May 31, 1960 J. P. JOSEPH 2,938,619

STOP CONTROL FOR PROPORTIONAL SPACING TYPEWRITER

Filed Nov. 4, 1957 2 Sheets-Sheet 1

FIG. 3

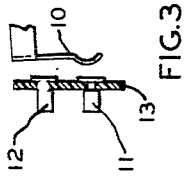


FIG. 1

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FIG. 4

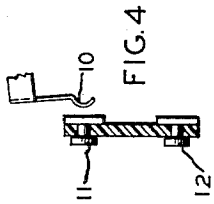


FIG. 2

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United States Patent Office 2,938,619
Patented May 31, 1960

2,938,619

STOP CONTROL FOR PROPORTIONAL SPACING TYPEWRITER

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Filed Nov. 4, 1957, Ser. No. 694,246

13 Claims. (Cl. 197—84)

This invention relates generally to improvements in typewriters and like key operated printing machines, and more specifically to so called "proportional spacing" machines wherein the paper carriage is made to move varying extents proportional to the width of the character being typed.

It is an object of the invention to provide electrical means for automatically actuating a variable spacing mechanism at higher speeds than has been possible with the use of mechanical permutation means.

Another object of the invention is to provide electrical means for actuating a variable spacing mechanism that is automatically responsive to character key selection.

A further object of the invention is to provide electrical means for automatically actuating variable spacing mechanism that will provide for proportional spacing of both upper and lower case characters in machines that shift the platen or the type basket for change of case.

The invention includes key responsive electrical circuits to actuate existing variable spacing mechanisms replacing the mechanical complex of slides, levers, bars and stops now employed.

Briefly stated, means are provided whereby, upon depression of a key, an associated contact arm is momentarily moved against a predetermined one of a plurality of contact members thus completing a selected circuit. Each circuit contains an electromagnetic element energized by circuit completion thus activating its associated part to which is linked a particular one of a plurality of sector stop bars. The effect of this is to displace the selected stop bar so that it will limit "normal swing" of a sector gear. The amount of rotation permitted this sector gear defines the amount of paper carriage displacement that will occur after completion of the type stroke.

Still other and further objects and advantages of the invention will be apparent from the specification and drawings.

The features of novelty which are thought to be characteristic of the invention are set forth in the appended claims. The invention itself, however, both as to its fundamental principles and its particular embodiments will best be understood by reference to the specification and accompanying drawings in which:

Fig. 1 is a fragmentary view in perspective illustrating the electrical selection circuits and portions of a machine with which they cooperate;

Fig. 2 is a schematic representation of the electrical indexing unit showing the relationship between various keyboard characters and their respective circuits;

Fig. 3 is a vertical section taken through the contact panel of Fig. 1 showing the relation between a pair of contact members and their associated key controlled arms; and

Fig. 4 is a view similar to Fig. 3 showing the arrangement used with a platen movable for case shift.

Referring to the drawings in detail, fragmentary portions of a Remington typewriter are shown, of the kind described in copending application of common assignee,

Serial No. 566,197, filed February 17, 1956, now U.S. Patent No. 2,919,007 in the name of F. W. Schremp. A plurality of power arms **1**, of which three are shown, extends in transverse relation to the power roll of the machine (shown fully in Fig. 1 of the above mentioned copending application). The power roll operates the power arm corresponding to the typewriter key selected. Each power arm has a roller **2** mounted on one end for engagement with a cam surface **3** of a type bar bell crank **4**. Each bell crank is pivotally mounted on a rod **5** which extends between, and is connected to, the usual side frames of the machine. A cross bar **6**, supported by a plate **7**, limits counter-clockwise rotation of the bell cranks **4**, and serves as an anchor for one of the ends of the restoring springs **8**. The other end of each spring **8** is attached to a rearwardly and downwardly extending arm **9** of each bell crank **4**, said arm being formed of a suitable insulating material. Each arm **9** carries a flexible contact arm **10**, formed of a suitable conducting material, and positioned so that its depending free end can engage with one contact, of either of two sets of contact members **11** or **12**, when its associated bell crank **4** is rocked in clockwise direction.

