Feb. 3, 1959 SEYED KHALIL 2,872,014

VARIABLE BACKSPACING MECHANISM FOR PROPORTIONAL SPACING TYPEWRITERS

Filed Nov. 8, 1954 3 Sheets-Sheet 1

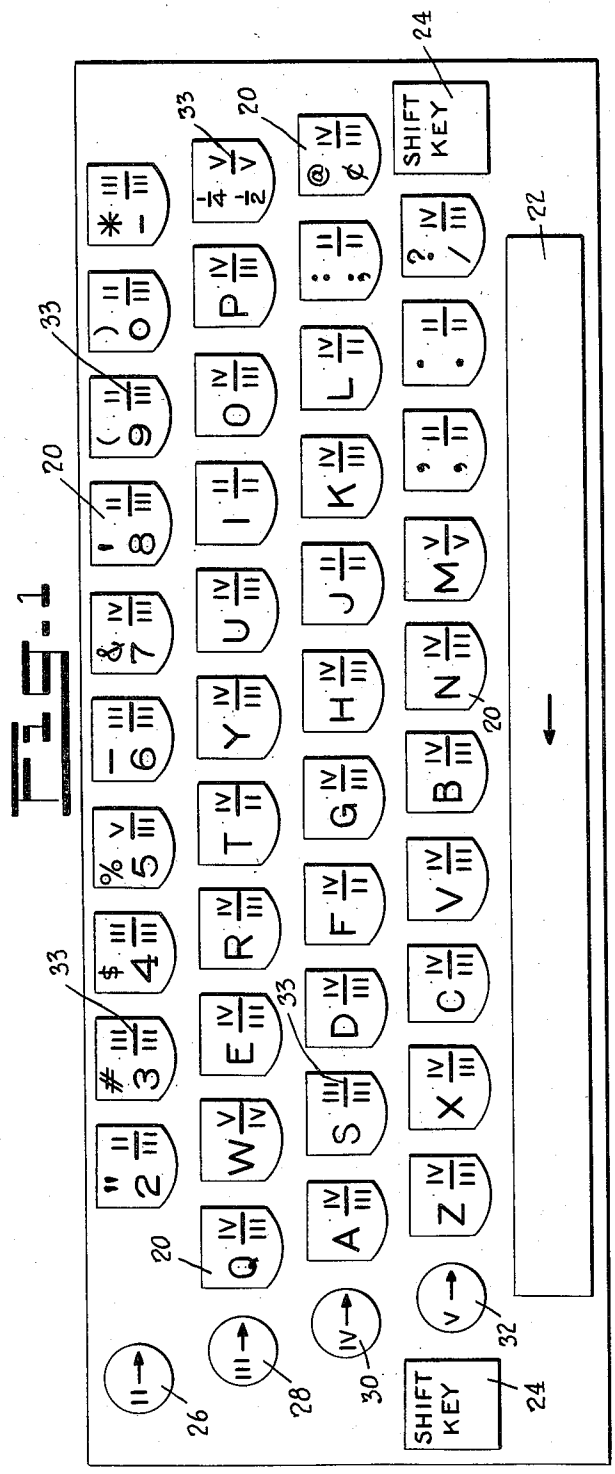

FIG. 1

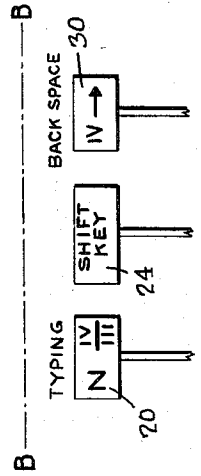

FIG. 3

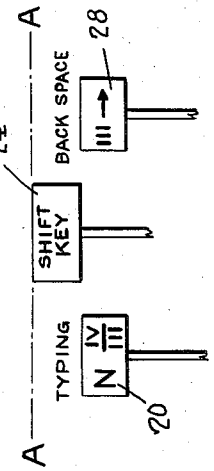

FIG. 2

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VARIABLE BACKSPACING MECHANISM FOR PROPORTIONAL SPACING TYPEWRITERS

Filed Nov. 8, 1954 3 Sheets-Sheet 2

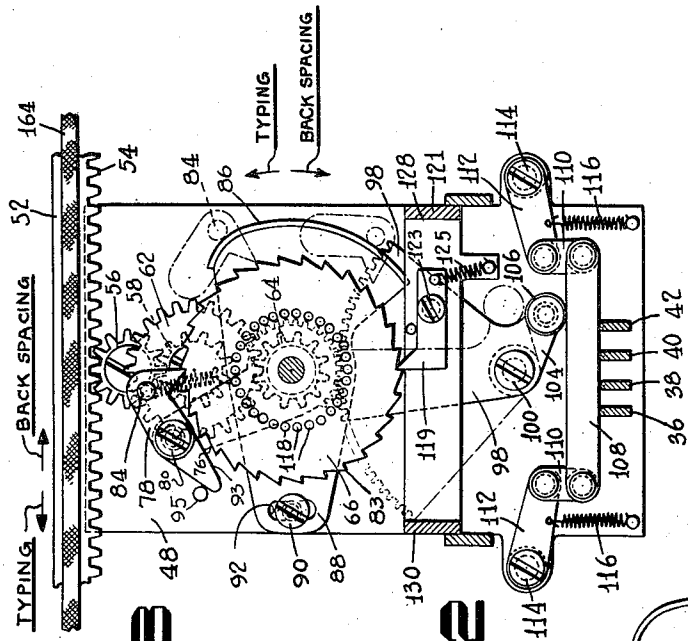

FIG. 8

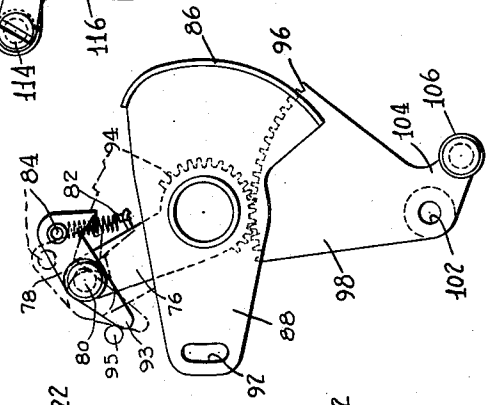

FIG. 12

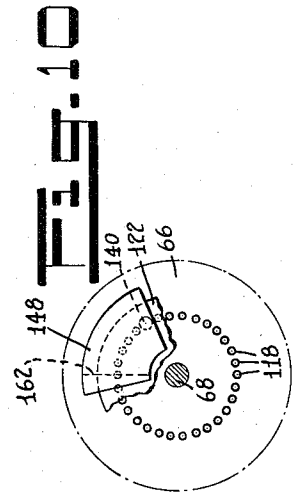

FIG. 10

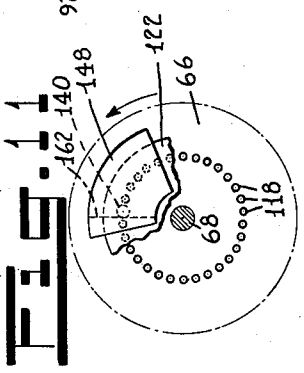

FIG. 11

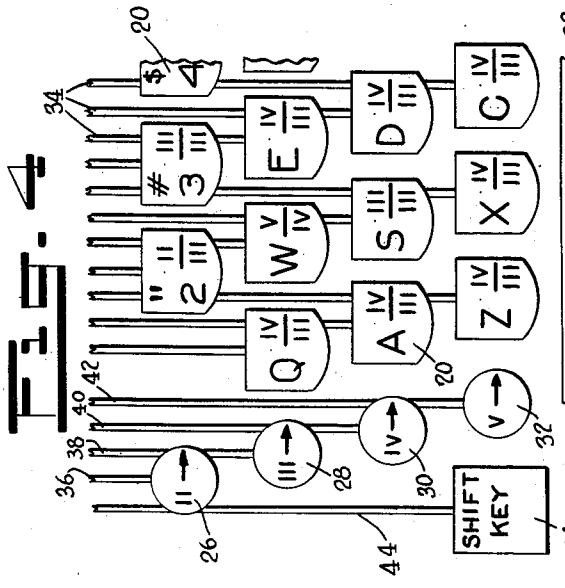

