March 12, 1946. R. VON REPPERT 2,396,401

TYPEWRITING MACHINE

Original Filed Dec. 11, 1943 2 Sheets-Sheet 1

FIG. 2.

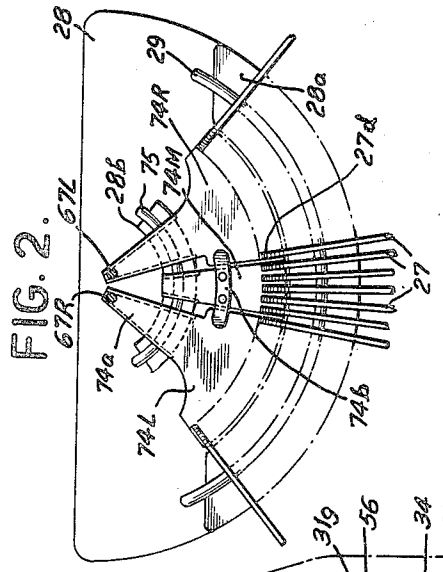


FIG. 1.

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TYPEWRITING MACHINE

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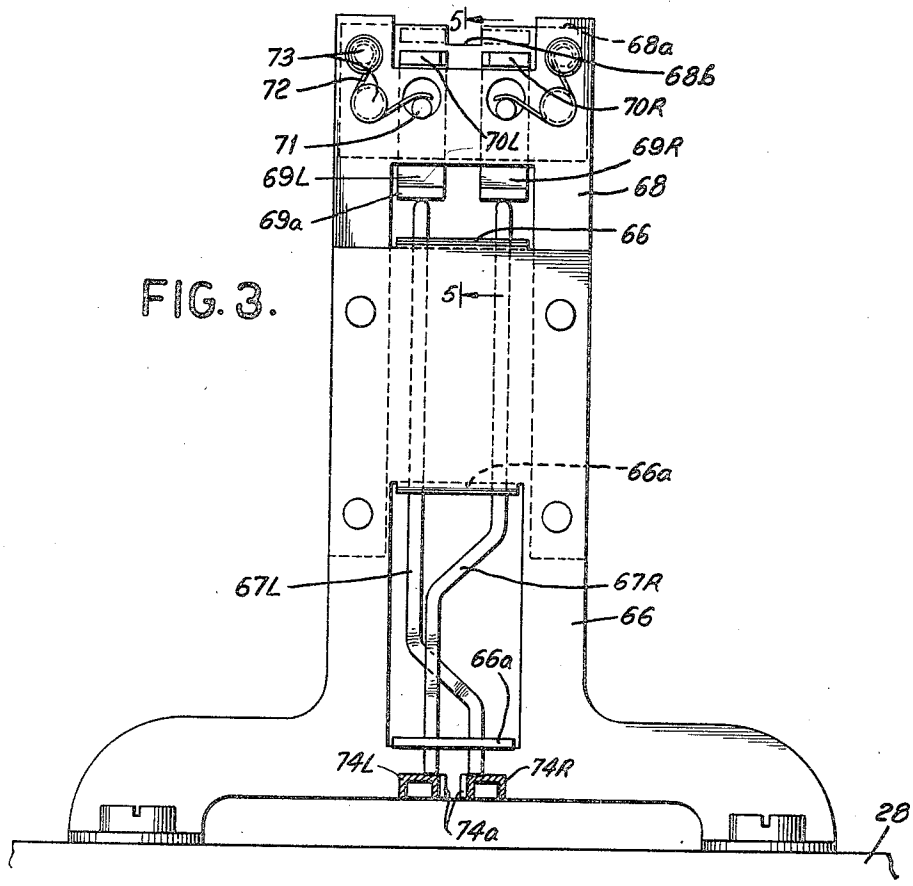


FIG. 3.

