Jan. 8, 1963 P. Z. RIDER ET AL 3,072,743

PRECEDENCE SYMBOL RECORDING MEANS

Filed Dec. 3, 1956 3 Sheets-Sheet 1

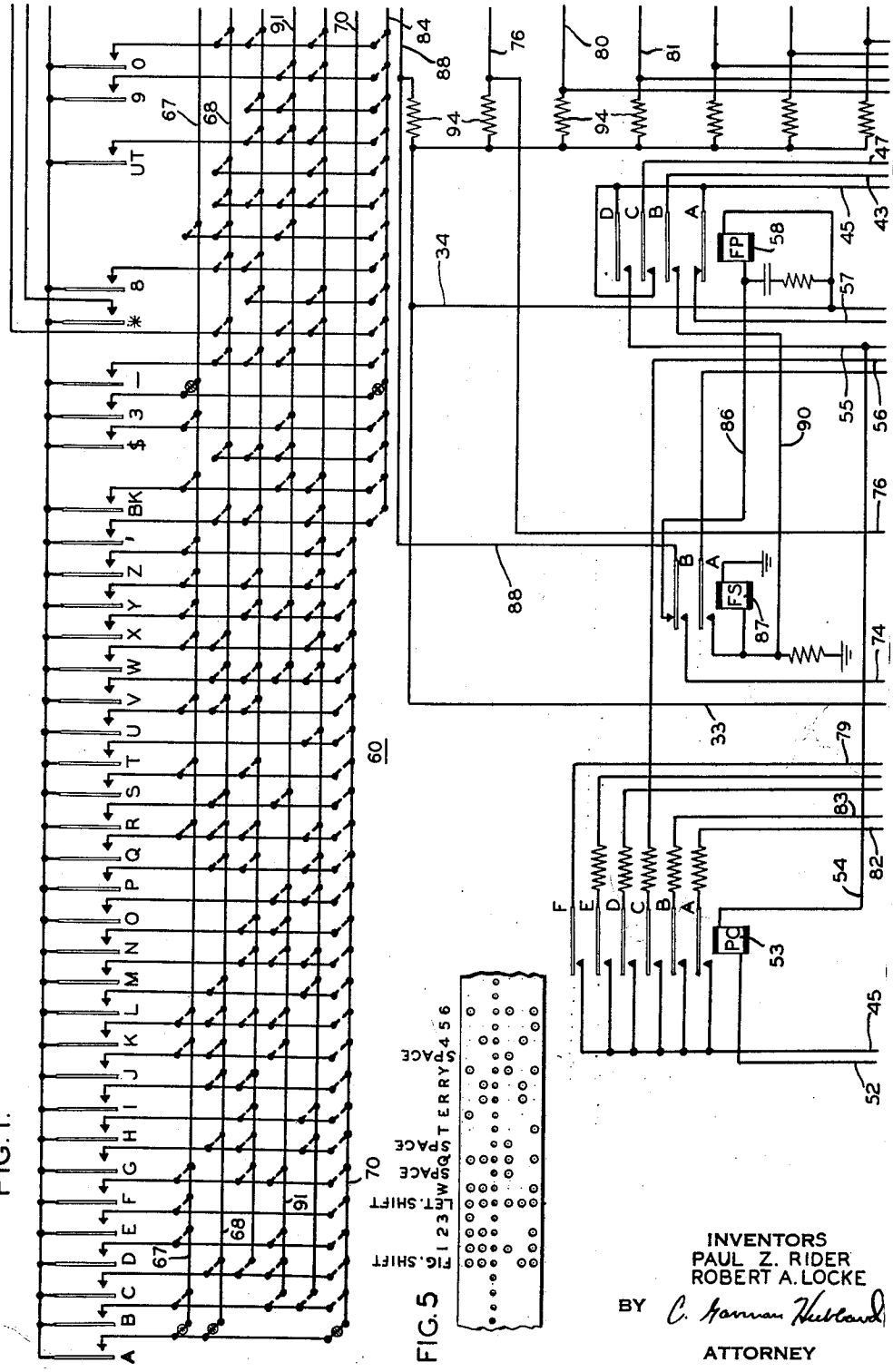


FIG. 1.