FIG. 4

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VARIABLE BACKSPACING MECHANISM FOR PROPORTIONAL SPACING TYPEWRITERS

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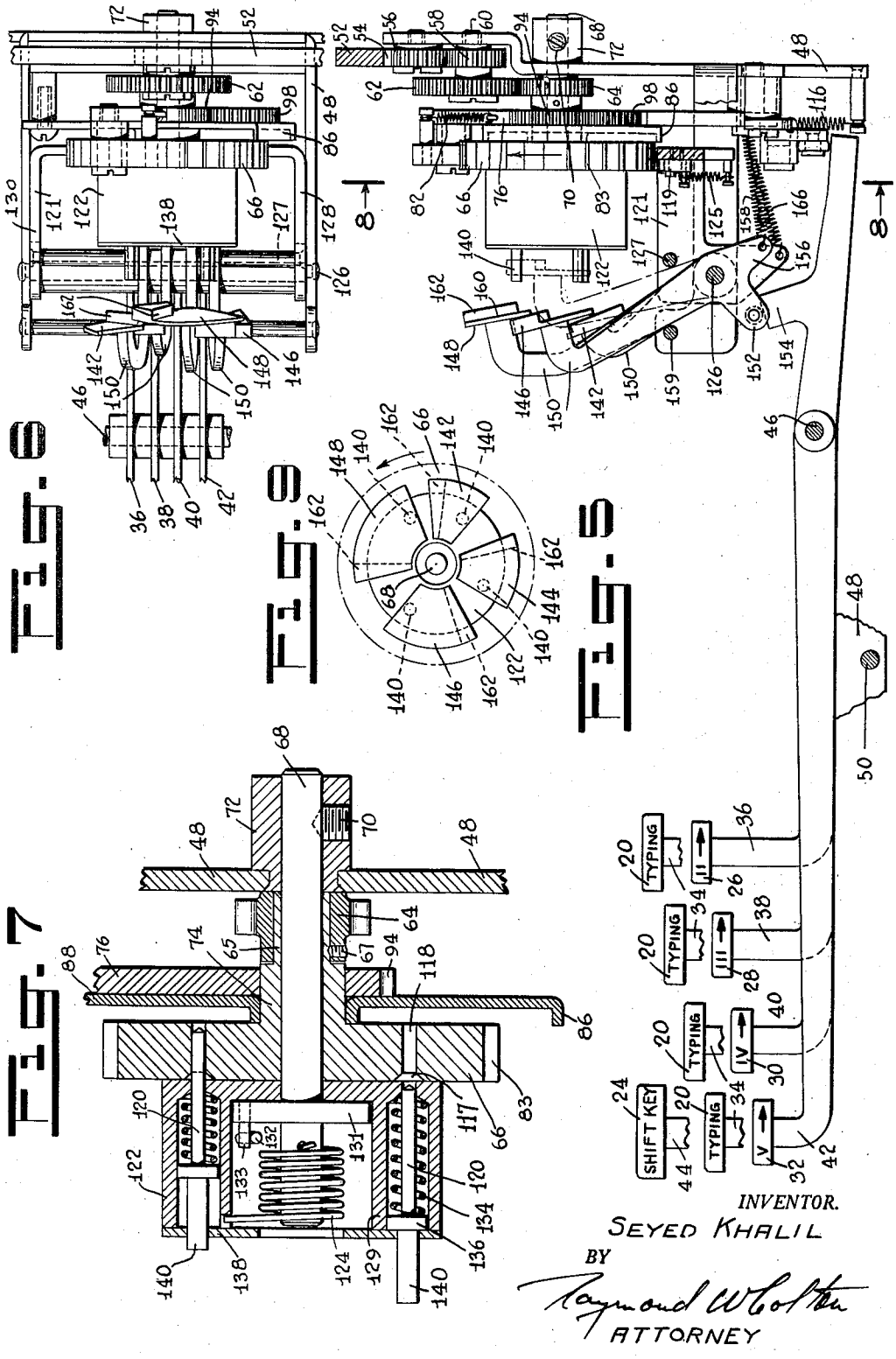
3 Sheets-Sheet 3



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United States Patent Office

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VARIABLE BACKSPACING MECHANISM FOR PROPORTIONAL SPACING TYPEWRITERS

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Application November 8, 1954, Serial No. 467,457

12 Claims. (Cl. 197—84)

This invention relates to back spacing devices for proportional spacing typewriters.

Since the advent of proportional spacing typewriters there has been a serious problem in connection with back spacing. Inasmuch as various of the characters of such typewriters occupy different numbers of units of space on the printed page, it is necessary that when a given character is to be corrected, the back spacing movement imparted to the carriage be the correct one corresponding to that character. Numerous approaches to a solution of this problem in the past have shared the common defect of imposing an excessive burden on the typist. For example, correction of a particular character has required the operator either to consult a table or to develop a remarkable memory.

