Nov. 7, 1939. W. F. HELMOND 2,178,689

TYPEWRITING MACHINE

Original Filed Feb. 23, 1935 2 Sheets-Sheet 1

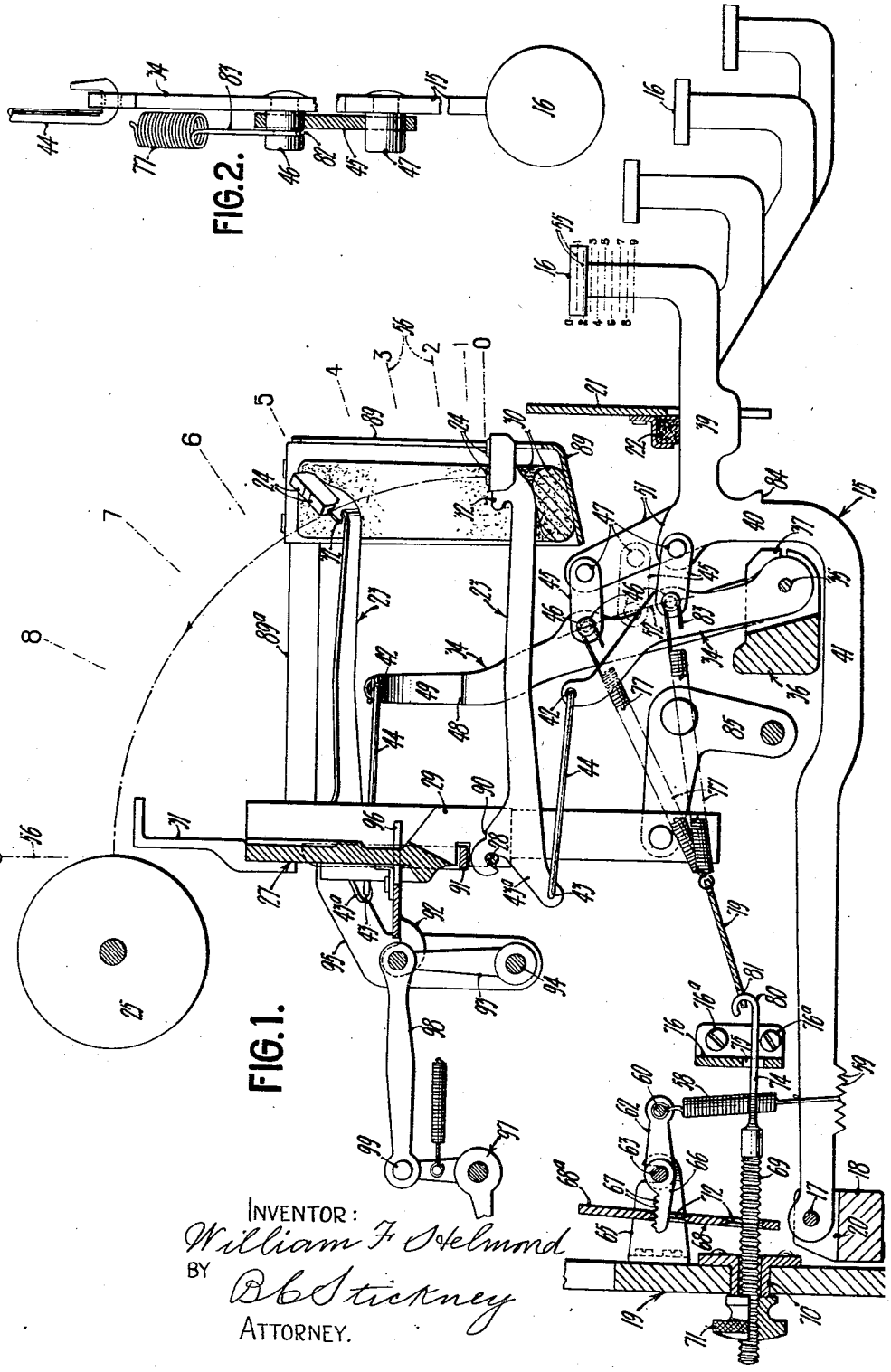


FIG. 1.

