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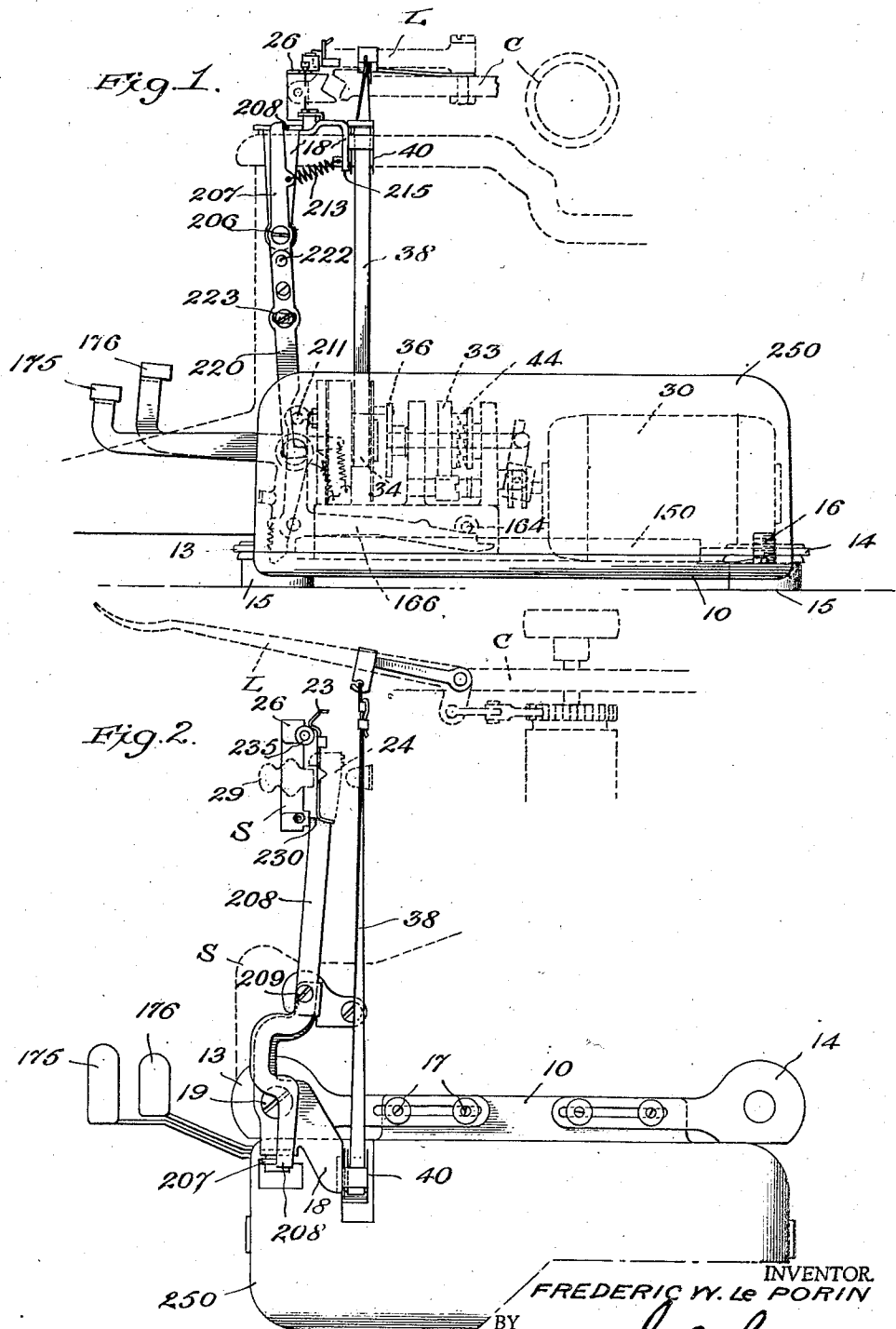
F. W. LE FORIN

2,214,906

UNIVERSAL CARRIAGE RETURN MECHANISM FOR TYPEWRITERS

Filed May 8, 1937

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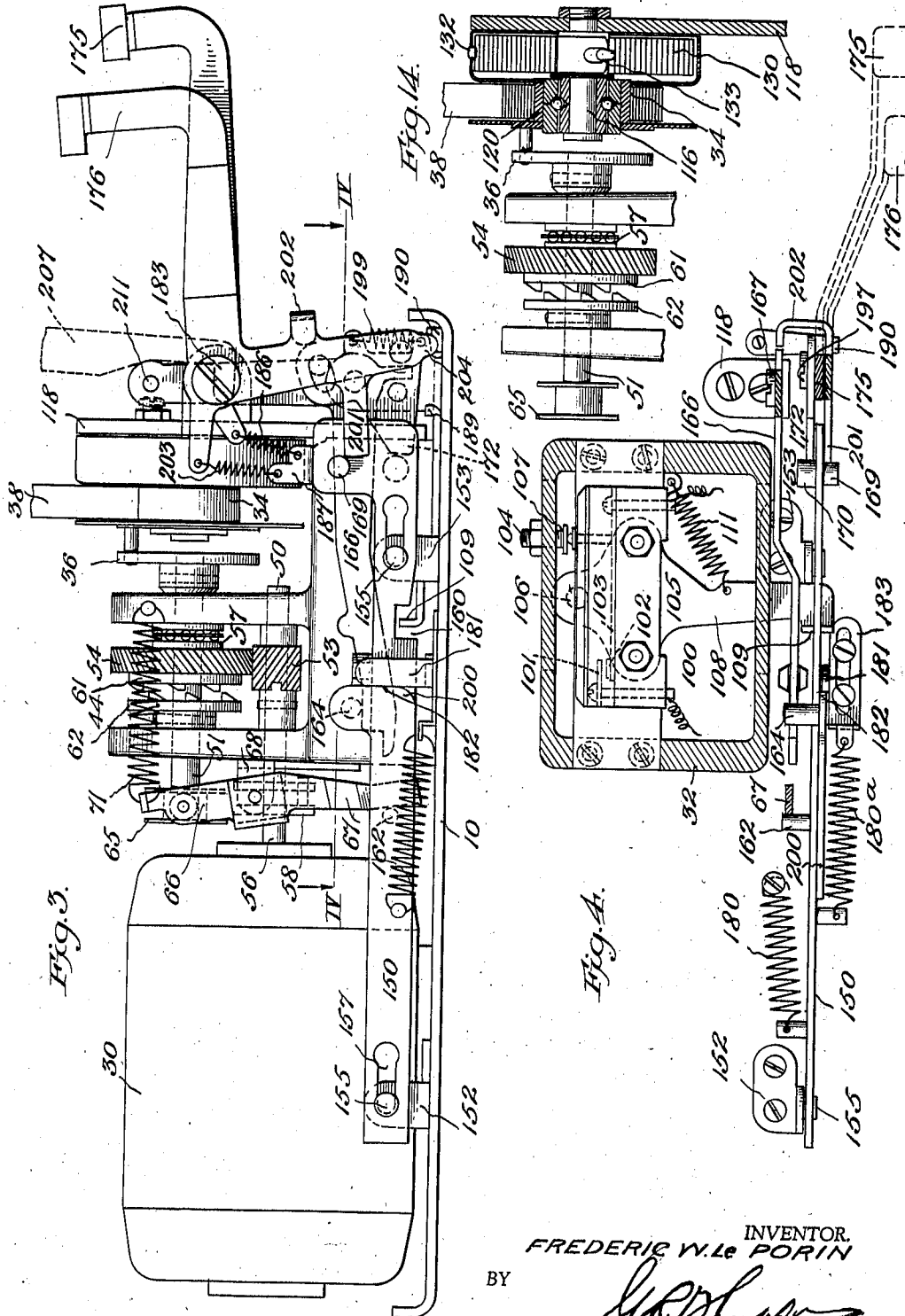
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UNIVERSAL CARRIAGE RETURN MECHANISM FOR TYPEWRITERS

