Oct. 8, 1940. A. W. MILLS 2,217,179

RECORD CONTROLLED MACHINE

Original Filed Sept. 11, 1937

FIG. 1.

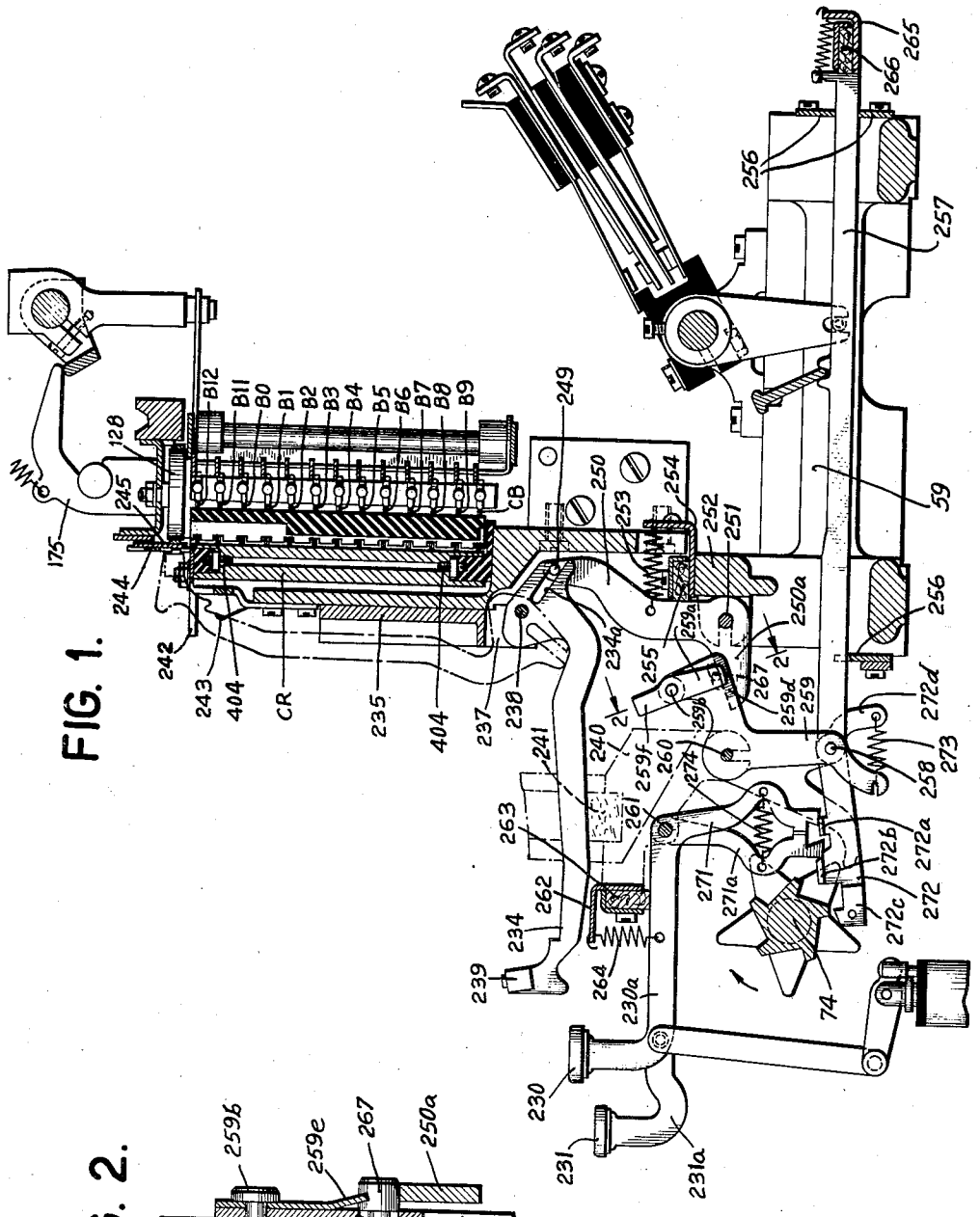


FIG. 2.

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RECORD CONTROLLED MACHINE

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Original application September 11, 1937, Serial No. 163,385. Divided and this application March 9, 1938, Serial No. 194,740

7 Claims. (Cl. 197—27)

This application is a division of application Serial No. 163,385, filed September 11, 1937, by Albert W. Mills.