FIG. 5

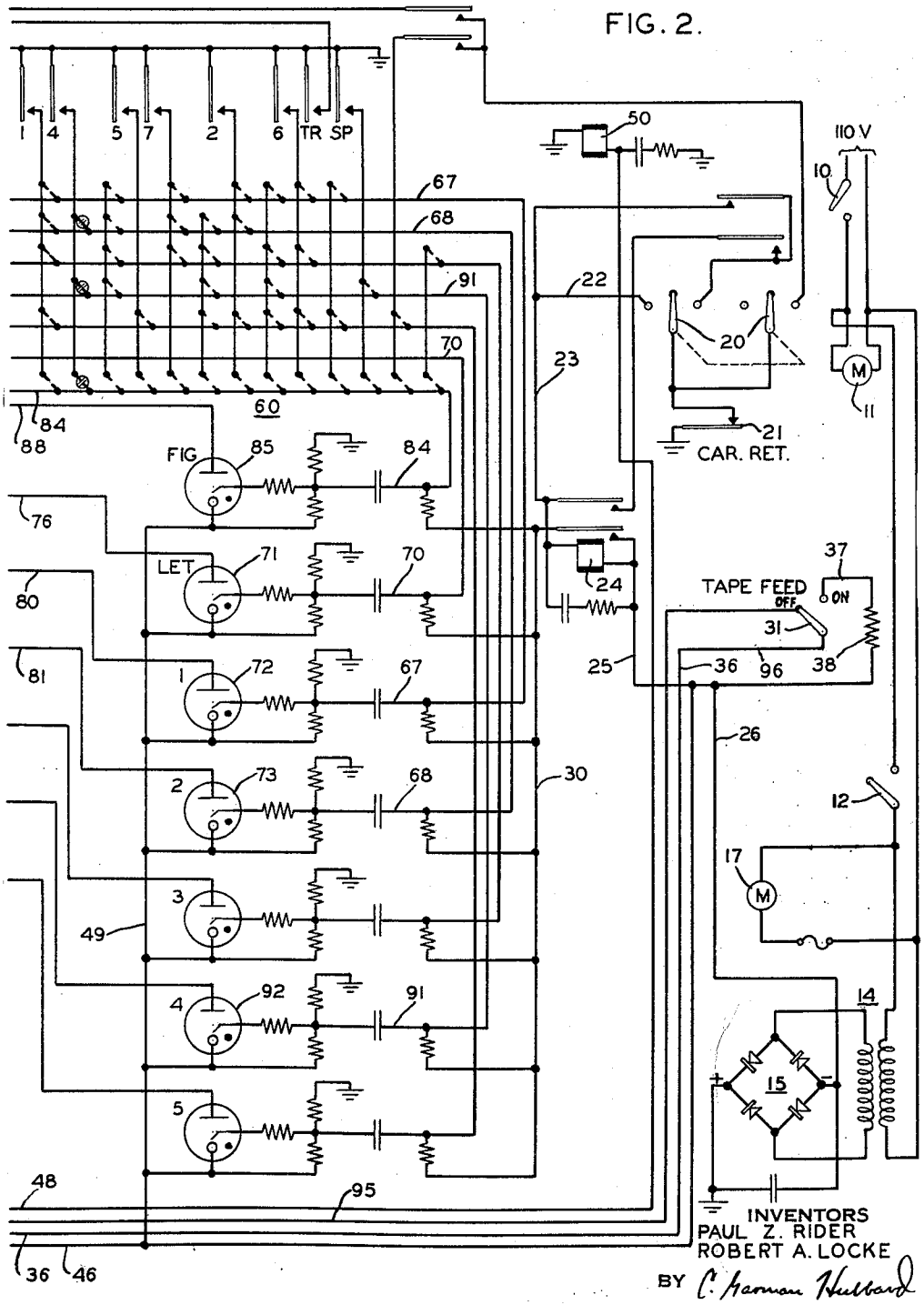
INVENTORS
PAUL Z. RIDER
ROBERT A. LOCKE
BY C. Harman Hubbard
ATTORNEY

Jan. 8, 1963 P. Z. RIDER ET AL 3,072,743

PRECEDENCE SYMBOL RECORDING MEANS

Filed Dec. 3, 1956 3 Sheets-Sheet 2

FIG. 2.



