April 5, 1966 P. W. GOLDEN 3,244,364

COMPOSING APPARATUS FOR PHOTOTYPOGRAPHICAL MACHINES

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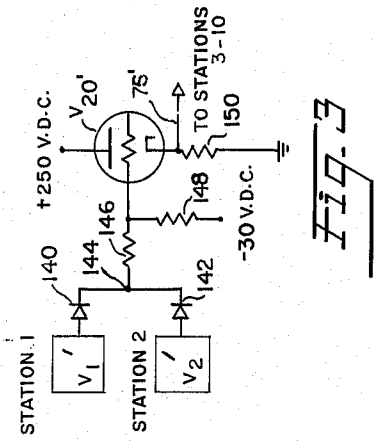


Fig. 3

Fig. 1

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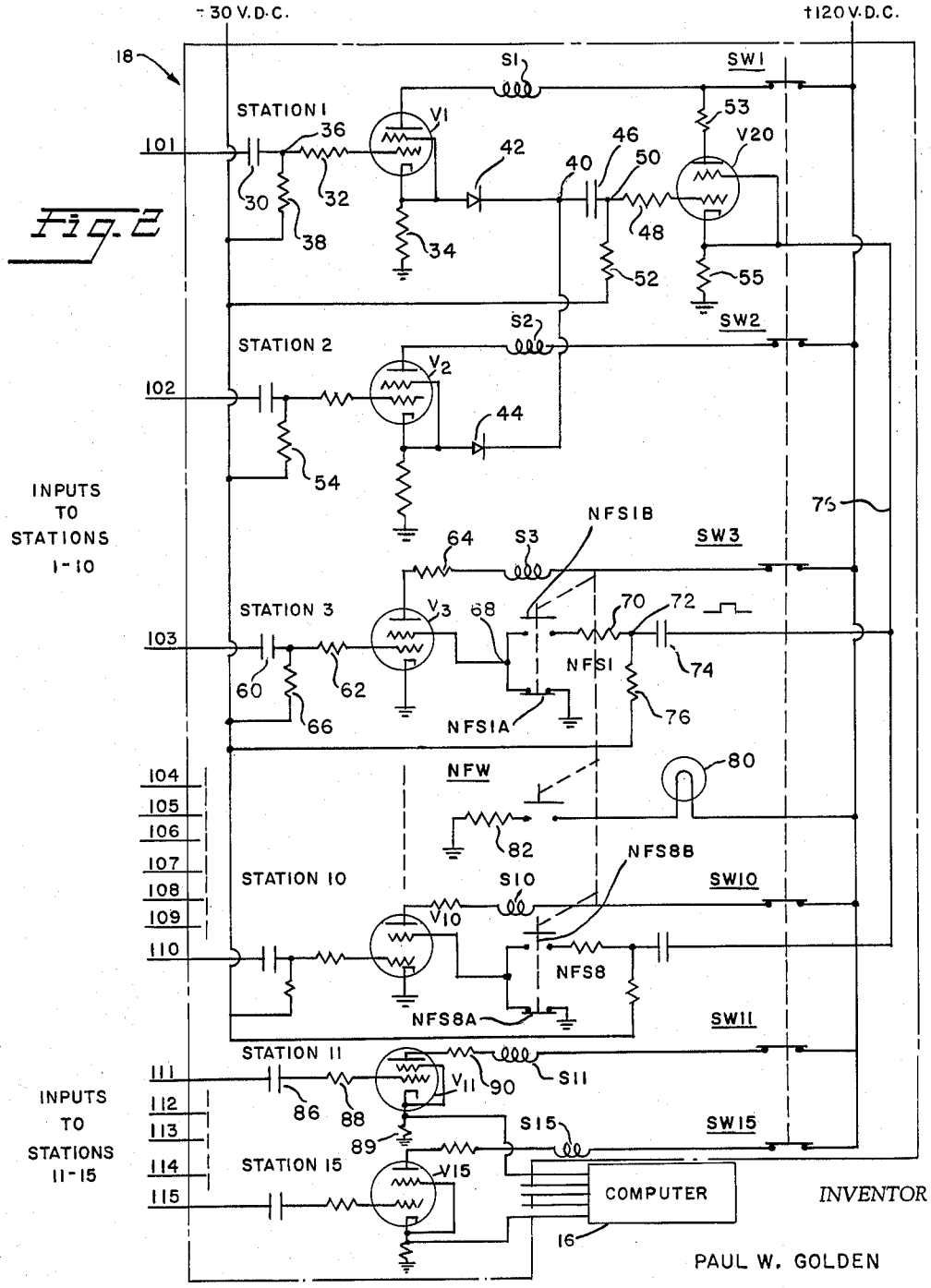
ATTORNEYS