The broad object of the invention disclosed in the present application is to improve the printing mechanism of a record controlled machine.

Another object is to provide improved type bar operating means whereby the types produce more even impressions.

Another object is to provide an improved type bar operating mechanism suitable for use in typewriting machines and similar machines employing pivoted type bars which swing in an arc to effect an impression.

An object is to provide a simple means for adjusting the stroke of the type bars and compensating for the varying lengths of the sub-levers which operate the type bars.

Further objects of the instant invention reside in any novel feature of construction or operation or novel combination of parts present in the embodiment of the invention described and shown in the accompanying drawing whether within or without the scope of the appended claims and irrespective of other specific statements as to the scope of the invention contained herein.

In the drawing:

Fig. 1 is a vertical section showing a type bar and its operating mechanism.

Fig. 2 is a section along the line 2—2 of Fig. 1.

The invention is disclosed in the drawing as applied to a machine forming the subject matter of the above Mills application. However, it is not limited in application to the specific machine selected for purposes of illustration but is applicable to typewriters, printing telegraph machines and other machines employing conventional type bar actions of the sort commonly used in typewriting machines.

The Mills application discloses a machine wherein a perforated accounting and statistical record card is sensed by electric sensing brushes designated B—0 to B—12 in Fig. 1, which reach through the holes representing data in the columns of the record card and make contact with a contact roller CR. The latter is pivotally mounted on studs 404 which support the contact roller with the axes of rotation vertical. The studs are insulatably mounted and a common brush CB is provided to connect the contact roller to the control circuits of the machine. The perforated record card is fed horizontally between contact rolls CR and brushes B—0 to B—12, inclusive, by means of escapement mechanism not shown but of a conventional form commonly used in typewriting machines. The brushes B—0 to B—12 sense one column of the card at a time and control circuits which cause the typing mechanism hereinafter to be described to become operative to print along the top edge of the card the letters or numerals which the holes in the card columns designate. The brushes and contact roller are so disposed in relation to the typing mechanism that each letter or numeral is printed at the head of the column in which the corresponding hole appears. A suitable carriage is provided for feeding the cards, one by one, past the brushes B—0 to B—12, and includes arms like 175, Fig. 1, having fingers (not shown) engaging the ends of the card. Since the construction of the carriage and the escapement mechanism therefor forms no part of the present invention it has not been disclosed. For a more complete understanding thereof reference may be had to the Mills application.

Printing mechanism

Printing of letters and numerals along the upper edge of the card is effected by means of a series of type bars 234 of more or less conventional form which are operated by the actuator 74 under control of keys 230, 231. The actuator 74 is continually rotated in the direction of the arrow in Fig. 1 by a suitable motor. Type bars 234 are pivotally mounted in a segment 235 secured to the front face of an offset portion of a cross frame 60a forming part of the man framework. Only one of the type bars 234 appears in Fig. 1. The type bars are pivoted on a segment 235 in a manner well known in the typewriter art, that is, the lower edge of the segment is arcuate in contour and provided with slots 237 radial of the center of curvature of the lower edge of segment 235, in which slots the type bars are pivoted by means of a curved wire or rod 238 mounted in a groove cut in the rear face of segment 235 and concentric with the lower edge of said segment. The wire 238 is removably held in place by means of suitable screws not shown. A segment of the type shown is sometimes called a "wire segment" because of the manner in which the type bars are pivoted to the segment.

Each type bar has a type head 239 on which is embossed or swaged a single type character. Normally, the type bars 234 lie in a substantially horizontal position and are supported by a suitable cross frame 240 shown by broken lines in Fig. 1. This frame 240 has its upper part curved concentrically with the lower edge of the segment 235 and secured in a groove or channel in

this curved part of frame 240 is a rebound pad 241 of any suitable construction upon which pad the type bars rest. This pad reduces noise and prevents rebounding of the type bars when they are restored.

The type bars, as usual in the typewriter art, swing in an arc of a circle of approximately 90° when operated in the manner hereinafter described, to strike the upper edge of the card at a point directly in front of the platen 128. The striking position is shown by broken lines in Fig. 1. The platen is a disc pivoted on a stud carried by a bracket 127. The latter is secured to the lower carriage rail 56a. The platen is faced with resilient material.

