tape. Closure of the stop switch automatically causes an end of tape code and a tail to be punched in the tape.

Referring to FIG. II of the drawing, selector modules F, P, L and S consist of groups of rotary switches which are wired for selection of either digits, alphanumeric characters, or specific point size codes.

A signal from an impulse generator 90 is routed through module gates 80 to the contacts of switching gate 70, then through lines C or C' to the appropriate wipers of selector switches 12 through 22 of left bank 10a or to selector switches 23 through 33 of right bank 10b. The signal passes through the selected contacts of the selector switches to cells of the encoding matrix 110. Transport and punch signals are routed from the impulse generator 90 to the encoding matrix 110 to deliver the signals to conventional keypunch equipment (not shown) to cause the parameters to be punched in a control tape.

Each control selector switch 12 through 33, FIG. III, is positioned so as to generate the code for a particular digit or alpha-numeric character. Numerous equivalent devices could be used to replace the rotary control selector switches 12 through 33 such as ganged push-button switches, toggle switches, or switches in visual displays.

Switching gate 70 consists of an electro-magnetic, twelve pole, double throw relay. As shown in FIG. III of the drawing, the normally closed contacts of the switching gate direct current through lines C-1 through C-11 (conduit C) to the wipers of selector switches 12 through 22 of left bank 10a respectively. When the normally open contacts of the switching gate 70 are closed, current is directed to the wiper of selector switches 23 through 33 of the right bank 10b by lines C-12 through C-22 (conduit C') respectively.

The function of the switching gate 70 is to switch signals from the module gates 80 to either the left bank 10a or the right bank 10b. The switching gate 70 could consist of any gating or routing device, for example relays, AND gates, NAND gates, or flip flops.

The module gates 80F, 80P, 80L and 80S consist of electromagnetic six pole, double throw relays. When the coil of any given module gate is activated, a circuit is made between the impulse generator 90 and the switching gate 70. Lines D-1 through D-12 (conduit D) connect normally open contacts of the module gates 80F-S to the switching gate 70 allowing current to be directed to the selector switches 12 through 33 hereinbefore explained.

The function of the module gates 80 is to route pulses from an impulse generator 90 to the appropriate selector module F, P, L or S so that pre-selected codes can be punched in sequence. The module gate could consist of any gating or routing device, or simple relays, AND gates, NAND gates, or flip flops. The selector control switches of modules F, P, L and S are connected through the contacts of switching gate 70 to module gates 80F, 80P, 80L and 80S, respectively.

The impulse generator 90 consists of a four-level, 52 contact stepping switch for producing very short pulses of current. The number of impulses, their duration, and the interval between pulses can be varied according to application requirements. The impulse generator could consist of a fixed programmable pulse generator, for example stepping switches, electro-mechanical drum program, cam operated switches, vacuum tube oscillating wave generators, or solid state pulse or wave generators. The impulse generator 90 provides a sequence of either positive or negative pulses through lines S-2, S-3, S-4 and S-5 (conduit S) to the module gates 80F, 80P, 80L and 80S to be conducted through conduit D to the switching gate 70 and consequently through conduit C or C' to the selector switches. The first three levels 91, 92, 93 of the impulse generator 90 are equipped with break-before-make wipers (non-shorting). The fourth level 94 of the impulse generator 90 is equipped with a make-before-break wiper (shorting). The coil 95 is furnished with standard interruptor contacts for self-stepping operation.

The sequence generator 100, FIG. III-A, is a four-level, 20-contact stepping switch with the same wiper configuration as the impulse generator 90. The function of the sequence generator 100 is to cycle the impulse generator 90 and the module gates 80F, 80P, 80L and 80S in synchronization so as to sequence the module bank 10a or 10b through all available code structures.