The contact members **11** and **12** (Figs. 1 and 3) representing lower and upper case characters respectively, are formed of a suitable conducting material and are mounted in lower and upper rows respectively on a transvetsely extending plate **13** which is of suitable insulating material. The upper case contact numbers **12** are moved down into position to cooperate with contact arms **10** when the usual case shift key of the keyboard is depressed to lower the type basket and the plate **13**, the lower case contacts **11** being normally in register with the arms **10**. This is also true when the platen is shifted instead of the type basket, as will be later explained.

In the operation of the machine used in the drawings to illustrate the invention, depression of the shift key lowers the type bar basket **26**. Links **14** (of which one is shown) fixed to opposite ends of plate **13**, are pivotally connected to the type bar basket **26** as at **14A**. Depression of the type bar basket **26** consequently lowers plate **13** thereby placing the upper case contact members **12** in position to be engaged by any contact arm **10** moved by its bell crank **4**. When the shift key is released, permitting the type bar basket to resume its former raised position, the lower case contact members **11** are again raised to normal position to be engaged by the contact arms **10**, when the latter are operated.

While the invention has been described and illustrated as applied to a machine wherein depression of the shift key lowers the type bar basket **26** to permit the typing of upper case characters, it is evident that the invention is equally applicable to machines wherein depression of the shift key effects a different result such as an upward shift of the platen. In this instance the contact members **11** and **12** (Fig. 2) mounted on plate **13** are reversed in position with reference to their cooperating contact arms **10** when a change is made between upper case and lower case printing. This is more clearly shown in Fig. 4 wherein the positional relationship between a pair of contact members **11** and **12** and their associated contact arm **10** is shown. The vertical distance between the contact members is equal to the vertical displacement of the platen, or of the type basket **26** in the type of machine selected for the purposes of illustration.

Each of the contact members **11** and **12** (Fig. 2) are connected in parallel to one of a plurality of electromagnetic members such as solenoids **S2**, **S3** and **S4**, by the respective leads **L2**, **L3** and **L4**. Each electromagnetic element is arranged to actuate a sector stop bar **18** (Fig. 1) having an arm **17** extending therefrom. Each arm **17** has pivoted to the end thereof, the core **15** of

its associated electromagnetic device by means of a pin 16. The lower end of each sector stop bar 18 is connected to the base of the machine by a spring 21 in order to bias each bar to non-stop position. The upper or stop end of each sector stop bar is shaped to present a stop edge or face 28. The three stop bars 18 each have the stop edge 28 thereof extending different distances so that, as the bars are selectively raised, a segment pin 27 will limit in its swinging operation to thereafter define a predetermined movement of the segment gear 19 for character space movement of the carriage through the gears 20 and rack 30.

When the sector stop bars 18 are in their rest positions, the surfaces 28 thereof are below the path of movement of the pin 27. If no stop bar is raised the pin 27 will be limited in its swinging movement by edges 29 at the extreme upper ends of the bars 18 to provide for the maximum swing of pin 27, which corresponds to a five increment movement of the carriage. The stop bars 18 actuated by the solenoids S2, S3 and S4 correspond to the two, three and four increment movements of the carriage and are guided in vertical movement in a guide plate 24 having slots through which the bars slide.

Thus a different, discrete amount of paper carriage displacement is permitted for each sector stop bar face 28 and a further discrete amount of displacement is provided when the segment gear 19 limits against the edge 29. Hence, if there are M circuits, M electromagnetic elements and M associated sector stop bars there is possible M plus 1 distinct amounts of paper carriage displacement.

As above noted, the electromagnetic elements S2, S3 and S4 control respectively two, three and four units of paper carriage displacement, and when no sector stop bar is actuated five units of displacement is permitted. Referring to Fig. 2, it will be seen that the characters whose width requires two, three or four units of spacing are shown next to their associated contact member 11 or 12 mounted on plate 13. Characters requiring five units of spacing do not appear inasmuch as no contact member is provided for them. It should be noted that for the sake of simplifying the drawing, contact arms 10 have been represented as being above the plane of plate 13. The actual positional relationship between contact arms 10, plate 13, and contact members 11 and 12 is as shown in Figs. 3 and 4.