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COMPOSING APPARATUS FOR PHOTOTYPOGRAPHICAL MACHINES

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Fig. 2



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3,244,364

COMPOSING APPARATUS FOR PHOTO-TYPOGRAPHICAL MACHINES

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12 Claims. (Cl. 234—4)

This invention relates to a keyboard or composing unit for preparing a control tape to be used in the photographic unit of a two-unit typographical photocomposing machine.

More particularly, the invention relates to an improved tape perforator including keyboard-operated "no-flash" circuit means which are operable to effect recordation on the control tape of only the character width component of the character code, the character identification component being omitted from the coded tape.

In the patented prior art, keyboard machines have been disclosed for producing perforated control tapes whereon lines of composed text material, including justification, quad right or left, or centering information that controls photography of a line in the desired manner, are represented as code signals. Examples of such machines are presented in the patents to Rossetto et al. No. 2,816,609 of December 17, 1957, Robbins et al. No. 2,848,049 of August 19, 1958, and Donahue et al. No. 3,056,545 of October 2, 1962. The coded control tape may thereupon be used in a photographic machine of the type disclosed in the patents to Corrado et al. No. 2,923,215 of February 2, 1960 and Rossetto et al. No. 3,106,880 of October 15, 1963, wherein the text material represented by the coded signals on the control tape is recorded on a sensitized film as latent images.

As disclosed in these prior patents, operation of the composing unit keyboard, as by actuation of the character keys, produces character identification signals as well as character width signals which are transmitted direct to a tape coding unit, such as a perforator, where the signals are coded on the tape. Actuation of a space key or space bar similarly results in the transmission of a space signal to the coding unit. The character width signals and the space signal, in addition, are transmitted to the justification, quadding and centering computer where the information is appropriately stored so that when the end of the line is reached and the machine operator depresses an end-of-line key, such as the justification or quadding or centering key, a justification, quadding or centering signal is coded on the tape following the succession of character signals for the same line. The tape so produced can thereupon be used to control the operation of the photographic unit to provide a photographically composed record of the text material keyboarded in the composing unit. The photographic unit includes a photographic font of type characters and a shutter mechanism which, in response to a tape character signal, exposes the character represented thereby for photographic action. The time of photography is controlled responsive to the width portion of the character signal or the justification, quadding or centering signal so that the line of text material is justified, quadded or centered depending on the end of line operation called for by the composing unit operator.

Each of the characters of the font has a definite set width measured in units of a typographical em. Of course, for typographical refinement, the set widths vary from character to character, but the widths are based on an 18-unit system. That is the em is 18 units wide and all characters have a width of a predetermined number of units. Therefore, if one was to add up the widths of all the characters in a line, a definite number of units would be arrived at indicative of the space in the line actually occupied by the characters. At the same time, the length of the line in which the characters are to appear is known and this also is given a value in units. Thus, if a justified line is to be 40 ems in length, such line can be considered to contain 40×18 or 720 units. The number of units in a predetermined line length will always exceed the number of units allocated for interword spaces. For example, a normal interword space may be 4 units. Even considering the units taken by a normal word space, the units taken by the characters and the word spaces do not generally equal the number of units in the line, but, rather, total a lesser number. The difference between the units of a predetermined line length and the units of a line of characters plus interword spaces is termed the line remainder. The number of units in the line remainder must be apportioned among the interword spaces if the line is to be justified to its predetermined length. On the other hand, the line may be photographed flush left, or quad left, that is the first character coinciding with the left-hand margin, as in the last line of a printed paragraph. In this case, the interword spaces are of normal width and the line remainder is the blank space to right of the line. As another condition, the line may be photographed flush right, or quad right, with the last character in the line coinciding with the right-hand margin. Again, in this case, the interword spaces are of normal width and the line remainder is the blank space to the left of the line. The last condition is when the line is to be centered, or photographed midway between the left-hand and right-hand margins, again with normal interword spaces. Here the line remainder is divided into two parts corresponding to the white space to the left and to the right of the centered line.