The wiper of sequencing generator 100 advances one contact for each cycle of the impulse generator 90. As will be hereinafter explained, the sequencing generator 100 fires a signal to the coil of module gate 80F causing the impulse generated by the first cycle of impulse generator 90 to be directed to the wiper of a selector switch in module F of bank 10a or 10b. When the pulse has been delivered to module F, the sequencing generator breaks the circuit by deenergizing the coil of module gate 80F and energizes the coil of module gate 80P to cause the pulse

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generated by the next cycle of impulse generator 90 to be directed to module P. The sequence of operation continues supplying pulses to modules L and S.

The signals to the coils of the module gates are delivered through lines K-1, K-2, K-3 and K-4 (conduit K). Conduit K is joined with conduit S' after passing through start gate 42a.

The sequence generator 100 could consist of stepping switches, electro-mechanical drum program, cam operated switches, vacuum tube oscillating wave generators, or solid state impulse or wave generators.

Sequencing control switches 102 and 103 for controlling the left bank 10a and the right bank 10b, respectively, are mounted adjacent the keyboard of a standard tape perforating machine. These switches are multiple pole, double throw, momentary contact push-button switches. Any standard switching medium could be utilized.

The function of the each sequencing switch 102 and 103 is to make a circuit to simultaneously energize the sequencing generator 100 through lines K-8 and to cause the switching gate 70 to assume the appropriate position to direct the pulses from impulse generator 90 to the desired bank 10a or 10b. As was hereinbefore pointed out, the normally closed contacts of switching gate 70 direct the impulses to left bank 10a. When sequencing switch 103 is closed current passes through line K-7 to energize the coil of switching gate 70 to close the normally open contacts directing the impulses through conduit C' to the right bank 10b.

The individual module activate switches 34 through 41 are multiple pole, double throw, momentary contact push button switches, the function of which is to by-pass the sequencing generator 100 to energize the coil of a single module gate through line K'-1, K'-2, K'-3 or K'-4, cause the switching gate 70 to assume the proper position, line K-7, and send a signal through line 45a to activate impulse generator 90 to cause impulses to be directed to the desired selector switch contacts of the desired bank to change a single parameter. It should be noted that the individual module activate switches are arranged in a first set 34-37 for activating modules F, P, L and S of left bank 10 and a second set 38-41 for activating modules F, P, L and S of the right bank 10b. Closure of switches in the second set sends current through line K-7 to energize the coil of switching gate 70 to route the signal to the right bank 10b.

The encoding matrix 110 is a standard diode matrix to convert single impulses into multiple signals to activate a multiplicity of punch solenoids (not shown) so as to punch the specific code for each selected alpha-numeric character. The encoding matrix 110 is designed to encode single impulses into the eight level code utilized in a specific typesetting operation. Other configurations could result in other code structures for tapes of any number of levels and code block configuration. A multiplicity of matrix configurations could adapt the generated command codes for a wide variety of applications.

Each contact of each control selector switch 12 through 22 of the left bank 10a and each contact of each switch 23 through 33 is connected through conduit E or E' to an appropriate cell in the matrix 110 in any suitable manner.

The start switch 42 may be closed to energize the coil 42b of the start gate 42a through line 44 to close the normally open contacts to make a circuit whereby current may flow between the sequencing generator 100 and impulse generator 90. The coil 42b of the start gate 42a remains activated until current from level 104 of sequence generator 100 is interrupted causing the holding circuits to be broken.

It is readily apparent from the foregoing description of the present invention that additional selector modules other than F, P, L and S may be incorporated into the present structure if instructional codes other than point size, line spacing, line length and type style are desired. It is also readily apparent that additional banks of mod-

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ules 10a and 10b could be added if it is desirable to have banks whereby a multiplicity of secondary parameters can be preset.

OPERATION

Closure of the start switch 42, FIG. III-A, simultaneously activates the coil 42b of the start gate 42a through line 44 and the coil 95 in the impulse generator 90 through line 45. Start gate 42a is held in an active condition by current from level 104 of the sequence generator 100 through lines X-3 and X-4, through the NO contacts of the start gate 42a through holding circuit K-5, to the coil 42b.