Each contact arm 10 is adapted to be operated by depression of one associated key which, in the standard typewriter, controls the typing of two different characters. To permit one contact arm to cooperate with two contact members, the pair of contact members 11 and 12, representing the characters whose reproduction is controlled by one key, are vertically aligned on plate 13 as shown in the various views. As shown in Fig. 2, one terminal of a power source 22 is connected through a standard bridge rectifier 23 to a common reference point, and each of the plurality of contact arms 10 is connected in parallel to that terminal. The other terminal of power source 22 is connected through the rectifier 23 and line 23A to one terminal of each of the electromagnetic elements S2, S3 and S4. The contact members 11 and 12 are each connected in parallel to one of the leads L2, L3 and L4 which are respectively connected to the other terminals of electromagnetic elements S2, S3 and S4.

In following the operation of the invention let it be assumed that the character key "a" is depressed. The roller 2 on the associated power arm 1 (Fig. 1) rocks bell crank 4 in a clockwise direction about the pivot rod 5 against the tension of spring 8. Contact member mounted on arm 9 of bell crank 4 is displaced sufficiently to engage the corresponding contact member 11. This completes the circuit (Fig. 2) from contact member 11 thru lead L3, solenoid S3, line 23A, rectified power source 22 and contact arm 10*a* to ground. The solenoid S3 actuates its core 15 (Fig. 1) which elevates its sector stop bar 18 against the tension of its spring 21.

The sector stop bar face 28 is now in the path of pin 19 on gear sector 27 and permits the latter to swing through an arc corresponding in length to three units of paper carriage displacement. Similarly, selection of the "A" character for typing involves operation of the case shift key to lower the type basket 26 which, through link 14, causes the plate 13 to be lowered so that when the character key is depressed, the same contact arm 10 operates to engage the contact member 12 completing a circuit through lead L4 and solenoid S4. This elevates the stop bar 18 to place the face 28 thereof in position to limit the arcuate movement of pin 19 and provide four units of paper carriage displacement.

If the figure selected requires two units of space, solenoid S2 will be energized thru L2. If the figure requires three units of space, solenoid S3 will be energized thru L3, and as above noted if the character such as "A" requires four units of space, solenoid S4 will be energized thru L4. Where a character is selected requiring the maximum amount of five increment spacing, no contact member is provided (e.g. "W," "M," "m") no solenoid is energized, no sector stop bar 18 is elevated, and pin 19 limits against the edges 29 of the bars to provide a paper carriage displacement of five units.

The spacing between words is a two increment one and in the application above referred to was done by operation of a space lever 31 engaging a lip 32 on the two increment stop bar 18. It is evident that the space bar of the typewriter can be connected in circuit with solenoid S2 to do the spacing operation electrically, if desired. For the sake of simplicity, certain keyboard characters have been omitted such as "½," "¼," etc. It should be understood, however, that characters may be added to the keyboard as desired. If the greatest amount of paper carriage displacement is desired, such character would have no contact member, and if paper carriage displacement less than the greatest is desired then a contact member can be provided connected by a lead to the appropriate electromagnetic element.

What has been shown, then, is a device for selecting the particular element of a variable spacing unit which controls paper carriage displacement, wherein mechanical combinations are largely replaced by inexpensive and relatively trouble-free electric circuits. The high speed with which the mechanism of this invention operates helps to insure that all of the action in selecting the increment, and shifting the paper carriage, takes place after operation of the character key and before impact of the type head in printing. This rapidity of operation is highly desirable so that the paper carriage is at rest for the printing operation.

While there have been shown and described certain preferred embodiments of the invention, and the best mode in which it is contemplated employing that invention, it is to be understood that modifications and changes may be made without departing from the spirit and scope of the invention, as will be clear to those skilled in the art.

What I claim is:

1. In a key operated printing machine including type bar operating means wherein the positional relationship between the recording medium and the printing mechanism is altered subsequent to each type stroke including an escapement gear for controlling the movements of a carriage, a pivoted segment gear having a free movement in one direction and a movement in the opposite direction in mesh with said escapement gear, a plurality of sector stop bars for controlling the operation of said segment gear in one direction of movement to effect said alteration, electrical means for actuating selected ones of said sector stop bars including a plurality of contact members and a plurality of contact arms mounted on said

type bar operating means, and a plate of dielectric material for mounting said contact members.

2. The apparatus of claim 1 wherein said electrical means further includes means for adapting each of said contact arms to cooperate with at least one of said contact members.

3. The apparatus of claim 1 wherein said plurality of contact members are mounted in two horizontal rows on said dielectric plate, one of said rows representing upper case characters and the other of said rows representing lower case characters.