As disclosed in the Robbins et al. Patent No. 2,848,049, an electric typewriter carrying the character keys is normally used in composing copy and an auxiliary keyboard carrying keys for controlling machine functions, such as selecting the typographical font to be used in the photographic unit (this unit having a plurality of fonts, from any selected one of which characters can be photographed), and for controlling point size of the character images recorded on film, as well as auxiliary keys, such as the justification, quadding and centering keys, for causing the information in the computer apparatus to be coded on the control tape. Electrical switches operated by the key levers of the typewriter and the auxiliary keyboard control circuitry which in turn operates the tape coding unit and the computer mechanism.

In general terms, the key operated switch which is closed upon depression of a character key completes a plurality of circuits which may be grouped according to the function performed and, as such, defined. A first group of circuits completed will include diode coding circuits which identify the characters in binary form. The binary circuits in turn, through the intermediary of electronic circuitry and tubes, lead to the tape coding device or, in the present case, to punch operating solenoids of a tape perforator. The solenoids will be selectively operated according to the character key depressed and the perforator will therefore code the control tape in a manner corresponding thereto. Such coded representations will be read or decoded in the second or photographic unit of the photocomposing machine to control the operation of so-called binary shutters in the manner disclosed in the aforementioned Rossetto et al. Patent No. 3,106,880.

A second group of circuits energized by depression of a character key will be those which deal with character width information. In the first instance, the circuit will proceed selectively to a decimal coder which represents the width of the character for the key depressed. More specifically, the decimal coder will include a plurality of

coding groups, only one group of which will be in operation at one time. Each group represents the width information for the characters of a particular type font, so only that group will be used which corresponds with the character font to be used in the photographic unit for the particular text matter being composed. Selection of the coding group is under the control of the operator. From the decimal coder, the circuit is traced to the unit adding and subtracting circuit where the width value of a character can be modified for reasons of typographical refinement, such as kerning or letter spacing. The circuit thereafter proceeds to the width coder which converts the width information from decimal to binary form. The width coder is a diode coding circuit similar to that provided in the character identification group of circuits. After conversion to binary form, the width information follows two paths, one to the tape coding device whereby it is coded onto the tape adjacent the character identification signal in a manner similar to that of the character identification information. The second path followed by the binary width information is to the computing device wherein the widths of the characters and spaces making up the line of composition are totaled so that upon completion of the line, information as to justification, quadding or centering can be obtained as desired. An electronic embodiment of such a computing device is presented in the aforementioned Donahue et al. Patent No. 3,056,545. The electronic device of this patent computes justification information by dividing the units-of-an-em line remainder by the number of interword spaces in the composed line. The electronic computer, in addition to effecting the dividing operation, also converts the answer to binary form, which has been found most useful in controlling the operation of the photographic unit in a two unit photocomposing machine. The electronic computer, furthermore, maintains a continuing count of the line remainder and is capable of coding this information, again in binary form, when such is required for lines of text that are to be quadded right. Moreover, the electronic computer is capable of coding, in binary form, and from the line remainder count, the information that is required to center a line of text. In this instance, the line remainder count is divided by two, so that the information is coded as ens and units of an em, or more specifically, tens of ens, ones of ens and units-of-an-em.