INVENTORS
PAUL Z. RIDER
ROBERT A. LOCKE
BY C. Harman Hubbard
ATTORNEY

Jan. 8, 1963 P. Z. RIDER ET AL 3,072,743

PRECEDENCE SYMBOL RECORDING MEANS

Filed Dec. 3, 1956 3 Sheets-Sheet 3

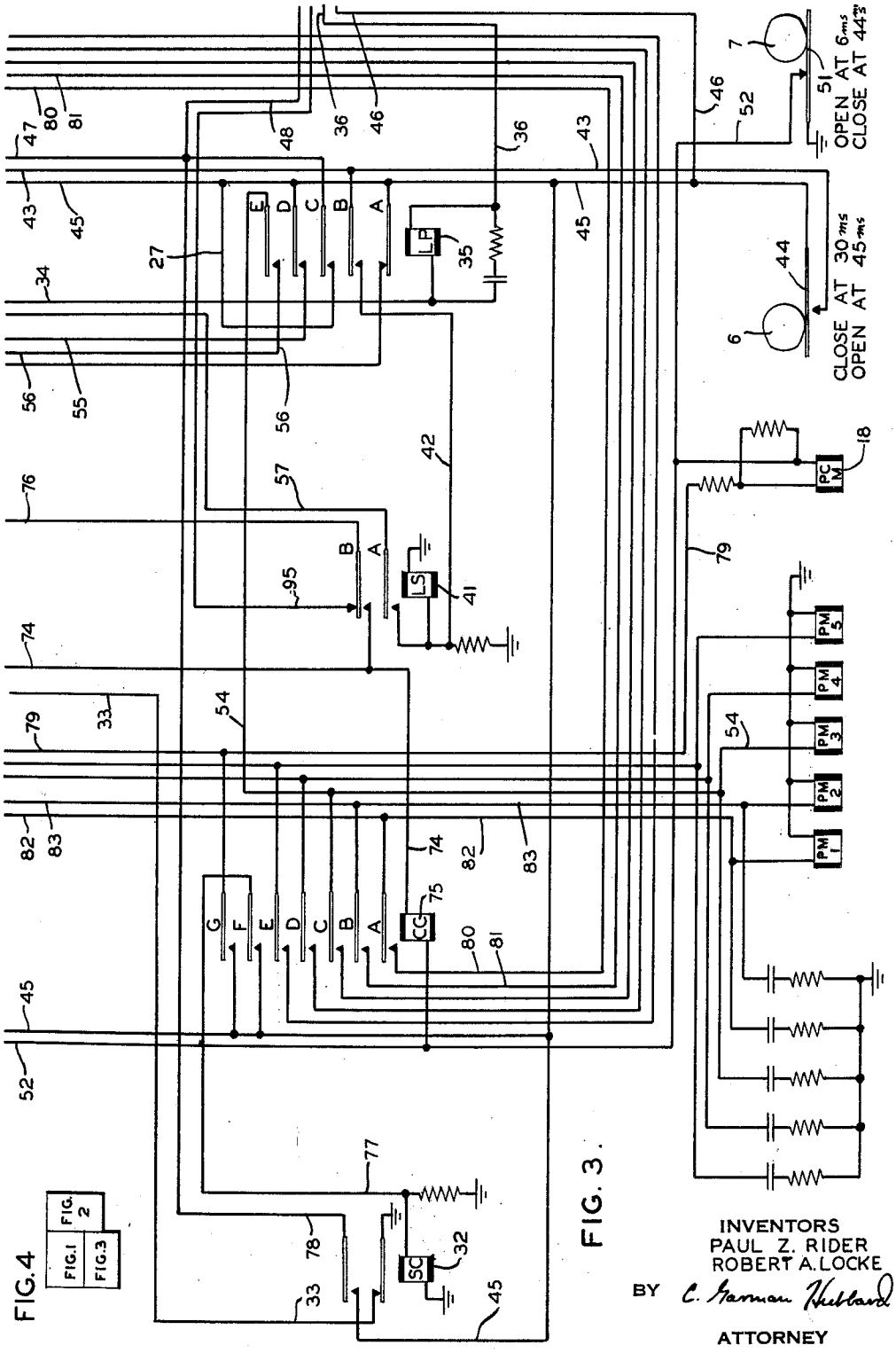


FIG. 3.

FIG. 4

INVENTORS
PAUL Z. RIDER
ROBERT A. LOCKE
BY C. Garman Hubbard
ATTORNEY

United States Patent Office

3,072,743

Patented Jan. 8, 1963

3,072,743

PRECEDENCE SYMBOL RECORDING MEANS

Paul Z. Rider, San Diego, Calif., and Robert A. Locke, Easton, Conn., assignors to Sperry Rand Corporation, New York, N.Y., a corporation of Delaware

Filed Dec. 3, 1956, Ser. No. 625,728
17 Claims. (Cl. 178—17)

This application relates to tape perforators and more particularly to a circuit for controlling the perforation of precedence, i.e., letter and figure shift, symbols.