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4 Sheets-Sheet 2



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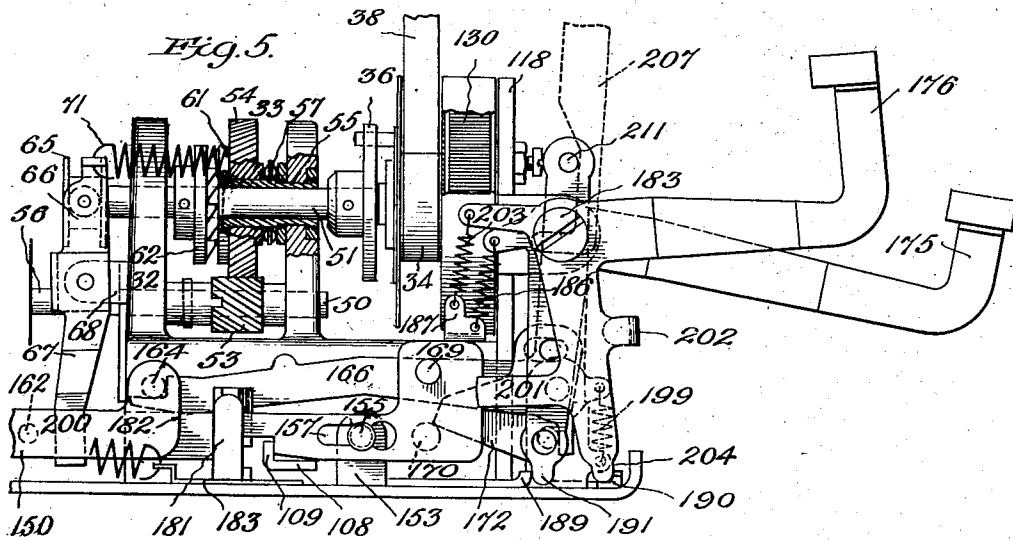
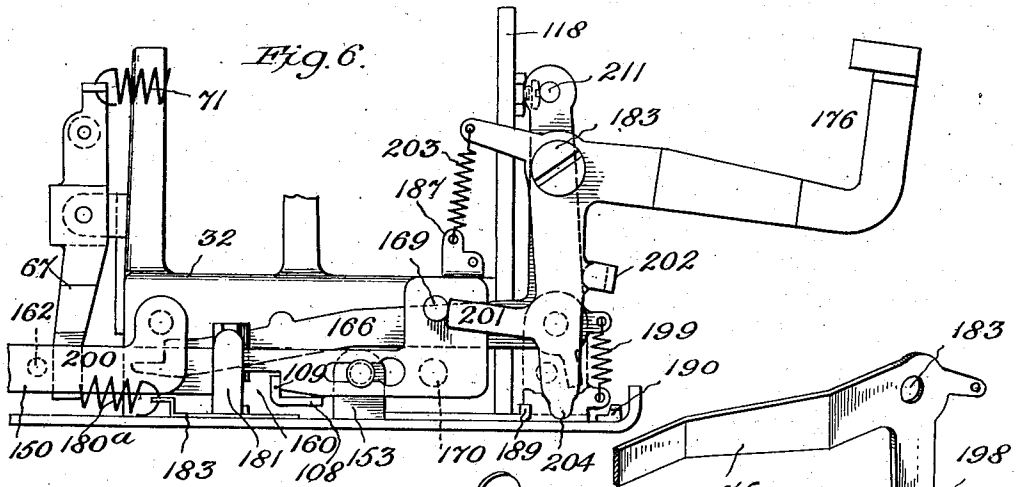
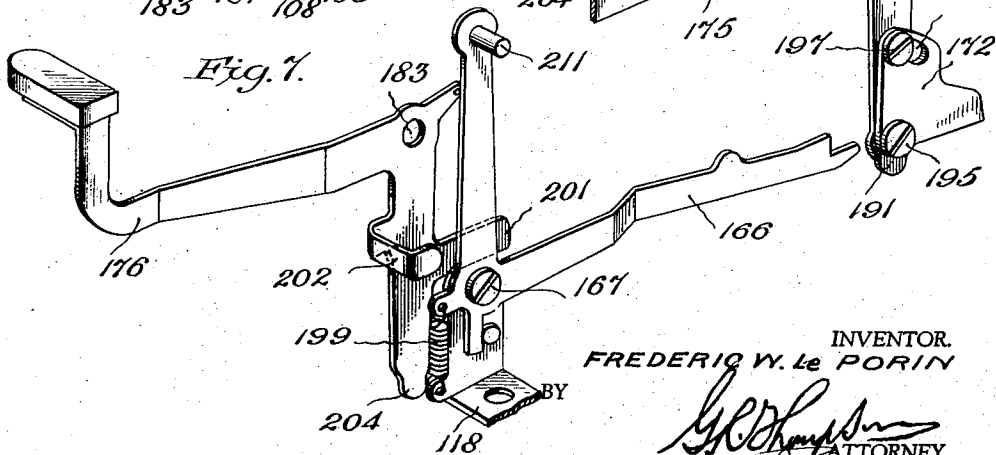
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UNIVERSAL CARRIAGE RETURN MECHANISM FOR TYPEWRITERS

