

Feb. 1, 1966

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3,232,405

TYPEWRITER ESCAPEMENT MECHANISM WITH SPACING MEANS

Filed June 26, 1963

3 Sheets-Sheet 1

FIG. 1

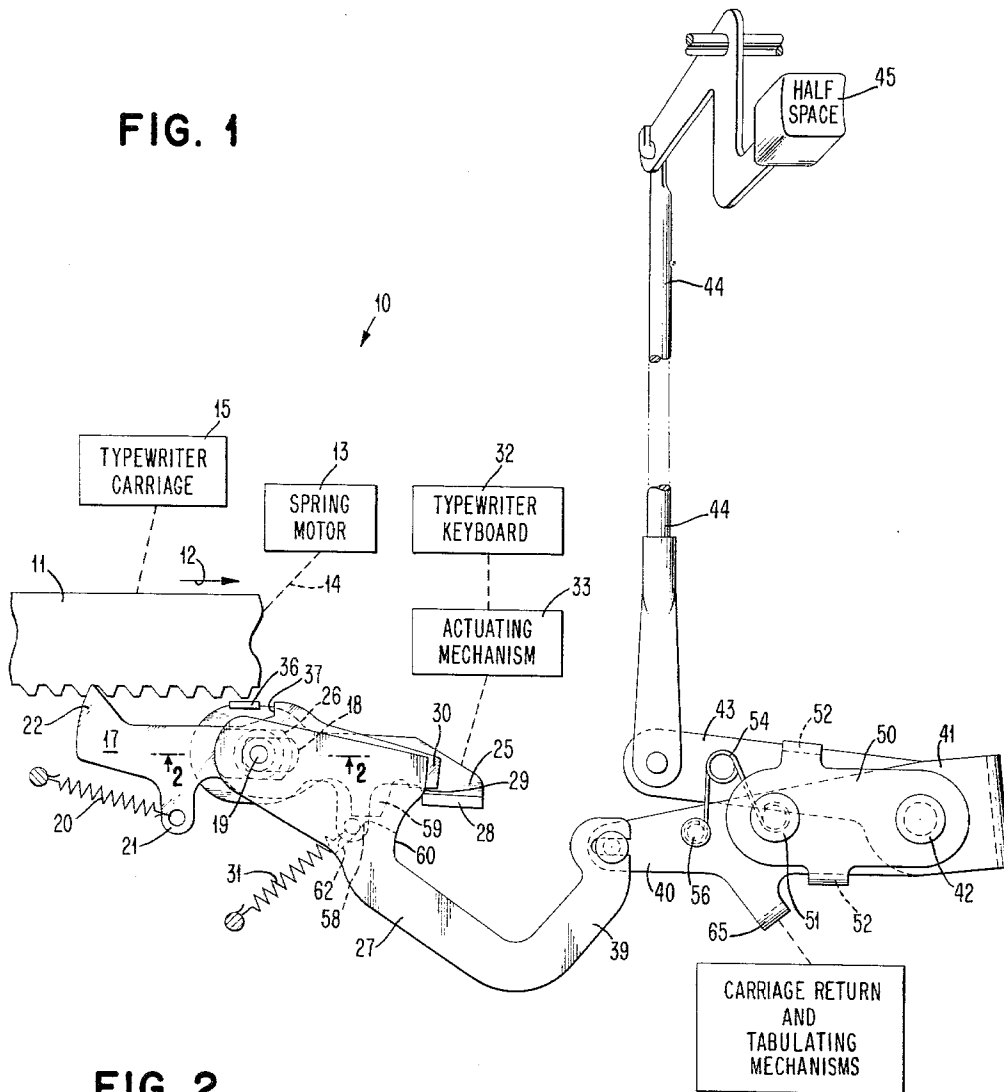
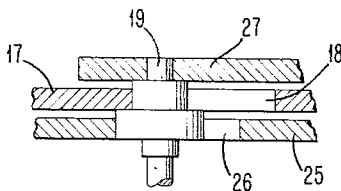