In certain codes used with perforated tape, particularly the code used in telegraphy, the same grouping of perforations is used for numerals as for letters. The only distinguishing feature is the entry of a precedence or shift symbol which must be entered before each change from alpha to numeric and vice versa. There are two precedence symbols i.e. letter shift and figure shift. Many methods for entering these symbols have been devised but all circuits are complicated and contain many elements.

It is the principal object of this invention to provide a circuit which will automatically enter a precedence symbol upon change from alpha to numeric code and vice versa.

A further object is to provide a simple and efficient circuit for controlling the automatic entry of precedence symbols.

A more clear understanding of the further objects, construction and operation of the invention may be had from the following specification when read in the light of the acommpanying drawings in which; FIGS. 1, 2 and 3, when combined as shown in FIG. 4, form the circuit; and FIG. 5 is a showing of a portion of telegraph tape showing the code.

The embodiment of the invention herein disclosed is one wherein a typewriter keyboard is connected directly to a tape perforator. Such a perforator is disclosed in the patent to Rabenda 2,412,422 or that to Doty 2,340,800. The typewriter keys control contacts which close circuits through an encoding matrix for controlling the tape perforator.

The code herein employed is the standard Teletype code a sample of which is shown in FIG. 5. As can be seen in FIG. 5, the letter shift precedence symbol which indicates the letter-number characteristic of the data immediately following consists of all five code positions, while the figure shift precedence symbol consists of all code positions except the third position.

To start the circuit the typewriter switch 10 is closed starting the typewriter motor 11. The closing of the punch switch 12 completes a power circuit to the transformer 14, the secondary of which is connected to a rectifier 15, and also starts a punch motor 17 which is connected to the punch through a drive clutch controlled by magnet 18. The closure of punch double switch 20 closes a circuit from ground on a carriage return contact 21 through the left hand blade of switch 20, leads 22 and 23, through the winding of punch on relay 24, leads 25 and 26, to the negative side of rectifier 15. The operation of relay 24, closes a circuit from negative supply over leads 25, 26 and inner make contact of the relay, to the lead 30 which is common to the control grids for all the triodes which complete circuits for actuating the punch magnets, as will be described later. In order to condition the machine for data entry the tape feed switch 31 is closed completing a circuit from ground on the inner break contact of Storage Control relay 32 (FIG. 3) over leads 33 and 34, through the winding of Letter Precedence relay 35, over lead 36, through the tape feed switch 31, lead 37, resistance 38, lead 26, to negative supply, operating relay 35.

The operation of Letter Precedence relay 35 opens a

locking circuit to the Figure Storage relay 87 at its contact A. This has no effect at this time however, as this relay 87 has not yet been operated. A circuit is prepared by operation of relay 35 through the contact B thereof to operate the Letter Storage relay 41 over a circuit from ground through the winding of the relay, lead 42, contact B of relay 35, lead 43, through cam operated contact 44, leads 45, 46, 25, and 26 to negative on rectifier 15. Hereinafter in the description lead 45 will be referred to as the negative supply lead. The cam operated contact 44 is one of two operated by the punch during punching operations and controlled by cams 6 and 7. A cycle of these cams consumes 50 milliseconds. The contacts control the operation and release of the several relays thus determining when certain data is entered in the tape. Relay 35 also closes a circuit from negative supply lead 45 over lead 27, through contact C of the relay, over leads 47 and 48, to ground through the key lock magnet 50, thus operating the magnet to lock the keyboard during the punching cycle. A circuit is closed from ground through a normally closed cam controlled contact 51, lead 52, through the winding of Precedence Code relay 53, leads 54 and 55, contact D of relay 35, to negative supply lead 45 operating the Precedence Code relay 53 to connect negative current from the negative supply lead 45 through its contacts to ground through the punch magnets PM1, PM2, PM4 and PM5 and the punch clutch magnet 18. Relay 35 also closes a circuit from ground through the punch magnet PM3, lead 54, contact E of the relay 35, lead 56 through contact C of relay 53, to negative supply 45. Thus it is seen that relay 35 operates the Letter Storage relay 41, locks the keyboard, actuates the Precedence Code relay and also completes the circuit for the punch magnet PM3. All of these circuits were completed to enable the punch to perforate the positions "1," "2',, "3," "4," "5" which is the "letter shift" symbol as well as the "delete" symbol thus placing "delete" symbols in the first portion or ladder of the tape. These symbols continue to be entered automatically by the cyclic operation of relay 53 through cam contacts 51, until they are discontinued by the opening of the tape feed switch 31. The Letter Storage relay 41 locks up from ground, through its winding and contact A, lead 57, contact A of Figure Precedence relay 58, to negative supply lead 45. This relay will remain locked until the Figure Precedence relay 58 is operated.