FIG. 2.

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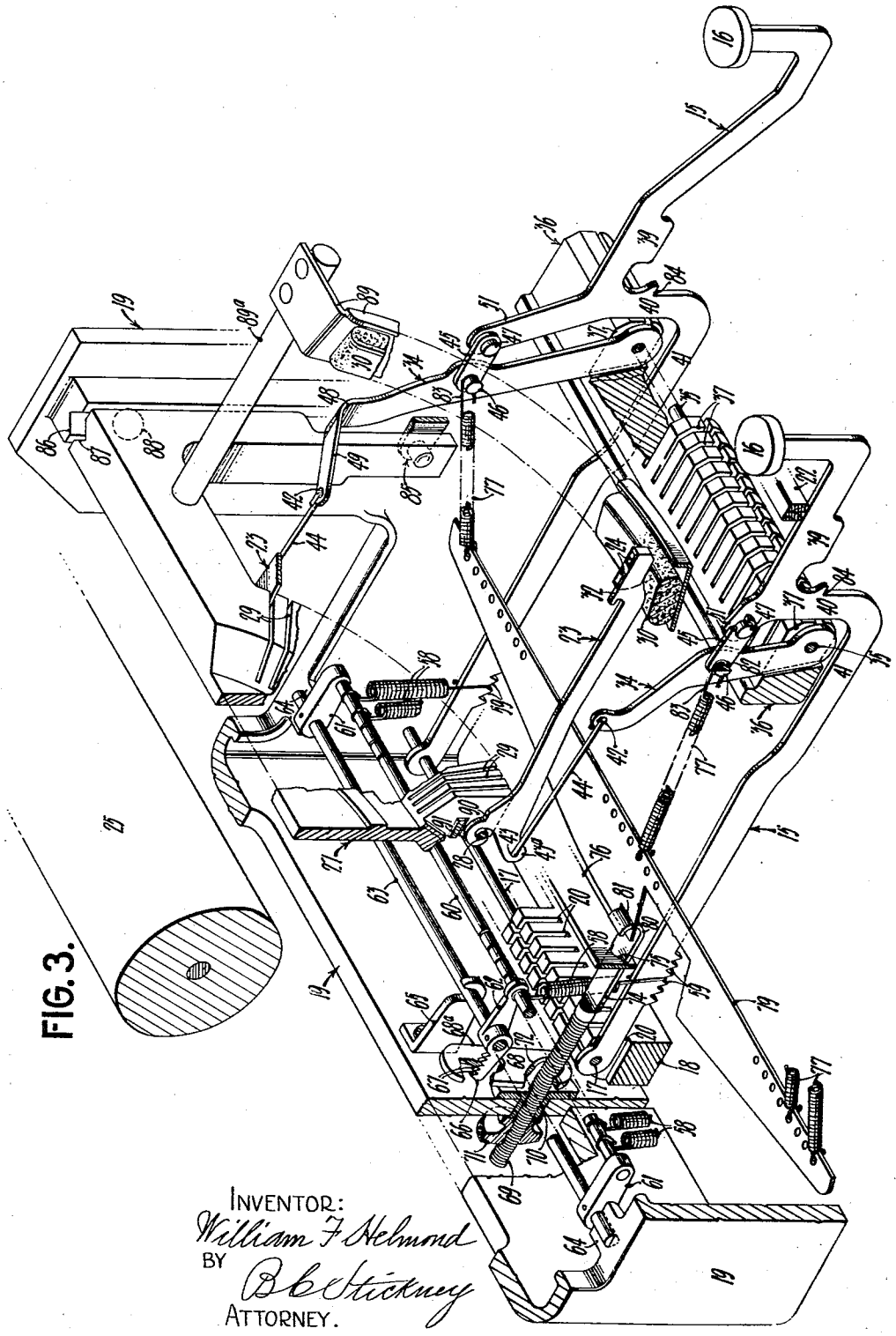


FIG. 3.

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2,178,689

TYPEWRITING MACHINE

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Original application February 23, 1935, Serial No. 7,679. Divided and this application December 5, 1936, Serial No. 114,353

10 Claims. (Cl. 197—33)

This invention relates to typewriter type-actions and will be herein explained with reference to a system of pivoted front-strike type-bars normally cumbent in an arcuate array which curves upwardly from the middle towards the sides of the system, and an associated system of type-key-levers extending individually fore and aft of the machine and disposed in substantially horizontal array below the type-bars.