By virtue of the present invention, the problem has been solved through the use of a plurality of back spacing keys each of which causes the carriage to move in a back spacing direction a predetermined amount corresponding to the width of a character. This result is achieved with an extremely simple mechanism which effects a back spacing movement and then a movement in a typing direction equal to the difference between the predetermined back spacing movement and the number of units occupied by the character for which the back spacing composite movement is to correspond.

The burden imposed upon the operator in conjunction with this novel back spacing arrangement has been reduced to a minimum by the provision of a novel system of coding or designations whereby the typing keys of the keyboard are co-related to the back spacing keys in such a way that the operator can determine at a glance which of the back spacing keys should be depressed to move the carriage in a back spacing direction an aggregate amount equal to the number of space units occupied by the character to be corrected. Inasmuch as a pair of characters carried by the same support frequently occupy different numbers of space units, the coding or designations contemplated by the present invention indicate which back spacing key must be actuated for both positions of the typewriter shift key. Accordingly, there is provided for each typing key, a designation for each character which it controls, such designation corresponding with one of those identifying a back spacing key. In a proportional spacing system wherein the characters are assigned four different space units such as two units for the letter "l," three units for the letter "n" (lower case), four units for the letter "N" (upper case) and five units for the letter "M," there will be provided four back spacing keys for producing an aggregate back spacing movement of two units, three units, four units and five units respectively.

Under such circumstances, it will be clear that the smallest number of space units involved by a character will be two units and the largest number, five units. To satisfy the requirements of such a system, a back spacing operation will involve back spacing the carriage a number of units corresponding to the sum of the smallest and largest values, namely, two and five, giving a total of

seven, and forwardly spacing the carriage in the typing direction that number of units which if added to the number of units corresponding to the width of the character to be corrected would equal seven, such back spacing and forward spacing being produced by a single operation of a single key.

In addition to the keyboard arrangement for such a system of back spacing, the present invention contemplates a novel feed mechanism with which forward spacing movements of differing numbers of units can be achieved with a single escapement wheel and combinations of such forward spacing movements can be achieved with back spacing movements of a predetermined number of units.

Further objects and details of the invention will follow from a description of the accompanying drawings wherein:

Fig. 1 is a somewhat enlarged diagrammatic showing in plan of a typewriter keyboard coded in accordance with the present invention;

Fig. 2 is a fragmentary diagrammatic showing of the relationship of three keys of a keyboard to achieve back spacing of a given number of units for typing a lower case character.

Fig. 3 is a diagrammatic showing of three keys of the keyboard in positions corresponding to a back spacing operation of a different number of units for typing an upper case character;

Fig. 4 is a fragmentary showing in plan of a portion of the keyboard of Fig. 1 wherein the key levers have been depicted;

Fig. 5 is a somewhat diagrammatic elevation of a portion of a keyboard and a portion of a feed mechanism embodying the principles of the present invention;

Fig. 6 is a fragmentary plan view of the feed mechanism depicted in Fig. 5;

Fig. 7 is a sectional elevation of a portion of the feed mechanism of Figs. 5 and 6;

Fig. 8 is an elevation partially in section taken along line 8—8 of Fig. 5;

Figs. 9, 10 and 11 are diagrammatic views depicting relative positions assumed by portions of the feed mechanism of the preceding figures; and

Fig. 12 is an elevation depicting the back spacing components of the feed mechanism appearing in Fig. 8.

To provide for ready reference to the detailed construction and mode of operation of a preferred form of the invention shown in these drawings, the hereinafter appearing titles are used.

The keyboard

A diagrammatical and enlarged keyboard in Fig. 1 shows a general principle of the present invention. Several keys, such as for example "Shift Lock," "Tabulating Settings," "Tabulating Release," etc. are omitted as they do not form part of this invention.

The keyboard appearing in Fig. 1 includes character keys **20**, a space bar **22**, case shift keys **24**, and a plurality of back spacing keys **26**, **28**, **30** and **32**. The character keys are those whose actuation produces a printing action and by characters are intended the letters of the alphabet, numerals, punctuation marks, and other symbols of the kind customarily employed in typewriters. Each of the character keys as depicted in Fig. 1 bears an inscription of the type character controlled thereby, in the case of the letters, a single letter appearing despite the fact that each such key is intended to actuate both upper and lower case letters of that description.

In addition to the character designations on the keys of Fig. 1, there are two Roman numerals, arranged above and below a horizontal line **33** respectively, the lower Roman numeral in each case indicating the number of

space units occupied by the character with the shift keys **24** in their unactuated positions. The upper Roman numeral in each case indicates the number of space units occupied by the character which is printed when one of the shift keys **24** is actuated. In other words, with regard to the typing key for the letter "N," for example, there is an upper Roman numeral "IV" indicating that the letter occupies four space units when the shift key is depressed and a lower Roman numeral "III" indicating that the lower case letter occupies only three space units when the typing key is actuated with the shift key in its unactuated position.