FIG. 2



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FIG. 3

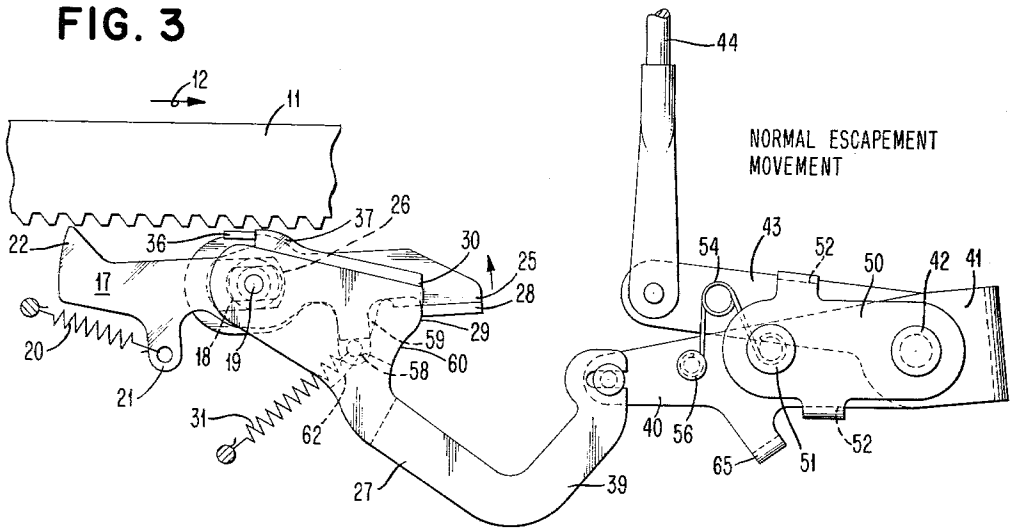
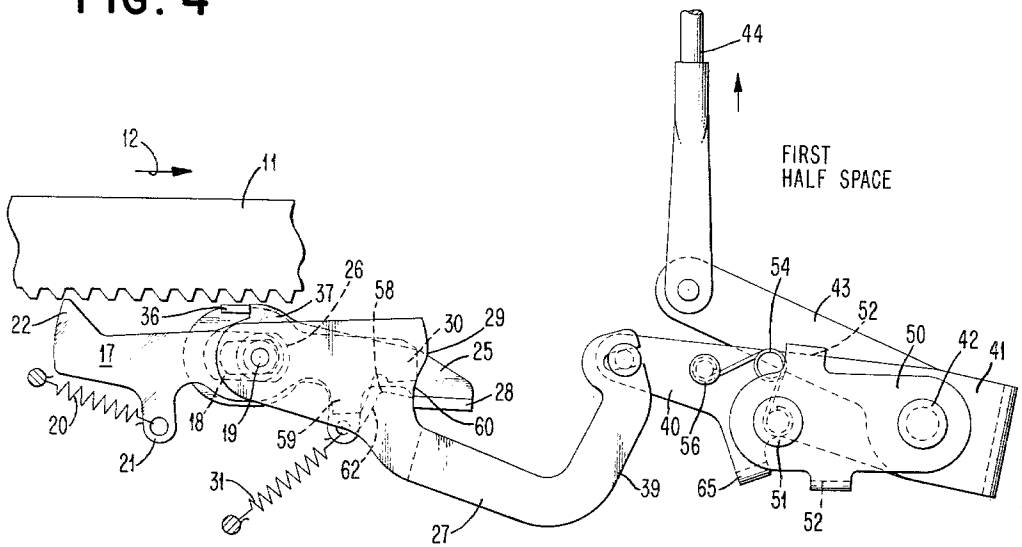