The machine is now in condition to proceed with the entering of typed data in the tape. Operation of a letter key such "A" (FIG. 1) will close a circuit from ground through the matrix 60 over leads 67, 68 and 70 to the common lead 30 and thence through the lower make contact of relay 24 to negative supply over leads 25 and 26. The matrix 60 is of the usual neon lamp type in which cross leads are connected by neon lamps to form a code arrangement. The circuits 67, 68 and 70 extending from ground to negative supply will fire the triodes 71, 72 and 73. The triode 71 will complete a circuit from ground, cam contact 51 (FIG. 3), lead 52, winding of Character Code Relay 75, lead 74, make contact B of Letter Storage relay 41, lead 76, through the triode 71 to the negative supply over leads 49, 46, 25 and 26. The operation of relay 75 controls the punch magnet circuits and also actuates the Storage Control relay 32 over a circuit from ground over lead 77, through contact F of relay 75 to negative supply on lead 45. Relay 32 through its upper make contact closes a circuit from the negative supply lead 45 over leads 78 and 48 to maintain the Key-Lock magnet 50 operated. The signal circuits extending to triodes 72 and 73 extend over leads 80 and 81 to contacts A and B of Character Code relay 75 and thence over leads 82 and 83 to ground through the punch magnets PM1 and PM2 thus entering the perforations in those positions

indicating the code for A. The Character Code relay 75 upon operating closes a circuit to the punch clutch magnet 18 from ground on cam contact 51 lead 52 through the magnet 18, lead 79, contact G of relay 75 to the negative supply lead 45. This starts the punch and second cycle during which the rotation of the punch cam shaft through cam 7 at 6 milliseconds opens contacts 51 to release relay 75. The operation of relay 32 with each character perforating cycle removes ground through its inner break contact from lead 33 thus extinguishing the triodes by opening their plate circuit. Relay 32 is not operated in precedence signal perforating cycles, thereby the triodes are not extinguished and the character signal is thus stored for the next cycle.

If the key "3" is now operated, circuits are closed from ground through the matrix over leads 67 and 84. The circuit over lead 67 fires triode 72 connected through a resistor 94 with ground at inner contact of relay 32 to thus store the signal. Subsequently in the next cycle when relay 75 is operated, this circuit becomes similar to that described above for entering an "A" and will extend through triode 72 and the contact A of relay 75 to actuate the punch magnet PM1. The circuit over lead 84 extends through to the negative lead 30 and fires the triode 85.

The firing of triode 85 completes the circuit from ground on the inner break contact of relay 32, leads 33 and 34, winding of Figure Precedence relay 58, lead 86, break contact of Figure Storage relay 87, lead 88, through the plate circuit of triode 85 to negative on common lead 49.

The operation of relay 58 opens the locking circuit of relay 41 at contact A; prepares the circuit for Figure Storage relay 87, from ground through the winding of the relay, lead 90, contact B of relay 58, lead 43, through cam contact 44 to negative supply lead 45. This circuit is closed at thirty milliseconds of the punch cycle to switch the plate circuit for triode 85 from relay 58 to relay 75. The contacts D and C of relay 58 close "Code" and "Key-Lock" circuits similar to those described for contacts D and C of relay 35. The "Code" circuit actuates relay 53 over leads 52, 54 and 45, and closes circuits through A, B, D, E and F. Since the contact E of relay 35 is not closed only positions "1," "2," "4" and "5" will be punched into the tape to indicate a Figure Shift. The Punch Clutch magnet 18 will be actuated through the contact F of relay 53 under control of ground or cam contact 51 as described above. This operation will cause the punch cam shaft to open this "Code" circuit at six milliseconds of the punch cycle. At thirty milliseconds contact 44 is closed and the Figure Storage relay 87 operates as described above, becomes locked up through contact A of relay 35, and opens the circuit for the Figure Precedence relay 58 through the break contact B of relay 87.