Thus with reference to Fig. 2, where the line A—A indicates the unactuated positions of the keys, it will be noted that with the shift key in its normal unactuated position, depression of the "N" key to print a lower case letter "n" will produce a carriage movement corresponding to three space units under which conditions the back spacing key **28** bearing the Roman numeral "III" would be depressed to achieve a corresponding back spacing movement. Where the upper case letter is involved, as depicted in Fig. 3, depression of the "N" key with the shift key likewise depressed from the initial position depicted by the line B—B, would advance the carriage four space units as indicated by the Roman numeral "IV" so that a corresponding back spacing movement would be achieved by actuation of the back spacing key **30** bearing the Roman numeral "IV." Briefly, in conjunction with the assignment of space units contemplated by the present disclosure, three space units are occupied by each of the lower case letters a, b, c, d, e, g, h, k, n, o, p, q, r, s, u, v, x, y, and z; two space units are occupied by each of the lower case letters f, i, j, l, and t; five space units are occupied by the lower case letter m; and four space units are occupied by the lower case letter w. Four space units are occupied by each of the upper case letters A to H inclusive, K, L, N to R inclusive, T, U, V, X, Y and Z; two space units are required by the upper case letters I and J; five space units are required by the upper case letters M and W; and three space units are occupied by the upper case letter S. Each of the numerals occupies three space units and the requirements for each of the other characters of the keyboard will be apparent from the Roman numerals appearing in Fig. 1 on the typing keys adjacent such characters.

From the foregoing it can be seen that the widths of characters (including numerals, punctuations, symbols, etc.) are classified into four "groups" of two, three, four and five units respectively. The characters will be carried by suitable supports, such as conventional type bars or drums, for actuation by the typing keys.

Since the width of character spacing is divided into four groups, four back spacing keys are provided, one for each group as shown in Fig. 1, each of them bearing an arrow indicating the direction of movement of the carriage during a back spacing operation; and each one of them bearing Roman numerals indicating the number of space units through which it back spaces the carriage.

It will be understood of course, that where different numbers of space units are assigned to the various characters, suitable designations will be provided and a suitable number of back spacing keys will be employed so that each degree of back spacing movement corresponding to the differing spacing units will be possible.

Although there has been illustrated a "coded keyboard" in which Roman numerals constitute the code, other code systems, such as Arabic numerals, geometrical figures, ornamental designs, symbols, or others, may be used. Any such coding designations may be integral with the keys, engraved thereon, or impressed thereon, in one or more colors. The code may be applied to the keys themselves or to some other part of the typewriter or its keyboard in such a fashion that a typist can readily discern it.

The shift keys **24** are mounted on the usual levers **44** for transmitting desired shifting movements to the carriage or type segment.

It will be noted that arrows applied to the various keys are indicative of the direction of carriage movement resulting from the operation of such keys. In the case of the back spacing keys, the carriage movement will be towards the right as viewed in Fig. 1 whereas actuation of the space bar **22** results in carriage movement towards the left.

The proportional spacing mechanism

The number of space units provided in a proportional spacing typewriter should correspond to the number of different widths selected for the various characters. The present proportional spacing mechanism contemplates four different space units; namely two, three, four and five units.

Each of the typing keys **20** is provided with a lever **34** for transmitting its movements to produce an impression and effect movement of the feed mechanism corresponding to the character widths. These key levers **34** are associated with universal bars or selectors, not shown, and wherever a character occupies two space units, depression of its key to produce an impression will, through a universal bar, cause the feed mechanism to advance the carriage two space units. Similarly, depression of those keys to produce impressions requiring three space units will, through another universal bar, but with the same feed mechanism, advance the carriage three space units. And similarly, through suitable universal bars, the feed mechanism produces carriage movements of four and five space units respectively.

The feed mechanism of the machine comprises the usual rack **52** mounted on the carriage, not shown, having its downwardly directed teeth **54** in mesh with a feed pinion **56** which also meshes with a reduction gear **58** rotatably carried by a shaft **60** and secured to another reduction gear **62** mounted on the same shaft and meshing with another reduction gear **64** secured to a reduced extension **65** of the hub of an escapement wheel **66** by means of a set screw **67** for rotation therewith at all times. The escapement wheel and gear **64** rotate freely about a shaft **68** which is secured against rotation by means of a set screw **70** received in a boss **72** which is secured to the frame **48** generally designating the escapement frame as well as the main frame of the typewriter.

