

Feb. 25, 1941.

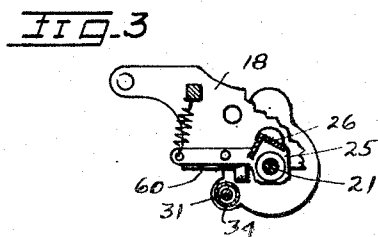
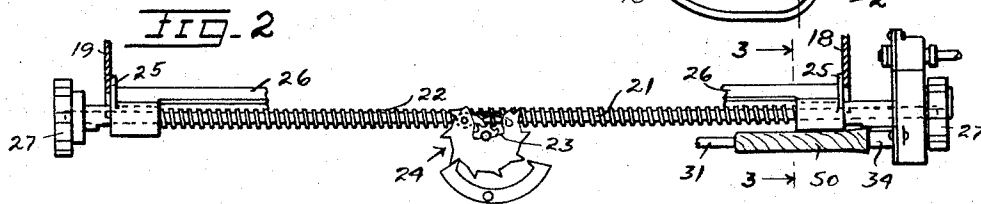
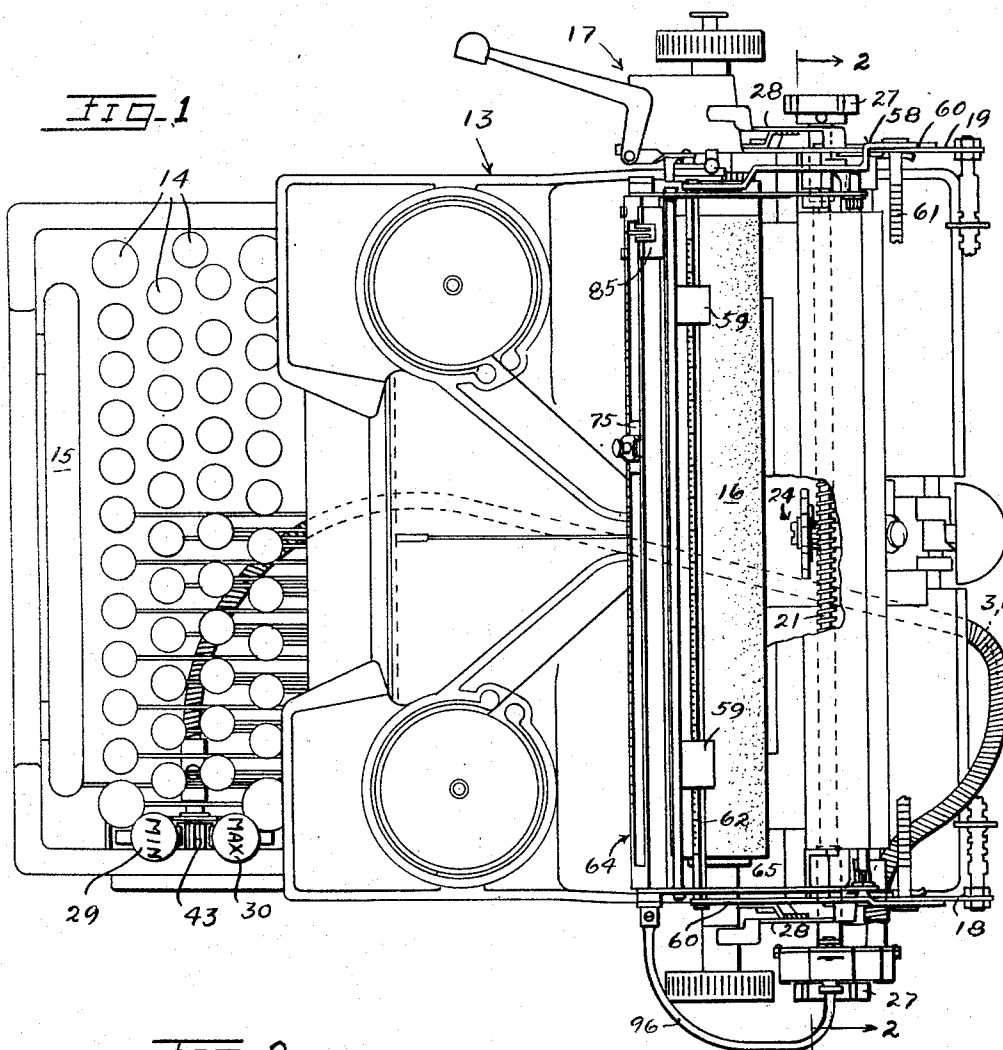
H. H. BERNHARD

2,233,092

SPACING CONTROL FOR TYPEWRITER CHARACTERS

Filed May 17, 1938

3 Sheets-Sheet 1



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Feb. 25, 1941.