During this precedence signal perforating cycle, diodes 72 and 85 continue to conduct. At forty-four milliseconds contact 51 will again close to initiate the character signal perforating cycle by completing a circuit from ground through contact 51 lead 52 through the winding of relay 75, lead 74, make contact B of Figure Storage relay 87, lead 88, triode 85 to negative supply. The operation of relay 75 closes a circuit from ground on the "1" punch magnet, lead 82, contact A of relay 75, lead 80, through triode 72, to negative supply. Operation of relay 75, as aforementioned, also closes circuits to magnet 18 and to relay 32 to thereby start the punch cycle and to cut off signal storage in the triodes. Thus it will be seen that the depression of a figure key after an alpha key will operate the Figure Precedence relay 58 which releases the Letter Storage relay 41, operates the Precedence Code relay 53 to enter the Figure Shift symbol in the tape, and operates the Figure Storage relay 87 under control of contacts controlled by a cam in the punch. The Figure Shift symbol is entered during the first punching cycle under control of contact F of relay 53. At forty-four milliseconds of the first punch cycle the circuit for the Character Code relay 75 is closed energizing the relay 75 which connects punch magnet PM1 to the plate of triode 72 energizing punch magnet PM1.

If the Figure "4" key is now actuated circuits are closed over leads 68, 91 and 84. The circuit over lead 84 fires triode 85 as described above and if this were the first figure signal after a Letter Signal a circuit would be closed to operate the Figure Precedence relay 58. This circuit, however, has been switched and is open at break contact B of the Figure Storage relay 87. Thus no precedence signal is given. The contact B of relay 87 does however close a direct circuit from ground on cam controlled contact 51, lead 52, winding of Character Code relay 75, lead 74, make contact B of relay 87, lead 88, triode 85, to negative. The relay 75 closes its contacts to complete circuits from triodes 73 and 92 through contacts B and D to ground through the punch magnets. This operation causes the perforation of positions two and four in the tape to represent a "4." Since the punch magnets are used only to trip latches such as that in the above mentioned patent they only have to operate momentarily. The closure of contact G of relay 75 operates the punch clutch magnet 18 and starts the cam 7 rotating to cut off relay 75 at 6 milliseconds by removing ground at contact 51. It is apparent from the above that with the operation of two figure keys sequentially after a letter key operation the circuit for the Figure Precedence signal will be cut off prior to the operation of the second key.

It is apparent that the matrix 60 is designed so that each figure key operation will fire triode 85 in addition to the triodes corresponding to the particular figure code symbol and each letter key operation will fire triode 71 in addition to triodes corresponding to the particular letter code symbol. When a letter key is operated following a figure key operation the letter shift or precedence symbol is first perforated by operation of Letter Precedence relay 35 in a circuit running from negative lead 49, triode 71, lead 76, contact B of relay 41, lead 95, switch 31, lead 36, relay 35, leads 34, 33 to ground through lower contact of relay 32. During this first perforating cycle the signals are stored in the triodes since relay 32 has not operated. Near the completion of this cycle, the signal stored by triode 71 operates Character Code relay 75 over lead 76, the now switched contact B of letter storage relay 41, leads 74 the relay 75, lead 52, and contact 51 to ground. This operation of relay 75 initiates the character perforating cycle for the stored signals and at the same time operates relay 32 to terminate signal storage in the triodes.

While there has been hereinabove described what is regarded as a preferred embodiment of the invention, it will be obvious that changes in form could be made without departing from the concept thereof, and, therefore, it is intended that the invention be not limited to the exact form herein shown and described, nor to anything less than the whole of the invention as hereinbefore set forth and as hereinafter claimed.

What is claimed and desired to be secured by Letters Patent is:

1. In key operable apparatus of the class described for converting data into a code utilizing the same symbol for both a letter and a numeral and including means for recording the data in code symbols, a matrix operated by the keyboard for encoding the data of each key into a combination of signals which includes a signal indicative of the letter-figure characteristic of the data encoded, circuit means for storing each signal generated by said matrix, and relay means operable in response to stored signals for selectively actuating said recording means and including relay means responsive to stored signals indicative of the letter-figure characteristic of the encoded data, said last mentioned relay means when operated selectively actuating said recording means in accordance with the letter-figure characteristic of the stored data prior

to the actuation of said recording means in accordance with the character code symbol for the stored encoded data.

2. In key operable aparatus of the class described for converting data into a code utilizing the same symbol for both a letter and a numeral and including means for recording the data in code symbols, a matrix operated by the keyboard for encoding the data of each key into a combination of signals which includes a signal indicative of the letter-figure characteristic of the data encoded, circuit means for storing each signal generated by said matrix, and relay means for selectively actuating said recording means including a separate relay responsive to each separate signal indicative of the letter-figure characteristic of the stored data, each said separate relay means when operated selectively actuating said recording means in accordance with the letter-figure characteristic of the stored data and preventing operation of said recording means in accordance with the letter-figure characteristic of the stored data when the preceding character recorded had the same letter-figure characteristic.

