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TYPEWRITER HAVING MEANS TO STORE CHARACTERS SELECTED DURING CARRIAGE MOVEMENTS

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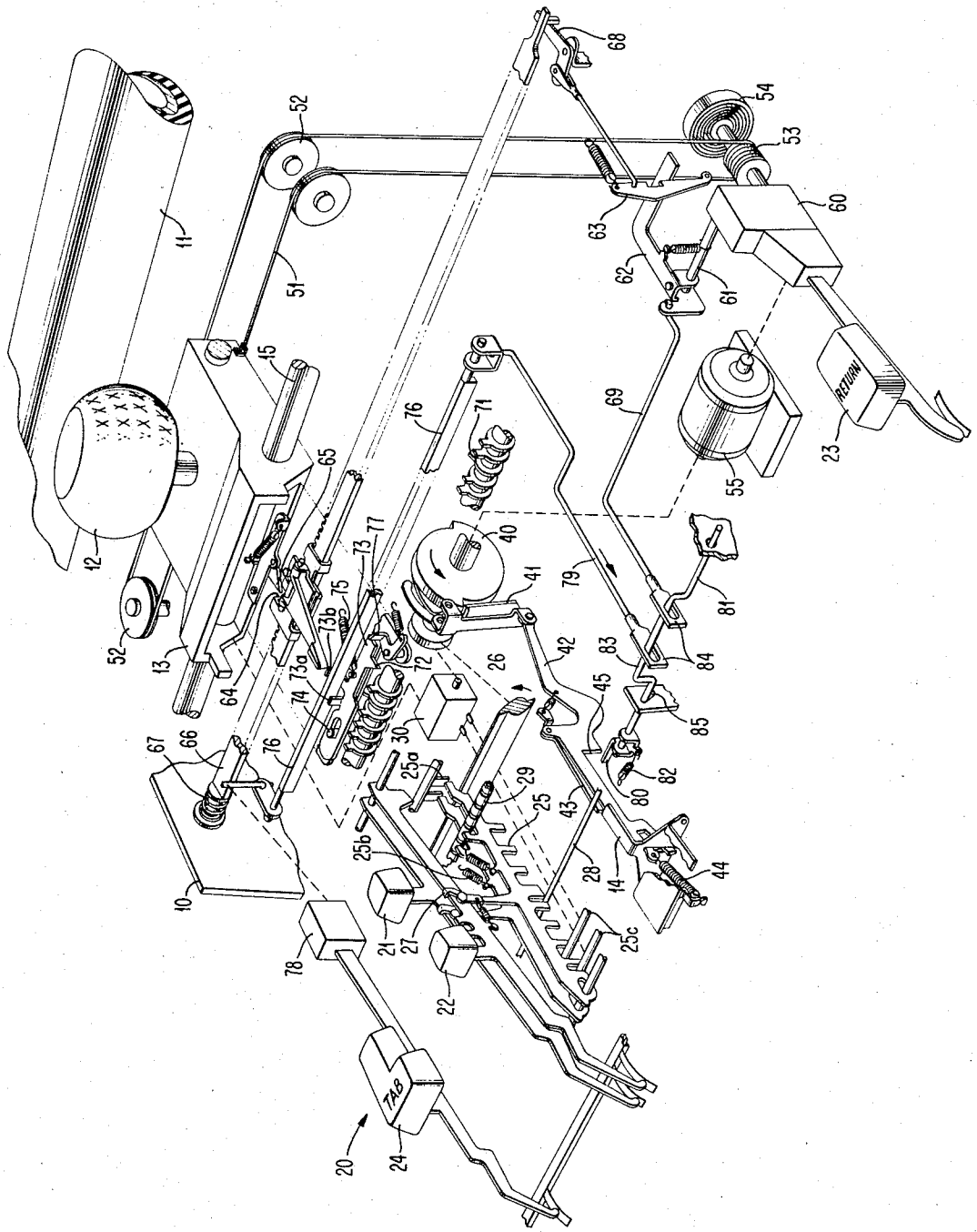

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TYPEWRITER HAVING MEANS TO STORE CHARACTERS SELECTED DURING CARRIAGE MOVEMENTS

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ABSTRACT OF THE DISCLOSURE

A typewriter keyboard is made more tolerant of operator judgment errors as to the termination of long, random length functions such as carriage return or tabulation, by storing information from depression of one key if such depression occurs prior to such termination. The stored information is automatically accepted by the typewriter immediately after long function termination without any specific awareness by the operator that a misjudgment had been made.