The impulse generator 90, activated by current through line 45 upon closure of start switch 42, is held in the activated condition by current from line PW through the make-before-break wiper of level 94 of impulse generator 90 through the contacts of level 94 which are joined by a common line 94' to the coil 95. The impulse generator steps automatically through a complete 52 point cycle.

Alternate positive pulses from level 92 of the impulse generator 90 through punch terminals 91P and transport terminals 91T provide a succession of tape feed punches and tape transport signals.

As the 50th contact 94X' in level 94 of the impulse generator 90 is closed, a signal through line S-8 is routed through NO contacts of the start gate 42a to line S-13 through the first contact 103a of level 103 of the sequence generator 100 through line S-16 to the coil 105 of the sequence generator stepping the sequence generator to position No. 2.

When the impulse generator 90 completes its cycle and returns to position No. 1, contacts 91a, 92a, 93a and 94a, the current through the first contact 93a of level 93 of the impulse generator 90 is routed through terminal S-6; through the second contact 101b in level 101 of the sequence generator 100; through line S-9; through the NO contacts of the start gate 42a through line 45 to the coil 95 of the impulse generator 90 triggering another impulse generator cycle.

This process is repeated and sequence generator 100 is triggered by current from contact 94X' in level 94 of impulse generator 90 through line S-8 which in turn triggers impulse generator 90 through line S-6 in level 101 until the sequence generator 100 steps to the 18th position 104r when the start gate hold circuit is broken, start gate 42a reverts to NC condition, and subsequent signals from S-6 are routed through X-1, NC contacts of start gate 42a and line S-16; to the interruptor contacts 105i of the sequence generator 100 to step it "home" to position No. 1 at which time all action ceases. This process provides a tape leader with feed holes for insertion into the computer. It should be noted that a rectifier 96 is provided in line 94'.

Closure of module activate switch 34 of module F of the left module bank 10a sends current simultaneously through line K'-1 to the coil of module gate 80F and through line 45a to the interruptor contacts 95a of the impulse generator 90. Activation of module gate 80F routes all inputs through the normally open contacts. Activation of interruptor contacts 95a of the impulse generator 90 causes the impulse generator to step to position No. 2. Current through level 94 of the impulse generator 90 through line KH holds module gate 80F in the activated position through its NO contacts, and causes the impulse generator 90 to step successively through a complete cycle.

As the impulse generator 90 steps to position 91c a positive impulse is routed through line S-1, through the NC contacts of the start gate 42a, through line CM to the encoding matrix and to the proper channels to punch the command code. The fifth contact 91e of level 91 of the impulse generator 90 provides a transport signal, through line 91T to the encoding matrix.

The seventh contact 91g of level 91 of the impulse generator 90 routes the positive impulse through

line S-2 through NO contacts of module gate 80F through line S-2' (conduit S') to the encoding matrix 110 to punch the code designation for the type style. Contact 91i of level 91 of the impulse generator 90 repeats a transport signal.

Contact 91k of level 91 of the impulse generator 90 routes a positive impulse through line S-3, through the NO contacts of module gate 80F, through line D-1, through the NC contact of switching gate 70 to line C-1 to selector module F, then through the selected contact of switch 12 through conduit E to the encoding matrix 110 to punch the selected code.

The thirteenth contact 91m sends a transport signal. The fifteenth contact 91o sends a signal through line S-4, D-2, C-2, through the wiper of switch 13 to the selected contact of selector module F and punches the second code. The seventeenth contact 91q provides a transport signal.

The contact 91s punches a third code, if any. Line S-5 is connected through the module gate 80F to line 91P in the illustrated embodiment because there are only two selector switches 12 and 13 in module F of each bank 10a and 10b. Line S-5 is connected through lines D-5 and D-8 and D-11 through the switching gate to lines C-5, C-8 and C-11 respectively to provide impulses to selector switches 16, 19 and 22 respectively of modules P, L and S of bank 10a.