In order to secure accurate alignment and spacing of the printed characters, there is secured to the front face of segment 235, adjacent the upper edge, a type bar guide 242 which is bifurcated to guide the type heads 239 when they strike the card. A leaf spring 243 is secured to the front face of the upper end of frame 60a above segment 235 and serves to reduce shock, minimize noise, and ensure that sticking of the type bars in the guide 242 cannot occur. The guide 242 also has two rearwardly bent lugs 242b supporting a ribbon guide 244 (Fig. 1) which guides the inking ribbon 245.

Each type bar 234 is slotted at 234a as shown in Fig. 1 to receive a pin 249 carried by one arm of a type bar operating sub-lever 250. The sub-levers 250 are pivoted on a wire 251 laid in a horizontal straight groove cut lengthwise of a cross piece 252 forming part of a frame 59, each sub-lever 250 being mounted in a vertical slot cut in cross piece 252. Springs 253, each anchored to a lever 250 and to an angle strip 254 secured to cross piece 252, hold sub-levers 250 against the edge of a strip of "Bakelite" or similar material 255 secured to the top of angle strip 254 by the screws which secure said strip to said cross piece. The strip 255 helps to prevent rebound of sub-levers 250 and their associated type bars and also makes these parts operate quietly.

The vertical arms of sub-levers 250 carrying the pins 249 vary in length and are bent to right or left of the planes of the horizontal arms to compensate for the varying heights of the type bars 234 above cross piece 252, due to the curved shape of the lower edge of segment 235. Obviously, counterclockwise movement of any sub-lever 250 (Fig. 1) will cause the associated type bar 234 to be rocked in a clockwise direction due to the camming effect of pin 249 on the walls of the slot 234a in the type bar.

Slidably mounted in three combs 256 supported by frame 59 is a plurality of slide bars 257, the forward ends of which are pivoted at 258 to the vertical arms of bell cranks 259. The latter are pivoted on a wire 260 secured in a horizontal groove cut in frame 240 and mounted in vertical slots cut in the frame 240. The wires 251 and 260, like the wire acting as pivot for type bars 234, are held in their respective slots by suitable screws. The above described method of mounting type bars 234 and levers 250, 259, greatly facilitates assembly, repair, and replacement of the type bars and levers.

The key levers 230a, 231a of keys 230, 231 are pivoted in frame 240 by means of a wire 261, the keys being mounted in the same slots which receive levers 259. Secured to the front of frame 240 is an angle bar 262 and "Bakelite" strip 263 like the angle bar 254 and strip 255. Anchored to angle bar 262 are springs 264 attached to the key levers 230a, 231a. Springs 264 normally hold the key levers 229b against the strip 263, which acts as a sound deadening adjustable stop, and said springs return the keys to normal position after being depressed. A similar angle strip 265 is secured to the rear edges of frames 54 and 55 and carries a "Bakelite" strip 266 acting as a stop for the bars 257, against which strip the rear ends of said bars normally abut.

Each lever 259 has a rearwardly and upwardly extending arm 259a on which is mounted a pin 267 which overlies and is in contact with the forwardly extending arm 250a of one of the sub-levers 250. When a slide bar 257 is drawn forward, that is, to the left (Fig. 1), its associated lever 259 will be rocked clockwise thereby rocking the associated sub-lever 250 counterclockwise, and the operated sub-lever 250 will in turn propel the corresponding type bar 234 toward printing position. There is a bar 257, a lever 259, a sub-lever 250, and a type bar 234 associated with each of the keys 230, 231.

Slide bars 257 are operated by power derived from the actuator 74 and for that purpose may be selectively coupled to said driver by means of the keys 230, 231. The actuator 74, as shown in Fig. 1, is shaped in section like a ratchet wheel having five teeth and closely resembles a straight reamer with five flutes in general appearance. It constantly rotates in suitable bearings carried by the framework and extends crosswise of the machine almost directly in front of the forward ends of slide bars 257 and beneath all the key levers 230a, 231a.

Each key lever 230a, 231a has a downwardly extending arm 271. Pivoted to each slide bar 257 at 258 is an operating hook 272 having two bent-over lugs 272a, 272b, a hook shaped portion 272c, and an arm 272d. A spring 273, connected to each arm 272d and an extension of lever 259, normally tends to rock each hook 272 clockwise to hold lug 272a against the lower end of one of the arms 271. When the operating hooks 272 are in this position, both the lugs 272b and the hook portions 272c are clear of the ribs formed by the flutes in the actuator 74.