FIG. 4



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FIG. 5

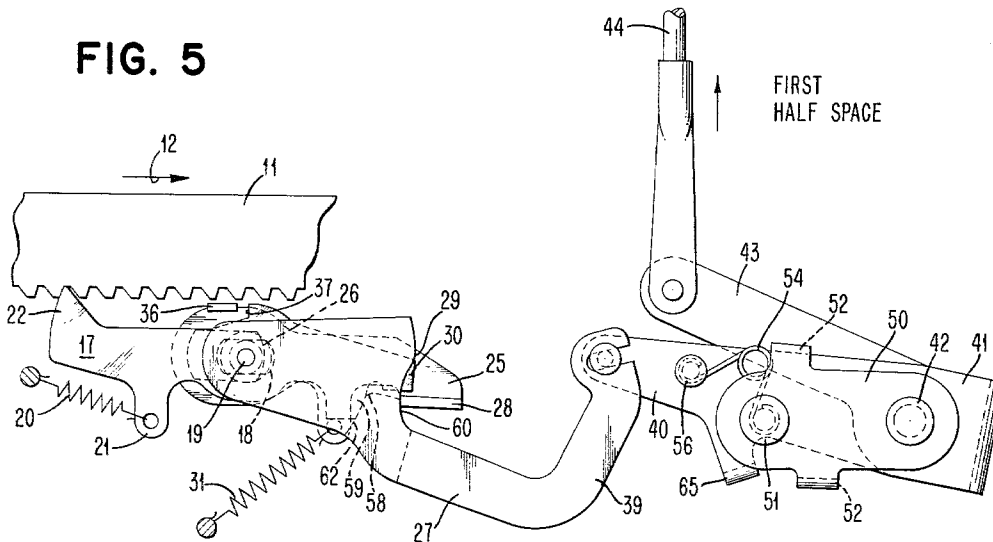
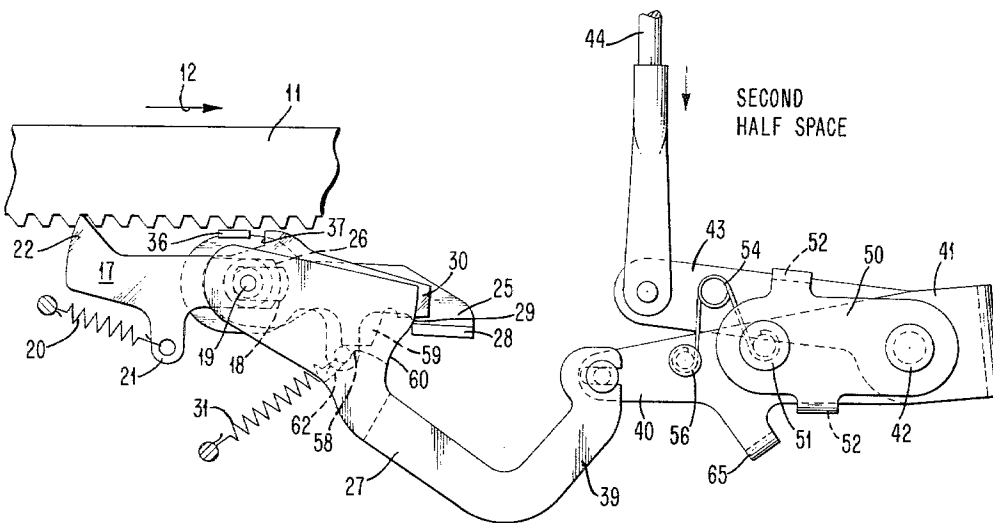


FIG. 6



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## TYPEWRITER ESCAPEMENT MECHANISM WITH SPACING MEANS

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The present invention relates generally to the typewriter art and more particularly to an improved typewriter escapement mechanism. The escapement mechanism comprises spacing means for advancing a movable typewriter carriage a predetermined distance which is less than the normal or standard escapement distance.

As will be understood by those skilled in the art, a typewriter has a movable carriage which is moved in the character spacing direction to effect relative longitudinal movement between the printing means and a paper holding means. The printing means may comprise a series of type bars or a single print head and the paper holding means includes a rotatable platen and associated apparatus. Either the printing means or the paper holding means can be mounted for movement with the movable carriage. The carriage is spring biased for movement in the character spacing direction and movement in this direction is controlled by the escapement mechanism. Each time a typist actuates a character or space key on the typewriter keyboard, the escapement mechanism allows the carriage to move in the character spacing direction a distance corresponding to the associated character or space between adjacent words. A line of printing is formed on the paper in this manner.

A common typist mistake is to leave out a character in a word or to include an extra character in a word. The typist may not realize that a mistake has been made until several additional words have been typed or, in fact, until the entire page has been typed. To correct a word where a character has been omitted, the erroneous word and all typing on the same line to the right of this word must be erased and retyped if spacing between the words is to be maintained. This is a time-consuming task and in many cases the typist will retype the entire page rather than try to correct the mistake. In the case where a word includes an extra character, only the word in error need be erased and retyped. However, an abnormally large space is left between the corrected word and an adjacent word which seriously detracts from the appearance and quality of the typed page.