Connections from the type-key levers to the type-bars include sub-levers. Each sub-lever is connected, at a point between its fulcrum-end and upper type-bar-driving end, to its key-lever by a short link extending forwardly from the sub-lever to an opposite point provided upon the key-lever. The arrangement is such that, during the dip of the key-lever, said short link pulls upon the sub-lever in a direction which becomes increasingly inclined toward a line joining said sub-lever point and fulcrum. The sub-lever and type-bar accordingly start slowly, to make the key-touch easy, at the beginning of the key-stroke, the sub-lever and type-bar speed continuously increasing as the key-stroke progresses at uniform speed, there being, correspondingly, continuously increasing resistance at the key throughout said stroke, thereby producing the desired effect of absorbing the momentum of the operator's hand to cushion the latter at the moment of high-speed-printing impact of the type.

The invention provides improvements pertaining to a system of retracting springs associated with the type-actions. There are employed a set of key-lever springs, and a set of auxiliary springs to aid the key-lever springs as when the purchase of a key-lever upon the sub-lever at the beginning of its return stroke is at a minimum, due to the maximum inclination at that time of the connecting link. The auxiliary springs are therefore arranged to act directly upon the sub-levers and extend from a common anchor-member. The key-lever springs extend from a separate, common anchor-member, and novel means are provided whereby said anchor-members may be jointly or individually adjusted to effect joint or individual adjustment of the tension effects of the two sets of springs, the arrangement furthermore being such that individual adjustment of the several key-lever springs may be effected.

Improved devices are also provided whereby the connection or disconnection of the sub-levers, links and key-levers, as in servicing the machine, is facilitated.

This application is a division of my application Serial No. 7,679, filed February 23, 1935, now Patent No. 2,072,878, dated March 9, 1937.

Other features and advantages will hereinafter appear.

In the accompanying drawings,

Figure 1 is a side-elevation view of the novel type-action and spring-system, and parts of the typewriter related thereto, some of the members being shown in section.

Figure 2 is an enlarged fragmentary plan view, showing details of the arrangement provided to facilitate connection and disconnection of the sub-lever, key-lever and connecting link.

Figure 3 is a perspective view, showing features of the type-action and spring-system in detail, some of the parts being sectioned and broken away for clearness.

Key-levers 15 having type-keys 16, constitut- the usual keyboard, extend rearwardly from the latter to a common fulcrum-rod 17 retained in a cross-bar 18, supported by the partly-shown main frame 19 of the machine. Slots 20 of said cross-bar space the rear ends of the key-levers transversely of the machine. A comb-plate 21, supported by the machine-framework, similarly spaces the key-levers at their forward portions, and may support a cushioning stop 22 which the key-levers abut, Figure 1, to determine their normal positions.

By means of said key-levers, and novel connections which will presently be described, type-bars 23, normally cumbent in arcuate array, as indicated in Figures 1 and 3, are selectively actuated to bring their types 24 to a common printing-point traversed by a platen 25 mounted in a carriage (not shown).

A type-bar segment 27, having an arcuate fulcrum-rod 28, about which the type-bars 23 swing, and also having radial type-bar-spacing slots 29, determines the arcuate type-bar array which curves upwardly from the middle to the sides of the system, and in which array the cumbent type-bars abut an arcuate rest 30. A type-guide 31 upon the segment 27 co-operates in known manner with a nose 32 of any type-bar to gage the printing-point.

The key-levers 15 have their fulcrum-rod 17 at the rear of the machine, somewhat above the base of the machine, as indicated in Figure 1, and are disposed in horizontal array across the machine.

In the means for connecting the horizontally-arrayed key-levers to the arcuately-arrayed type-bars, there is included a system of graded sub-levers 34 upstanding from a common fulcrum-

rod 35, disposed somewhat above the base of the machine, Figure 1, and horizontally retained in a cross-bar 36, which may be supported by the main frame 19. Said cross-bar has slots 37, whereby the lower portions of the sub-levers are disposed in operative alignment with the key-levers 15, the latter being formed with uniform reaches passing first through the comb-plate, as at 39, then downwardly in front of the sub-levers, as at 40, to extend under the sub-lever mounting cross-bar 36 to the key-lever fulcrum-rod 17, as at 41.