The control tape thus will comprise, generally, a succession of dual signals representing the characters to be photographed in a line, each signal having what might be considered two parts, namely, a character identification part (which could properly be regarded as an individual signal) and a character width part (which could also properly be regarded as a separate individual signal) and a justification or quad or center signal. The latter signal is read or decoded in the photographic unit to control the composition of the line. Each line to be composed will contain the foregoing signals and the entire control tape will comprise groups of such signals. Other signals may appear in the tape, either to control movement of the tape through the photographic unit tape or to control the performance of the photographic unit as, for example, to control the point size and leading of the photographed copy.

One problem that arises in the printing of certain text material is the fact that the spacing of characters of a given line may necessarily be dependent upon the spacing of the characters of a preceding or subsequent line. Consider, for example, the problem of printing the following formula:

$$F=-NKT\left[\log\frac{a}{k}+\frac{3}{4}\log T+\frac{1}{b}\right]$$

If this formula were to be typed on a conventional typewriter, the typist could not type the first line (containing the numerators a, 3 and 1) or the third line (containing the denominators k, 4 and b) until the second line were typed. This is because the positions of the characters on the first and third lines are dependent upon the locations of the characters of the second line. Similarly, in a phototypographical composing machine, it would be impossible to determine the character spacing of the first and third lines of the formula until the second line has been coded and justified (or centered).

One solution to this problem is to analyze and temporarily store the character width information of a given line and then to subsequently determine the character spacing of the line after the character spacing of a predominant prior or subsequent line has been determined. To this end, it may be desired to record on the perforated tape only the character width portion of the code for a given character, the character identification portion of the code being omitted from the punched control tape for the time being.

Accordingly, a primary object of the present invention is to provide a tape perforator including keyboard-operated "no-flash" circuit means for preventing the recordation of the character identification portion of the code on the tape, the remaining portion of the character code being punched on the tape.

More specifically, another object of the invention is to provide keyboard-operated no-flash circuit means for disabling the thyratrons associated with the perforator solenoids at those stations which normally punch character identification apertures in the control tape. The remaining stations of the perforator are not affected, and consequently upon actuation of a character key on the main keyboard and the no-flash key on the auxiliary keyboard, only the character width information is coded on the tape.

According to a further object of the invention, machine function enabling circuit means are provided for enabling operation of the aforementioned character information punching stations in the event that a machine function is to be coded on the tape and the no-flash key is operating. In this manner, operation of a machine function key on the auxiliary keyboard is caused to have priority over the no-flash key whereby those stations that code character identification information on the tape are enabled even though the no-flash key should be in operation.

Another object of the invention is to provide no-flash warning circuit means that afford a visible indication that the no-flash circuit is in operation.

Other objects and advantages of the invention will become apparent from a study of the following specification when considered in conjunction with the accompanying drawing, in which:

FIGURE 1 is a schematic circuit diagram in block form showing the signal circuitry of the keyboard unit;

FIGURE 2 is a schematic diagram of the electrical circuitry of the tape perforator of FIGURE 1; and

FIGURE 3 illustrates a modification of the machine function enabling means of the circuit of FIGURE 2.

Referring first to FIGURE 1, the tape perforating apparatus includes a main keyboard **2** containing the conventional character and spacing keys, and an auxiliary keyboard **4** containing the machine function keys (for example, the keys for effecting justification, leading information, font selection, point size selection, centering, quad right or quad left, line erase and end of composition). In accordance with the present invention, the auxiliary keyboard is also provided with a no-flash key, the operation of which will be discussed in greater detail below. As disclosed in the aforementioned Robbins et al. Patent No. 2,848,049, signals resulting from the operation of the character selecting keys of the main keyboard **2** are applied both to the binary character identification coder **6** and to the decimal coders **8** via font selector contacts **10**. The output terminals of the decimal coders **8** are connected with the input terminals of the unit spacing means **12** the output terminals of which are connected with the binary width coder **14**. The signals from the five output terminals of the binary width coder

14 are applied to the input leads of stations 11–15, respectively, of a fifteen station tape perforator 18. These perforator stations 11–15 have output terminals connected with corresponding input terminals of the computer 16.