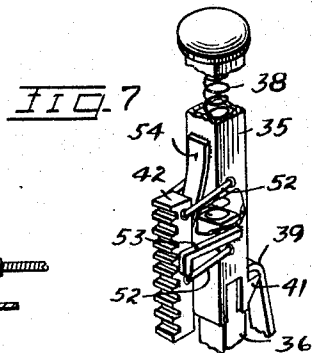
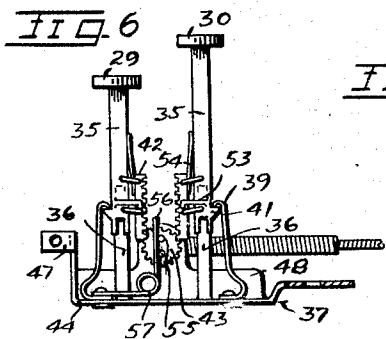
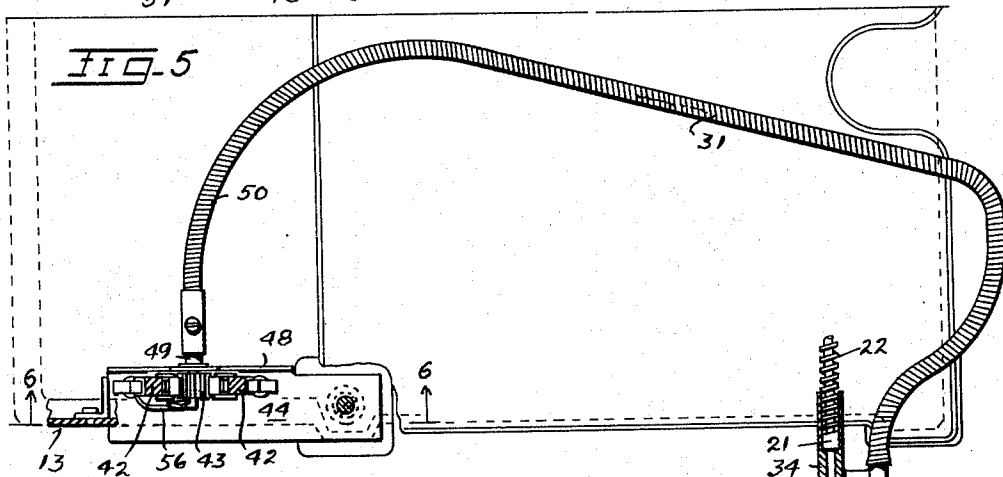
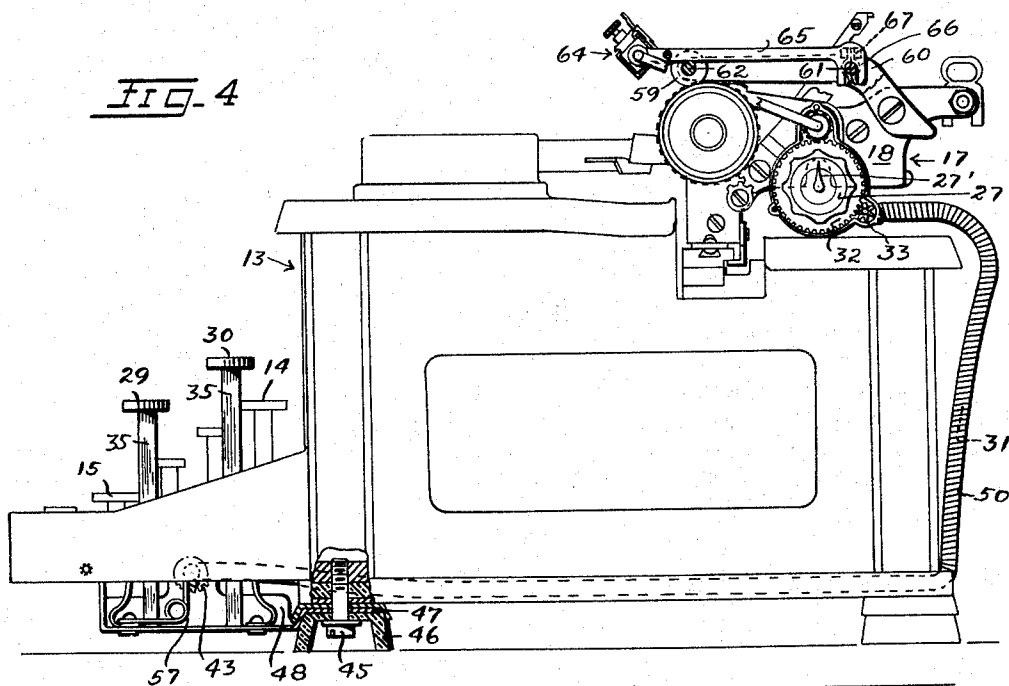
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SPACING CONTROL FOR TYPEWRITER CHARACTERS