A holding dog **119** engages the ratchet teeth of the escapement wheel **66** to restrain its movement in a counter-clockwise direction as viewed from Fig. 8 corresponding with the typing direction of the carriage. This holding dog is mounted in a yoke **121**, being pivotally supported therein by means of a screw **123** and biased towards its restraining position by means of a spring **125**. The yoke **121** is pivotally mounted relative to the frame of the machine about a shaft **126** and is provided with another shaft **127** extending between its legs **128** and **130** through which arcuate movement is applied in order to retract the holding dog from the teeth of the escapement wheel to permit carriage movement in a typing direction.

As particularly well shown in Fig. 7 (see also Fig. 9), the escapement wheel **66** is provided with a circularly arranged series of openings **118** provided with counterbores **117** at the exposed surface of the wheel for the reception of four detents or clutch pins **120** slidably carried in a clutch drum **122** mounted coaxially with the shaft **68** and resiliently coupled thereto by means of a spring **124** whose opposite ends are connected respectively, with the shaft **68** and a wall **129** of the clutch drum. A flange **131** on the shaft **68** carries a pin **133** which cooperates with a pin **132** projecting inwardly from the wall **129** of the clutch drum to limit movement of the drum **122** relative to the shaft **68** and thereby maintain the helical spring **124** under torsional stress at all times. The pins **120** are urged outwardly towards the left as

viewed in Fig. 7 by means of springs 134 until their flanges 136 engage a cover plate 138 suitably secured to the end of the drum. Extensions 140 of the pins 120 project outwardly through the cover plate for cooperation with their respective actuating plates 142, 144, 146 and 148 as shown in Fig. 5. These plates 142, 144, 146 and 148 are carried by levers 150 intermediately pivoted about the shaft 126 and each having an arm 156 for cooperation with its retracting spring 158 biasing the pivotally mounted plates counter-clockwise as viewed in Fig. 5, towards engagement with a limiting rod 159. Each of the plates provides a substantially plane portion 160 terminating in a shoulder 162, each plane portion having a different length than the others, so that when its lever 150 is turned clockwise as viewed in Fig. 5, its plane surface 160 will engage its corresponding clutch pin extension 140 moving it against the force of its spring 134 into locking engagement with the opening 118 of the escapement wheel with which the particular clutch pin 120 is at that time in registry. As the lever 150 continues in its clockwise direction, it engages the shaft 127 which bridges the legs 128 and 130 of the yoke 121 and imparts to that yoke a similar clockwise movement sufficient to retract the holding dog 119 from the tooth of the escapement wheel 66 permitting the main or feed spring, not shown, to exert its force through a band 164, as shown in Fig. 8, the feed rack 52, feed pinion 56 and the intermediate reduction gears to produce rotation of the escapement wheel until the particular pin extension 140 engages the shoulder 162 of the plate at which time the clutch drum and interlocked escapement wheel come to rest, whereupon the plate drops away in a counter-clockwise direction under the influence of its spring 158, permitting the yoke 121 to return under the influence of its spring 166 to restore the holding dog 119 to its holding position, following which the clutch pin will be completely retracted from its opening 118 of the escapement wheel. At this point, the restoring spring 124, which is wound to some extent during rotation of the clutch drum with the escapement wheel, will tend to unwind to restore the clutch drum 122 to its initial position relative to the machine frame, coming to rest when its stop pin 132 engages the cooperating stop pin 133 carried by the flange 131 of the fixed shaft 68.

Fig. 10 diagrammatically shows the escapement wheel 66 containing the circular arrangement of openings 118, the clutch drum 122 and one of its pin extensions 140 cooperating with the actuating plate 148 whose shoulder 162 will limit rotation of the clutch drum and escapement wheel through an arc corresponding to five space units. Fig. 11 illustrates the position assumed by the pin extension 140 relative to the shoulder 162 after such movement has occurred.

The diagrammatical showing of Fig. 9 illustrates the initial position of the escapement wheel 66, the clutch drum 122 and the actuating plates 142, 144, 146 and 148. Plate 148, shown in Fig. 10, provides five space units, plate 146 four space units, plate 144 three space units, and plate 142 two space units.

The back spacing mechanism

The number of back spacing keys to be used in the proportional spacing typewriter contemplated herein should, preferably, be four to correspond with the two, three, four and five space units respectively, which are assigned to the various character widths.