In certain typing applications, the typist is required to type a predetermined amount of material in an area on the page which is slightly larger or smaller than the area normally required for the material. When the available area is too small, it is practically impossible for the typist to type the material in a manner where the typing is of acceptable quality. Conversely, if the area is too large, spaces of widely varying dimensions may be left between the words. Such widely varying spaces are readily apparent to the observer and detract from the appearance of the printing. Although the above limitations of conventional typewriter escapement mechanisms have long been recognized in the art, no completely satisfactory solution has been proposed.

Briefly, the present invention provides an escapement mechanism for typewriters having spacing means which can be actuated by the typist to advance the typewriter

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carriage a distance corresponding to a predetermined increment of the normal or standard escapement distance. Thereafter, the carriage moves the standard escapement distance when the character and space keys are depressed until the spacing means is again actuated. Means are also provided for automatically again actuating the spacing means in response to initiation of certain typewriter functions by the typist, such as carriage return and tabulation. A pivoted escapement pawl having a slot therein co-operates with a spring biased escapement rack in advancing the carriage in a character spacing direction. A key on the typewriter keyboard controls the spacing means which is operative to change the point of pivotal mounting of the escapement pawl and provides for movement of the escapement rack by a predetermined distance, such as one-half the normal escapement distance. The spacing means also changes the position of the stop means which limit longitudinal movement of the escapement pawl when the same is disengaged from the escapement rack.

It is the primary or ultimate object of this invention to provide typewriter escapement mechanism with spacing means whereby the typist can insert as many spaces as desired in a line of typing, the spaces being smaller than the normal escapement distance. This permits a typist to correct misspelled words having more or less characters than required without the necessity of erasing the major portion of a line of typing and/or adversely affecting the quality or appearance of the typing. Also, the spacing means allows a specific amount of typing material to be included in an area which, considering the standard escapement movement of the carriage, is too large or too small for the material in such a manner that the typed material does not appear overly crowded or have large varying spaces between the words. Further, the spacing means can be employed for lengthening or shortening a line of typing to justify or even up the right hand margin in a manner similar to that employed by a typist when using a typewriter equipped with relatively complicated proportional escapement mechanism.

A further object of the invention is the provision of a typewriter escapement mechanism of the type described above which is extremely simplified in construction and operation but yet is highly reliable. The escapement mechanism includes an escapement pawl and suitable actuating link for changing not only the effective point of pivotal mounting of the escapement pawl but also the position of the stop means which limit longitudinal movement of the pawl. The construction is such that the spacing means can be incorporated in existing typewriters with a minimum of design changes.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment as illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a plan view of a typewriter escapement mechanism with spacing means constructed and operated in accordance with the teachings of the present invention;

FIGURE 2 is a side sectional view taken along the section line 2—2 of FIGURE 1;

FIGURE 3 is a plan view illustrating the relative positions of certain parts of the escapement mechanism during a normal escapement operation;

FIGURES 4 and 5 are plan views showing the relative positions of certain parts of the escapement mechanism immediately after the spacing means has been actuated; and

FIGURE 6 is a plan view similar to that of FIGURE 1 illustrating the positions of certain parts of the escapement mechanism after the spacing means has again been actuated to insert a second half space in a line of printing.

Referring now to the drawings, and initially to FIGURES 1 and 2 thereof, the reference numeral 10 designates generally an escapement mechanism with spacing means. The escapement mechanism comprises an elongated escapement rack 11 which is urged in a character spacing direction as illustrated by arrow 12 under the action of a spring motor 13. The escapement rack 11 and the spring motor 13 are interconnected by a drive means 14, such as flexible tape. Mounted for movement with the rack 11 is a typewriter carriage 15 which carries the printing means or the paper holding means of the typewriter as will be understood by those skilled in the art.

An escapement pawl 17 having an elongated slot 18 therein is pivotally mounted on a shouldered stud 19 from a stationary portion of the typewriter. A spring 20 has one end rigidly attached to the typewriter frame and the other end connected to an arm 21 of the escapement pawl. The arrangement is such that a tip portion 22 of the pawl is normally biased into engagement with the teeth of rack 11 and carriage 15 is held against movement in the character spacing direction.