3. In key operable apparatus of the class described for converting data into a code utilizing the same symbol for both a letter and a numeral and including means for recording the data in code symbols, a matrix operated by the keyboard for encoding the data of each key into a combination of signals which includes a signal indicative of the letter-figure characteristic of the data encoded, circuit means for storing each signal generated by said matrix, and relay means operable in response to stored signals for selectively actuating said recording means and including relay means responsive to stored signals indicative of the letter-figure characteristic of the encoded data, said last mentioned relay means when operated selectively actuating said recording means in accordance with the letter-figure characteristic of the stored data prior to the actuation of the said recording means in accordance with the character symbol for the stored data and preventing operation of said recording means in accordance with the letter-figuer characteristic of the stored data when the preceding character recorded had the same letter-figure characteristic.

4. In key operable apparatus of the class described for converting data into a code utilizing the same symbols for both letters and numerals and including means for recording the data in code symbols, a matrix operated by the keyboard for encoding the data of each key into a combination of signals which includes a signal indicative of the letter-figure characteristic of the data encoded, circuit means for storing each of said signals, a relay means operable by each signal storage means indicative of the letter-figure characteristic of the encoded data for selectively actuating said recording means to indicate the letter-figure characteristic of the encoded stored data, and separate self locking switching means for each said relay means operable in dependence of the operation of the associated relay means, each said switching means when operated preventing a repeat operation of the associated relay means by the related letter-figure characteristic signal storage means and enabling selectively operation of said recording means by said storage means in accordance with the character code symbol for the data encoded.

5. The invention according to claim 4, wherein the means by which each switching means self locks includes contacts opened by operation of the relay associated with the other switching means.

6. The invention according to claim 4, wherein the means for selectively actuating said recording means to indicate the characteristic of encoded stored data includes a precedence code switch actuated upon operation of either one of said relay means for completing circuits to said recording means including a circuit completed only upon operation of a predetermined one of said relays, whereby the precedence symbol recorded by operation of one of said relays is distinct from the precedence symbol recorded by operation of the other one of said relays.

7. The invention according to claim 4, including timing means under control of said recording means for delaying the operation of said switching means until a time subsequent to the actuation of said recording means by operation of one of said relay means.

8. The invention according to claim 4, wherein the means enabling selective operation of said recording means in accordance with the character code symbol for the encoded data includes a character code switch operable to connect said recording means with said signal storage means.

9. The invention according to claim 8, including signal storage control means operated by the contacts of said character code switch to terminate signal storage when the character code switch is operated.

10. The invention according to claim 4, wherein the means for storing signals comprise cold cathode triodes each having parallel plate circuits, one plate circuit for each said triode being effective independently of the operation of said relays and switches, whereby signals represented by the ignition of said triodes are stored for a duration co-extensive with the completion of said independently effective one of the parallel plate circuits for each said triode.

11. The invention according to claim 10 including a storage control relay for interrupting said independently effective plate circuits, said control relay being operated by said means enabling selective operation of said recording means, whereby signal storage is terminated upon the recording of the character code symbol for the stored encoded data.

12. In data encoding apparatus of the class described having a keyboard and means for recording code symbols in a code utilizing the same symbol for both a letter and a numeral, an encoding matrix effective under control of said keyboard for generating signals in code combinations, each combination of signals including a signal indicative of the letter-figure characteristic of the data encoded, a plurality of triodes including one receptive to each of said generated signals, said triodes having a normally established common plate circuit for enabling storage of the received signals, a parallel plate circuit for each of said triodes, the parallel plate circuits for the triodes representing the code symbol for the character encoded being connectable with said recording means, the parallel plate circuits for the triodes representing the letter-figure characteristic of encoded data including an associated precedence control relay operable for selectively actuating said recording means in accordance with the symbol indicative of the letter-figure characteristic of the stored data, a relay operable for connecting said recording means with said parallel plate circuits for the triodes representing the character code for the stored data, means associated with each of said precedence control relays and effective after the associated control relay has been operated for switching the related parallel plate circuit from the associated control relay to the said relay operable for connecting said recording means with the parallel plate circuits for the triodes indicative of the character code for the stored data, and means for locking up said switching means until the precedence control relay associated with the other switching means is operated.