The sub-levers 34 are of graded proportions, so that in extending from their common horizontal fulcrum-rod 35, their upper type-bar-driving points 42 conform to the arcuate array of type-bars, and may be connected to points 43 of operating arms 43a of the type-bars by pull-rods 44, the array of sub-levers 34 being disposed forwardly of the type-bar fulcrum-rod 28. For uniformity in the lengths of said pull-rods 44, said operating points 43 of the type-bars may be uniformly disposed relatively to the fulcrum-rod 28, and the sub-levers may be formed so that their upper type-bar-driving points 42 are uniformly disposed relatively to said type-bar-operating arms, as indicated in Figure 1.

In order that the key-touch may be light at the beginning of the key-stroke, and that the speed of the sub-lever 34 and type-bar 23 continuously increases from a slow starting speed while the key-stroke progresses at even speed, each key-lever 15 is connected to the corresponding sub-lever 34 by a link 45. The arrangement is such that said link 45 becomes increasingly inclined to the sub-lever 34, and thereby increases the ratio of movement of the latter to the key-lever movement, as the down key-stroke progresses.

The novel spring-system usable for the type-actions will now be described.

For each key-lever 15 there is an individual restoring spring 58, which by means of notches 59 upon the key-lever may engage the latter at different distances from the key-lever fulcrum-rod 17, to thereby regulate the effect of the spring upon the key-lever. The springs for the several key-levers are connected to a common anchor-rod 60, supported at its ends by arms 61 and at an intermediate point by an arm 62, said arms 61, 62 extending forwardly from and being fastened to a cross-rod 63, removably journaled at its ends in open sockets 64 formed in the main frame 19, as indicated in Figure 3. An arm 65 extending from the main frame 19 is arranged as shown to support the cross-rod 63, at a point intermediate its ends to minimize deflection of said cross-rod 63 and anchor-rod 60 under the pull of the row of springs 58.

Extending rearwardly from and fastened to the cross-rod 63 is an arm 66 having notches 67, in one or another of which a link 68 pendent from said notched arm 66 is caught, said pendent link 68 being similarly caught at its lower end in one or another of notches formed by the threads of a screw 69, which projects forwardly from the main frame 19 and co-operates with said pendent link 68 for adjustably securing the spring-anchor structure comprising the rods 60, 63. Said screw 69 may be guided for endwise adjustment in a bushing 70 and carries a thumb-nut 71 for effecting said adjustment micrometrically. For articulation with the notches 67 of arm 66 and of the screw 69, the pendent link 68 may have sharp-edged openings 72, as indicated in Figures 1 and 3.

By means of a flattened forward extension 74 slidably fitting a guide-slot 75 in a cross-bar 76, supported at the sides of the main frame 19 to which it may be secured by screws 76a, the screw 69 is prevented from turning so that turning of the thumb-nut 71 is effective to move the screw 69 endwise in a forward or rearward direction. Said cross-bar 76 also co-operates to support the screw 69 against deflection under the pull of the pendent link 68. Such endwise movement of the screw 69 shifts the bottom of the link 68 forwardly or backwardly, and thereby causes turning of the spring-anchor frame in the sockets 64 to thereby raise or lower the anchor-rod 60 to vary the tension of all the key-lever springs 58. Thus, by turning said thumb-screw 71 one way or the other, the tension effect of the springs 58 upon all the key-levers is varied, while, for individual adjustment of the tension effect upon each key-lever, the lower end of the corresponding spring 58 may be adjusted along the key-lever notches 59.