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4 Sheets-Sheet 3



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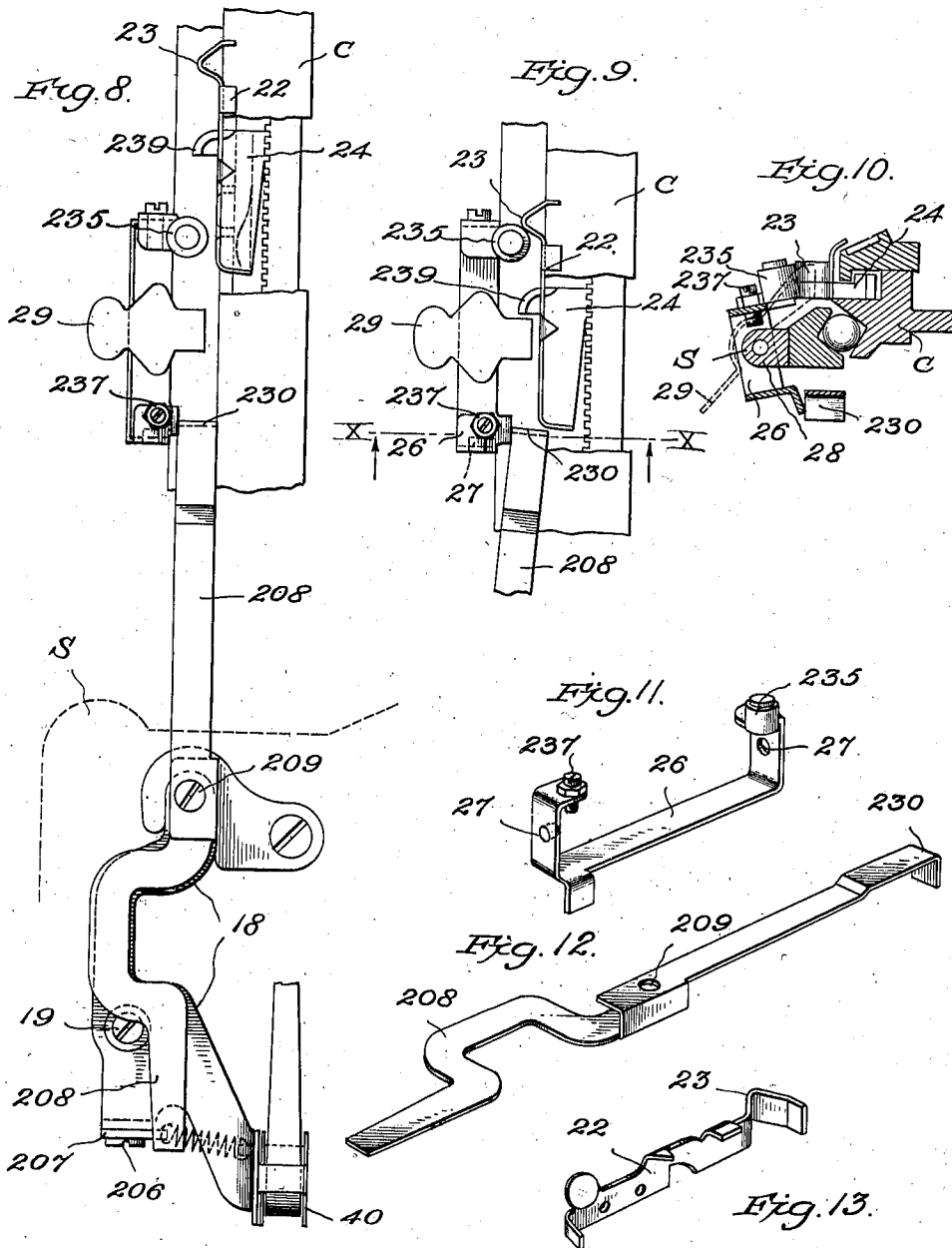
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UNIVERSAL CARRIAGE RETURN MECHANISM FOR TYPEWRITERS

Filed May 8, 1937

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,214,906

UNIVERSAL CARRIAGE RETURN MECHANISM FOR TYPEWRITERS

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Application May 8, 1937, Serial No. 141,409

13 Claims. (CL 197—66)

This invention relates to automatic return mechanism for carriages of typewriters, and provides improvements therein.

The invention provides an automatic carriage return mechanism which is universal in meeting the conditions of typewriter carriage return; it operates to automatically return the carriage from any position to the line-beginning position determined by the marginal stops, to return it to a position adjacent a tabulating stop for tabulating work, and to return it to a position determined at will.

The automatic carriage return mechanism can be applied to typewriters of the kinds in general use (in which the carriages are manually returned) with virtually no alteration of the mechanism of the typewriter, with a minimum of additive parts, and with no alteration of the normal functioning of the typewriter, the automatic return mechanism functioning collaterally or alternatively with the manual return operation.

The invention further provides an improved mechanism which can be economically built, and the parts of which may be assembled with a minimum of special fitting.

The invention further provides an improved mechanism which will operate satisfactorily notwithstanding moderate deformations of the parts due to rough treatment of the typewriter, inaccuracies of alignment, etc., in assembling the parts, and in attaching the mechanism to a typewriter, and in which the construction is such as to eliminate any binding or drag on the carriage during typing.

The invention also provides an improved mechanism which operates easily, without violent shocks, and in which the operation of the elements, following the operation of a key to start the carriage return and the operation of mechanism for stopping the carriage return, is instantaneous and timed so as to obtain the best coaction and in which the stopping of the motor is automatic, following the depression of the automatic full-return key-lever, when the carriage reaches the line-beginning position determined by the marginal stop.

The invention further provides novel and useful combinations and sub-combinations herein-after set forth and defined in the claims.

An embodiment of the invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a view in side elevation of the carriage return mechanism, with parts of the typewriter shown in dotted lines.

Fig. 2 is a top plan view with parts of the typewriter shown in dotted lines.

Fig. 3 is an enlarged view in side elevation of parts of the carriage return mechanism (including the motor, speed-reduction gearing, clutch, key-levers, and switch-and-clutch control-bar)

the parts being shown in the position in which the motor is cut off and also in the position in which they are when the typing mechanism is being used.

Fig. 4 is a horizontal sectional view on the line IV—IV, Fig. 3, showing the switch and omitting the motor.

Fig. 5 is a view similar to Fig. 3, confined to the parts at the right-hand side, and showing the automatic full-return key-lever depressed and the parts in the position in which they remain during the automatic return of the typewriter carriage to the marginal-stopping position.

Fig. 6 is a view similar to Fig. 5 (with more parts omitted) showing the automatic limited-return key-lever depressed and the parts in the position which they occupy while said automatic limited-return key-lever is maintained in the depressed position.

Fig. 7 is a group view of the two key-levers and control-bar detent, the automatic limited-return key-lever being shown in position with relation to the detent, and the automatic full-return key-lever displaced from its position co-axial with, in front of, and alongside of the other key-lever.

Figs. 8, 9 and 10 are views of parts mounted on the front parts of the movable carriage and the stationary frame of the typewriter, respectively, which co-act to initiate the stopping of the carriage-return motor, when the carriage has completed its return movement, as determined by the marginal stops of the typewriter, which marginal stops appear in the figures; in which Fig. 8 is a top plan showing the carriage marginal stop approaching the stopping position; Fig. 9 is a similar view showing the carriage marginal stop and coacting parts in the position in which the control-bar has been released from the detent and the motor switch opened and clutch disengaged, and Fig. 10 is a cross section on the line X—X, Fig. 9.

Figs. 11, 12 and 13 are perspective views showing certain of the parts in Figs. 8, 9 and 10 in detail.