Associated with each arm 271 is a second arm 271a which is pivoted on arm 271. Both arms 271, 271a of each key are notched at their extreme lower ends to provide a recess which confronts the lug 272a immediately below. Arm 271a extends slightly further downwardly than arm 271. A spring 274 connected to both arms 271, 271a tends to draw said arms toward each other to hold a bent-over lug in arm 271a in contact with a projecting part of arm 271.

When a numerical key 230 or letter key 231 is manually depressed, its arm 271 moves rearwardly (or to the right in Fig. 1) until arm 271a catches on the front edge of lug 272a and is stopped. This creates a space into which lug 272a slips, thereby releasing the associated operating hook 272 which will then be rocked slightly clockwise by its spring 273. As a result the hook portion 272c will slip into one of the flutes or grooves in actuator 74 and eventually will be positively engaged by a rib. As the actuator continues its rotation, the operating hook 272 and its slide bar 257 will be drawn to the left thereby operating the type bar 234 corresponding to the selected key to print the selected letter or numeral on the top edge of the card.

During movement of the selected operating hook to the left, its lug 272b will be carried into

the path of the next succeding rib on the actuator **74** and will be engaged by such rib with the result that the hook portion **272c** of the operating hook will be gradually cammed out of engagement with the actuator, this action occurring after the type bar has moved approximately 45°, so that the actual impression on the card is made with a hammer blow due to inertia of the type bar.

Also while operating hook **272** is moving to the left, arm **271***a* will be pushed forwardly or to the left (Fig. 1) by lug **272***a* to a position slightly beyond the normal position of arm **271***a*. When the hook is cammed downwardly due to lug **272***b* engaging a rib on the actuator, arm **271***a* will be freed from the lug **272***a* and be drawn by its spring **274** back into engagement with arm **271** and will then occupy a position above lug **272***a*, which at this time will have been displaced to the left the maximum distance.

Assuming that the selected key has been promptly released by the operator, spring **253** will now restore arms **250**, **259**, slide bar **257**, and hook **272** to the position of Fig. 1. While hook **272** is moving to the right, lug **272***a* will pass underneath the lower end of arm **271***a* which will, by engaging said lug, prevent reengagement of the hook portion **272***c* and lug **272***b* with the ribs on the actuator **74**. When the hook **272** arrives in the position of Fig. 1, the lug **272***a* will slip off the end of arm **271***a* and rise slightly to resume its position behind the arm **271***a* and abutting the end of arm **271**.

If the operator should hold a key down too long, either deliberately or by failure to promptly remove his fingers from the keys, or if sticking should prevent prompt return of the selected key to normal position, arm **271***a*, when freed from lug **272***a*, will be drawn by spring **274** to the right of the normal position of arm **271***a*. In this position arm **271***a* will overlie lug **272***a* and hold the hook **272** out of engagement with the ribs of the actuator **74** when said hook is almost fully returned to its normal position. Upon release of the key, it will be moved by its spring **264** back to the position of Fig. 1, lug **272***a* rising to its normal position behind the lower end of arm **271***a* when the key reaches its normal position.

The purpose of arm **271***a* is to prevent repeated operation of a type bar in case a key is held down too long, or slight sticking may make the keys sluggish in returning to normal position. This result is obtained by making arm **271***a* slightly longer than arm **271** and by making the recess formed by the notches in the ends of arms **271**, **271***a* when said arms are in normal position too small to ordinarily receive lug **272** so that the arms must be moved apart far enough to expand the recess sufficiently to allow the lug **272***a* to enter such recess. Obviously, the only time the recess can be expanded is when arms **271**, **271***a* are in the normal position of Fig. 1 with lug **272***a* behind the lower end of arm **271***a*.