The back spacing keys 26, 28, 30 and 32 have their respective levers 36, 38, 40 and 42 pivotally supported on a shaft 46 suitably mounted in the frame 48 of the machine which also supports a stop member 50 for limiting the downward motion of these levers. The ends of these levers lying to the right of the shaft 46 as depicted in Fig. 5 cooperate with the back spacing mechanism which comprises a pawl carrier 76 freely rotatably mounted on the hub 74 of the escapement wheel 66. At the outer

end of this pawl carrier 76 a pawl 78 is mounted by means of a pivot 80 and biased radially inwardly by means of a spring 82 for engagement with the ratchet teeth 83 of the escapement wheel 66. The forward end of the pawl 78 is provided with a follower 84 engageable with the surface of a cam 86 formed on a sector 88 rotatably mounted for adjustment about the hub 74 of the escapement wheel 66 and suitably secured in adjusted position relative to the frame of the machine by means of a screw 90 cooperating with its arcuate slot 92. Accordingly, when the pawl carrier has been rotated through a predetermined angle clockwise as viewed in Fig. 12, the surface of the cam 86 will be engaged by the follower 84 elevating the pawl out of contact with respect to the ratchet teeth 83 of the escapement wheel 66 to discontinue the driving relationship of the pawl relative to the wheel. The left end 93 of the pawl 78 is adapted to engage a pin 95 when the pawl carrier 76 returns to typing position so as to elevate the right end of the pawl from engagement with the ratchet teeth 83 of the escapement wheel 66, as depicted in broken lines in Fig. 12. Rotation of the pawl carrier is produced by means of a segmental gear 94 carried at its inner end in mesh with the teeth 96 of a gear sector 98 pivotally carried by a screw 100 received through its bearing 102 and penetrating a suitable portion of the machine frame. An arm 104 eccentrically disposed with respect to the bearing 102 terminates in a cylindrical crank 106 which rests on a bar 108, as shown in Fig. 8, which is in turn supported by the ends of the levers 36, 38, 40 and 42 and by a system of pivoted links 110 and 112, the latter being pivotally supported by the frame by means of screws 114 and biased downwardly by means of springs 116.

When one of the back spacing keys is depressed its extreme right end as viewed in Fig. 5, will elevate the bar 108 against the force of its springs 116, raising the crank 106 to rotate the sector gear 98 about its pivot 100 towards the broken line position depicted in Fig. 8 in a counter-clockwise direction, rotating the gear segment 94 and its pawl carrier 76 in a clockwise direction so that the pawl 78 will rotate the escapement wheel 66 likewise in a clockwise direction corresponding to a back spacing movement of the carriage, which movement is interrupted when the follower 84 of the pawl 78 assumes the broken line position shown in Fig. 8 with respect to the cam surface 86, resulting in a back spacing movement of seven units in accordance with the system adopted for purposes of illustrating the present invention, whereupon the arm 154 of the back spacing lever rotates the arm 152 and its lever 150 about the shaft 126 to an extent sufficient for its actuating plate 142, 144, 146, or 148 to depress its corresponding pin extension 140 to effect a clutching relationship between the clutch drum 122 and the escapement wheel 66, following which the yoke 121 will be rotated in a clockwise direction about its pivot shaft 126 to retract the holding dog 119 from the teeth of the escapement wheel so that the feed spring will advance the carriage in a typing direction until the pin extension 140 engages the shoulder 162 of the actuating plate, after which the actuating plate will be moved in a counter-clockwise direction causing first the holding dog 119 to engage the proximate tooth of the escapement wheel, then permitting the clutch pin to be retracted from its opening in the escapement wheel and the clutch drum to return to its initial position relative to the machine frame in readiness for a subsequent spacing operation.

Thus it is evident that an exceedingly simple back spacing mechanism has been provided comprising the arrangement shown in Fig. 12 accompanied by a few modifications of a proportional feed typewriter. And it can be seen that the back-and-forth system of back spacing is adaptable to effect carriage back spacing for any desired selection of space units.

It will be clear to those skilled in the art that the designations or coding arrangements provided for the keys

can assume forms other than those depicted and that the specific mechanism for producing the mechanical movements described can be modified appreciably and accordingly, it is intended that the invention be not limited to these details beyond the scope of the appended claims.