Referring to Figure 1, it will be obvious that the effect of the key-lever spring 58 is at a minimum for starting the return of the type-action, in so far as the purchase of the key-lever upon the sub-lever 34 is at a minimum due to the maximum downward inclination of the link 45 to the sub-lever at that time. For reinforcing the effect of the key-lever springs 58 at the start of returning the type-action, there is provided a system of auxiliary springs 77, arranged to act directly upon the sub-levers 34. Each auxiliary spring 77 may accordingly be attached at one end to a stud 46 which, as indicated in Figures 1 and 3, also serves as the link-pivot 46 upon the sub-lever. The other ends of the set of auxiliary springs 77 may be attached to a common anchor-plate 79, which, for adjustment to vary the tension of all the auxiliary springs 77, may be connected to the screw 69, the flattened portion 74 of the latter having for this purpose a hooked end 80 engaging a companion slot 81 in said auxiliary spring-anchor plate 79.

It will be seen that a quick or pronounced change or adjustment of the tension effect of the key-lever springs 58 may be made by pressing downward at the upper end 68a of the link 68 to free its lower end from the screw 69, and then tilting said link forward or backward to change stepwise the location of said lower link-end along the screw 69, to raise or lower the spring-anchor rod 60. In this way quick and rough or approximately correct adjustment of the tension effect or stretch of the key-lever springs 58 may be made first, and then the thumb-nut 71 may be turned to make a finer adjustment of the tension effect of the key-lever springs 58. It will also be seen that, by turning the thumb-nut 71, the tension effect of the key-lever springs 58 and the sub-lever auxiliary springs 77 may be adjusted jointly, provided the link 68 remains in engagement with the screw 69. The sub-lever or auxiliary springs 77 may also be adjusted without changing the tension effect of the key-lever springs 58. In such case the thumb-nut 71 would be turned until the desired tension effect of the auxiliary springs 77 is obtained, the link 68 being manipulated either to restore the lower link-end, after the thumb-nut 71 is turned for the auxiliary spring adjustment, or to hold said lower link-end clear of the screw 69, while the thumb-nut 71 is turned to effect the auxiliary spring adjustment. It will also be seen that movement of the lower

end of the link 68 along the screw 69 will cause raising or lowering of the key-lever spring-anchor rod 60 to extents which will vary in accordance with the particular notch 67 of arm 66 which the link 68 depends from.

For facilitating connection and disconnection of the links 45, the sub-levers 34 and the key-levers 15, the studs, which constitute the link-pivot points 46 and 47 and which have the same reference numbers as said pivot-points, may be made without enlarged heads, and, in lieu of said enlarged heads, said studs may extend substantially beyond the outer side of the link, as indicated in Figure 2. Adjacent said outer link-side the link-pivot stud 46 may have a groove 82 into which an elongately looped end 83 of the auxiliary or sub-lever spring 77 is hooked to keep the link 45 in place. Thus, when the auxiliary spring-end 83 is unhooked from the pivot-stud 46, the link 45 may be readily disconnected from or reconnected to the sub-lever and key-lever to facilitate servicing of the machine. With the links 45 disconnectible and reconnectible as described removal and replacement of any key-lever 15 is facilitated, it being noted that to this end the key-lever reach 39, 40, 41, from the keyboard to the key-lever fulcrum-rod 17 is arranged to pass under the array of sub-levers 34 and other parts. The vertical portions 40 of the key-lever reaches may present shoulders 84 engageable by a key-locking device not shown.

It will be noted that, by using the pull-rods 44 to connect the type-bars 23 and sub-levers 34, the latter are disposed well forward in the machine, so that, correspondingly, the links 45 are easily accessible for removal or replacement. There is also gained by such forward disposal of the sub-levers adequate extent of stroke at the link-pivot point 47 on the key-levers.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. In a typewriter type-action mechanism having a set of type-carriers, the combination of a set of type-key levers, a set of restoring springs for said key-levers, a set of sub-levers connected to the type-carriers, sub-lever-accelerating connections between the sub-levers and key-levers wherefore the restoring effect of a key-lever spring is at a minimum at the beginning of a key-lever return stroke, a set of auxiliary springs arranged to act substantially upon said sub-levers to aid such minimum restoring effect of the key-lever springs, and spring-regulating means including devices selectively manipulatable to adjust the forces of said sets of key-lever and auxiliary springs jointly, or to adjust the force of either set of springs separately.