Fig. 14 is a vertical cross-section through the drum 34, and its support, and through the speed-reducing gears and clutch, Fig. 3.

Referring to said drawings, the stationary parts of the typewriter to which the carriage return mechanism is attached, or is to be attached, are indicated by the reference letter S, and the movable spring-tensioned carriage by the letter C.

The carriage return mechanism preferably comprises a base 10, which is conveniently formed by stamping from a sheet of metal, and on which most of the parts of the carriage return mechanism may be mounted. As here shown, base 10 is conveniently a plate provided with punched portions 13 and 14 which are designed to fit between the feet 15 of the typewriter and the base

thereof, and base 10 may be attached to the typewriter by removing the feet 15, passing the screws 16 of the feet through the holes in the portions 13 and 14 of the base, and then fastening the screws 16 in the threaded sockets therefor in the frame of the typewriter. In order that the base 10 may be readily attached to typewriters having feet 15 spaced differently apart, the punched portions 13 and 14 may be formed as separate pieces, as shown, and each have a slot therein through which passes a screw 17 by which said portions 13 and 14 are held in adjusted position on the base 10.

There are only a few other parts which are required for attachment to the typewriter. One is the bracket 18 shown in Figs. 2 and 3, which is attached to the typewriter by removing the screw 19 which fastens the top-plate of the typewriter to one of the vertical posts of the typewriter frame, passing the screw 19 through the hole provided therefor in the bracket 18, and then replacing the screw 19. Another part is a small plate 22 (Fig. 13) provided with a beveled face or cam 23, which plate 22 is formed on or fastened to the adjustable marginal stop 24, which latter is carried by the carriage C, and co-acts with a part 26 pivotally mounted on the typewriter frame S, as indicated at 27.

The part 26 may be, as shown in Fig. 11, a ball-like lever spanning and pivoted on the same block 28 on the frame S as the regular marginal stop 29 is pivoted.

Mounted on the base 10 is an electric motor 30, and adjacent the motor is the frame 32 of a speed-reduction gearing 33, also mounted on the said base 10. Numeral 34 designates a drum which is connected with the speed-reduction gearing 33 through a universal coupling 36, and which drum 34 has attached thereto a flexible cord or tape 38 which is attached to the movable carriage C, and preferably to the lever L of the line-spacing mechanism on the carriage, the tape at the side of the typewriter passing over a roller 40 which is mounted on the bracket 18 which is attached to the typewriter frame.

The motor drives the drum 34 through a clutch 44.

The speed-reduction mechanism 33 advantageously comprises shafts 50 and 51 having meshing helical gears 53, 54 thereon. The helical gears are of a type through which motion may be transmitted with equal facility in either direction, and are to be distinguished from worm gears which resist backward turning. The gear 54 turns loosely on a sleeve 55 fixed to the frame 32, and the shaft 51 turns freely in said sleeve 55. The mounting of the gear 54 on the sleeve 55 has the advantage that any distorting forces acting on the gear 54 are sustained by the sleeve 55, and not by the shaft 51, and thereby the extremely light running of the shaft 51 when the clutch 44 is disengaged, which is desired, is protected. Also an anti-friction thrust-bearing 57 is provided between the gear 54 and the frame 32, as a means to the same end of obtaining extremely light running of the shaft 51, as hereinafter more fully explained.

The axes of shafts 50 and 51 may be arranged parallel to one another, with the shaft 50 in line with the shaft 56 of the electric motor 30, giving the advantage of a compact and aligned arrangement of the motor 30, reduction gearing 33 and drum 34. To avoid the necessity of accurate alignment between the bearings for shaft 56 and for shaft 50, and to facilitate assembly,

a universal coupling 58 may be provided between these two shafts. The universal coupling 58 may be similar in construction to the universal coupling 36. These universal couplings have the simple form of adjacent disks coupled through a pin which is fastened to one disk and projects through a slot in the other, as shown.

The clutch 44, as shown in the embodiment here illustrated, may be combined with the speed-reduction gearing 33. The gear 54 may have fixed thereon a jaw-plate 61, and opposite thereto, and fixed on shaft 51, is a companion jaw-plate 62. The shaft 51 is axially movable in its bearing, and such axial movement, to bring the jaws 61 and 62 into and out of clutching engagement, is effected through suitable means, as a grooved collar 65 fixed on shaft 51, and a two-arm shift lever 66, 67, which may be pivoted in a bracket 68, fastened on the frame 32. The shift-lever 66, 67 is acted upon by a spring 71 in a direction to move the shaft 51 axially to bring the jaws 61, 62 of the clutch into engagement.

Numeral 100 designates a switch for controlling the flow of current to the motor 30. This switch 100 is conveniently located within a housing forming a part of the frame 32, as shown in Fig. 4. The switch comprises a fixed contact 101 and a movable contact 102. The movable contact 102 is carried on a spring-arm 103. Opposite the spring-arm 103 is arranged a pin or projection 104 which flexes the arm 103 to break the circuit when the arm 103 is moved against said pin. The position of the pin 104 with respect to the spring-arm 103 may be made adjustable as by means of a screw-thread connection 107 between it and the frame 32. The switch 100 may be mounted on a plate 105, which is pivotally mounted as indicated at 106, and which plate has an arm 108 having a projection 109 for a purpose hereinafter explained. The plate 105 carrying the switch 100 is acted on by a spring 111 in a direction to bring the arm 103, on which the contact 102 is mounted, into contact with the pin 104, to thereby separate the contacts 101, 102, to break the circuit to the motor 30. The spring 111 is conveniently attached at one end to the arm 108 of the plate 105, and at its other end to a part fixed on the frame 32.

The position of the projection 104 may be adjusted so that the making and breaking of the circuit to the motor 30 may be timed with relation to the engagement of the jaws of clutch 44. The preferred timing is such that the clutch 44 is partially engaged before the motor begins to turn shaft 50, and the circuit to the motor 30 broken before or during the disengagement of the clutch 44.

The drum 34 is conveniently mounted on a stud 116 (Fig. 14) fastened upon a bracket 118, fastened to the frame 32. A ball bearing 120 is preferably provided between the drum 34 and its support, so that the said drum may turn easily under the pull of the tape 38 during the movement of the carriage C, as in typing.

The drum 34 is also preferably acted upon by a coiled spring 130 (Fig. 5), one end of which is connected to a flange on the drum, as indicated at 132, and the other end of which, as indicated at 133, is connected to an inclined tooth on the stud 116. The spring 130 acts in a direction to turn the drum 34 in a direction to maintain a slight tension or pull on the tape 38, so that the pull of the spring 130 on the drum will maintain tautness of the tape 38 throughout all movements of the carriage which occur when the

motor 30 is not acting through the drum to effect the return of the carriage.

The tooth on stud 116 is so formed as to release the end of spring 130 when the drum 34 is rotated rapidly backward, such as occurs when tape 30 breaks, and such a construction has been found to have the advantage of preventing the breaking of spring 130 in such a contingency.