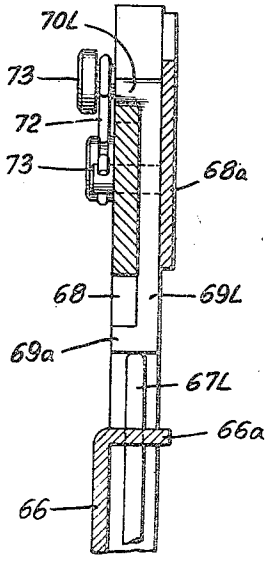


FIG. 5.

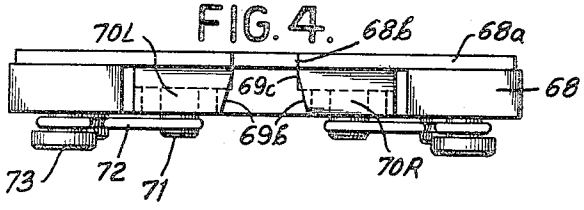


FIG. 4.

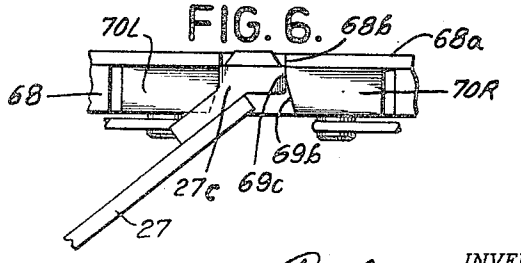


FIG. 6.

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UNITED STATES PATENT OFFICE

2,396,401

TYPEWRITING MACHINE

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Original application December 11, 1943, Serial No. 513,939. Divided and this application September 1, 1944, Serial No. 552,245

3 Claims. (Cl. 197—43)

This invention relates to typewriting machines.

This is a division of application Serial No. 513,939, filed December 11, 1943, by Richard v. Reppert, containing claims to the type bar action, whereas the present application claims the type bar aligning means.

The primary object of the present invention is to provide a novel type bar aligning means for typewriting machines.

An object is to provide a type bar aligning device suitable for use in noiseless typewriters in which type elements strike the work sheet at various angles, instead of at right angles as in machines having the type bars pivoted so that the type elements travel in arcs of circles intercepting the printing plane normally.

An object is to provide a type aligning device or guide which eliminates the necessity of providing a complexly milled type guide at the printing point to accommodate every possible angle of approach of a type member to the platen.

An object is to provide a type guide or aligning device which permits a larger angle of approach of the type member to the platen in order to thereby permit a larger number of type members to be used.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated of applying that principle.

Fig. 1 is a vertical section;

Fig. 2 is a large scale horizontal section on the line 2—2 in Fig. 1;

Fig. 3 is a large scale front elevation of the aligning means;

Fig. 4 is a plan view of the aligning means;

Fig. 5 is a vertical section on the line 5—5 in Fig. 3;

Fig. 6 is a plan view similar to Fig. 5 and showing a type bar under the control of the aligning means at the moment of impact.

Fig. 1 illustrates in vertical section a machine embodying the novel type bar action and type bar aligning means of the present invention. In this view the numeral 10 designates in dot-dash outline a portion of the base or housing frame which supports various cross frames and support bars carrying the mechanism. The numeral 11 designates one of the keys of the keyboard which keys are guided at their front or righthand ends (Fig. 1) in a key comb 12. The latter also supports a sound deadening strip 13.

Each key 11 is somewhat T-shaped in general shape (Fig. 1) and one end of the crossbar of the T is formed with a hooked shaped portion 11a by means of which the key 11 is pivotally suspended from a fulcrum bar 14 secured to an angle strip 15 suitably mounted in the base 10. The fulcrum bar 14 also has secured thereto a comb 16 which spaces the key extensions 11a of all the keys apart. The portion 11b of the crossbar of each key 11 extends downwardly and is slotted to embrace a pin 17a on the trip lever 17b of a cam unit generally designated 17. There is provided a cam unit 17 for each key 11 and its associated type bar. The cam units are of a conventional form well known in the art and are pivotally supported by a fulcrum wire 18 carried by a crossbar 19 mounted in the base 10. The cam units 17 have cams 17c which cooperate with a power roller 20 which rotates continuously in the direction of the arrow in Fig. 1 while the machine is in use.