The machine function signals from the auxiliary keyboard 4 are applied to the function coder unit 20 that has ten output terminals connected with the input terminals to stations 1–10, respectively, of the tape perforator 18. Similarly, the binary character identification coder 6 has eight output terminals connected with the input terminals of stations 3–10 of the tape perforator 18.

As shown in FIGURE 1, the fifteen stations of perforator 18 are operable to punch coded information on the control tape 22. In the illustrated embodiment, the code consists of three portions—a machine function portion (produced by perforator stations 1 and 2), a character identification portion (produced by stations 3–10), and a character width portion (produced by stations 11–15). As will become apparent from the discussion presented below, to record the complete code for effecting a desired machine function, operation of selected ones of the perforating means associated with stations 3–10 is normally required in addition to the operation of the perforating means of stations 1 and 2.

The operation of the perforator of FIGURE 1 is conventional. The operator will keyboard the entire line of text and each time a character key is depressed, a dual signal representing the character will be coded on the control tape, the signal comprising a character identification portion and a character width information portion. At the same time, the computer will be operated by the same character width information to totalize the set widths of the individual characters and subtract such total from the preset justified line length.

In addition to the characters which go to make up a line of text, there is also included within the line interword spaces which appear between the word groupings of characters. In keyboarding a line, each interword space is given a predetermined or normal value of set width, which value is transmitted to the computer, so that the width of the interword spaces are totalized with the widths of the characters. Therefore, the computer gives a true line remainder which takes into account the normal spacing between words. The line remainder thus obtained may be used with facility to provide any of the normal line composition controls. That is, for purposes of justification, the line remainder is divided among the number of interword spaces and the result of such division is added to each normal word space for quadding right, the line remainder is simply counted off before actual composition of the line by photography takes place. For centering, the line remainder is divided in half, one half the remainder appearing at the beginning of a line while the other portion of the remainder appears at the end of the line.

Detailed description of the various units of FIGURE 1 is presented in the aforementioned patents to Robbins et al. No. 2,848,049 and Donahue et al. No. 3,056,545.

Referring now to FIGURE 2, it will be apparent that the tape perforator 18 includes fifteen perforating stations that may be considered as consisting of three groups of similar circuits. More specifically, the first group consists of similar stations 1 and 2, the second group consists of similar stations 3 through 10, and the third group consists of stations 11–15. The stations include interponent (i.e., perforating) solenoids S1 through S15 that are connected in series with thyratron control tubes V1 through V15, respectively.

Considering first the circuit of station 1, the input signal appearing at input terminal 101 of the perforator is applied to the control grid of tetrode V1 via capacitor 30 and grid resistor 32. The cathode of tube V1 is connected with ground via cathode resistor 34, and the plate is connected with the positive battery source via perforator solenoid S1 and switch SW1. The screen grid of the tetrode is connected with the cathode electrode as shown, and the junction 36 between capacitor 30 and resistor 32 is connected with the negative D.C. bus via grid bias resistor 38. The circuit of station 2 is similar to that of station 1 as thusfar described. The cathodes of tubes V1 and V2 are connected with junction 40 via diodes 42 and 44, respectively, which junction is connected with the control grid of V20 via capacitor 46 and grid resistor 48. Junction 50 between capacitor 46 and grid resistor 48 is connected with the negative D.C. bus via biasing resistor 52. Tubes V1, V2 and V20 are normally biased to a nonconductive condition by the grid biasing resistors 38, 54 and 52, respectively.