As a part of the means for controlling the operation of the motor 30, a control-bar 150 is provided. This bar is conveniently in the form of a flat strip extending parallel with the axes of the motor and shafts of the reduction-gears, and having limited reciprocatory movement. The bar 150 may be supported in brackets 152, 153 attached to the base 10 of the attachment, the brackets 152, 153 being provided with headed pins 155 which pass through elongated slots 157 in the said bar 150. The bar 150 has therein an elongated notch 160, within which the projection 109 on the arm 106 of the switch 100 extends. The bar 150 also has thereon a pin 162 which extends across the arm 67, as shown in Figs. 3, 4, 5 and 6. The bar 150 also has thereon a pin 164 (Figs. 1-6) which is adapted to be engaged by a detent 166 which may be pivotally mounted on the bracket 118, as indicated at 167. The bar 150 also has thereon two other pins 168 and 170.

Numerals 175 and 176 designate key-levers. The key-lever 175 is designated herein as the automatic full-return key-lever, and the key-lever 176 as the automatic limited-return key-lever.

The automatic full-return key-lever 175 has thereon a pivoted pawl 172 which coacts with the pin 170 on the bar 150, and the automatic limited-return key-lever 176 coacts with the pin 168 on said bar 150, as will be hereinafter more fully explained.

The bar 150 is acted on by a predominant spring 180, and the action of the spring is to normally hold the bar in the position shown in Figs. 3 and 4 where the movement of the bar 150 in the direction of the pull of spring 180 is limited by a shoulder 182 bearing against a stop 181. The stop 181 is advantageously made adjustable, as indicated at 183, so that the roller on arm 66 of the clutch shift-lever is held in a neutral position in the grooved collar 65. The neutral position is one where the clutch parts 61, 62 are fully disengaged and neither the bar 150 nor the spring 71 acts on the shift-lever 66, 67 in such a way that axially directed pressure is produced by any part on shaft 51 against any fixed part, and the light running of shaft 51, hereinbefore referred to, is preserved. The pin 162 on the bar 150 bears on the arm 67 of the clutch shift-lever, normally holding the clutch parts 61 and 62 in their disengaged position and the clutch-lever in the neutral position just described. The notch 160 in the bar 150 also normally frees the projection 109, so that the spring 111 can act to turn arm 108 to hold the switch 100 in position to break the circuit to the motor through the action of projection 104 on spring arm 103 which carries contact 102. The pin 164 on the bar 150 normally lies above the detent 166, and holds it depressed. When the pin 164 on the bar 150 has been engaged by the detent 166, and the detent 166 is thereafter moved to disengage the pin 164, the force of the predominant spring 180 is such as to overcome the force of the spring 71 acting on the shift-lever 66, 67 of the clutch, and shoot the bar 150 to the position shown in Figs. 3 and 4, as hereinafter described.

The function of the predominant spring 180 is advantageously performed by two springs, one (180) attached to the bar on one side, and another, 180*, attached to bar 150 on the opposite side. In this way, side thrust of the bar 150 against its supports is avoided, and the possibility of a stiff action or binding avoided.

The automatic full-return key-lever 175 is pivoted as indicated at 183 (Figs. 3, 5, 6 and 7) to the bracket 118. A spring 186 attached at one end to the automatic full-return key-lever 175 and at its other end to an arm 187 on said frame 32 normally acts to hold said automatic full-return key-lever up, as indicated in Fig. 3. The movement of the key-lever 175 around its pivot is limited by spaced abutments 189, 190 and a projection 191 on said key-lever, Fig. 5. The pawl 172 is pivotally attached to the automatic full-return key-lever 175, as indicated at 195, Fig. 7. The movement of the pawl 172 around its pivot 195 is, however, limited by a pin 197 on the key-lever extending into a slot 198 in the pawl. The pivotal mounting of the pawl 172 and the shape of the tooth of the pawl enable the pawl to slip quickly out of engagement with the pin 170 after the bar 150 has been advanced to a position where the detent 166 is able to rise and engage the pin 164. A spring 199 acts on said detent 166 in a direction to turn it to a position to engage the pin 164. The pin 164 may be mounted on a plate 200 which is adjustable with respect to the bar 150, so that the proper timing of the engagement of the pin 164 by the detent 166 following the release of the pin 170 on the bar 150 by the pawl 172 on the automatic full-return key-lever 175, may be effected.

The automatic limited-return key-lever 176 is pivoted co-axially with key-lever 175, as indicated at 183, and has a portion 201, which makes contact with pin 169 on the bar 150, when the said key-lever 176 is depressed. The key-lever 176 also has thereon a projection 202 which (when the key-lever 176 is depressed) makes contact with the detent 166 during the movement of bar 150 by the portion 201 of key-lever 176, and before the pin 164 on the bar 150 releases the detent 166, in such manner as to prevent the said detent 166 from rising and engaging the pin 164 and thereby preventing the return of bar 150 under the action of spring 180 when the said automatic limited-return key-lever 176 is released. Bar 150 moves forward and back again with the movement of automatic limited-return key-lever 176 when it is depressed and when it is released. Projection 202 may be arched, as shown, so as to pass around key-lever 175 and clear said key-lever 175 when the key-lever 176 is depressed. A spring 203 attached to arm 187 pulls on key-lever 176 in a direction to hold it up, as indicated in Fig. 3, and the movement of key-lever 176 around its pivot is limited by the abutments 189, 190, and a projection 204 on said key-lever, Fig. 6.

Suitable means for moving the detent 164 to release the bar 150, following the depression of the automatic full-return key-lever 175, as the carriage reaches the end of its return movement against the marginal stop, and thereby stop the operation of the carriage return mechanism, are provided. Means suited to the style of typewriter having a marginal stop at the front of the frame, may be as follows and is illustrated in Figs. 1, 2 and 8-13 inclusive: Pivoted on the bracket 18, as indicated at 206, Fig. 1, is a lever 207, and co-

acting with said lever 207 is a lever 208 also pivoted to said bracket 18, as indicated at 209, Figs. 2 and 8. The detent 166 has thereon a pin 211 which is adapted to be engaged by the end of said lever 207. A spring 213, Fig. 1, connected to said lever 207 and to an arm 215 on said bracket 18 normally tends to hold the lever 207 out of the range of movement of said pin 211 on detent 166. The lower end of said lever 207 is, however, made adjustable, so that the action of said lever 207 on the detent 166 may be properly timed. The adjustment may be effected by providing the lever 207 with an extension 220 (Fig. 1) which is pivoted to the lever 207, as indicated at 222, and which is made fast in its adjusted positions by means of a binding-screw 223.