Also pivotally mounted on the stud 19 beneath the escapement pawl 17 is an actuating lever 25 having an elongated slot 26 therein. Overlying the escapement pawl and pivoted on the stud 19 is a half space lever 27 whose use and operation will be hereinafter more fully explained. The mounting of the pawl 17, pawl actuating lever 25 and half space lever 27 on the stud 19 is most clearly shown in FIGURE 2 of the drawings.

The pawl actuating lever 25 has a vertically projecting tab 28 at the rear end thereof which engages a stop surface 29 on the half space lever 27 and is adapted to engage the projecting rear end 30 of pawl 17 when counterclockwise rotary motion is imparted to the actuating lever. The actuating lever is normally maintained in the position shown in FIGURE 1 of the drawings by a spring 31. The typewriter comprises a typewriter keyboard 32 whose keys, not shown, are operatively connected via actuating mechanism 33, such as a universal bar, to the pawl actuating lever. Whenever a character or space key on the typewriter keyboard is depressed, the pawl actuating lever 25 is rotated in the counterclockwise direction and tab 28 engages the rear end 30 of pawl 17. The pawl is rocked in a counterclockwise direction about stud 19 and the tip 22 of pawl 17 moves out of engagement with the teeth of escapement rack 11. This is shown in FIGURE 3 of the drawings and the escapement rack 11 and carriage 15 are now free to move in the character spacing direction represented by arrow 12 under the action of spring motor 13.

An escapement actuating mechanism of the general type so far described is employed on many typewriters, such as the IBM standard electric typewriter which is fully described in "IBM Customer Engineering Instruction Manual—Model C-1 Standard Typewriter," Form 241-5065-0, copyright 1960 which is available from the IBM Corporation, Armonk, New York. However, it should be understood at the outset that, in its broader aspects, the present invention is not limited to any particular type of basic escapement mechanism. The typewriter keyboard 32 and the actuating mechanism 33 may be of any well known construction capable of imparting a momentary counterclockwise rotary force to actuating lever 25 each time one of the character or space keys is actuated.

The forward end of pawl actuating lever 25 is formed with a vertically extending tab 36 which is adapted to be engaged by an abutment 37 on the escapement pawl 17 during escapement movement. When a character or normal space key on the typewriter keyboard 32 is depressed, the tip 22 of escapement pawl is pivoted out of engagement with the teeth on the escapement rack 11 so that the rack and carriage 15 are free to move in the character spacing direction under the action of spring motor 13 as above described. At the same time, the escapement pawl is free to move in the opposite direction under the action of spring 20 due to the elongated slot 18 in the pawl. Eventually, abutment 37 on the pawl engages the tab 36 on the pawl actuating lever 25 to limit longitudinal movement of the pawl. The arrangement of the parts at this time during a normal escapement movement is shown in FIGURE 3 of the drawings. After longitudinal movement of the pawl has been arrested, the spring 20 exerts a force which pivots the tip 22 of the pawl back into engagement with the teeth of rack 11. In essence, the tip portion of escapement pawl 17 moves over the tooth on the escapement rack which it previously engaged and back into the rack where it can be engaged by the next succeeding tooth on the rack in response to actuation of a character or normal space key. Longitudinal movement of the rack and carriage in the character spacing direction continues even though the tip of pawl 17 has re-engaged the teeth of the escapement rack until the forward edge of elongated slot 18 in the pawl abuts against stud 19. For normal escapement movement, the abutment 37 on pawl 17 and tab 36 on actuating lever 25 and the forward edge of slot 18 in pawl 17 and stud 19 provide a pair of cooperating stop means which define the extent of the normal escapement distance. It should be noted that the relative spacing between the tab 36 and abutment 37 is constant until the tip of pawl is disengaged from the rack since the pawl and actuating lever are effectively coupled and rotating about the same pivot point during this time interval.