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3 Sheets-Sheet 2



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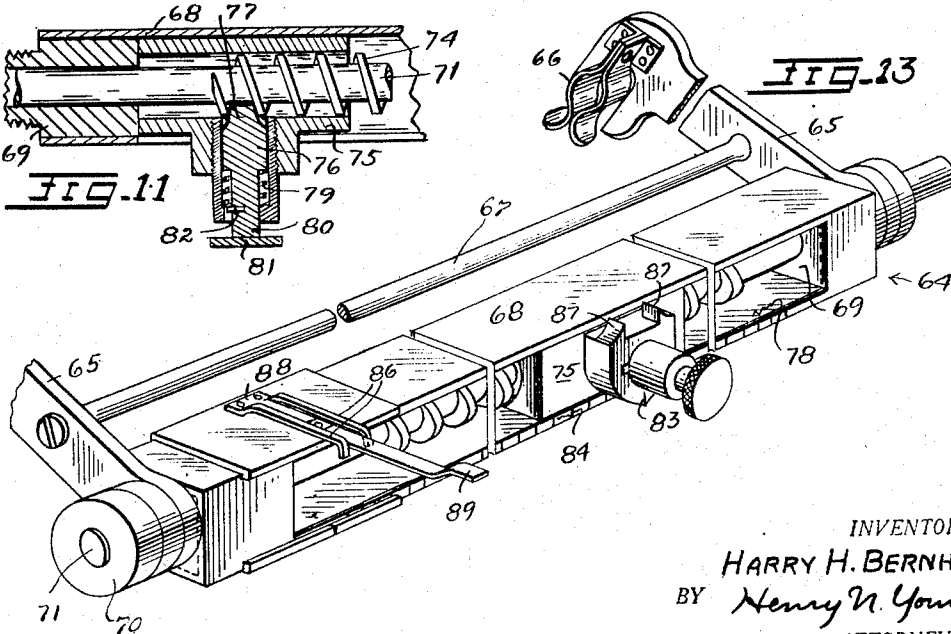
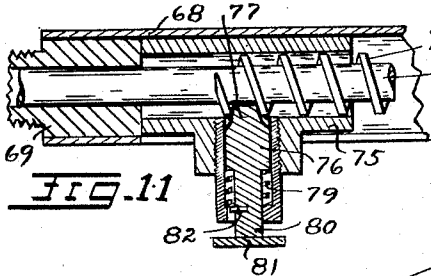
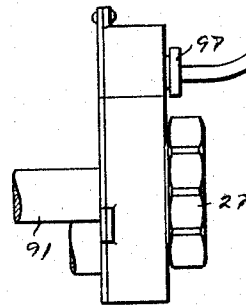
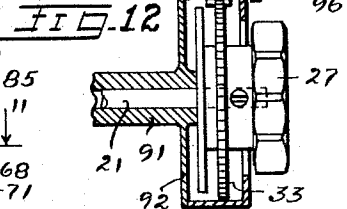
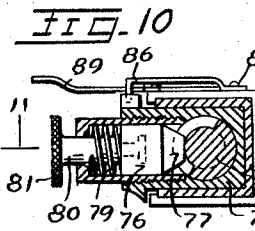
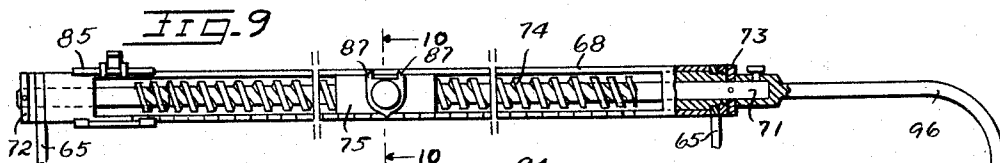
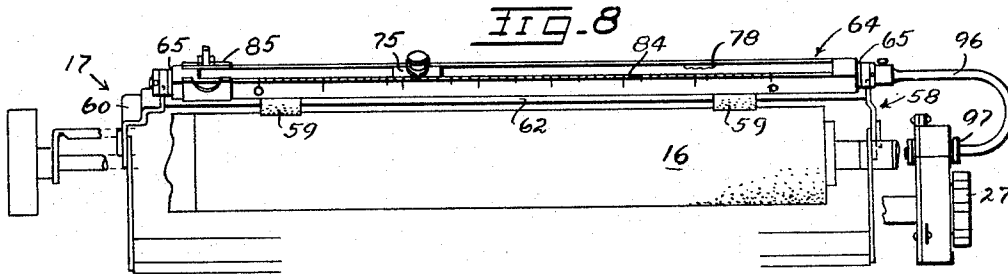
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SPACING CONTROL FOR TYPEWRITER CHARACTERS

Filed May 17, 1938

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,233,092

SPACING CONTROL FOR TYPEWRITER
CHARACTERS

Harry H. Bernhard, Oakland, Calif.