When a key 11 is depressed, the extension 11b rocks the trip lever 17b counterclockwise (Fig. 1) and causes the cam 17c to become operatively engaged with the power roller 20 in a well known way. The power roller, by rotating the cam 17c a half revolution, effects clockwise rotation of the cam unit 17.

The cam units 17 are connected by links 21 (Fig. 1) to intermediate levers 22 pivoted at 23a to short bars 23. The bars 23 are received in horizontal slots in a crossbar 24 secured in the base 10 and are individually clamped in said slots by any suitable means such as a screw 25 and a suitable washer, the screws 25 being received in threaded holes in the crossbar 24. By this construction, the short bars 23 may be adjusted horizontally a limited extent. Counterclockwise movement of the intermediate levers 22 is restricted by a resilient stop bar 26 which may consist of a strip of resilient material such as rubber secured in a channel shaped of metal suitably supported in the base 10.

The type bars are designated 27 (Figs. 1 and 2) and are pivotally mounted in the segment 28 by means of a fulcrum wire 29 received in an arcuate slot in a rib 28a formed on the top face of the segment 28, as best shown in Fig. 2. As usual, the type bars 27 are arranged fan-shaped (Fig. 2) in an arc of a circle, which, in the present case, is approximately 102°. The segment 28 is secured to an angle bar 30 suitably supported in the base 10.

Associated with each type bar is a separate train of operating mechanism or action which is actuated by the appropriate one of the inter-

mediate levers 22. This train of mechanism is conveniently mounted on a removable support plate which enables the parts comprising the type bar action for a single type bar to be removed as a unit when required in servicing the machine. These plates are mounted in fan-shaped relation so as to be approximately coplanar with the type bars.

In the case of the type bar 27 shown in Fig. 1, the support plate is designated 31 and is formed with a round-nosed lug 31*a* resting in a groove 32*a* formed in a curved crossframe 32 suitably supported in the base 10. The plates 31 are spaced from each other by a flat curved comb plate 33 secured to the top face of frame 32 and the groove 32*a* is concentric with the groove of the pivot wire 29, or at least lies in a cylinder which is concentric with a cylinder containing the pivot wire 29 to insure that the distance between the pivot wire 29 and the lug 31*a* may be constant for all of the type bars 27 and their supporting plates 31. The plates 31 are held with their lugs 31*a* (Fig. 1) in the groove 32*a* in bar 32 by means of springs like 34 which are anchored to a curved angular strip 35 secured to the frame 32 and to holes in plates 31.

Each of the plates 31 is formed with an upwardly extending arm 31*b* which is guided in a comb 36 secured to the top face of a curved frame 37. Springs 38, anchored to hooks formed in the plates 31, and to a spring anchoring strip 39 secured to the frame 37, hold the extension arms 31*b* against stop screws 40 carried by the frame 37. The plate 31 is also formed with a second extension arm 31*c* formed with a lug 31*d* received in a curved comb 41 fixed to the face of a curved strip 42 carried by the frame 43. This frame is suitably supported in the base 10 and is curved concentrically with the frames 32 and 37. The strip 42 is formed with a flange along its upper edge and has secured to its rear face a curved angle strip 44 supporting a resilient rebound strip 45 for the type bars 27. Each of the type bars 27 is formed with a pad or shoe 46 which engages the rebound strip 45 to spread the force of rebound over a relatively large area of the rebound strip 45 to reduce cutting said strip.

The type bars 27 are formed with extensions 27*a* (Fig. 1) which engage flat springs 47 secured to the under edge of the frame 43. These springs 47 are flexed to the broken line position of Fig. 1 when the type bar is operated and assist in restoring the type bars and parts of the type bar action after each operation. Each type bar is connected by a toggle link 48 to a toggle link 49 pivoted at 31*e* to the extension 31*b* of frame 31. The link 49 has a short extension arm which is connected by a link 50 to a three arm lever 51 pivoted at 31*f* to the plate 31. One of the arms of each lever 51 is formed with a curved surface 51*a* engaging a leaf spring 52 clamped to a bent-over lug 31*g* formed in the associated frame 31.