As explained in the foregoing portions of the specification, it is desirable that the typist be provided with a means for advancing the escapement rack and carriage in the character spacing direction by a distance which is a predetermined increment of the normal character spacing distance. Such a spacing means is extremely useful in correcting mistakes, arranging a predetermined amount of typing in a defined area or in justifying the right-hand margin. In the illustrated embodiment of the invention, the spacing means is operative to allow movement of the carriage by an amount equal to one-half of the normal escapement distance. This particular incremental distance should not be considered as limiting the present invention since this distance can be selected by the designer in accordance with principles which will be hereinafter more fully apparent.

The rear end of half space lever 27 is formed to provide a hook-like extension 39 that is pivotally connected to a first arm 40 of a bellcrank lever 41. The bellcrank lever is mounted from the frame of the typewriter by pivot pin 42 and a second arm 43 of this bellcrank is pivotally connected to an actuating link 44 which drivingly interconnects the escapement mechanism and a half space key 45. The half space key 45 is preferably mounted on the typewriter keyboard 32 where the same is readily accessible to the typist. When half space key 45 is depressed the actuating link 44 is moved upwardly.

A stop plate 50 is rigidly attached to the frame of the typewriter by pivot pin 42 and a stud 51. This stop plate has a pair of downturned tabs 52 on the opposite sides thereof which define stops that limit the pivotal movement of the bellcrank 41 and hence the rotation of half space lever 27. If desired, the stop plate 50 can be mounted for longitudinal movement with respect to the

bellcrank whereby the extent of pivotal movement of the latter member can be adjusted. A hairpin spring 54 has one end secured to the stud 51 and the other end connected to a stud 56 which is carried by arm 40 of the bellcrank 41. In essence, the spring 54 defines an over center detent means for biasing and maintaining the bellcrank lever 41 in either of two rotary positions as determined by the position of stops 52 on stop plate 50 and the actuated state of half space key 45. If the key 45 is depressed, the bellcrank 41 will be rotated in a clockwise direction until the top of arm 40 engages the upper stop 52 of the stop plate. When the operator raises the key from the depressed state, the bellcrank 41 will rotate in the opposite direction and return to the position shown in FIGURE 1 of the drawings.

Upward movement of the actuating link 44 in response to the typist depressing half space key 45 rotates bellcrank 41 in a clockwise direction which in turn imparts a counterclockwise movement to half space lever 27. This causes a shoulder 58 formed on the half space lever to engage a projection 59 on escapement pawl 17 so that the tip 22 is disengaged from the teeth of the escapement rack. The escapement rack and carriage are free to move in the character spacing direction and the pawl moves in the opposite longitudinal direction under the action of spring 20. The movement of pawl 17 is limited by the abutment 37 engaging tab 36 on the actuating lever 25. As the half space lever 27 is rotated, the pawl actuating lever 25 moves longitudinally under the action of spring 31 due to the elongated slot 26 therein and the movement of cam surface 60 behind the tab 28 on the pawl actuating lever. The half space lever 27 is being rotated at this time but the relative movement of tab 36 away from abutment 37 is limited so the tip portion of the escapement pawl moves over the tooth on the escapement rack which it previously engaged and back into the rack where it can be engaged by the next succeeding tooth on the rack. The abutment 37 engages tab 36 to limit movement of the pawl and the various parts are in the positions shown in FIGURE 4 of the drawings at this time.

The tip of pawl 17 is forced back into engagement with the teeth of escapement rack 11 by the action of spring 20. The rack and carriage continue to move in the character spacing direction and drive the escapement pawl in the same direction. During this time interval, the half space lever 27 has continued its rotation in a counterclockwise direction whereby the actuating lever 25 has finished its longitudinal movement and a surface 62 of the shoulder 58 of the half space lever has moved up behind the projection 59 of the escapement pawl. The surface 62 forms a stop which limits rearward movement of the pawl and the total movement of the escapement rack and carriage in the character spacing direction is one-half the distance of the normal or standard escapement distance. During normal escapement movements as described in connection with FIGURE 3 of the drawings, the movement of the pawl in the character spacing direction is limited by the forward end of slot 18 engaging the stud 19. When the half space key is depressed the corresponding movement of pawl 17 is limited by the projection 59 abutting against surface 62 of the half space lever 27. This changing of the effective stop means allows the escapement rack and carriage to move only one-half of the normal escapement distance. It will be noted that the pivot pin 19 is now located adjacent the center of the slot 18 in the pawl and adjacent the rear of slot 26 in the actuating lever 25 as is shown in FIGURE 5 of the drawings rather than adjacent the forward edges of these slots as shown in FIGURE 1 of the drawings.