Disclosure of the invention

My invention provides mechanism for preventing undesired printing during the performance of a long function, usually of indeterminate length (e.g. line or carriage return, or tabulation) while permitting at least limited operation of character keys and without loss of information. More specifically, I provide means for storing character print information entered during the performance of a long function until the function is complete. At that time, the stored information is allowed to cause a print output. For example, with my invention, a typist may strike a letter key during a line return operation, but the letter will not print until the beginning of the new line has been reached.

Typing speed is related among other things, to considerations of rhythm and the pressure or concentration required to avoid errors. Efforts to speed up and interlock various operations have been exerted over the years with considerable beneficial effect. For example, a relatively fast interlocked keyboard is disclosed in U.S. Patent 3,086,635 entitled "Keylever Storage Mechanism," issued Apr. 23, 1963 to L.E. Palmer. Also, mechanism for interlocking physically inconsistent functions, such as, character and case selection in a single element typewriter is disclosed in U.S. Patent 3,157,265 entitled "Print Interlock for Typewriter," issued Nov. 17, 1964 to L. E. Palmer. Interlocks have also been known for long functions, such as carriage return, as shown for example in U.S. Patent 2,103,921 entitled "Typewriting Machine," issued Dec. 28, 1937 to R. G. Thompson.

Carriage return interlocks such as that of U.S. Patent 2,103,921 have provided their error preventing function at the expense of rhythm considerations since the interlocking function was accomplished by preventing key depression. It can be appreciated that a typist who misjudges the completion of a carriage return and encounters a physically blocked keybutton will be thrown off stride or will already be depressing a second key before recognizing that the first key did not cause a print. An error would result due to missing the first selected character. Presently, these conditions are mentally compensated for by positive effort on the typist's part to avoid early typing. This solution of itself detracts from typing speed.

Accordingly, an object of my invention has been to provide a simple mechanism for preventing undesired printing during long functions, such as line return and tabulation, without interrupting the typist's normal rhythm.

Another object of my invention has been to provide interlocking mechanism that extends the range of permissible typist's timing error relative to termination of a long function, to avoid rhythm interruption and reduce error pressure.

These objects are obtained in my invention through the use of a cyclically operating character storing keyboard and printer, such as that of the "Selectric" typewriter manufactured by International Business Machines Corporation, Armonk, New York, and fully described in Instruction Manual Form Part No. 241–5032–2, published January 1966. It is to be understood, however, that my invention is not limited to single element typewriters but is generally applicable to keyboard operated printers wherein character print operations are limited to sequential rather than overlapping cyclic operation. Examples of typebar typewriters having sequential cycle operation are found in U.S. Patent 2,489,826 entitled "Power Mechanism for Typewriting Machines," issued Nov. 29, 1949 to J. F. Smathers and aforesaid U.S. Patent 3,086,635.

In sequential cycle machines, some means is provided for initiating a cyclic operation under the control of, but time wise independent of key depression. A new cycle can begin only after the previous cycle is complete. As it is impossible for key depression to occur at a rate exceeding the rate of sequential cycles, mechanism is provided to retain or store the information that a particular key was depressed and, at the proper sequential cyclic time, an appropriate print operation occurs. This operation may be considered as converting a time wise random entry or flurry of keyboard data into a time wise regular sequence of print operations. While such a time wise regular sequence is a virtual necessity for a single element typewriter, it is a useful feature for typebar typewriters as it prevents typebar clashing, which is a major cause of type misalignment.

By my invention, mechanism, is provided to recognize the continued performance of a long function which has been latched into operation, and to prevent initiation of any print cycle during such performance. Inasmuch as the keyboard employed has physically separated key entry from the print operation, information stored representative of a depressed key will simply be retained until the long function mechanism ceases to operate or is unlatched.

An added advantage is provided by the addition of an interkey interlock that prevents simultaneous storage of information from plural character keybuttons. Accordingly, in the preferred embodiment of my invention, one key can be depressed during a long function and its information will be stored. A depression of a second key will be prevented however by the interkey interlock. It will be appreciated that one benefit gained by permitting a single character to be stored is the extension of the period of time for the typist to judge termination of a long function and thereby increase typing speed by reducing the possibility of rhythm interruption and of error. Another benefit is the positive "start" signal produced for the operator by feeling the second key during line return. For example, a typist desiring to type the word "and" at the beginning of a new line could strike the line return key and immediately strike the "a" key which would be stored. By placing her finger on the "n" key

during the remainder of the line return, the typist will feel the time to start typing the "d" and the remainder of the line by when the "n" key goes down.