It is customary in typewriting mechanisms to propel the type bars positively to a predetermined point in front of the platen and then permit the type bar to move the remaining distance by virtue of the kinetic energy stored therein by the propelling means which, in the present case, is the power actuator **74**, the object being to effect the impression of the type by percussion in order to produce a clear impression. The point at which kinetic energy takes effect is variable in commercial machines and depends largely upon such factors as the mass of moving parts such as the type bar and other parts in the train of operating connections. As a general rule, the type bar is positively driven through 85% or 90% of its stroke and the remaining 10% or 15% is effected solely by the kinetic energy stored in the type bar, the propelling means ceasing to control the type bar during the period in which it is under the influence of kinetic energy. While the point at which kinetic energy takes effect is variable in different machines, for the same machine it is approximately constant for all type bars.

Owing to the fact that it is necessary to make the sub-levers **250** of graduated lengths and also to bend them toward the segment, it is necessary to use separate blanking and forming dies for each individual sub-lever. Naturally, even with precision manufacture of the sub-levers, type bars, and other parts in the train of operating connections, small inaccuracies occur, particularly in the sub-levers, which have the effect, in the assembled machine, of causing variations in that portion of the stroke of the type bar which is effected positively. In other words, the type bar actuating means is likely to move the type bars different extents before relinquishing control of the type bars for further movement thereof by virtue of kinetic energy stored therein. This means that the point at which kinetic energy takes effect to complete the stroke of the type bars is different for each type bar and is dependent upon such inaccuracies of manufacture as may be present in the type bars and their operating connections.

Another fact of importance is that the areas of the type faces vary considerably whereby, to produce clear impressions, it is desirable that the type bars strike the platen with a force which is commensurate with the area of the type face; otherwise, the characters of small area will tend to emboss the paper or card in front of the platen whereas the characters having a large area of type face may receive only enough impulsive force to cause them to print clearly. In commercial machines, the point at which kinetic energy takes effect to complete the stroke of the type bars, while variable for different makes, is predetermined by design of the type bars and operating connections so that all type bars strike so heavily as to make the impressions uniform. In other words, some type bars will receive an excessive impulsive force in order that the impressions may be uniform, the object being to cause the type bars to strike with such force as to obliterate any tendency to produce non-uniform impressions. As a result, many type bars operate more noisily than others and have a tendency to emboss the work sheet, which in the present machine is a card.

In order to compensate for the variations in the length of the sub-levers **250**, made necessary by the fact that the type bars **234** are located on different levels, and for inaccuracies of manufacture, and at the same time to minimize the noise of impact of the type bars on the card, means is provided whereby the stroke of the type bars under the influence of the power operating mechanism may be adjusted after the machine has been assembled. The adjustment of the strokes of the type bars is effected by movably mounting the pins **267** on the levers **259** whereby the radial distances of the pins **267** from the center of pivot wire **260** may be varied commensurately with the length of the associated sub-lever **250**, any inaccuracies that may be present in the train of operating connections between the associated type bar and the power mechanism, and in accordance

with the type face area of the character carried by the type bar.

For the purpose of adjusting the radial distance of each pin **267** from center of wire **260**, the pin is mounted upon an arm **259***a* which is pivoted to the lever **259** by means of a rivet **259***b*. The pin **267** extends through an arcuate slot **259***c* formed in the lever **259** whereby the arm **259***a* may be rotated so as to move the pin **267** radially of the wire **260**. In order to retain the arm **259***a* in its adjusted positions, the lower end of the arm **259***a* is serrated as at **259***d* and the lever **259** is correspondingly serrated to interlock with the serrations in the end of arm **259***a*. The pin **267** has a slot cut in the upper side thereof receiving the notched end of a leaf spring **259***e* which is loosely secured to the lever **259** on the side thereof opposite to the arm **259***a* by means of rivet **259***b*. By moving the lower end of arm **259***a* to the left in Fig. 2, sufficiently far to disengage the serrations **259***d* thereon from the serrations in lever **259**, the arm **259***a* may be rocked either clockwise or counterclockwise (Fig. 1) to decrease or increase, respectively, the stroke of the associated type bar **234**. It is obvious from Fig. 1 that moving the pin **267** toward the wire **260** will shorten the radial distance from the center of wire **260** to pin **267** and thereby shorten the stroke of the type bar **234**. On the other hand, if the pin **267** is moved to the right in Fig. 1, the radial distance from wire **260** to said pin will be increased and a longer stroke will be produced in the type bar. In other words, moving the pin **267** to the right or left will have the effect of changing the driving ratio between lever **259** and the arm **250***a* of sub-lever **250**.