The half space key 45 is now in the depressed condition with the half space lever 28 rotated to the position shown in FIGURE 5 of the drawings. The escapement rack and carriage have been advanced by a distance equal to one-half of the normal escapement distance. The typist may

continue typing with the escapement rack and carriage being advanced the normal escapement distance. Actuation of a character or normal space key on the typewriter keyboard 32 causes counterclockwise movement of escapement pawl actuating lever 25 so that tab 28 engages the rear end 30 of pawl 17 and moves the tip 22 thereof from the teeth of rack 11. The rack and carriage are pulled in the character spacing direction by spring motor 13 while the pawl moves in the opposite direction under the influence of spring 20. Eventually, the abutment 37 on the pawl engages tab 36 so that the tip of the pawl is rotated back into engagement with the teeth of the rack. It is important to note that the contour of cam surface 60 on the half space lever 27 is such that the same relative spacing exists between the tab 36 and abutment 37 both before and after the half space key 45 is actuated. This insures proper operation of the escapement mechanism during normal escapement operations.

When the tip 22 of pawl 17 is rocked back into engagement with the rack, the direction of movement of the pawl is reversed and the same is carried in the character spacing direction with the rack and the carriage. This movement continues until the projection 59 of the pawl engages the surface 62 on the half space lever 27. The arrangement is such that the escapement rack and carriage have moved the normal escapement distance after having previously advanced one-half the normal escapement distance. The escapement mechanism can be actuated under control of the normal character and space keys for as many escapement operations as required even though these escapement movements are out of phase with respect to the normal escapement movement by one-half of the standard escapement distance due to the previous actuation of half space key 45.

If it is desired to insert another half space in a line of printing, the key 45 is lifted to lower actuating link 44 and half space lever 27 is rotated in a clockwise direction back to its initial position as is shown in FIGURE 6 of the drawings. The surface 60 on half space lever 27 is lowered and this allows the carriage, escapement rack and escapement pawl to move as a unit to the right until the forward edge of the slot 18 in pawl 17 engages stud 19. At the same time, the downward movement of cam surface 60 on the half space lever forces the cam actuating lever 25 to the right to reposition the tab 36. A movement equal to one-half the normal escapement distance is provided and the rack and carriage are back in phase with the normal escapement movements.

It is desirable that the spacing means be automatically returned to its initial condition when certain machine functions, such as carriage return or tabulation, are initiated. This is accomplished in the present instance by providing an extension 65 on the arm 40 of bellcrank 41 which is adapted to be pulled downwardly when the carriage return or tabulating mechanism is actuated. These latter mechanisms form no portion of the present invention other than being able to apply a force to extension 65 which moves the bellcrank 41 back to its initial or home position as shown in FIGURE 1 of the drawings. The key 45 is automatically lifted and half space lever 27 rotates in a clockwise direction. Obviously, if the spacing means is already in its initial or home state, actuation of the carriage return or tabulating mechanism will have no effect on the spacing means. Typewriter mechanisms other than those mentioned above can be connected with extension 65 for automatically returning the spacing means to its initial state.

It should now be apparent that the objects initially set forth have been accomplished. Of particular importance is the provision of typewriter escapement mechanism with spacing means wherein the typist can insert spaces which are less than the normal escapement movement as required in making corrections or other typing operations. The spacing means comprises apparatus for changing the

position of the stop means which limit the longitudinal movement of the escapement pawl.

While the invention has been particularly described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of this invention.