Application May 17, 1938, Serial No. 208,432

6 Claims. (Cl. 197—84)

The invention relates to a device for increasing or decreasing from normal the lateral spacing between typewritten characters in a line thereof and at the will of an operator of a typewriter equipped with it.

5 An object of the invention is to provide a particularly simple and effective control device of the character described which is readily adaptable to different present structures of typewriter writers.

Another object is to provide for the aforesaid control from such a point and in such a manner as to minimize the necessary movements of the operator for using the same.

15 A further object is to provide a means for initially indicating an original total number of spacing variations desired for a line of typing and thereafter automatically and positively indicating in an attention-calling manner when said number of spacing variations has been used up.

Yet another object is to provide for making any degree of space variation which may be desired.

25 The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth or be apparent in the following description of a typical embodiment thereof, and in the accompanying drawings, in which,

30 Figure 1 is a plan view of a typewriter equipped with the control features of the present invention.

Figure 2 is a fragmentary view taken at the line 2—2 in Figure 1 and showing a carriage-escapement rack in the form of a screw.

Figure 3 is a fragmentary view at 3—3 in Figures 2.

Figure 4 is a right-end view of the typewriter with the present control.

Figure 5 is a plan view showing the manual control means for the escapement screw and connected therewith.

Figure 6 is a fragmentary view taken at the line 6—6 in Figure 5.

Figure 7 is an enlarged fragmentary perspective view of a portion of the manual control means.

Figure 8 is a fragmentary front elevation showing an indicator means.

Figure 9 is an enlarged and partly sectional view of the indicator.

Figure 10 is an enlarged section at 10—10 in Figure 9.

55 Figure 11 is a section taken at the plane of

the line 11—11 in Figure 10 and showing a movable indicator member at one limit of its travel.

Figure 12 is a vertical section taken axially through a gearing assembly shown in elevation in Figure 9.

Figure 13 is an enlarged fragmentary perspective view of the indicator and its mounting.

As herewith shown for purposes of illustration, the features of the present invention are provided in connection with the structure of a typewriter which includes a frame 13 mounting a battery of keys 14 at a keyboard of the typewriter and carried on key bars through which the displacement of a selected key may be operative to cause the printing of a character for the key on a piece of paper (not shown) resting against a usual platen roller 16, the arrangement also providing at least one spacer key 15. The roller 16 is rotatively carried on a carriage 17 which is mounted on and above the frame rearwardly of the keyboard for rectilinear reciprocation laterally of the frame. As shown, the carriage 17 includes end plates 18 and 19 connected in rigid relation by spacer bars which carry stops and other control elements for the carriage.

It will be recalled that the usual typewriter carriage is urged to the left by a tension spring means and mounts a rack bar having its teeth engaged by those of a gear which is held against lateral travel with the carriage and is controlled by an escapement in such a manner that each operative depression of a key 14 or 15 to type a character or provide a space is followed by a longitudinal shift of the carriage by the uniform distance between successive typed letters, the spacing of the rack teeth being equal to the latter distance. The present device for controlling the position of the carriage during typing provides for varying the spacing of adjacent typed characters from normal at the will of an operator, whereby to accomplish certain useful results to be hereinafter brought out.

In the present instance, the shaft 21 is rotatively mounted on the carriage in lieu of the more usual rack bar previously referred to, and said shaft is threaded as a screw between the carriage ends whereby its continuous thread 22 is normally engaged by a control gear 23 disposed at a fixed point of the frame, adjacent turns of the thread 22 having the normal spacing for the typewriter characters. As long as a given rotative setting of the shaft 21 is maintained, successive characters of a printed line thereof will be spaced in a normal manner as

with the usual rack; if, however, the shaft is rotated to a greater or less degree following the printing of a particular character, the spacing of the succeeding character from the first may be increased or decreased in accordance with the direction and degree of adjusted turning of the shaft, the gear 23 being controlled by a suitable escapement mechanism 24 which is arranged to automatically permit a one-tooth rotation of the gear following the printing of each character or the actuation of the spring key 15.