The lever 208 is held with its end in contact with the pivoted bail-like lever 26 which is pivoted on the frame S co-axial with the marginal stop 29. When the adjustable marginal stop 24 carried by the carriage C strikes the roller 235 on the bail-like lever 26, the said bail-like lever 26 is caused to turn rapidly on its pivots. The bail-like lever 26 (being in contact with the lever 208 at its end 230) imparts movement to the said lever 208 around its pivot 209, and the lever 209 acting upon the lever 207, turns this latter lever around its pivot 206, and brings its end against the pin 211 on the detent 166, thus moving the detent out of the path of the pin 164 on bar 150, and thus allowing the predominant spring 180 to bring the shoulder 182 on bar 150 against the adjustable stop 181, in which position, as hereinbefore described, the motor 30 is deenergized and disconnected through the clutch. After the motor 30 is disconnected, the momentum of the carriage C will ordinarily be sufficient to carry the carriage the few remaining spaces until the marginal stop 24 abuts against the fixed marginal stop 29, thus bringing the carriage to the line-beginning position.

When the carriage C is in the line beginning position it is advantageous to have the full-return key-lever 175 ineffective to latch the control-bar 150 through the detent 166. The said full-return key-lever 175 is rendered ineffective for the purpose just stated, through the following means: The cam 23 on the plate 22 makes contact with the roller 235 on the lever 26, and turns and holds the levers 208 and 207 in such positions that the lower end of lever 207 presses against the pin 211 to prevent the detent 166 from rising (when control bar 150 is moved to the left, Fig. 3) and engaging the pin 164 on the control bar 150. In this way the clutch 44 and the switch 100 cannot be more than momentarily closed.

A means 237 is advantageously provided for adjustably limiting the swing of the bail-like lever 26 toward the marginal stop 24. The means may be, as shown, a stud or pin having a screw-thread engagement with the lever 26 and located so as to come into contact with the top of block 28 as the lever 26 turns toward stop 24. The contact of stud 237 with block 28 determines the position of rest (or normal position) of bail-like lever 26. In its position of rest, the roller 235 should be in such position with relation to the nose 239 on stop 24, that when the roller 235 and nose 239 come into contact, the end of nose 239 will be sufficiently spaced from the center of the roller to cause the lever 26 to readily turn and to minimize the shock between the roller 235 and the nose 239.

Because of the light and easy running of the

mechanism provided by the non-binding driving connections through the universal joints 36 and 58, the mounting of gear 54 on sleeve 55, and the anti-friction thrust-bearing 57, the motor 30 may be one of minimum power for doing the work of returning the carriage. This construction and arrangement, especially when combined with the gears (such as the helical gears 53, 54) which transmit motion with equal facility in either direction, has multiple advantages. The shock when the marginal stop 24 on the carriage and the marginal stop 29 come together is mild. The clutch parts 61, 62 may move instantly out of disengagement under the influence of a comparatively light spring. The motor stalls easily when an obstruction is met by the carriage, damage to the typewriter and injury to persons are avoided, and by reason of the easy reverse turning of the special type of gears which are provided, an object which is caught between the carriage and a fixed part of the typewriter is not held but is easily released.

A cover 250 may be provided for the motor 30 and parts associated therewith on base 10.

OPERATION

By the use of the two key-levers, the automatic full-return key-lever 175, and the automatic limited-return key-lever 176, the carriage C may be automatically returned from any position to any position; i. e. to a position against the marginal stop 29, to a position adjacent a tabulating stop, or to a position determined at the will of the operator. The mechanism functions universally to answer the requirements of automatic carriage-return.

Automatic full-return of carriage against marginal stop 29

Automatic full-return key-lever 175 is depressed for this purpose. The position of the parts prior to depression of key-lever 175 is shown in Figs. 3 and 8, and the position of the parts upon the depression of said key-lever 175 is shown in Fig. 5. When the key-lever 175 is struck, it moves around its pivot 183, bringing the pawl 172 thereon into contact with the pin 170 on the bar 150. The pawl 172 moves the bar 150 to the left in Fig. 3, and as the key-lever 175 approaches the limit of its turning movement, the detent 166 rises under the force of its spring 199 to a position behind the pin 164 on the bar 150. At about the same time the pawl 172 slips off of the pin 170 and releases the bar 150, after which the bar 150 is retained by the detent 166. Upon the release of the key-lever 175, its spring 186 restores it to its normal position (shown in Fig. 3), the pawl 172 turning on its pivot 195 on the return movement of the key-lever so as to pass over the pin 170.

As the bar 150 is projected to the left under the action of the automatic full-return key-lever 175, the edge of slot 160 moves against the projection 109 on the switch-lever 108 (Fig. 4), and the pin 162 moves away from the arm 67 of the clutch-lever, which allows the shaft 51 to move quickly to the right under the influence of the spring 71, and thereby bring the clutch part 62 into engagement with the clutch part 61. Practically simultaneously with the movement of the shaft 51, but with enough time difference to allow the clutch parts to partially engage before the motor 30 starts, the switch 100 is rapidly turned under the influence of the spring pressed bar 150 to establish the motor circuit through the contacts 101, 102. The motor thereupon starts, driving

the shaft 50 of the speed reducing means 33 through the universal joint 58. The helical gear 53 drives the helical gear 54, and the gear 54 being connected to the shaft 51 through the clutch parts 61, 62 rotates the said shaft 51, and the said shaft 51 through the universal joint 36 drives the drum 34. The drum rotates, winding the tape 38 thereon. The winding tape pulls the carriage C until the marginal stop 24 on the carriage is brought to a stop against the marginal stop 29 (Fig. 2). The tape 38 being connected to the line-spacing lever L on the carriage, however, first moves the lever L to rotate the platen of the carriage C a distance corresponding to the spacing to be made between lines, and thereafter the pull of the tape 38 on the lever L moves the carriage on its return movement, as just described.

The action of the carriage return mechanism is automatically stopped as follows: As the carriage returns to within about seven "spaces" of its limit of movement permitted by the marginal stops 24 and 29, the nose 239 of stop 24 (Figs. 9 and 10) strikes the roller on bail-like lever 26 causing lever 26 to turn with great rapidity. The turning movement of the bail-like lever 26 produces a turning movement of the lever 208, and this turning movement of the lever 208 causes a turning movement of the lever 207. The movement of the lower end of lever 207 against the pin 211 on detent 166 moves the detent out of engagement with the pin 164 on the bar 150, and the bar being thereby released shoots quickly to the right under the influence of the predominant spring 180; and the movement of the edge of notch 160 (Fig. 3) out of contact with the projection 109 on the arm 108 allows the spring 111 to turn the switch 100 to move the contacts 101, 102 apart to quickly break the circuit at the contacts 101, 102, and, at about the same instant, the motor is disengaged through the clutch 44 by the contact of pin 162 with the arm 67 of the clutch lever, turning said clutch lever, and the engagement of the arm 66 of the clutch lever with the collar 65 on shaft 51 slides the shaft 51 to the left, thereby separating the clutch parts 61, 62. With stop 181 properly adjusted, the clutch lever 66, 67 is held in the neutral position heretofore described, which leaves the shaft 51 extremely free to turn in response to the movement of the carriage during typing.

