ABSTRACT
A typewriter underline printing control system which adds adding underline starting and completing code signals in the front and the rear of a given character code group to be underlined, respectively. During the printing operation, when the underline starting code is red out, the characters corresponding to the character code are printed successively, while the back-spacing and underline printing operations are automatically repeated each time said character is printed, until the underline completing code is read out.

4 Claims, 3 Drawing Figures
FIG. 3

UNDERLINE CORD BACK-SPACING UNDERLINING OPERATION

UNDERLINE CORD BEING FED OPERATION

OPERATION OF A FLIP-FLOP I1

OPERATION OF A FLIP-FLOP I2

BACK-SPACING OPERATION

UNDERLINING OPERATION

CYCLE TO BE REPEATED
UNDERLINE PRINTING CONTROL SYSTEM FOR USE IN A TYPEWRITER

BACKGROUND OF THE INVENTION

This invention relates to a typewriter, and more particularly to an underline printing control system for use in the same.

In general, in a high class or sophisticated typewriter provided with an electric control unit and a memory storage, when the character key or control key on a keyboard is struck, the key inputs are successively converted into code signals, which each correspond to said key struck, and then recorded in a memory, accordingly. Then, the code signals stored in said memory are in turn read out, whereupon characters corresponding to said code signals are printed on a recording paper under the control of a control unit.

Meanwhile, there arises a need to score underlines under the specific passages or the like, in case a table or the like has to be prepared by using a typewriter. Hitherto, printing of such underlines has been carried out by using the aforesaid type of a typewriter in the following manner. After a group of character keys requiring underlines have been struck, the back-spacing keys are struck the number of times equal to the number of steps corresponding to that of the aforesaid group of the character keys, after which the underline key is struck the same number of times as has been aforesaid. In this case, however, subsequent to the storage of each character code signal, the back-spacing codes and underline codes corresponding in number to said character code signals are successively stored in the memory. To describe the printing operation in more detail, the character code signals are first read out from the memory, and then the characters corresponding to each character code are printed, after which the back-spacing codes are read out from the memory so that the back-spacing operations are carried out the number of times corresponding to the number of said back-spacing codes, i.e., the number of character codes. Then, finally, the underline codes are read out from the memory, and then the underline printing is carried out the number of times corresponding to the number of said underline codes, i.e., the number of character code signals.

However, such a conventional type of a typewriter suffers from disadvantages in that the operation for printing underlines is extremely complicated and likely to result in committing errors and in that, since lack of the back-spacing codes and underline codes corresponding in number to the characters requiring underlines are stored in a memory, the use of the memory results in poor efficiency.

It is accordingly an object of the present invention to provide an underline printing control system which is simple in operation.

It is a further object of the invention to provide an underline printing control system which improves the usage efficiency of memory.

It is a still further object of the invention to provide an underline printing control system which enables the insertion of the underlines for each printed character of a given character code group, solely by inserting the underline starting and completing codes in the front and the rear of a given code group requiring printing of underlines, respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a system diagram showing an automatic-type typewriter embodying the present invention;

FIG. 2 is a block diagram showing one embodiment of the underline printing control system of the present invention; and

FIG. 3 is a timing chart for the embodiment of FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, provided on a keyboard 10 are various types of character keys and function keys. Included among the function keys are forward- and back-spacing keys, a line feed key and an underline key. For a better understanding, only underline key UL is shown separated from the keyboard 10. A control unit 20 serves to control each part of the device, i.e., a typewriter. Shown at 30 is a memory and at 40 a printing section. As can be seen from this, when the keys on the keyboard 10 are struck, the code signals corresponding to each key are successively stored via control unit 20 in the memory 30. Thereafter, the code signals stored in the memory are successively read out, decoded and then printed on a recording paper of the printing section 40 as characters corresponding to the aforesaid code signals, under the control of the control unit 20.

With the arrangement shown, in case printing of underlines is required, the underline key UL on the key board is first depressed, and then the character keys are struck the number of times corresponding to the number of steps requiring underlines, followed by the storing of the key UL. According to the aforesaid operation, an underline starting code, a character code group of steps of the number required and an underline completing code are sequentially stored in the memory. To describe the underline starting and completing codes, they are prepared in the control unit 20 beforehand, and then the underline starting code is selected in response to the setting operation of the UL key, while the underline completing code is selected in response to the resetting operation of the UL key. The mechanism required for the operations described are well known to those versed in the art, thus the detailed description will be omitted. During the printing operation, code signals stored in the memory 30 are in turn read out at the control unit 20. In this respect, when the control unit interprets that the information read out from the memory 30 is the underline starting code, then the back-spacing instruction as well as the underline instruction for one character will be fed to the printing section 40, successively and automatically, each time a respective character is printed, until the underline completing code is read out. As a result, the printing section 40 effects the back-spacing operation for one character automatically, each time a respective character is printed, thus inserting or printing underlines under each character printed.