Means are provided for freeing the carriage 17 from the restraint normally imposed on it by the escapement 24, said means comprising the provision of a device for laterally displacing the screw 21 out of its normal engagement with the gear 23. In the present instance, the carriage is restrained and guided solely for its rectilinear movement with respect to its support on the frame, and the screw 21 is swivelled in and between similar levers 25 comprising plates which are pivoted to the carriage ends 18 and 19 at their inner faces and are integrally connected by an angle-iron bar 26 for their rocking as a unit against spring resistance to laterally swing the screw out of contact with the gear 23 when the carriage is to be released.

The extremities of the screw 21 extend beyond the carriage ends 18 and 19, and mount suitable knobs 27 for manual manipulation to rotatively adjust the screw. To insure a left-edge registration of a succession of typed lines, the knobs 27 are each preferably provided with an indicator mark 27' so that the operator may be visually advised as to the rotative setting of the screw and may reset the screw, if necessary, to the same initial position rotatively thereof at the start of each line of typing. Mutually independent levers 28 are pivoted on the carriage ends 18 and 19 for their selective and manual actuation to engage the levers to shift the screw 21 away from the gear 23.

At a point at or adjacent the keyboard, means are provided for changing the rotative setting of the screw 21 in both possible directions. As is brought out in Figures 4 to 7 inclusive, depressible keys 29 and 30 are provided at the keyboard for selective actuation to rotate a flexible shaft 31 which is connected with the screw 21 through engaged gears 32 and 33 respectively carried on the shaft and screw for rotation therewith. The gear 32 is shown as mounted on the screw end between the supporting lever 25 and the corresponding knob 27, and the portion of the shaft 31 immediately adjacent the gear 33 is journaled in a sleeve 34 provided on the lever 25 whereby the engaged gears 32 and 33 may be retained in coplanar and fully cooperative relation at all times.

The keys 29 and 30 are mounted on similar tubular stems 35 which telescopically receive posts 36 extending from a base element 37. Compression springs 38 disposed within the stem cavities to seat at the upper ends thereof and having their lower ends engage the post tops urge a raised positioning of the keys to limiting positions imposed by hook-like stop members 39 which extend from the base 37 and engage stem extensions 41 when the keys are fully raised. At their mutually opposed sides the stems 35 carry rack bars 42 which are arranged for selective engagement with a common gear 43 at diametrically opposite sides thereof, said gear being connected to the flexible shaft 31 for rotating the same to change the setting of the screw 21 as previously described.

The present base element 37 is shaped of sheet material to provide an horizontal portion 44 from which the posts 36 extend at opposite sides of the gear 43. The base portion 44 is perforated at one end to receive the screw 45 which secures a supporting foot element 46 for the typewriter, the perforated base portion being clamped between the frame and the foot element, and a lug 47 extends from the other end of the element 46 for securing it to the frame at the side of the keyboard; in this manner, the element 37 is arranged for its fixed mounting on the typewriter. A side portion 48 of the element 37 extends upwardly within the keyboard space and fixedly mounts a bearing sleeve 49 through which the flexible shaft 31 extends to a connection with the gear 43. The shaft 31 is enclosed in a flexible sheath 50 which fixedly receives the sleeves 34 and 49 within its ends, it being understood that the shaft 31, and sheath 50, must be long enough to permit the full movement of the carriage 17 from side to side.

It will now be noted that the rack bars or blocks 42 are connected to the stems 35 and 36 by means of mutually parallel links 52 whereby their lines of teeth may be constantly parallel to and variably spaced from the stems which mount them. Movement of each rack 42 is permitted only from a raised position in which the links 52 are substantially perpendicular to the stem which 30 mounts the rack to a lowered position in which the rack is swung away from the gear 43; as shown, stop arms 53 extend from the stems 35 and 36 for engagement by a link of a pair to impose the aforesaid upper limit on the positioning of the racks. A spring 54 is operative between each rack 42 and its supporting stem for urging the rack outwardly of the stem; in the present instance, the spring 54 is a leaf spring which is fixed to the stem and has its free end slidably engage the back of the rack with which it is co-active.

Normally, and as shown in Figure 6, the bottom tooth of each rack 42 rests on a tooth of the gear 43, and the link thereof which is designed to contact the stop arm 53 is disposed slightly below said arm. A pair of pins 55 extend from the free face of the gear 43 in a diametrical line thereof and at opposite sides of the gear axis, and said pins are normally both engaged by a spring-pressed bar 56 whereby the bar is constantly operative to urge a fixed disposal of the gear rotatively thereof. If the gear is rotated through an angle of less than ninety degrees, the bar 56 urges its return to starting position, but when the gear rotation exceeds ninety degrees, the bar urges the completion of the half turn. This arrangement for the racks and gear is designed to permit an adjustment rotation of the screw 21 by the use of the knobs 27 while the engaged rack and gear teeth are cooperative as a spring detent means to maintain definite settings of the screw, as is desirable. In the present instance, the spring bar 56 is provided as one end of an helical spring 57 having its other end fixed to the supporting element 37.