Considering now the perforating stations 3–10, a signal appearing at input terminal 103 is applied to the control grid of thyratron V3 via capacitor 60 and grid resistor 62. The cathode of tube V3 is grounded and the plate is connected with the positive terminal of the D.C. source via plate resistor 64, perforator solenoid S3 and switch SW3. Tube V3 is normally biased to a nonconductive condition by grid biasing resistor 66. The screen grid of tetrode V3 is connected with junction 68 that is normally in communication with ground via the normally closed contacts NFS1A of no-flash switch NFS1. This no-flash switch is operable by the no-flash key on the auxiliary keyboard 4 to open contacts NFS1A and to close a second set of contacts NFS1B, whereby junction 68 (and consequently the screen grid of tube V3) are connected with the cathode of enabling tube V20 via resistor 70, junction 72, capacitor 74 and lead 75. Junction 72 is connected with the negative D.C. source via biasing resistor 76. All the eight no-flash switches NFS1 through NFS8 associated with the perforator solenoid circuits of stations 3 through 10, respectively, are interconnected for simultaneous operation by the single no-flash key on the auxiliary keyboard 4. The circuits of stations 4–10 are identical to that of station 3. Furthermore, an additional no-flash warning switch NFW is operated simultaneously with the no-flash switches NFS1 through NFS8 for energizing a no-flash indicating lamp 80. More particularly, and as shown in FIGURE 2, the no-flash warning circuit—including lamp 80, switch NFW and resistor 82 in series—is connected between the positive terminal of the D.C. source and ground.

With reference to perforator stations 11–15, the input signal applied to input terminal 111 of station 11 is applied to the control grid of thyratron V11 via capacitor 86 and grid resistor 88. The cathode of tube V11, to which the screen grid is connected, communicates with ground via resistor 89. The plate is connected with the positive D.C. source via resistor 90, perforator solenoid S11, and switch SW11. The circuits of stations 12–15 are identical to that of station 11. Output signals appearing at the cathode junctions of resistors 89 are applied to the computer 16.

Operation

In operation, assuming that the no-flash key on auxiliary keyboard 4 is actuated, switches NFS1 through NFS8 associated with perforator stations 3–10, respectively, are operated to remove the grounds from the screen grids of thyratrons V3 through V10, respectively, and to apply negative biasing potentials upon the screen grids via switch contacts NFS1B through NFS8B, respectively. Consequently, the tubes V3 through V10 are switched from their illustrated enabled condition to a disabled condition in which they are prevented from being fired by input pulses applied to terminals 103–110, respectively. For example, in the case of station 3, the negative biasing potential is applied to the screen grid of tube V3 via resistors 76 and 70, and switch contacts NFS1B. The screen grid biasing potential has such

a value that thyratron V3 cannot be fired even though a trigger pulse of appreciable magnitude be applied to input terminal 103.

Simultaneously with the operation of no-flash switches NFS1 through NFS8 by operation of the no-flash keyboard button, the no-flash warning switch NFW is closed to energize the indicating lamp 80 (which may be physically located on the auxiliary keyboard 4 or elsewhere, as desired).

Release of the no-flash keyboard button causes return of the thyratrons V3 through V10 to their illustrated enabled conditions, and de-energization of the no-flash warning lamp 80.

Assuming that the no-flash keyboard button is operated, stations 3 through 10 are disabled, and consequently the character identification portion of the punch code is omitted from the control tape 22. More specifically, even though trigger pulses were to be applied to the thirteen perforator input terminals 103–115 associated with stations 3–15, respectively, flashing of only those thyratrons (and operation of the associated perforating interponent solenoids) at stations 11–15 will be effected, and only the character width information will be recorded on the tape 22.

There are times, however, when it may be necessary to effect operation of perforating interponent solenoids S3–S10 even though the no-flash key has been actuated to disable stations 3–10. For example, when a machine function code is to be recorded on tape 22, operation of perforator stations 1–10 may be required to effect recordation of the entire code. To this end, according to another feature of the invention, enabling means including tube V20 are provided which cause the circuits of stations 3–10 to become enabled upon the application of trigger pulses to either or both machine function stations 1 and 2 even though the no-flash keyboard button be operated.