Pivoted at 31*h* (Fig. 1) is an arm 53 which extends over the third arm 51*b* of the lever 51 so as to be engageable therewith when the arm 53 is rocked clockwise. Arm 53 is connected by a vertical link 54 with one arm of a lever 55 pivoted at 31*i* to the plate 31 adjacent the lug 31*a*. The lever 55 is urged in a clockwise direction by means of a spring 56 anchored to the other arm of lever 55 and to a lug formed in the plate 31. The first arm of lever 55 in turn is connected by a link 57 to the appropriate intermediate lever 22.

Operation of the train of mechanism just described is as follows: When the key 11 is depressed the cam unit 17 is rendered operable by the power roller and draws down the link 21 to rock the intermediate lever 22 clockwise. This movement is transmitted to the arm 53 through the link 57, the lever 55, and the link 54, thereby rocking the arm 53 clockwise. The latter engages the third arm 51*b* of the lever 51 and rocks the latter counterclockwise thereby thrusting the link 50 to the left, rocking the toggle link 49 clockwise, and, through the toggle link 48 the type bar 27 is actuated counterclockwise to the printing position shown by dot-dash lines in Fig. 1.

The type bar 27 may be positively driven through approximately three fourths of its stroke by cam unit 17 and thereafter the further operation of the type bar is effected by the momentum of the type bar itself and the members 48, 49, 50 and 51 against the opposing force of the restoring spring 52 which is flexed when the lever 51 is rocked to actuate the type bar. As the type bar 27 approaches the printing point, the toggle links 48, 49 straighten out and check the momentum of the type bar causing it to print through the inking ribbon by pressure rather than by percussion.

The arm 53 is operated through a predetermined distance by the cam unit 17 which may be materially less than the whole distance travelled by the third arm 51*b* of lever 51 which said arm 53 engages, with the result that arm 53 completes its stroke and the cam unit 17 and parts connected thereto at least start to restore before the type bar starts its restoring stroke. This causes the type bar action to operate more quietly than heretofore because the restoring of the parts is divided into several phases so that the noises arising from the arrival of the parts back to their normal positions do not coincide but are spread over a period of time and at the same time their individual intensities are reduced. This is largely due to the fact that the power type bar actuating means is not unyieldingly connected to the type bar itself through the type bar action, whereby there is considerably less momentum in the restoring movement of the type bar, thereby reducing the noise of the shock produced when the parts arrive at their home position and at the same time reducing the tendency to rebound.

Since the train of connections from the cam unit 17 to the type bar 27, unlike prior art constructions, is not composed of parts such as levers and links inseparably interconnected so as to compel movement of all parts together but is broken between arm 51*b* and arm 53 so as to constitute a positive drive in only one direction, it is possible for the power operating mechanism to complete its operating cycle more rapidly and become restored well in advance of restoration of the type bar. Since the power mechanism is not greatly affected by the momentum of the restoring type bars, the restoration of the power mechanism is effected more quietly. Thus, the noise for which the restoration of the power mechanism is responsible is not merely out of synchronism with the noise arising from restoration of the type bar, but also is diminished in volume. In other words, instead of a plurality of synchronized clicks heard as one big noise, there is produced several non-

synchronized clicks of lesser magnitude and hence less noticeable.

There is some tendency for the type bars and the parts directly connected thereto to rebound during a restoring movement and this is prevented by means of a rebound check member **60** having a slot through which passes a pin **51***c* carried by the lever **51**. The member **60** is approximately T-shaped in outline with the crossbar of the T extending symmetrically above and below the pin **51***c* and engaged by a flat spring **61** secured to an offset lug formed in the member **51**. This spring presses the member **60** to the left in Fig. 1 to the limit of the slot in said member and also holds said member in the slanting position there shown which, in the normal positions of the parts prevents counterclockwise rotation of the lever **51** by engagement with the end of arm **53**, a slight clearance being provided to insure that the lefthand end of member **60** will always snap in front of the end of the arm **53** when the parts are restored. A gap is provided between the arm **53** and arm **51***b* so that, when the cam unit operates the type bar as described above, the arm **53** will be drawn downwardly far enough for the end of the arm **53** to clear the end of the rebound member **60** before engaging the arm **51***b* of lever **51** to rock said lever counterclockwise. As the lever **51** rocks in this fashion the end of the member **60** passes to the left over the pivot of the link **54** to the arm **53**.