It will now be noted that the depression of either rack 42 is arranged to positively effect the rotation of the gear 43, and so, through the flexible shaft 31, of the screw 21. To effect a rotative adjustment of the screw 21, depression of a key 29 or 30 must be effected until the gear has been rotated more than ninety degrees, after which the spring bar 56 is operative to complete the working stroke of the rack by continuing the

gear motion until the pins 55 both again engage the spring bar; the final movement is more or less a snap action to aid the operator. When the operator's finger is removed to release the fully depressed key, the spring 38 is operative to raise the stem and rack with the latter swinging downwardly and out of positive engagement with the gear; in this manner, a one-way rotation of the shaft 31 is provided for each cycle of movement of the key. It will be understood that the pressures exerted by the springs 38 and 54 and 57 would have values which are coordinated for providing the described actions.

In the present arrangement in which each depression of a key 29 or 30 produces a half rotation of the gear 43, the ratio of the gears 33 and 32 is four to one whereby each actuation of a key 29 or 30 produces a one-eighth turn of the escapement screw 21. In the present arrangement, a single depression of the key 29 produces a shortening of the permitted carriage movement at escapement by one-eighth of the space of a character of the typewriter, two depressions two-eighths, and so on. Similarly, each actuation of the key 30 increases the permitted escapement movement of the carriage by one-eighth of a letter width. It will thus be understood that an operator may lengthen or shorten the spacing of successive characters in a line thereof by merely depressing the appropriate key 29 or 30 before striking a character key 14 or the spacer key 15 for the desired number of times. While the present variation is one-eighth of a character space, it will be understood that the arrangement is readily adaptable to other fractions of a character space as may be desired.

It will now be understood that a given line of typing may be justified to a right-side marginal line adjacent its last letter by effecting a spreading or contraction of the typed line at the rate of eight rotative adjustments of the screw character space to be taken up or absorbed in the justified typewritten line. Since eight shifts, as for one character, would be required at least, means are provided for aiding the operator in keeping track of the adjustments as they are made, said means being automatically operated in synchronism with said adjustments, being initially set in accordance with the total number of character spaces to be added or subtracted, and providing a distinctive indication as to when the desired number of adjustments is completed.

The aforesaid adjustment-indicating means is arranged within constant sight of the typewriter operator and adjacent the line of typing which the operator may be watching. In the present instance, said means is mounted on the frame 58 which provides rollers 59 for pressing the paper being typed on against the platen 16 above the line being typed, said frame comprising side bars 60 having their rear ends pivoted to the carriage 17, a rear cross-member 61, and a front cross-member 62 which carries the rollers 59. The indicating means referred to is provided in a unitary structure 64 for removable mounting on the frame 58 and for connection with the screw 21 with which it is actuated. The unit 64, which is shown in greatest detail in Figures 8 to 12, is carried at and between corresponding extremities of a pair of similar arms 65 having the other ends thereof provided with spring clips 66 for pivotally connecting the arms to the cross member 61 of the frame 58 adjacent opposite sides of the latter. A tie bar 67 rigidly connects the arms 65 intermediately thereof, and the unit

64 is mounted between the forward arm ends for its rotative adjustment about an axis extending longitudinally thereof.

In its present embodiment, the unit 64 comprises a tubular casing member 68 of square cross-section and having blocks 69 fixed in its extremities. The blocks 69 have reduced and threaded portions beyond the end of the casing 68 for engagement through complementary openings provided in the extremities of the arms 65, nut members 70 being applied on the threaded portions of the blocks 69 outwardly of the arms to clamp the casing assembly to the arms in rotatively adjusted position thereon. Axial bores through the blocks 69 provide bearings for a shaft 71, said shaft having a radial collar 72 fixed thereto at its left end for bearing engagement against the outer end of the block 69 thereat. The right end of the shaft carries a bearing collar 73 fixed thereto opposite the end of the block 69 thereat and extends somewhat beyond said collar. It will be understood that the collars 73 cooperate with the respective blocks 69 to prevent an axial shifting of the shaft 71.