There is shown in FIG. 2 the arrangement by which, during the time when the aforesaid underline starting code is read out until the underline completing code is read out, the back-spacing instruction and the underline instruction for one character are automatically issued, each time a character corresponding to each character code is printed.
Turning now to FIG. 2, a flip-flop 11 designates the extent of a passage to be underlined, while a flip-flop 12 designates the underline printing for one character. Shown as block 13 is a counter, in which D-type flip-flops are connected in a multi-staged manner. FIG. 3 is a timing chart for the system of FIG. 2 and shows the timing sequence of a single back-space and underline operation of the embodiment therein. Cycle periods $\pi_{1,2}$ are indicated on the horizontal axis, and within each cycle period the sequential timing points $T_1 - T_4$ are shown. The designations $T_1 - T_4$ in FIG. 3 also correspond to the input lines $T_1 - T_4$ shown in FIG. 2. Thus, the input line $T_1$ in FIG. 2 receives a signal at the timing point $T_1$, shown in FIG. 3 during each cycle period. Similarly, input lines $T_2 - T_4$ of FIG. 2 each receive signals at their respective timing points $T_2 - T_4$ during each cycle period. FIG. 3 therefore conveys operational system timing information with respect to both cycle periods and timing points within each period.

The reading-out operation of the character code for one character from the memory 30 and the printing operation of the character corresponding to said character code are repeated at a cycle period $\pi_1$. In other words, the content of the memory 30 is read out for each character at the timing $T_1$ during a cycle period $\pi_1$, and in the case when the aforesaid content is a character code, the printing operation of the corresponding character will be completed within the cycle $\pi_1$. Assume that the code which has been read out at the cycle $\pi_1$ and timing $T_1$ be an underline starting code. Then, the underline starting code will be interpreted at the control unit 20, and thus the underline starting signal is selected. The underline starting signal thus selected will be fed via a gate G1, to the flip-flop 11 at the timing $T_2$, thereby rendering the flip-flop 11 in a set condition. At the timing $T_1$ of the subsequent cycle $\pi_2$, the first character code requiring underline will be read out, and thus the character corresponding to the aforesaid character will be printed within the cycle $\pi_2$, during which time the setting output from the flip-flop 11 will be fed via a gate G2 to the flip-flop 12 at the timing $T_3$, thereby rendering said flip-flop 12 in a set condition. Likewise, a gate G3 will be energized at the timing $T_3$ due to the set condition of the flip-flop 12, such that the counter 13 will advance by one step, issuing the back-spacing instruction. In other words, a "11" signal at the first digit is utilized as a back-spacing instruction signal, which is to be fed to the printing section 40.

When the back-spacing instruction signal is issued from the counter 13, the printing section 40 will effect the back-spacing operation for one character during the subsequent cycle $\pi_2$. Then, the gate G4 will be again energized during the cycle $\pi_2$ at timing $T_4$, by a signal on input line $T_4$ such that the counter 13 will advance by one step, the underline instruction signal will be issued, and the underline operation will begin, as shown in FIG. 3. In other words, the 1 signal at the second digit of the counter 13 is utilized as an underline instruction signal, which will be fed to the printing section 40. Accordingly, the underline printing of the character at the cycle $\pi_2$ will be effected at the subsequent cycle $\pi_1$. During the time when the back-spacing or underline instruction signal is being issued from the counter 13, the subsequent information will not be read out from the memory 30. An output signal from the counter 13 is fed via a gate G3 to the flip-flop 12 at the end of the underline operation, at the cycle $\pi_4$ and timing $T_5$. As a result, the flip-flop 12 will be reset, whereupon the counter 13 will be reset by means of the resetting output from the flip-flop 12. During that time, the flip-flop 11 is maintained in the set condition. Thus, each time a character code is read out from the memory 30, the flip-flop 12 will be set, thus repeating the aforesaid operations.

When the underline completing code is read out from the memory 30 and interpreted at the control section, then the underline completing signal will be issued. This signal will be fed via the gate G4 to the flip-flop 11 at the timing $T_5$, with the result that the flip-flop 11 is restored to the reset condition. Accordingly, the ordinary printing operation free from underline printing will be carried out thereafter.

It will be understood that the above description is merely illustrative of preferred embodiments of the invention. Additional modifications and improvements utilizing the principles of the present invention can be readily anticipated by those skilled in the art from the present disclosure, and such modifications and improvements may fairly be presumed to be within the scope and purview of the invention as defined by the claims that follow.

What is claimed is:

1. An underline printing control system for use in a memory typewriter, comprising:
   a. a memory means for storing a series of character code signals, an underline starting code signal added in the front of said series of character code signals and an underline completing code signal added in the rear of said series of character code signals;
   b. a printing section adapted to successively print the characters corresponding to each character code signal read out from said memory means;
   c. a control unit having a first flip-flop set in response to said underline starting code signal, said signal read out from said memory means and reset in response to said underline completing code signal read out from said memory means; and
   d. means within said control unit for feeding to said printing section a back-spacing instruction and an underline instruction for one character, each time the character corresponding to each character code signal read out from the memory means is printed, during the time when said first flip-flop is maintained in a set condition.

2. A system as set forth in claim 1, wherein said means within said control unit comprises a counter adapted to advance successively in response to the setting output from said first flip-flop, each time the printing of one character is completed while said first flip-flop is maintained in a set condition, whereby the outputs from said counter may be successively utilized as a back-spacing instruction signal and an underline instruction signal.

3. A system as set forth in claim 2, wherein said control unit further comprises a second flip-flop set in response to the set output from said first flip-flop and reset in response to a signal from said counter after said underline instructions signal has been generated, said second flip-flop advancing said counter each time the printing of one character is completed so long as said first flip-flop is in set condition, and said second flip-flop resetting said counter in response to the signal
from said counter after said underline instruction signal
has been generated.

4. A system as set forth in claim 1, wherein said sys-

5 tem further comprises a keyboard provided with an un-
derline key, means, when said underline key is de-

6 pressed, for selecting the underline starting code signal
and means for selecting the underline completing code
signal when said underline key is restored to the initial

position.