The cam unit **17** and the parts directly connected thereto up to and including the arm **53** are restored by spring **56** well in advance of the restoration of the type bar **27** with the result that the end of the arm **53** will be rising while the type bar is restoring thus resulting in rocking member **60** clockwise on the pin **51***c* against the tension of the spring **61**. In other words, an upward thrust of the arm **53** is transmitted to the lever **51** through the member **60** and spring **61** thereby assisting the restoring movement of the type bar. This also exerts a slight retarding effect on arm **53** due to the reaction imposed by spring **61** and lever **51** which helps to restore the cam unit **17** and parts connected thereby more smoothly and with less shock.

In its restoring stroke, the lever **51** draws the member **60** to the right in Fig. 1, dragging said member over the end of arm **53**, until said member snaps in front of the end of arm **53**. If now the type bar and other members involved in the train of connections from the type bar to the lever **51** tend to rebound, the member **60** will, by engagement with the arm **53**, prevent rebound. The slot in the member **60** embracing pin **51***c* allows a small amount of yielding movement which may assist in quieting the stoppage of the type bar and connected parts during the restoring movement. The spring **61** also prevents bending the type bar or any of the parts in the mechanical train to and including lever **51** in the event an attempt is made to move the type bar by hand, the spring **61** yielding under these conditions.

In order to insure that the member **60** will not be accidentally pushed downwardly below the position of Fig. 1, there is provided a stop pin **51***b* which limits counterclockwise movement of member **60**. This pin is not necessary in the normal operation of the mechanism because of the fact that the spring **61** presses against the flat edge at the right hand end of the member **60** which edge is more or less symmetrical with respect to the pin **51***c* and will hold the member **60** in the position of Fig. 1 independently of the pin **51***d*. However, there is a possibility that in servicing the machine the member **60** might be pushed downwardly accidentally far enough to be retained in a vertical position by the spring **61**.

In order to permit the lever **51** to rock clockwise when the cam unit **17** is operated, a clearance is provided between the end of the arm **53** and the arm **51***b* of lever **51** sufficient to enable the arm **53** to clear the member **60** before the lever **51** starts to rock. On account of the resistance which the arm **53** gives in the restoration of the type bar through the member **60**, the spring **52** may be of weaker tension than would ordinarily be the case, consequently, the restoration of the type bar may be effected more quietly and with less rebound than is the case where relatively strong springs are directly connected to the type bars or to the sub-levers of conventional type bar actions comprising inflexibly coupled elements.

The type bars **27** being disposed fan-shaped, the type bars in the center strike the work sheet on platen **65** virtually normal to the surface while the end type bars strike at an acute angle. Therefore, it is necessary to either bend the type bars varying amounts or to construct the type elements so that the type faces make varying angles with the body of the type bar, so as to enable all type faces to strike the platen normally. In the present case the type bars **27** are substantially flat but the bulk of the type elements **27***a* are shaped as shown in Fig. 6 so that the faces of the types make an angle of approximately 45° or less to the axis of the type bar. This, of course, is a feature old in the art.

Provision is made for aligning the type elements and guiding them in a direction normal to the platen while the type elements are effecting their impression on a work sheet on the platen through the usual inked ribbon not shown.