The intermediate portion of the shaft 71 is formed with a continuous male thread 74 arranged for propelling coaction with a block 75 which is slidably engaged within the bore of the casing 68. The bore of the block 75 freely receives the thread 74, and a spring-pressed cylindrical plunger 76 having a point 77 for engagement as a segmental thread between adjacent turns of the thread 74 provides for the travel of the block along the shaft when it is turned, said shaft comprising a worm shaft with respect to the block. The block 75, it is noted, has a portion which extends through and from a slot 78 provided in and along one side of the casing 68, and provides a guideway bore in which the plunger 76 may be moved outwardly against the resistance of a spring 79 to free its point 77 from the worm thread 74. A stem 80 extends from the plunger 76, and is provided with a knurled knob 81 to facilitate the pulling out of the plunger for permitting an adjustable setting of the block along the worm. The stem 80 has a radial pin 82 extending therefrom for its sliding engagement in a longitudinal slot provided in the guideway bore and for its disposal beyond the outer end of the guideway portion of the block when the point 77 of the plunger 76 is disposed beyond the zone of action of the thread 74, whereby a slight rotative turning of the fully withdrawn plunger is arranged to permit a seating of the pin against the end of the block portion thereat to releasably retain the plunger in inoperative position with respect to the worm.

At one side thereof, the extending portion of the block 75 is provided with a point or projection 83 for reference to the graduations of a scale 84 provided on the casing exterior adjacent the corresponding edge of the slot 78 whereby an operator may be guided to set the block 75 at any desired distance from the zero of the scale while the block is freed by the withdrawal of the plunger point 77 from engagement with the worm threads. The axial length and position of the thread 74 on the worm is preferably such that the plunger point 77 may be constantly coactive with the thread as long as the plunger is in its inner position. This arrangement provides for automatically disposing the block 75 against an end block 69 of the casing 68 at one end or the other as the worm shaft 71 is rotated in one direction or the other following a setting

of the block for its shifting by the worm, and zero points of the scale 84 preferably correspond to the points where the gauge point 83 of the block 75 is disposed when the block engages the end casing blocks 69. In this manner, when the block 75 reaches either limit of its travel against a block 69, the further rotation of the worm is prevented, whereby to positively prevent an operative actuation of a body 29 or 30 through the connections hereinafter described and so prevent the effecting of more rotative adjustments of spacing than called for by the initial setting of the travelling block.

Means may be provided for audibly indicating to the operator as to when the final or zero position is reached or approached by the block 75. In the present instance, the latter means comprises a signal which may be sounded by the block 75, as it reaches or approaches its said second, or zero, position. As shown, a slide member 85 is provided and comprises a sleeve of U section slidably mounted on the casing in frictional engagement therewith. The member 85 carries resilient tines 86 for engagement by and release from wedge-shaped extensions 87 of the blocks 75 to selectively set them in audible vibration when the block reaches or approaches its desired second position. The tines 86 comprise laterally spaced parts of a resilient plate member 88 having one end fixed to the member 85 and providing a normally depressed tongue 89 which engages in part beneath the tines 86 and may be raised to lift the tines above the projections 87 for releasing either time from between the projections or for moving the tines and the member 85 from one side of the block to the other, as may be desired, the tongue 89 being conveniently used as a handle for shifting the member while raising the tines.

The portion of the screw 21 which extends outwardly of the lever 19 is journaled in a sleeve 91 which is integral with the lever and is provided with a terminal flange 92 which provides the bearing sleeve 34 for the flexible shaft 31. The flange 92 also provides a sleeve bearing 93 having a shaft 94 journaled therein and carrying a gear 95 engaging the gear 32, said gear 95 and its shaft 94 providing an axial and conically tapered socket. A flexible shaft 96 is suitably fixed to the right end of the worm shaft 71 of the indicator 64 and is provided at its other end with a conically tapered plug 97 for frictional fitted engagement in the socket of the gear 95 whereby the shaft may be connected to and driven by the gear 32 in synchronism with the rotative adjustments of the shaft 21.

It will be understood that the present indicator assembly may be simply and completely removed from the typewriter by disconnecting the chips 66 from the bar 61 and removing the plug 97 from the socket which receives it for connecting the shaft 96 with the screw 21. Also, the gear 33 might provide the socket for receiving the connecting plug 97, in which case the gear 95 would be omitted. In any event, it is primarily essential that the indicator block 75 be visibly moved with respect to the scale 84 at each rotary adjustment of the screw 21, and the present gear and shaft and worm screw connection has been so designed, it being obvious that a movement equal to one-eighth of the width of a character space is not readily noticeable and must be appreciably magnified at the indicator unit for its ready visibility.

An operator of the typewriter having an origi-

nal typed and unjustified copy of matter to be provided in justified form as to its right side line, would have the desired margin line indicated on the copy and would then note with respect to each line to be retyped in justified form how many character spaces the line of copy is shorter or longer than the desired length for the line. If the line of copy is too long, for example, by four character widths, the member 85 of the indicator is disposed at a zero setting at the appropriate side of the block 75 and the block 75 is set with its pointer 83 at thirty-two scale units from the appropriate scale end. The operator then types the line, actuating the space-reducing key 29 occasionally or after each character is struck until all required reduction of the typed line length is effected. With the present audible signal provided by a tine 86, the operator is warned when the last desired spacing adjustment is approached or made, depending on the initial spacing of the member and block.