These and other objects, features, and advantages of my invention will be apparent to those skilled in the art upon reading and understanding the following description of a specific preferred embodiment of my invention wherein reference is made to the accompanying drawings, of which:

The figure is a simplified perspective view of a typewriter showing the operative components of my preferred embodiment.

More specifically the figure shows a typewriter or printer **10** having a platen **11** to provide paper holding means, a print element **12** cooperable with the platen **11** to provide printing means, a carrier **13** for supporting the print element **12** for lateral displacement relative to the platen **11**, and a keyboard **20** for providing operator control of printing and displacement of the print element **12**. Details of a typewriter of this type are more completely disclosed in the aforesaid Instruction Manual.

The keyboard **20** includes character keys of which keys **21** and **22** are typical, and long function keys such as a line or carrier return key **23** and a tabulation key **24**. The character keys **21** and **22** are associated with individual code selecting interposers or transfer links **25** which provide the means for conveying character selcetion information from a depressed character key to the print element **12** through schematically shown selection and print drive mechanism **30**. The interposers **25** are normally retained leftwardly of storage latch springs **25***a* against the bias of individual coil springs **25***b*, and out of operative range of a rotatable filter shaft **26**. This normal position of the interposer **25** is identified as its inactive state or condition.

Depression of a key such as **22**, moves its associated interposer **25** downwardly by force transmitted through non-repeat connection **27** thus releasing the interposer from its latch spring **25***a* and allowing the interposer to move rightwardly under the influence of coil spring **25***b*. Latch spring **25***a* now serves to retain the thus displaced interposer **25** is a rightward and downward position where it is operatively aligned with the filter shaft **26** to be driven rearwardly thereby upon its rotation. This latched down position of the interposer **25** is identified as its storage state or condition.

Rotation of the filter shaft **26** and power driving of the selection and print drive mechanism **30** is accomplished through a cyclically operable print power control device such as a spring clutch **40**. Cycle initiation of clutch **40** is controlled by a self restoring stop latch **41** having an operating link **42** and a control latch **43**. The operating link **42** is normally held in an inactive position, as shown, against the bias of a coil spring **44** by engagement between the control latch **43** and stationary frame **14**. A bail or universal bar **28** transmits the downward position of any interposer **25** in its stored condition to the control latch **43** thus permitting spring **44** to pull stop latch **41** to an active position out of engagement with the cycle clutch **40**, thereby initiating a cycle of operation. The cycle of operation causes various functions through mechanism known in the art and shown only schematically, including rotation of the filter shaft **26**, impact driving of the type element **12** and letter feed escapement of the carrier **13**. As the filter shaft **26** rotates, it drives the previously displaced interposer **25** leftwardly to cause print selection by bails **25***c* and restores the interposer to its inactive state all as more completely described in aforesaid Patent 3,086,635. The condition of the interposer **25** while in leftward or character selection controlling motion, is identified as its control state or condition.

An interkey ball interlock **29** is provided to prevent the simultaneous presence of two interposers **25** in the storage state which would cause an erroneous character selection. The ball interlock **29** is constructed however, to permit one interposer **25** to be in the control state and a second interposer **25** to be placed in the storage state. By this means, a random flurry of key operations can be reconciled with a regular sequential cyclic print output.

Displacement of the carrier **13** along its supporting rail **15** relative to the platen **11** is accomplished through energy supplied by a cord **51** that is guided in a closed loop by pulleys **52** to a power capstan **53**. The cord **51** is driven in one direction by a spiral main spring **54** for forward or left to right movement, and by a motor **55** in the reverse direction. The motor **55** also serves to wind the spring **54** and provide the rotational energy controlled by the cycle clutch **40**. The letter feed escapement control itself forms no part of this invention and reference may be had to pages **39** through **42** particularly of the aforesaid Instruction Manual for details thereof.