Secured to the top surface of the segment **28** is a bracket **66** (Figs. 1 and 3) which is formed with horizontal bent over flanges **66***a* in which are vertically guided the rods **67L**, **67R**. These rods are so shaped that they are crossed for a purpose which presently will be made clear. Secured to the upper end of the bracket **66** is an inverted U-shaped plate **68** the rear face of which is slotted to vertically guide the type aligning elements **69R**, **69L**, the guiding elements being held in the guide slots in plate **68** by means of a plate **68***a* secured to the back of the upper end of the plate **68**. The guide elements **69R**, **69L** are formed with bent over lugs **69***a* which are engaged by the upper ends of the rods **67R**, **67L**, the rod **67R** engaging the lug **69***a* for the element **69R** and the rod **67L** similarly engaging the element **69L**.

The elements **69R**, **69L** are provided with pins **71** which extend through holes in the plate **68** which are considerably larger than the pins **71** whereby the edges of the holes act as stops in cooperation with the pins **71** to limit the sliding movement of elements **69R**, **69L**. Normally the pins **71** are pressed downwardly on the lower edges of the holes in plate **68** by means of wishbone springs **72**, each coiled around a pair of pins carried by plate **68**. Each element **69R**, **69L** has formed therein at its upper end a bent over lug **70R**, **70L**. These lugs are slightly beveled at **69***b* forming a cam surface the function of which will be made clear.

Normally both of the guide elements **69R**, **69L** are held in the lowered or retracted position (Fig.

1) by the springs 72 so as to be slightly below the position of the lower type on the type element at the moment of striking the work sheet. When either or both of the elements 69R, 69L, is raised, however, the lugs 70R, 70L will be raised to the dotted position (Fig. 3) sufficiently to enable the cam surface or surfaces 69*b* to engage the type element to the point 27*b* (Fig. 1) and guide it normally of the platen into engagement with the work sheet.

The plate 68*a* is provided with a clearance notch 68*b* through which the heel portion 27*b* of the type element 27*c* passes in printing. When the aligning elements 69R, 69L are raised the lugs 70R, 70L thereof will be positioned on a level with this notch as shown by broken lines in Fig. 3. Movement of the elements 69R, 69L is effected selectively by a universal bar mechanism which conveniently may be operated directly by the type bars in moving to printing position.

Three universal bars are provided designated 74R, 74M and 74L (Figs. 1 and 2), which consist of fan-shaped flat plates pivoted on a curved fulcrum wire 75 located in a groove formed in a rib 28*a* integral with the segment 28. The forward or lower edges, Fig. 2, of the universal bars 74R, 74M, 74L are curved to coincide with an arc of a circle which is concentric with the pivot wire 29 and are located so as to be engaged by the curved parts 27*d* (Figs. 1 and 2) of the type bars 27 adjacent the pivot wire 29. The universal bars 74R, 74L are formed with rearward extensions 74*a* which underlie the lower ends of the rods 67R, 67L. The extension 74*a* of the universal bar 74R presses lightly against the lower end of the rod 67L while the extension for the universal bar 74L presses against the end of the rod 67R. The universal bar 74M has secured to it a crossbar 74*b* which extends on each side to overlap the universal bars 74R, 74L respectively.

It is clear from the foregoing that when the front ends of the universal bars 74R, 74L are depressed, the rods 67L, 67R will be raised respectively. When the universal bar 74M, however, is operated both the universal bars 74R, 74L will be actuated and raise both rods 67R, 67L simultaneously.

The universal bar 74M is associated with a small group of type bars 27 (Fig. 2) located at the center of the segment which make small angles with the platen, while the universal bars 74R, 74L are respectively associated with the remaining type bars to the right and to the left.

When a type bar in the lefthand group (Fig. 2) with which the universal bar 74L is associated, is actuated, the extension 74*a* of the universal bar 74L will raise the rod 67R and thereby will raise the righthand aligning element 69R (Figs. 3 and 6), this action taking place concomitantly with the progress of the operated type bar toward the printing point. As a result, when the operated type bar is within a very short distance of the work sheet, the type element 27*c* will strike the cam surface 69*b* of the lug 70R on aligning element 69R and be guided into cooperation with the vertical flat lefthand edge 69*c* of the lug 70R as in Fig. 6, which, in turn, will force the type element 27*c*, to travel rearwardly or straight upwardly in said figure so as to strike the work sheet normally through notch 68*a*.