What is claimed is:

1. An escapement mechanism for advancing a typewriter carrier through a standard escapement distance in a character spacing direction and having spacing means operative when actuated to advance said typewriter carriage in said character spacing direction by a distance which is less than said standard escapement distance comprising:

an escapement member having teeth thereon and mounting said typewriter carrier;

first means biasing said escapement member for movement in said character spacing direction;

an escapement pawl having a tip portion and an elongated slot therein;

a stationary mounting stud projecting into said elongated slot whereby said escapement pawl is mounted for longitudinal and pivotal movement;

second means biasing said escapement pawl for movement in a direction opposite to said character spacing direction and said tip portion of said escapement pawl into engagement with said teeth on said escapement member;

a plurality of stop means for limiting longitudinal movement of said escapement pawl in said character spacing direction and said direction opposite thereto;

said stop means comprising a plurality of abutment surfaces carried by said escapement pawl and a plurality of stop surfaces;

first means for pivoting said escapement pawl about said stud to move said tip portion out of engagement with said teeth on said escapement member, permit said second biasing means to advance said escapement pawl in said opposite direction and pivot said tip portion of said escapement pawl into engagement with said escapement member, and then permit said first biasing means to move said escapement pawl and said escapement member in said character spacing direction;

said stop means causing said escapement member to advance by said standard escapement distance when said first means for pivoting is actuated;

second means for pivoting said escapement pawl about said stud to move said tip portion out of engagement with said teeth on said escapement member, permit said second biasing means to advance said escapement pawl in said opposite direction and pivot said tip portion of said escapement pawl into engagement with said escapement member, and then permit said first biasing means to move said escapement pawl and said escapement member in said character spacing direction;

said stop means causing said escapement member to advance by said distance less than said standard escapement distance when said second means for pivoting is moved to an actuated position; and

said stop means being positioned after movement of said second means for pivoting to said actuated position to cause said escapement member to advance through said standard escapement distance when said first means for pivoting is actuated and said second means for pivoting remains in said actuated position.

2. Apparatus according to claim 1 wherein:

said second means for pivoting mounts one of said stop surfaces; and

said one of said stop surfaces being moved from an inoperative position to a position where it is engaged by a corresponding abutment surface on said escape-

ment pawl when said second means for pivoting is moved to said actuated position.

3. Apparatus according to claim 1 wherein:

said first means for pivoting comprises a pawl actuating lever;

said second means for pivoting comprises a spacing lever; and

said pawl actuating lever and said spacing lever being pivotally mounted on said stationary mounting stud.

4. Apparatus according to claim 3 wherein:

said spacing lever has a cam surface thereon;

a projection on said pawl actuating lever engaging said cam surface;

means biasing said projection against said cam surface; and

said cam surface causing movement of said pawl actuating lever relative to said escapement pawl when said spacing lever is moved to said actuated position.

5. An escapement mechanism for advancing a typewriter carrier through a standard escapement distance in a character spacing direction and having spacing means operative when actuated to advance said typewriter carrier in said character spacing direction by a distance which is less than said standard escapement distance comprising:

an escapement member having teeth thereon;

first means biasing said escapement member for movement in said character spacing direction;

an escapement pawl having a tip portion;

means mounting said pawl for limited longitudinal and pivoting movement relative to said escapement member;

second means biasing said escapement pawl in a direction opposite said character spacing direction and said tip portion of said escapement pawl into engagement with said teeth on said escapement member;

a plurality of stop means for limiting longitudinal movement of said escapement pawl in said character spacing direction and said direction opposite thereto;

said stop means comprising a plurality of abutment surfaces carried by said escapement pawl and a plurality of stop surfaces;

first means for actuating said escapement pawl to move said tip portion out of engagement with said teeth on said escapement member, permit said second biasing means to advance said escapement pawl in said opposite direction and move said tip portion of said escapement pawl into engagement with said escapement member, and then permit said first biasing means to move said escapement pawl and said escapement member in said character spacing direction;

said stop means causing said escapement member to advance by said standard escapement distance when said first means for actuating is actuated;

second means for actuating said escapement pawl to move said tip portion out of engagement with said teeth on said escapement member, permit said second biasing means to advance said escapement pawl in said opposite direction and move said tip portion of said escapement pawl into engagement with said escapement member, and then permit said first biasing means to move said escapement pawl and said escapement member in said character spacing direction;

said stop means causing said escapement member to advance by said distance less than said standard escapement distance when said second means for actuating is moved to an operative position; and

said stop means being positioned after movement of said second means for actuating to an actuated position to cause said escapement member to advance through said standard escapement distance when

said first means for actuating is actuated and said second means for actuating remains in said operative position.

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10 ROBERT E. PULFREY, *Primary Examiner*.

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