Assume, for example, that the no-flash keyboard button is operated to disable stations 3–10 and that a trigger pulse is applied to the input terminal 101 of station 1. Thyratron V1 will fire to operate solenoid S1 to effect perforation at station 1, and a pulse will be applied from the cathode of tube V1 to the control grid of enabling tube V20 via diode 42, capacitor 46, and resistor 48. Tube V20 will be fired, whereupon enabling pulses will be applied to the screen grids of each of the tubes V3 through V10 via lead 75 and the circuit paths including switch contacts NFS1B through NFS8B, respectively. Tubes V3 through V10 are now momentarily enabled, and the tubes of those stations to which trigger input pulses are applied will be fired in accordance with the desired perforator code to be recorded. The R-C time constant circuits including capacitors 74 and resistors 76 control the periods during which tubes V3–V10 are enabled, respectively.

Diodes 42 and 44 are provided to prevent interaction between tubes V1 and V2 when only one of the two tubes is fired in normal fashion. Of course, in certain cases both tubes V1 and V2 are fired simultaneously.

As is conventional in the art, switches SW1–SW15 are operated periodically to extinguish those thyratrons that are conductive at a given time.

Tubes V1 through V15 and V20 are normally 2D21 thyratrons. Typical values of the other components are as follows:

Capacitor 30	farad	.01
Resistors 32, 48, 62, 70	ohms	100K
Resistor 89	do	470
Resistor 90	do	300
Resistors 34, 53, 55, 64	do	750
Resistors 38, 54, 52, 66, 76	do	470K
Capacitor 46	farad	.01
Capacitor 74	μf	0.1
Resistor 82	ohms	3500

Lamp 80, Type 1819.

Instead of using a tetrode for the enabling tube V20 of FIGURE 2, a cathode follower triode circuit may be utilized as shown in the detailed schematic modification of FIGURE 3. More particularly, the pulses appearing at the cathodes of tubes V1′ and V2′ of stations 1 and 2 are applied (via diodes 140 and 142, respectively, junction 144 and a 680K resistor 146) upon the control grid of a 5963 triode V20′. The tube V20′ which functions in exactly the same manner as the enabling tube V20 of FIGURE 2, has a 470K grid biasing resistor 148 and a 39K cathode resistor 150. The cathode output of tube V20′ is connected with lead 75′ that corresponds with lead 75 of FIGURE 2.

While the use of electron tubes has been illustrated and described in the foregoing specification and accompanying drawing, it is apparent that solid state devices (for example, silicon controlled rectifiers, transistors and the like) could be used equally as well. Other variations and embodiments of the illustrated apparatus will become apparent to those skilled in the art without deviating from the invention set forth in the following claims.

What is claimed is:

1. Composing apparatus for preparing a perforated coded control tape to be used in the read-out unit of a two-unit phototypographical machine, comprising

a plurality of perforating stations each including a solenoid-operated perforator, and normally nonconductive pulse-responsive electronic switch means operable to actuate said solenoid;

means for applying character identification trigger pulses to the electronic switch means of a first group of said perforating stations to actuate selected solenoids thereof and thereby record the character identification portion of a character code on the tape;

means for applying character width trigger pulses to the electronic switch means of a second group of said perforating stations to actuate selected solenoids thereof and thereby record the character width portion of the character code on the tape; and

means for simultaneously disabling each of the electronic switch means associated with said first group of perforating stations, whereby said first group of perforating stations become nonresponsive to the trigger pulses applied thereto.

2. Apparatus as defined in claim 1, and further including means for applying function code trigger pulses to a third group of said perforating stations and to said first group of stations; and

enabling means responsive to the energization of the solenoids associated with said third group of perforating stations for enabling the electronic switch means of said first group of stations even though said disabling means are activated.

3. Composing apparatus for preparing a perforated coded control tape to be used in the read-out unit of a two-unit phototypographical machine, comprising

keyboard means including a plurality of character selector keys and a no-flash key;

a plurality of perforating stations each including a solenoid-operated perforator, and normally nonconductive pulse-responsive electronic switch means operable to actuate said solenoid;

means responsive to the operation of the respective character selector keys for applying character identification trigger pulses to the electronic switch means of a first group of said perforating stations to activate selected solenoids thereof and thereby record the character identification portion of a character code on the tape;

means responsive to the operation of the respective character selector keys for applying character width trigger pulses to the electronic switch means of a second group of said perforating stations to activate selected solenoids thereof and thereby record the

character width portion of a character code on the tape; and

means responsive to the operation of said no-flash key for simultaneously disabling each of the electronic switch means associated with said first group of perforating stations, whereby said first group of perforating stations become nonresponsive to the trigger pulses applied thereto.