Return of the carrier **13** to a new line is controlled by key **23** which operates an appropriate print position locating, line or carriage return mechanism generally indicated at **60**, details of which form no part of this invention. Suitable carriage return mechanisms are shown in U.S. Patent 2,902,133 entitled "Typewriter Carriage Return and Indexing Mechanism," issued Sept. 1, 1959, to N. D. Walton and H. R. Kruspe, and also, on pages 52 through 55 of the aforesaid manual. The significant portion of the mechanism **60** pertinent to this invention involves a two position shaft or line return control member **61** that controls continued operation of the line return mechanism throughout its random length of operation. Shaft **61** is rotated counterclockwise by a mechanism that initiates the line return operation in response to key depression and is retained by latch arm **62** and latch link **63** in the operative or line return "on" position until a margin stop **64** engages a counterstop **65** indicating that the left margin or new line position has been reached. Counterstop **65** drives the margin stop **64** and margin rack **66** leftwardly against a coil spring **67** to rotate a bell crank **68** counterclockwise pivoting latch link **63** counterclockwise and releasing the line return control arm **62** to return to the line return "off" condition. It should be noted that proper line return operation involves not only driving of the carrier **13** but also appropriate control of the normal letter feed mechanism, backspace mechanism and index or line feed mechanism. However, as such control is known in the art and forms no part of this invention, it is not specifically disclosed herein.

Tabulation or random length forward continued movement of the carrier **13** is accomplished as known in the art simply by freeing the carrier **13** from its normal letter feed control (not shown) and permitting main spring **54** to pull the carrier to the right until a preset tab stop **71** is encountered by a sensing finger **72**, at which time the normal letter feed escapement is placed back in control of the carrier **13**. As control over the letter feed mechanism to accomplish tabulation forms no part of this invention, specific description thereof, is unnecessary. Reference may be had however to pages 59 through 64 of the aforesaid instruction manual for appropriate details.

Of principal importance in the forward print position, locating or tabulation mechanism is the control lever or member **73** which senses and determines the continued operation of the tabulating mechanism. The tabulation control lever **73** is shown in its normal position pivotally and slidably mounted on a carrier mounted pivot stud **74** where it is retained by a coil spring **75**. A control torque bar **76** engages a control finger **73***a* and feedback finger **73***b* of the control lever **73** to provide a mechanical connection between the moving carrier **13** and the stationary operating mechanisms of the typewriter. It can be seen that clockwise pivoting of the torque bar **76** against control finger **73***a* drives the control lever **73** clockwise about pivot stud **74** permitting a latch link **77** to fall behind its outer end. The lever **73** is thus stored in its projected or

active position. In this position, the escapement mechanism (not shown) is manipulated to permit tabulation motion of the carrier **13**.

Feedback finger **73***b* engages the torque bar **76** and retains it in the clockwise position so long as the control lever is latched by link **77** into active position. When the carrier **13** reaches the desired lateral position the sensing finger **72** strikes a preset tab stop **71**, and control lever **73** is driven leftwardly against spring **75**, beyond the effective reach of latch link **77**. Spring **75** thus restores the control lever **73** counterclockwise to its original inactive position. In this position, the control of the carrier **13** is restored to the escapement mechanism (not shown). Initial operation of the tabulation mechanism is controlled by key **24** which can operate through suitable mechanism such as a power device or simply linkage **78**, to rotate or pivot the torque bar **76** as previously described.

From the foregoing description of the line return and tabulation mechanism, it will be observed that a common structural feature exists in the provision of latching means that maintain a controlling element operative until the associated function has been terminated. In each case, a member **61** and **73** is provided having a position representative of continued operation of the function. This member is employed to provide the intelligence for my invention.

In the lower central portion of the figure, there is shown an interrupter finger or stop member **80** that is mounted for pivotal movement on a shaft **81** and normally biased by an upwardly inclined spring **82** to a position of non-interference with the clutch operating link **42**. The interrupter **80** is rotatable against spring **82** to a position wherein it intercepts a shoulder or edge surface **45** of the operation link **42** in its leftward motion by spring **44**. The clutch latch **41** is thus inhibited from its normal response to movement of bail **82**.

Shaft **81** includes an upwardly projecting crank portion **83** to which is attached both a control link **69** that moves leftward in response to the active position of line return control member **61** taken from latch arm **62**, and a control link **79** which moves leftward in response to the active position of the tabulation control member **73** acting through the torque bar **76**. The control links **69** and **79** are connected permissively to the crank portion **83** by slotted brackets **84** such that movement of either control link leftwardly rotates the shaft **81** counterclockwise without interference with the other control link.