2. In a typewriter type-action mechanism having a set of type-carriers, the combination of a set of type-key levers, a set of restoring springs for said key-levers, a set of sub-levers connected to the type-carriers, sub-lever-accelerating connections between the sub-levers and key-levers wherefore the restoring effect of a key-lever spring is at a minimum at the beginning of a key-lever return stroke, a set of auxiliary springs arranged to act substantially upon said sub-levers to aid such minimum restoring effect of the key-lever springs, a support, a rod adjustable endwise in said support, screw-means being provided for adjusting said rod, and anchor-means to which the set of key-lever springs and set of auxiliary springs are connected, said anchor-means being in turn connected to said rod for joint adjustment of said sets of springs by means of said rod.

3. The invention as set forth in claim 2, the connection of said anchor-means to said rod being arranged to also permit separate adjustment of said sets of springs.

4. In a typewriting machine, the combination with a set of type-actions and a set of restoring springs therefor, of a common and movable anchor-structure for said springs, a support, a screw-rod projecting from said support, and connecting means from said anchor-structure to the projecting part of said screw-rod, said connecting means being adjustable along the screw-rod threads, and said screw-rod, by means of its threads, being adjustable together with said connecting means, to project more or less from said support, whereby said anchor-structure may be adjusted for varying the force of said springs.

5. In a typewriting machine having a set of type-actions, the combination of a set of type-action restoring springs, a support, a structure to which all of said springs are anchored and which is tiltably mounted in said support, a link for holding the anchor-structure, and means whereby said link may be differentially placed between said support and anchor-structure, to thereby cause the latter to be tilted to different positions for adjusting the spring force.

6. In a typewriting machine having a set of type-actions, the combination of a set of type-action restoring springs, a support, a structure to which all of said springs are anchored and which is tiltably mounted in said support, a link for holding the anchor-structure, and means whereby said link may be differentially placed between said support and anchor-structure, to thereby cause the latter to be tilted to different positions for adjusting the spring force, said link-placing means including a rod retained in said support and having a notched portion extending therefrom, said link being arranged to engage different notches along said rod-portion to effect said differential placing of the link.

7. In a typewriting machine having a set of type-actions, the combination of a set of type-action restoring springs, a support, a structure to which all of said springs are anchored and which is tiltably mounted in said support, a link for holding the anchor-structure, and means whereby said link may be differentially placed between said support and anchor-structure, to thereby cause the latter to be tilted to different positions for adjusting the spring force, said link-placing means including a rod retained in said support and having a notched portion extending therefrom, said link being arranged to engage different notches along said rod-portion to effect said differential placing of the link, means being also provided for effecting micrometic endwise adjustment of said rod in said support.

8. In a typwriting machine, the combination with a system of type actions, of a set of springs operatively connected to corresponding ones of said type-actions, a common anchor member for the springs, a support, and means, including two connections between said support and anchor member, whereby said anchor member is adjustably maintained on said support, one connection being arranged to be adjustable stepwise to move the anchor member in pronounced steps in such direction as to obtain pronounced variations in the spring stretch or force, and the other connection being arranged to be adjustable micrometrically to move the anchor member corre-

spondingly to adjust finely the spring stretch or force obtained by means of the first connection.

9. In a typewriting machine or the like, a system of individually operable parts, a set of springs operatively connected to corresponding ones of said parts, a spring anchor common to said springs, and means supporting said anchor for movement in spring-stretch-varying direction, said means including a support, an adjustable screw device carried by said support, and a link connection between said anchor and screw device, said link connection being adjustable to position variably said anchor relatively to the screw device to determine roughly the spring stretch, said screw device being adjustable to regulate micrometrically the roughly determined spring stretch.

10. In a typewriting machine or the like, the combination with a system of movable parts, two sets of springs for said system, each part having operatively connected thereto one spring of each of said sets, two anchor members each common to a corresponding set of said springs, and means for adjustably holding said anchor members, said means including a support, a screw device carried by said support, said anchor members each having a connection to said screw device, the connection of one of the anchor members to said screw device being adjustable to adjust said one anchor member relatively to said screw device to adjust the spring stretch or force of the corresponding set of springs, said screw device being adjustable to adjust both anchor members jointly to adjust jointly the stretches or forces of the two sets of springs.

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