4. Composing apparatus for preparing a perforated coded control tape to be used in the read-out unit of a two-unit phototypographical machine, comprising

keyboard means including a plurality of character selector keys, a no-flash key, and at least one machine function selector key;

a plurality of perforating stations each including a solenoid-operated perforator, and normally nonconductive pulse-responsive electronic switch means operable to actuate said solenoid;

means responsive to the operation of the respective character selector keys for applying character identification trigger pulses to the electronic switch means of a first group of said perforating stations to activate selected solenoids thereof and thereby record the character identification portion of a character code on the tape;

means responsive to the operation of the respective character selector keys for applying character width trigger pulses to the electronic switch means of a second group of said perforating stations to activate selected solenoids thereof and thereby record the character width portion of a character code on the tape;

means responsive to the operation of said no-flash key for simultaneously disabling each of the electronic switch means associated with said first group of perforating stations, whereby said first group of perforating stations become nonresponsive to the trigger pulses applied thereto;

means responsive to the operation of said machine function selector key for applying trigger pulses to the electronic switch means of a third group of said perforating stations and also to the electronic switch means of said first group of stations; and

enabling means responsive to the operation of any of the solenoids of said third group of stations for enabling the electronic switch means of said first group of stations even though the no-flash key is operated to normally disable said first group of stations.

5. Apparatus as defined in claim 3 wherein each of the electronic switch means of said first group of perforating stations includes a pair of power circuit electrodes connected in series with the associated solenoid of said perforator, a control electrode to which the associated trigger pulse is applied, an additional electrode for controlling the enabled and disabled states of said electronic switch means, and means normally maintaining said additional electrode at a potential permitting conduction of said electronic switch means upon the application of a trigger pulse thereto; and

further wherein each of said electronic switch disabling means includes no-flash switch means operable by said no-flash key for applying upon said additional electrode a potential which prevents conduction of the electronic switch means of said first group of stations.

6. Apparatus as defined in claim 5 wherein all of the no-flash switch means associated with the first group of stations are simultaneously operated by said no-flash key.

7. Apparatus as defined in claim 6 wherein each of the electronic switch means of said first group of stations comprises a tetrode electron tube having control and screen grids, said screen grid constituting said additional electrode.

8. Apparatus as defined in claim 6 wherein said keyboard means further includes at least one machine function selector key;

and further including means responsive to the operation of said machine function key for applying trigger pulses to the electronic switch means of a third group of said perforating stations and also to the electronic switch means of said first group of stations; and

enabling means responsive to the operation of any of the solenoids of said third group of stations for enabling the electronic switch means of said first group of stations when the no-flash key is in an activated condition.

9. Apparatus as defined in claim 8 wherein said enabling means comprises additional normally nonconductive pulse-responsive electronic switch means including a control electrode and an output circuit including a pair of power circuit electrodes, first circuit means for applying trigger pulses to said control electrode in response to activation of any of the electronic switches of said third group of stations, and means connected with said output circuit for applying enabling potentials upon the additional electrodes of said first group of electronic switches via said no-flash switch means when said no-flash key is in an activated condition.

10. Apparatus as defined in claim 9 wherein said first circuit means includes a plurality of parallel branches respectively connected with the solenoid circuits of said third group of stations, said parallel branches including diode isolating means having the same polarity relative to the control grid of said enabling electronic switch means.

11. Apparatus as defined in claim 10 wherein the additional electronic switch means of said enabling means comprises a tetrode electron tube.

12. Apparatus as defined in claim 10 wherein the additional electronic switch means comprises a cathode follower triode device.

No references cited.

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