Similarly, when a type bar in the righthand group (Fig. 2), associated with the universal bar 74R is operated, the type aligning element 69L will be raised and guide the type element for said type bar normally to the platen to effect the impression.

When any type bar associated with the middle universal bar 74M is operated, both universal bars 74R, 74L will be actuated along with the universal bar 74M and will raise both type guide elements 69R, 69L and lugs 70R, 70L, which together will form a narrow throat to guide the operated type bar normally of the platen.

In the case of all of the type bars, with the exception of the one or two at the center of the segment, there is a tendency of the type elements to slide on the work sheet parallel with the axis of the platen and this is prevented by the lugs 70R, 70L which, by engagement with the type elements, force them to travel in a direction normal to the platen in effecting an impression. In the case of the type bars associated with the universal bar 74M there is relatively little tendency for the type elements to slide in effecting the impression but, on account of the flexibility of the type bars, they tend to vibrate laterally in both directions and this is prevented by cooperation between both aligning elements 69R, 69L, which function under these conditions in much the same general fashion as in a conventional type guide in which the guide lugs are fixed relative to each other and to the type basket.

The main advantage of this construction is that a very complexly milled type guide element, such as has been used in present commercial noiseless machines is avoided. Such fixed elements are very difficult to manufacture and expensive since the fixed guiding surfaces must be designed to accommodate a minimum of twenty-one different angles of approach of the type bars. Furthermore, when such fixed type guides wear, as soon happens in normal use, a noticeably poor alignment of the characters develops which is characteristic of commercial "noiseless" machines.

Another advantage is that a larger number of type bars may be provided since a larger angle of approach may be accommodated than is the case with type guides hitherto provided in so-called noiseless typewriters. This results in very materially reduced cost of the type bars and greatly simplifies the problem of manufacturing accurately aligned types since only two types per type bar have to be aligned or replaced instead of four. On account of this feature, the replacing of defective or worn type bars is much cheaper and may be more conveniently accomplished. Furthermore it is unnecessary to disturb the alignment of the characters for two keys to repair misalignment or fracture of the types for a single key.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a single embodiment 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 typewriting machine having a series of type bars having a fan-shaped disposition symmetrically with respect to a plane passing through the printing point and normal to the surface receiving imprints whereby certain of the type bars strike at varying acute angles to such surface and others strike normally or closely approximating normal, a pair of normally retracted type

aligning members located below and on opposite sides of said printing point, and a plurality of universal bars for selectively raising said members when a type bar is operated and arranged to raise into type bar engaging position only the aligning member on the opposite side of said plane to the operated type bar when an acutely striking type bar is operated and to raise both aligning members when a normally or approximately normal type bar is operated, said aligning members guiding the acutely striking type bars normally of the platen and jointly preventing lateral vibration of the normally or approximately normally striking type bars.

2. In a typewriting machine having a series of type bars disposed fan-shaped and actuable to a common printing point and striking the print receiving surface with varying angles varying from the normal to materially less than a right angle, said type bars being divided into two main groups symmetrically disposed on each side of the printing point and comprising all of the type bars which strike with angles materially less than a right angle and including a central group comprising the type bars which strike at angles not materially less than a right angle; vertically slidable type aligning members, one for each of said main groups, disposed below and on the opposite side of the printing point to the related main group of type bars; means whereby the operation of a type bar in either of said main groups raises into type aligning position the corresponding aligning member, and means whereby the operation of a type bar in the central group raises both aligning members into type aligning position.

3. In a typewriting machine, a series of type bars selectively actuable from different positions to strike at the printing point with variant angles of approach, a pair of type aligning members normally disposed below the printing point and means selectively operated simultaneously with the approach of type bars to the printing point to raise one or both of the aligning members to type aligning position according to the angle of approach of the selected type bar, said aligning members being operative to force the types to strike at the printing point along a fixed path irrespective of the angle of approach of the type bars.

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