The length of a typed line may be increased from normal by a corresponding use of the indicator means in combination with the actuation of the key 30, the progressive movement of the block 75 being the reverse of that when a line is to be reduced from its normal length. Typewritten or duplicator matter which is produced with the present device lacks the ragged right-side margin line of usual typing and so more closely resembles matter printed from type, which latter is always justified. The present use of the displaced spacing control means is particularly valuable in the production of books or pamphlets with duplicators using typed stencils.

The present device for controlling the spacing of characters in typewritten lines thereof has further valuable uses. Thus, typewritten matter which is reinserted in a typewriter for corrections or additions is seldom so positioned that its characters are centered with respect to the typewriter characters, and lateral justifying adjustment as to an individual character or a marginal line may be readily made with the present device. Furthermore, the space occupied by a particular word or series of words may be lengthened or shortened to meet the requirements, as when a substitute word is to be typed in a normally too short or too long space for it, or emphasis is to be placed on a certain word by spreading its characters for contrast. Printing, the location of adjacent characters of different width at laterally equal distances apart, may also be effected with the present mechanism, with or without the described justifying. Other uses and advantages will readily occur to a typist having a typewriter provided with the present device.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the invention will be readily understood by those skilled in the art to which the invention appertains, and while I have described the principle of operation, together with a device which I now consider to be a preferred embodiment thereof, I desire to have it understood that the arrangement shown and described is primarily illustrative, and that such changes may be made, when desired, as fall within the scope of the following claims.

I claim:

1. In a typewriter, a frame, a set of character and spacing keys at a keyboard portion of the frame, a carriage for paper to be printed on

mounted on the frame for its rectilinear reciprocation in a line across the typewriter, a screw swiveled on the carriage in parallel relation to the said line of reciprocation thereof, escapement mechanism controlled by the aforesaid keys and engaging the thread of the screw as an escapement stop means with respect to the carriage, a flexible shaft connected with the screw and carrying a gear at its keyboard end, a pair of racks for independently engaging said gear, and keys depressible to actuate the different racks to effect relatively opposite and one-way rotative adjustments of the shaft and screw at each operative cycle of a key.

2. In a typewriter, a frame, a set of character and spacing keys, a paper carriage mounted for its rectilinear reciprocation, an escapement mechanism arranged to normally permit a predetermined escapement movement of the carriage following each actuation of a key, means for actuation by the typist to vary the escapement movement of the carriage from normal, indicator means including a worm screw, means to rotatively adjust said worm screw at each actuation of the first means, a reference scale fixedly related to said worm screw, and an indicator member engaged by said worm screw for its travel along the scale as the worm screw is adjusted.

3. In a typewriter, a frame, a set of character and spacing keys, a shiftable carriage mounted on the frame for successive escapement movements thereof, an escapement mechanism arranged to normally permit a fixed escapement movement of the carriage following each actuation of a key, means for actuation to vary the escapement movement from normal, indicator means including a worm screw, means automatically operative to effect a rotative adjustment of said worm screw at each actuation of the first means, an indicator member engaged by said worm screw and held against rotation with the screw for its progressive movement along the worm screw as the latter is rotated, a scale fixedly related to said worm screw for reference of the travelling indicator

member thereto for ascertaining the number of like actuations of the first means which has effected the movement of the member along the worm screw from one scale point to another and means to positively indicate in an attention-calling manner as to when the indicator member reaches a point of the scale which corresponds to a predetermined number of adjustments of the worm screw following an initial setting of the indicator member.

4. A structure in accordance with claim 2 wherein means are provided for disengaging the indicator member from the screw for its subsequent reengagement with the screw at a selected intermediate point thereof.

5. A structure in accordance with claim 2 providing a stop means at the end of travel of the indicator member along the screw such that the engagement of the member with the stop means is operative to prevent a further rotation of the worm screw.

6. In a typewriter, a frame, a set of character and spacing keys, a shiftable paper carriage mounted on the frame for successive escapement movements thereof in one direction, an escapement mechanism arranged to normally permit a predetermined escapement movement of the carriage following each actuation of a key, means for repeated actuation to vary certain escapement movements of the carriage from normal, a worm screw, mechanical drive connections between the aforesaid means and the worm screw so that the worm screw is positively rotated at each actuation of the means, a non-rotatable indicator member engaged by said worm screw for its progressive movement along the screw as the latter is rotated by actuations of the aforesaid means, and a stop means determining an end of travel of the indicator member along the screw whereby the engagement of the member with the stop means is positively operative to prevent a subsequent actuation of the escapement varying means.

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