The momentum of the carriage C after the stop 24 comes into contact with the roller 235 on the bail-like lever 26 to initiate the de-energization of the motor, and after the de-energization of the motor, will normally carry the carriage to the limit of its return movement permitted by the marginal stop 29.

Within the range of a few spaces from the line-beginning position, the limited return key-lever 176 is used for effecting the carriage return against the marginal stops.

Automatic limited return of carriage

Automatic limited-return key-lever 176 is depressed for this purpose. The position of the parts prior to the depression of key-lever 176 is shown in Fig. 3, and the position of the parts upon the depression of said key-lever 176 is shown in Fig. 6. When the key-lever 176 is struck, it moves around its pivot 183, bringing the portion 201 thereof into contact with the pin 169 on the bar 150, and moves the bar 150 to the position shown in Fig. 6. During the depression movement of the key-lever 176, the arched projection 202 thereon makes contact with the detent 166

before the said detent 166 is released by the pin 164 on the bar 150, so that the detent 166 cannot rise under the action of its spring 199 (when the aforesaid pin 164 clears the detent) and prevent the return of the bar 150 when the key-lever 176 is released. The arched projection 202 holds the detent 166 depressed, on the return movement of the bar 150, until the pin 164 on the bar 150 passes over the detent 166 so that it cannot rise. That is, the bar 150 remains in its key-lever actuated position (slightly to the left of the position shown in Fig. 6, the depression of the key-lever 176 not being fully completed), and, when the key-lever 176 is released, the bar 150, under the action of spring 180, follows the return movement of the said key-lever 176. That is, when the key-lever 176 returns to the position shown in Fig. 3, the bar 150 simultaneously returns to the position shown in Fig. 3.

The depression of the said automatic limited-return key-lever 176, and the movement thereby of the bar 150, brings about the engagement of the parts 61, 62 of the clutch 44, and the completion of the circuit to the motor 30 through the switch 100 in the manner already described. The engagement of the clutch parts 61, 62 and the energization of the motor 30 through the switch 100 continues as long as the automatic limited-return key-lever 176 is held in its depressed position. As soon as the key-lever 176 is released, the bar 150 is simultaneously returned by its spring 180, breaking the circuit to the motor 30 through the switch 100, and moving the parts 61, 62 of the clutch 44 to disengaging position.

If, for example, the typewriter is being used for tabulation in a column to the right of the line-beginning position determined by the marginal stop 29, the automatic limited-return key-lever 176 would be depressed and momentarily held. When the tabulating stop on the carriage passes slightly beyond the tabulating stop on the tabulating rack on the frame, the said key-lever 176 is released, and the tabulating-key struck, whereupon the spring-tensioned carriage C moves in the normal manner until the tabulating stops come together. The release of the key-lever 176 stops the motor, and restores the motor-starting parts to a position to be operated to again start the motor when one or the other of the key-levers 175, 176 is again depressed.

The automatic limited-return key-lever 176 can also be used to advantage in such work as addressing envelopes, where the successive lines of typing are begun at different distances from the margin of an envelope.

The automatic limited return key-lever 176 can also be used to advantage for successive line-spacing when the carriage C is held against a tabulating stop or against the marginal stop 29. In such position, the line-spacing mechanism on the carriage will be operated as many times as the said key-lever 176 is successively struck and released.

The arched construction of the projection 202 on the key-lever 176, clears the key-lever 175 when the former is depressed, so that the actuation of the key-lever 176 may be carried on without interference from or movement of the key-lever 175.

As the carriage C moves to the left in Fig. 2 in the operation of typing, or as the carriage is shifted back and forth manually, tension is maintained on the tape 38, so as to avoid slack occurring therein, by the spring 130, attached to the

drum 34, as heretofore described. The tension of the spring 130, however, is not sufficiently great to actuate the handle L of the line-spacing mechanism. The drum 34 and shaft 51 being disconnected from the motor through the clutch parts 61, 62 at this time, the stop 181 operating to hold the clutch lever 66, 67 in the neutral position heretofore described, and the gear 54 bearing on the sleeve 55 instead of on shaft 51, the said drum 34 turns most freely under the pull of the spring 130 and the pull of the carriage C and offers virtually no resistance thereto.

The character of the gears 53, 54 (described as helical gears) as well as the mounting of gear 54 on the sleeve 55, is of importance to the operation of quickly disengaging the clutch-parts 61 and 62. As the marginal stop 24 on the carriage moves against the marginal stop 29 on the frame, or as a tabulating stop on the carriage moves against a tabulating stop on the frame, there is a recoil or force produced which is opposite to the driving force of the motor 30. This recoil is transmitted through the drum 34 and shaft 51, to the clutch parts. The helical gears 53, 54 permit of easy movement in either direction of rotation. The recoil acting on gear 54 tends to produce movement of the gears 53, 54 in an opposite direction to the direction in which they are driven by the motor and this is transmitted to the armature causing it to move in the opposite direction, and therefore instead of the clutch and gear parts being jammed together by the force of recoil, the clutch-parts are free to move away from one another, because the force of recoil can act on the armature of the motor through the helical gears 53, 54 and relieve the pressure on the clutch teeth, and when the pressure on the clutch teeth is so relieved the clutch parts move apart easily and instantly under the action of the spring 180.

The invention may receive other embodiments than that herein specifically illustrated and described.

What is claimed is:

1. Carriage return mechanism for typewriters comprising an electric motor; means for operatively connecting the motor to the carriage of a typewriter; means for starting and stopping the motor comprising a switch; and means for closing and opening said switch comprising a spring-tensioned movable part 150, a full-return key-lever acting, when depressed, to move said spring-tensioned part to close said switch, a detent for retaining said spring-tensioned part in switch-closing position, when said full-return key-lever is released, carriage-controlled means for moving said detent to release said spring-tensioned part to open said switch and stop the motor when the typewriter carriage has been returned to a predetermined position, and a limited-return key-lever acting, when depressed, to move said spring-tensioned part to close said switch, and having a means for preventing said detent from acting to retain said spring-tensioned part in switch-closing position until said limited-return key-lever is released.

2. Carriage return mechanism for typewriters according to claim 1, wherein said means for operatively connecting the motor to the typewriter carriage comprises a clutch; and further comprising means for operating said clutch having an operative connection with said spring-tensioned movable part.

3. Carriage return mechanism for typewriters comprising an electric motor; means for operatively connecting the motor to the carriage of

a typewriter; means for starting and stopping the motor comprising a switch; and means for closing and opening said switch comprising a reciprocatory spring-tensioned bar, a full-return key-lever acting, when depressed, to move said bar to close said switch, a detent for retaining said spring-tensioned bar in switch-closing position when said full-return key-lever is released, carriage-controlled means for moving said detent to release said spring-tensioned bar to open said switch to stop the motor when the typewriter carriage has been returned to a predetermined position, and a limited-return key-lever acting, when depressed, to move said spring-tensioned bar to close said switch, and having a means for preventing said detent from acting to retain said spring-tensioned part in switch-closing position until said limited-return key-lever is released.