The remaining contacts in level 91 furnish alternate impulses to the punch and transport circuits to furnish five spaces after each code sequence. The impulse generator 90 then steps to position 91a and stops. The hold circuit is broken at contact 94p' and the module gate 80F is inactivated and returned to the NC condition, while current from level 93 of impulse generator 90 is routed through line 45 to coil 95.

Activation of any module activate switch 32 through 37 triggers the above described sequence of operations through one complete cycle of the impulse generator 90 as described. In addition closing of any module activate switch 38-41 of the right module 10b also sends current to the coil 70b of the switching gate 70 which is also held in the active state through the holding circuit through line KH. This routes the signal through the normally open contacts to the appropriate selector module P, S, L or F in the right bank 10b.

Closure of the sequencing switch 102 sends current simultaneously through line K-8 to the coil 105 of the sequence generator 100 and through line K-7 to close the switching gate which is held for the sequence cycle through line X-4. Release of the sequence switch 102 allows the sequence generator 100 to stop to position 101b, 102b, 103b and 104b. The first contact 93a of level 93 of the impulse generator 90 routes current through line S-6 through the sequence generator 100 at level 101 contact 101b through line S-9 to the NC contact of the start gate 42a to module gate 80F through line K-1, through line SS-1 to the impulse generator 90 at 95a activating an F module cycle.

The fiftieth contact 94X' of level 94 of the impulse generator 90 transmits a signal through line S-8, the contacts of level 103 of sequence generator 100, line S-16, to coil 105 which steps the sequence generator 100 to position 103c.

Return of the impulse generator 90 to position 93a sends an impulse through S-6 and contact 101c through S-10 to K-2 for a P module cycle and the operation repeats through S-11 for the L, and through S-12 for the S module cycles.

After reaching the sixth contact 101f in level 101 of the sequence generator 100 the signal from level 93 of the impulse generator 90 through S-6 is routed to line X-1 in level 101 of the sequence generator 100 through NC contacts of the start gate 42a to the interruptor contact 105i of the sequence generator 100 to step it to the home

position where the operation ceases. This process affects the punching of the four modules in sequence.

The closure of the stop switch 43 activates the stop gate 43a through line K-6, closing the NO contacts, and the impulse generator 90 through line 45. The stop gate 43a is held in activation by current through line H-6 to the NC contacts of the start gate 42a. Impulses through S-1, S-2, S-3, S-4 and S-5 (conduit S') are routed through the stop gate 43a to encoding matrix 110 to punch appropriate tape end codes.

Contact 93u of level 93 of the impulse generator 90 transmits a signal through S-7 to the NO contacts of the stop gate 43a and activates start gate 42 through line K-5. This activation breaks the hold circuit through lines KH, K-6 and H-6 and releases stop gate 43a to its inactive condition. Subsequent pulses of the impulse generator 90 cycle signal punch and transport codes. Contact 94x' of level 94 of the impulse generator 90 transmits a signal through line S-8 to the NC contacts of the start gate 42a through line S-13 to the sequence generator to step it to position 103b. Sequence generator 100 then steps impulse generator 90 through a series of punch-transport cycles as described above. Operation stops when the sequence generator steps to contact 104r when the start gate hold circuit is broken and the start gate 42a reverts to the NC condition. Subsequent signals are routed to the interruptor contacts 105i of the sequence generator 100 to step it to home position at which time all action ceases. This process provides a trailer for the tape through contact E'' of the stop gate.