4. In a key operated printing machine including type bar operating bell crank means wherein the positional relationship between the recording medium and the printing mechanism is altered subsequent to each type stroke under the control of a plurality of sector stop bars, including a movable type key basket and a shift key for controlling the movement of the basket in case shifting operations, electrical means for actuating selected ones of said stop bars including a plurality of contact arms on said bell crank means and contact members engageable by said arms, a plate on which said contact members are mounted in rows, and means linking said plate to the type key basket of said machine whereby depression of the shift key lowers the type key basket and said plate to effect alignment of one of said rows of contact members with their cooperating contact arms.

5. In a key operated printing machine wherein the positional relationship between the recording medium and the printing mechanism is altered subsequent to each type stroke under the control of a plurality of sector stop bars, electrical means for actuating selected ones of said stop bars including a plurality of circuits each of which comprises in series connection a power source, an electromagnetic element adapted to be energized by said power source, a plurality of contact members, a plate on which said contact members are arranged in spaced rows, a plurality of contact arms, means responsive to selection of a character to move the associated one of said contact arms against its corresponding contact member thereby to complete said circuit, and means for moving said plate to change the position of said rows with respect to said contact arms.

6. The apparatus of claim 5 wherein said contact arm moving means includes a plurality of members each bearing a contact arm on one end, said members being adapted to displace its associated contact arm when a particular keyboard character is selected.

7. Apparatus for the selective control of the proportional spacing mechanism of a key controlled printing machine including type bar operating means, a plurality of electric circuits each including an electromagnetic element energizable by circuit completion, a plurality of switches comprising contact arms on said type bar operating means and contact members engageable by said arms, said switches being connected in parallel to each of said circuits, each switch being associated with one keyboard character, said type bar operating means being adapted to close the associated one of said switches when the corresponding character is selected for printing, thereby completing a selected one of said plurality of circuits and said electromagnetic elements being responsive to circuit completion to selectively actuate said proportional spacing mechanism.

8. In a typewriter or like printing machine including type bar operating bell crank means and proportional spacing mechanism including a plurality of sector stop bars for variably limiting relative positioned displacement of the printing mechanism and the printing medium, apparatus for selectively actuating said proportional spacing mechanism including at least M–1 key responsive electric circuits wherein M represents the number of different spacing increments provided, each of said circuits comprising a plurality of contact arms on said bell crank means and contact members engageable by said contact arms constituting parallel switches selectively closed upon selecting of the character to be reproduced, and said selective actuating apparatus including electromagnetic elements each having a member actuated upon energization of the associated electromagnetic element, and a power source for energizing one of said electromagnetic elements upon completing each of said circuits, each member of said electromagnetic elements cooperating with one sector stop bar.

9. In a typewriter having type bar operating bell crank means and shift key means, the combination of a carriage urged in letter feed direction and a spacing mechanism including an escapement gear, a movable segment gear having a free movement in one direction and a movement in the opposite direction in mesh with said escapement gear, movable stop means for defining the limits of movement of the segment gear in said free movement direction for controlling the movement of the carriage in accordance with the widths of characters to be printed, means for selectively moving said stop means, contacts corresponding to each of said stop means, circuit completing contact arms on said type bar bell crank means for engaging said contacts, and circuit means including said stop moving means, said contacts, and said circuit completing contact arms.

10. A typewriter, as set forth in claim 9, including means for mounting said contacts in rows and means for changing the relative positions of said rows and said circuit completing contact arms.

11. In a typewriter having type bar operating bell crank means and shift key means, the combination of a carriage urged in letter feed direction and a spacing mechanism including an escapement gear, a pivoted movable segment gear having a free movement in one direction and a movement in the opposite direction in mesh with said escapement gear, movable stop means for defining the limits of movement of the segment gear in said free movement direction for controlling the movement of the carriage in accordance with the widths of characters to be printed, means for selectively moving said stop means, sets of contacts corresponding to each of said stop means, circuit completing contact arms on said type bar operating bell cranks for selectively engaging said sets of contacts, and circuit means including said stop moving means, said contacts, and said circuit completing contact arms.

12. A typewriter, as set forth in claim 11, including means for mounting said sets of contacts in row arrangement corresponding to upper and lower case and means for moving said mounting means to selectively position said sets of contacts for engagement by said circuit completing contact arms.

13. A typewriter, as set forth in claim 9, including means for moving one of said stop means independently of said selective stop moving means.

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