13. In data encoding apparatus of the class described having a keyboard and means for recording symbols in a code utilizing the same symbol for both a letter and a numeral, an encoding matrix effective under control of said keyboard for generating signals in code combinations, each combination of signals including a signal indicative of the letter-figure characteristic of the data encoded, a plurality of triodes including one receptive to each of said generated signals, said triodes having a normally established common plate circuit for enabling storage of the received signals, a parallel plate circuit for each of said

triodes, the parallel plate circuits for the triodes representing the character symbol for the data encoded being connectable with said recording means, the parallel plate circuits for the triodes representing the letter-figure characteristic of encoded data including associated precedence control relays, a precedence code relay operable in dependence of the operation of said control relays for selectively actuating said recording means in accordance with the code symbol indicative of the letter-figure characteristic of the stored data, a relay operable for connecting said recording means with the parallel plate circuits for the triodes representing the character code of the stored data, means associated with each of said precedence control relays and effective after the associated control relay has been operated for switching the related parallel plate circuit from the associated control relay to the said relay operable for connecting said recording means with the parallel plate circuits for the triodes indicative of the character symbol for the data encoded, and means for locking up said switching means until the precedence control relay associated with the other switching means is operated.

14. In data encoding apparatus of the class described having a keyboard and means for recording symbols in a code utilizing the same symbol for both a letter and numeral, an encoding matrix effective under control of said keyboard for generating signals in code combinations each combination of signals including a signal indicative of the letter-figure characteristic of the data encoded, a plurality of triodes including one receptive for each of said generated signals, said triodes having a normally established comon plate circuit for enabling storage for the received signals, a parallel plate circuit for each of said triodes, the parallel plate circuits for the triodes representing the code symbol for the character to be recorded being connectable with said recording means, each parallel plate circuit for the triodes representing the letter-figure characteristic of encoded data including an associated precedence control relay operable for selectively actuating said recording means in accordance with the symbol indicative of the letter-figure characteristic of the stored data, a further relay operable for connecting said recording means with said parallel plate circuits for the triodes representing the character code of the data to be recorded, means associated with each of said precedence control relays and effective after the associated control relay has been operated for switching the related parallel plate circuit from the associated control relay to said further relay, means for locking up said switching means until the precedence control relay associated with the other switching means is operated, and means made effective by the operation of said further relay for interrupting the common plate circuit for said triodes to terminate signal storage after the character symbol for the data stored by said triodes has been recorded.

15. In coding apparatus for use with key operated mechanisms containing keys in two character groups, a code strip formed by a plurality of code stacks responsive to energization for producing first code signals, said code stacks being divided into two character groups representative of the two character groups of keys, means for selectively energizing each of said code stacks in response to actuation of an associated key for generating the first code signals, means for generating second code signals in response to the initial energization of one of the code stacks in the first group subsequent to the energization of one of the code stacks in the second group, and means for generating third code signals in response to the initial energization of one of the code stacks in the second group subsequent to the energization of one of the code stacks in the first group.

16. In coding apparatus for use with key operated mechanisms containing keys in two character groups, a code strip formed by a plurality of code stacks responsive to energization for producing first code signals, said code stacks being divided into two groups representative of the two character groups of keys, means for selectively energizing each of said code stacks in response to actuation of an associated key for generating first code signals, first and second conductor means energized during generation of the first code signals representative of characters in the first and second groups, respectively, means responsive to the initial energization of the first conductor means subsequent to the energization of the second conductor means for generating second code signals, and means responsive to the initial energization of the second conductor means subsequent to the energization of the first conductor means for generating third code signals.

17. In coding apparatus to energize selectively information transfer means including a plurality of control devices, the apparatus adapted to be employed with key operated mechanisms containing keys in two character groups, a code strip formed by a plurality of code stacks responsive to energization for producing first code signals, said code stacks being divided into two groups representative of the two character groups of keys, means for selectively energizing each of said code stacks in response to actuation of an associated key for generating the first code signals, means for selectively energizing the control devices in the information transfer means in accordance with the first code signals, first and second conductor means energized during generation of the first code signals representative of characters in the first and second groups, respectively, means responsive to the initial energization of the first conductor means subsequent to the energization of the second conductor means for generating second code signals, means for selectively energizing the control devices in the information transfer means in accordance with the second code signals, means responsive to the energization of the second conductor means subsequent to the energization of the first conductor means for generating third code signals, and means for selectively energizing the control devices in the information transfer means in accordance with the third code signals.

References Cited in the file of this patent

UNITED STATES PATENTS

2,458,144	Bush	Jan. 4, 1949
2,859,276	Saykay	Nov. 4, 1958