I claim:

1. In combination with a typewriter proportional feed mechanism having a feed spring and an escapement wheel rotatably mounted for movement in a typing direction under the influence of said spring and in a back spacing direction; a detent engaging said wheel to restrain it against movement in a typing direction, driving means engageable with said wheel for imparting movement thereto in a back spacing direction, and means disengaging said detent from said wheel and limiting movement of said wheel in a typing direction to an amount less than said movement in said back spacing direction.

2. In combination with a proportional spacing typewriter having a frame, a carriage slidably mounted on said frame for movement in a typing direction and a reverse direction, and a feed mechanism including a spring and gearing for operating said carriage; a back spacing mechanism including an escapement wheel member operatively connected with said gearing, a detent restraining said wheel member against movement in one direction, driving means engageable with said wheel member for imparting a predetermined degree of movement thereto in another direction, and actuating means for inactivating said detent and limiting movement of said wheel member to a smaller degree in said one direction.

3. In combination with a typewriter proportional feed mechanism having an escapement wheel rotatably supported for movement in a typing direction and a back spacing direction, and a holding dog for restraining said wheel against movement in said typing direction; back spacing mechanism comprising driving means for rotating said wheel through a predetermined arc in said back spacing direction, actuating means limiting movement of said wheel to a smaller arc in said typing direction and retracting said dog, and a back spacing key sequentially operating said driving and actuating means.

4. In combination with a typewriter proportional feed mechanism having an escapement wheel rotatably supported for movement in a typing direction and a back spacing direction, and a plurality of typing keys for typing characters and effecting movement of said feed mechanism in a typing direction; back spacing mechanism comprising driving means for rotating said wheel through a predetermined arc in said back spacing direction, advancing means for rotating said wheel through a smaller arc in said typing direction, and a back spacing key sequentially operating said driving and advancing means.

5. The invention as set forth in claim 4 wherein the difference in arcs corresponds to a predetermined back spacing movement equal and opposite to the movement effected by certain of said typing keys.

6. In combination with a proportional spacing typewriter having a frame, a carriage movably supported on said frame, a spring tending to advance said carriage in a typing direction, gearing including an escapement wheel member for controlling movement of said carriage, and a holding dog biased towards engagement with said escapement wheel member to restrain movement of said carriage in a typing direction; a clutch member selectively engageable with said escapement wheel member and having an initial position relative to said frame, said members having a plurality of registrable detents for interlocking said members for simultaneous movement, an operator for actuating each of said detents to sequentially interlock said members and disengage said dog from said escapement wheel member, said operator providing a stop to limit said simultaneous movement, means biasing said detents towards positions to unlock said members, and means biasing said clutch member towards its initial position.

7. The invention as set forth in claim 6 wherein driving means is provided for moving said carriage in a back spacing direction, said driving means including a pawl engageable with said escapement wheel member, a carrier pivotally supporting said pawl and having a toothed gear member secured thereto, a toothed driving member meshing with said gear member for driving said escapement wheel member through said pawl, and a cam member disposed in the path of said pawl to disengage it from said escapement wheel member.

8. The invention as set forth in claim 7 wherein said escapement wheel member, said pawl carrier and said cam member are coaxially mounted in said frame.

9. In combination with a proportional spacing typewriter having a frame, a carriage slidably mounted on said frame for movement in a typing direction and a reverse direction, a feed mechanism for advancing said carriage in a typing direction, a back spacing mechanism for advancing said carriage in a reverse direction, and a plurality of back spacing keys operatively connected to said back spacing mechanism and said feed mechanism for actuating them successively with a single stroke, operation of each of said back spacing keys imparting an aggregate carriage movement in a reverse direction, said feed mechanism being operable for advancing said carriage to different extents when actuated by said back spacing keys respectively.

10. The invention as set forth in claim 9 wherein each of said back spacing keys impart to said back spacing mechanism a movement equal in degree and direction.

11. A typewriter having a frame, a carriage slidably mounted on said frame, type bars bearing typing characters having different widths, characters of equal width constituting a group, a keyboard including a key for each of said type bars and a back spacing key for each said group, and a feed mechanism comprising a proportional spacing mechanism for imparting movement to said carriage in one direction and a uniform spacing mechanism for imparting movement to said carriage in the opposite direction, each back spacing key being operatively connected to said spacing mechanisms to impart oppositely directed movements to said carriage in response to each depression of each back spacing key, each back spacing key imparting a different aggregate movement to said carriage corresponding to one of said groups.

12. A typewriter as set forth in claim 11 wherein each back spacing key is provided with a designation indicating the aggregate carriage movement imparted by its depression.

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