It can be seen that upon initiation of a long function, as by depression of either key **23** or key **24**, an associated control member, for example line return control shaft **61**, will be moved to a function controlling position causing normal initiation and performance of the function. The initiation of the function is transmitted through control link **69** to rotate the shaft **81** counterclockwise and bring interrupter finger **80** into alignment with the surface **45** on clutch latch operating link **42**. The line return latch arm **62** is retained by latch lever **63** in the active position during the continuance of the function such that the interrupter finger **80** is also retained in an active position. If a character key such as **22** is depressed, its associated interposer **25** will be stored under leaf spring **25***a*, the ball interlock **29** will be activated, and the cycle clutch bail **28** will activate the control latch **43** of the operating link **42** to free it from the frame part **14** and permit the link **42** to move rearwardly by spring **44**. Full movemen of the link **42** will not be permitted, however, due to the presence of interrupter finger **80** in the path of surface **45**. Since the cycle clutch **40** is not unlatched, the filter shaft **26** does not rotate and the interposer **25** is retained in the ball interlock **29**. Attempt to depress a second key such as **21** is resisted by the ball interlock **29** and accordingly, further keys cannot be depressed until the print cycle for the first character key has been initiated. As the carrier **13** reaches the left hand margin or new line position, counterstop **65** engages margin stop **64** and through bell crank **68** latch link **63** is pivoted to release latch arm **62** and shaft **61** thereby terminating the line return operation. Control link **69** is pulled to the right to permit interrupter **80** to move out of the path of surface **45** and permit the complete operation of stop latch **41** to initiate a print cycle for depressed key **22**.

It should be noted that timing considerations are involved, as a matter of design, between the time the line return mechanism is unlatched and the carrier settles at the margin, and the time required for print to occur after release of the interrupter **80**, to assure printing at the margin.

Similarly, tabulation is initiated by the depression of key **24**, when control lever **73** is moved to and stored in its projected or active position by clockwise pivoting of torque bar **76**. Feedback finger **73***b* of control lever **73** maintains the torque bar **76** in its pivoted position and through control link **79** pivots shaft **81** and moves interrupter **80** into alignment with surface **45**. Subsequent depression of a character key is stored as previously explained. Termination of the tabulation restores torque bar **76** to its counterclockwise position and permits the interrupter finger **80** to move out of the path of surface **45**.

It is possible that a line return or tabulation operation could be initiated prior to full restoration of the operating link **42** from a previous print cycle. To prevent part breakage and promote smooth operation I have provided a floating or yieldable mount or support for the shaft **81** in the form arcuate slot **85**. In the event that interrupter **80** strikes the bottom of the unrestored or active operating link **42**, the point of contact therebetween will act as a center and the overload will cause the shaft **81** to move bodily in slot **85** stretching spring **82**. When operating link **42** is fully restored, a path will be clear for the interrupter **80** to move by spring **82** into its active position.

It will be appreciated by those skilled in the art that I have described a particular preferred embodiment of a more general invention by which typing operations can be prevented at undesired times during the performance of long functions usually of indeterminate or random length. The principle thrust of my invention lies in its ability to lessen the criticality of the typist's judgment as to when a long function has been terminated and thereby increase typing speed and efficiency by reducing error pressure without introducing a rhythm interference. It will thus be understood that various modifications, deletions, and additions can be made to my invention without departing from the novel concepts thereof. In particular, it will be recognized that my invention is not limited to single element typewriters but is equally applicable to any sequential cycle keyboard printer.

Having thus described my invention and a preferred illustrative embodiment thereof, I claim:

1. A typewriter having a keyboard, a platen, printing means cooperable therewith under the control of said keyboard, and means supporting said platen and said printing means for relative movement along a writing line, the improved control mechanism comprising:

a transfer link individually associated with each character key of said keyboard, each of said transfer links having a normal inactive condition, a stored condition, and a control condition, each of said transfer links when in its control condition being operative to effect printing of an associated character;

a cyclically operable print power control device for effecting print operation in conjunction with said transfer links;

means normally operable upon the existence of any transfer link being in its stored condition for initiating a cycle of operation of said print power control device;

means operated by said print power control device for placing stored transfer links into their control condition;

a line return mechanism operatively connected to one of said printing means and said platen for causing relative movement thereof from an advanced line position to a new line position, said line return mechanism comprising a control member having a normal inactive position and an active position indicative of line return operation;

a latch operatively associated with said control member for retaining said control member in its active position when independently moved thereto;

means responsive to the attainment of a new line position by said printing means and said platen for moving said latch to unlatch said control member; and

ancillary means cooperative with said cycle initiating means for preventing cycle initiation thereby that any time said carriage return control member is in its active position.