It will be noted that the rotation of the arm **259***a* on the rivet **259***b* will have an inconsequential effect upon the normal position of the type bar because the edge of the arm **250***a* which contacts with the pin is tangent to the arc of a circle containing the point of contact of pin **267** with said arm and with its center in the axis of rivet **259***b*. Any slight tendency for rotation of the arm **259***a* to affect the normal position of the type bar **234** may be prevented by making the upper edge of arm **259***a* curved to correspond to an arc of a circle generated by the point of contact of pin **267** with the arm **250***a* when arm **259***a* is rotated. The arm **259***a* is formed with a tab or shank **259***f* which extends upwardly and provides a means whereby the arms **259***a* may be adjusted with a suitable tool after the machine has been assembled.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a single modification, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. In a type bar action, a pair of cooperating levers forming part of the train of connections between the type bar and its operating means, one of said levers being actuated by the other; an arm pivotally mounted on one of said levers and engaging the other of said levers, said arm being rotatable to vary the driving ratio between said levers, said arm and the lever on which it is mounted having serrated portions coacting to hold the arm in any one of a plurality of adjusted positions to which said arm may be rotated; and means to yieldingly hold the serrated portions in engagement.

2. In a type bar action, a pair of coacting levers in the train of operating connections to the type bar; a member movably supported by one of said levers and engaging a portion of the other lever whereby when one lever is moved the other is moved by the first lever, said member and its supporting lever both having serrations whereby said member may be locked to the supporting lever in any one of a plurality of positions each of which causes the second lever to be moved an extent different from the extents of movement with said member in other positions on the supporting lever; and yielding means to hold the serrated portions of the member and its supporting lever in engagement.

3. In a type bar action, a pair of cooperating levers forming part of the train of connections between the type bar and its operating means; an arm pivotally mounted on one of said levers and engaging the other of said levers, said arm being rotatable to vary the driving ratio between said levers, said arm and the lever on which it is mounted having serrated portions coacting to hold the arm in any one of a plurality of adjusted positions to which said arm may be rotated, said arm having a portion thereof adapted for manually changing the position of the arm by means of a suitable tool; and means to yieldingly hold the serrated portions in engagement.

4. In a type bar action, a pair of coacting levers forming part of a train of connections between the type bar and its operating means; a member movably mounted on one of said levers and engaging the other, said member being manually selectively movable to any one of a plurality of positions to change the point of engagement of the member with the other lever whereby to vary the driving ratio between said levers; means to hold the member in any one of its set positions releasable by a movement of the member relative to its supporting lever transversely of the direction of the movement to vary the driving ratio, and means to yieldingly hold the member in any one of its positions of adjustment.

5. In a type bar action, two cooperating levers forming part of a train of connections between the type bar and its operating means, an element interposed between said levers and adjustably movable to vary the driving ratio between said levers, means to movably mount said element on one of said levers, interlocking means on said element and on the lever on which it is mounted for yieldingly holding said element in any of its adjusted positions, and yielding means for normally maintaining the interlocking means effective, said yielding means permitting manual adjustment of the element by an initial movement of said element laterally of the lever to disengage the interlocking means followed by movement of the element parallel with the plane of the lever to the desired position, said yielding means being effective to reengage the interlocking means when said element is released.

6. In a type bar action, a pair of cooperating levers, one connected to the type bar and the other to the type bar actuating means; an arm mounted on one of said levers and engaging the other lever, said arm being manually rockable in a plane parallel with the planes in which the levers rotate; toothed means for holding said arm in any one of a plurality of positions to

which said arm may be manually rocked, said positions defining different driving ratios between said levers, said toothed means being releasable by a movement of said arm in a plane at right angles to the planes of the levers; and yielding means opposing the releasing movement of the arm.

7. In a type bar action, a pair of coacting elements in the train of operating connections to the type bar, one of said elements being operable by the other to actuate the type bar; a member movably supported by one of said elements and engaging a portion of the other element whereby, when one element is moved the other is moved by the first element, said member and its supporting element both having serrations whereby said member may be locked to the supporting element in any one of a plurality of positions, each of which causes the second element to be moved an extent different from the extents of movement with said member in other positions on the supporting element, said member having a portion thereof adapted to be engaged by a suitable tool for manually adjustably moving said member relative to its supporting element; and means to hold the serrated portions of the member and its supporting element in engagement.

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