4. Carriage return mechanism for typewriters according to claim 3, wherein said spring-tensioned bar has pins or projections thereon with which said key-levers contact, said detent being positioned adjacent said key-levers, and wherein said means for preventing said detent from acting to retain said spring tensioned part comprises a part on said limited-return key-lever for contacting with said detent when said key-lever is depressed.

5. Carriage return mechanism for typewriters according to claim 3, wherein said spring-tensioned bar has pins or projections thereon with which said key-levers contact, said detent being positioned adjacent said key-levers, and wherein said means for preventing said detent from acting to retain said spring-tensioned part comprises an arched projection on said limited-return key-lever which passes around said full-return key-lever and is arranged to contact with said detent when said limited-return key-lever is depressed.

6. Carriage return mechanism for typewriters, comprising an electric motor; means for starting and stopping the motor comprising a switch, means for connecting the motor to the carriage of a typewriter comprising a clutch, helical speed-reducing gears of a character to transmit motion in reverse directions, a drum, and a flexible connection between the drum and typewriter carriage; and means for closing and opening said switch and said clutch, comprising a spring-tensioned bar, a full-return key-lever acting, when depressed, to move said spring-tensioned bar to close said switch and clutch, a detent for retaining said spring-tensioned bar in switch and clutch closing position when said full-return lever is released, carriage controlled means for moving said detent to release said spring-tensioned bar to open said switch and clutch to stop the motor and disconnect it from said drum, when the typewriter carriage has been returned to a predetermined position, and a limited-return key-lever acting, when depressed, to move said spring-tensioned bar to close said switch and clutch, and having a means for preventing said detent from acting to retain said spring-tensioned part in switch and clutch closing position until said limited-return key-lever is released.

7. In carriage return mechanism for typewriters, the combination of an electric motor, means for connecting the motor to the carriage of a typewriter comprising a clutch and speed reducing gears, and means for starting and stopping the motor comprising a spring-tensioned part, a longitudinally movable rotatable shaft on which one of the clutch parts is mounted, one of

said speed-reducing gears having a companion clutch part thereon, a sleeve providing a long bearing for said shaft and within which it is rotatable and longitudinally movable, and also providing a bearing on which one of said speed-reducing gears is rotatable, a shift-lever for moving said shaft longitudinally, a spring acting on said shift-lever in a direction to shift said shaft in the direction of the closing movement of the clutch, said spring-tensioned part acting on said shift-lever in the opposite direction, and a stop for limiting the movement of said spring-tensioned part to a position in which said shift-lever, in the open-position of the clutch, is held in a neutral position in which no longitudinal pressure is exerted by said shift-lever on said shaft.

8. In carriage return mechanism for typewriters, the combination of a typewriter carriage, a motor, means for connecting the motor to the typewriter carriage, means for starting the motor comprising a key-lever, a detent for retaining the motor starting means in position to keep the motor running after the release of said key-lever, means for actuating said detent to release said motor starting means comprising a lever on the typewriter frame and a stop or projection on the typewriter carriage, said lever having a cam thereon (roller 235) and said stop having a cam-contacting portion which is substantially perpendicular to the line of travel of the carriage, and means for limiting the position of rest of said lever so that the reaction between said stop and cam is moderated and the turning of said lever easily accomplished.

9. In carriage return mechanism for typewriters, the combination of a typewriter frame and carriage, a motor, means for connecting the motor to the typewriter carriage, means for starting the motor comprising a key-lever, a detent for retaining the motor starting means in position to keep the motor running after the release of said key-lever, and means for actuating said detent to release said motor starting means comprising a lever on the typewriter frame and a stop on the carriage frame, said lever having a cam thereon (roller 235) and said stop on the carriage frame having a cam thereon 23 and a projection 239 in advance of said carriage cam 23, said carriage cam 23 and projection 239 co-acting with said lever cam 235, said carriage projection 239 first making contact with said lever cam 235 to operate and then free the detent, and said carriage cam 23 thereafter, when the carriage reaches the line-beginning position, co-acting with said lever cam 235 to hold the means for actuating the detent in a position to hold said detent out of action.

10. In carriage return mechanism for typewriters which comprises an electric motor, means for operatively connecting the motor to the carriage of a typewriter, and a switch for starting and stopping the motor, movable means for closing and opening said switch, a detent for holding said switch closing and opening means in switch closing position, a full-return key-lever acting, when momentarily depressed, in conjunction with said detent to move and hold said switch closing and opening means in switch closing position, carriage controlled means for releasing said switch opening and closing means from said de-

tent and moving it to switch-opening position when the typewriter carriage has been returned to a predetermined position, a limited-return key-lever acting when depressed, to move said switch opening and closing means to switch closing position, and means actuated by said limited-return key-lever for preventing said detent from holding said switch opening and closing means in switch-closing position until said limited-return key lever is released.

11. In carriage return mechanism for typewriters which comprises an electric motor, and means for connecting the motor to the carriage of a typewriter comprising a clutch and speed-reducing gears; a shaft on which one of the clutch parts is fastened, and a sleeve providing the bearing for said shaft and within which it is supported on a long bearing and is rotatable and longitudinally movable, one of said reducing gears having a bearing on the exterior of said sleeve and carrying a companion clutch part, the clutch parts being so arranged as to be brought into and out of clutching engagement by longitudinal movement of said shaft on its bearing in said sleeve.

12. In carriage return mechanism for typewriters which comprises an electric motor, and means for connecting the motor to the carriage of a typewriter comprising a clutch and speed-reducing gears; a shaft on which one of the clutch parts is fastened, and a sleeve providing the bearing for said shaft and within which it is supported on a long bearing and is rotatable and longitudinally movable, one of said reducing gears having a bearing on the exterior of said sleeve and carrying a companion clutch part, the clutch parts being so arranged as to be brought into and out of clutching-engagement by longitudinal movement of said shaft on its bearing in said sleeve, and an antifriction thrust-bearing for said speed-reducing gear acting to sustain thrust in the direction of the closing movement of the clutch.

13. In carriage return mechanism for typewriters which comprises an electric motor, and means for connecting the motor to the carriage of a typewriter comprising a clutch and speed-reducing gears; a shaft on which one of the clutch parts is fastened, a sleeve providing the bearing for said shaft and within which it is supported on a long bearing and is rotatable and longitudinally movable, one of said reducing gears having a bearing on the exterior of said sleeve and carrying a companion clutch part, means for moving said shaft longitudinally on its bearing in said sleeve comprising two oppositely acting springs, one spring acting on said shaft in the direction of the closing movement of the clutch, and the other spring being predominant and acting on said shaft in the direction of the opening movement of the clutch, and means for manually relieving said shaft of the action of said predominant spring, thereby allowing said spring which acts in the direction of the closing movement of the clutch, to move the clutch parts into clutch-engagement, said sleeve bearing providing a true bearing which enables the shaft to slide longitudinally with only the slight friction of the bearing to oppose its movement.

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