2. A typewriter as defined in claim **1** wherein:

said cycle initiating means comprises a movable operating link having an active condition and an inactive condition;

said ancillary means comprises a finger movable to a position of cooperation with said operating link when in its inactive condition to limit movement thereof; and

further comprising means yieldably supporting said finger to permit overload movement thereof whenever it is moved at a time when said operating link is in its active condition.

3. A typewriter as defined in claim **1** wherein:

said cycle initiating means comprises a movable operating link having active condition and an inactive condition;

said ancillary means comprises a finger movable to a position of cooperation with said operating link when in its inactive condition to limit movement thereof; and

further comprising means yieldably supporting said finger to permit overload movement thereof whenever it is moved at a time when said operating link is in its active condition.

4. A typewriter defined in claim **1** further comprising an interkey interlock operatively associated with all of said transfer links for preventing the multiple presence of transfer links in said storage state.

5. A typewriter as defined in claim **4** further comprising:

a tabulation mechanism operatively connected to said printing means and said platen for causing relative movement thereof to an advanced line position, said tabulation mechanism comprising a tabulation control member having normal inactive position and an active position indicative of continued tabulation operation;

a tabulation latch operatively associated with said tabulation control member for retaining said tabulation control member in its active position when independently moved thereto;

means responsive to the attainment of a predetermined advanced line position by said printing means and said platen for moving said tabulation latch to unlatch said tabulation control member;

and means connecting said tabulation mechanism with said ancillary means to further prevent cycle initiation at any time said tabulation control member is in its active position.

6. A typewriter having a keyboard, a platen, printing means cooperable therewith under the control of said keyboard, and means supporting said platen and said printing means for relative movement along a writing line, the improved control mechanism comprising:

a transfer link individually associated with each character key of said keyboard, each of said transfer links having a normal inactive condition, a stored condition, and a control condition, each of said transfer links when in its control condition being operative to effect printing of an associated character;

a cyclically operable print power control device for effecting printing operations in conjunction with said transfer links;

means normally operable upon the existence of any transfer link being in its stored condition for initiating a cycle of operation of said print power control device;

means operated by said print power control device for placing stored transfer links into their control condition;

a tabulation mechanism operatively connected to one of said printing means and said platen for causing relative movement thereof to an advanced line position, said tabulation mechanism comprising a control member having a normal inactive position and active position indicative of tabulation operation;

a latch operatively associated with said control member for retaining said control member in its active position when independently moved thereto;

means responsive to the attainment of a predetermined advanced line position by said printing means and said platen for moving said latch to unlatch said control member; and

ancillary means cooperative with said cycle initiating means for preventing cycle initiation thereby at any time said tabulation control member is in its active position.

7. A typewriter as defined in claim **6** further comprising an interkey interlock operatively associated with all of said transfer links for preventing the multiple presence of transfer links in said storage state.

8. A typewriter having a keyboard, a platen, printing means cooperable therewith under the control of said keyboard, and means supporting said platen and said printing means for relative movement along a writing line, the improved control mechanism comprising:

a transfer link individually associated with each character key of said keyboard, each of said transfer links having a normal inactive condition, a stored condition, and a control condition, each of said transfer links when in its control condition being operative to effect printing of an associated character;

a cyclically operable print power control device for effecting printing operations in conjunction with said transfer links;

means normally operable upon the existence of any transfer link being in its stored condition for initiating a cycle of operation of said print power control device;

means operated by said print power control device for placing stored transfer links into their control condition;

a print position locating mechanism operatively connected to one of said printing means and said platen for causing relative movement thereof a random distance to a predetermined print position, said mechanism comprising a control member having a normal inactive position and active position indicative of a print position relocating operation;

a latch operatively associated with said control member for retaining said control member in its active position when independently moved thereto;

means responsive to the attainment of said predetermined print position by said printing means and said platen for moving said latch to unlatch said control member; and

ancillary means cooperative with said cycle initiating means for preventing cycle initiation thereby at any time said control member is in its active position.

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