Having described our invention, we claim:

1. A sequencing command encoding generator comprising: an encoding matrix having a plurality of cells, each cell being connectable to suitable equipment for programming computer inputs; a plurality of selector modules arranged in at least one bank; a plurality of selector switches in each module; a plurality of contacts in each selector switch each contact being connected to a cell in the encoding matrix; a wiper in each switch positionable with relation to the contacts whereby the wiper may be selectively positioned to make a circuit through an individual contact to a cell in the matrix; a plurality of module gates having normally open contacts, each wiper of each selector switch being connected to the normally open contacts of at least one module gate; actuating means for closing the normally open contacts of the module gate when current is delivered to said actuating means; an impulse generator adapted to transmit pulses of current connected to at least one normally open contact of each module gate; means associated with the impulse generator for cycling same to generate a series of pulses; a sequence generator adapted to transmit pulses of current connected to the actuating means of each module gate and to the means for cycling the impulse generator; means associated with the sequence generator adapted to cycle same to generate a series of pulses; and a sequencing switch connected to the means for cycling the sequence generator and to a source of electricity; wherein closing the sequence switch triggers the sequence generator and the sequence generator causes the impulse generator to send pulses successively through each module gate to the matrix.

2. The combination called for in claim 1 with the addition of a first set of module activate switches, each module activate switch being connected to the actuating means for closing the normally open contacts of one module gate and to the means for cycling the impulse generator adapted to send a pulse to the selector switches of each module individually.

3. The combination called for in claim 2 with the addition of a plurality of banks of modules consisting of a first bank and at least one other bank; a switching gate; normally open contacts in said switching gate one side of each normally open contact being connected to the wiper of a selector switch in the other bank of modules;

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normally closed contacts in said switching gate one side of each normally closed contact being connected to the wiper of a selector switch in the first bank of modules; switching means for simultaneously closing the normally open contacts and opening the normally closed contacts; a second sequencing switch connected to the means for cycling the sequence generator and to the switching means for closing the normally open contacts of the switching gate for switching pulses to the selector switches of the other bank of modules.

4. The combination called for in claim 3 with the addition of a second set of module activate switches, each modulate activate switch of the second set being connected to the actuating means for closing the normally open contacts of one module gate, to the means for cycling the impulse generator, and to the switching means for closing the normally open contacts of the switching gate to send a pulse through the wiper of an individual selector switch in the other bank to the matrix.

5. The combination called for in claim 4 with the addition of a start switch and a start gate, one side of said start switch being connected to a source of electricity, the other side of said start switch being connected to the matrix and to the means for cycling the impulse generator normally closed contacts and normally open contacts in said start gate; means for opening the normally closed contacts and closing the normally open contacts; at least one of said normally open contacts in the start gate being connected to the means for cycling the impulse generator for sending a series of punch and transport codes alternately to the matrix, causing a leader to be punched in a control tape.

6. The combination called for in claim 5 with the addition of a stop switch and a stop gate; normally open and normally closed contacts in said stop gate; means for opening the normally closed contacts and closing normally

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open contacts; the stop switch being connected to the means for opening the normally closed and closing normally open contacts in the stop gate and to means for cycling the impulse generator to route tape end codes to the matrix to punch a tail for the control tape.

7. The combination called for in claim 1 wherein the impulse generator is a four-level multi-contact stepping switch and the means for cycling the impulse generator are interrupter contacts for self-stepping operation.

8. The combination called for in claim 1 wherein the sequence generator is a four-level multi-contact stepping switch and the means for cycling the sequence generator are interrupter contacts for self-stepping operation.

9. The combination called for in claim 1 wherein the module gates are electro-magnetic multi-pole double-throw relays.

10. The combination called for in claim 5 wherein the switching gate is an electro-magnetic, multi-pole, double-throw relay.

11. The combination called for in claim 6 wherein the stop gate is an electro-magnetic, multipole double-throw relay.

References Cited

UNITED STATES PATENTS

3,063,538	11/1962	Sausele	197—20
3,141,395	7/1964	O'Brien	197—20X
3,380,569	4/1968	Becking et al.	197—20
3,466,647	9/1969	Guzak	340—365

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