

March 7, 1944.

L. F. PASCHER

2,343,321

TYPEWRITING MACHINE

Filed Nov. 1, 1940

5 Sheets-Sheet 1

Fig. 1.

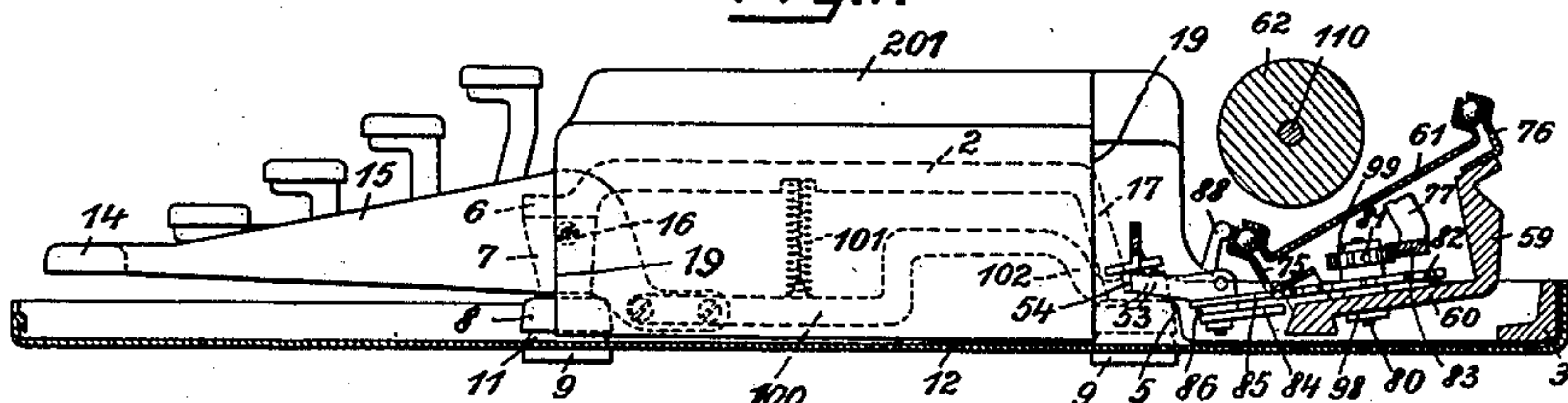
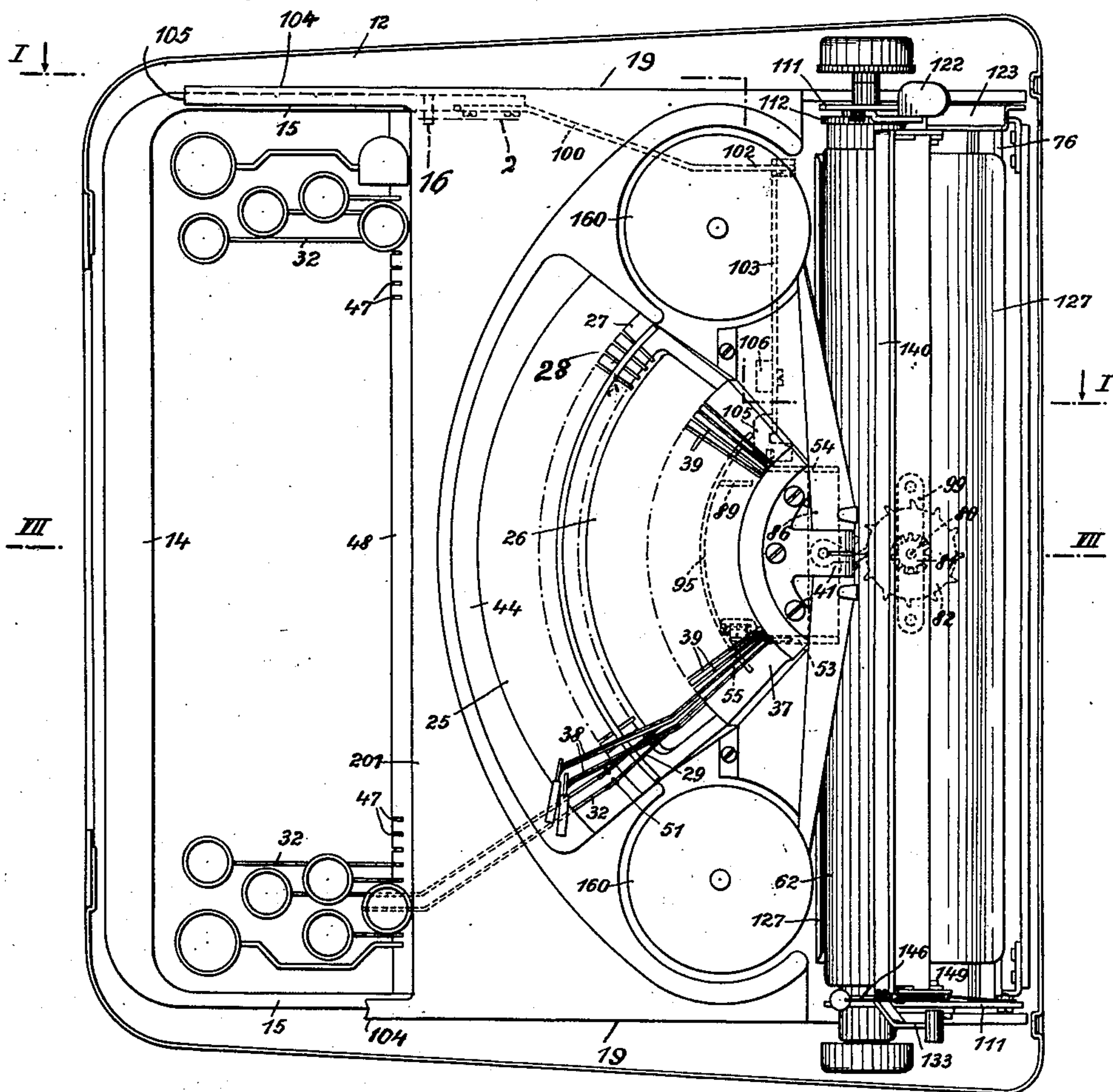


Fig. 2.



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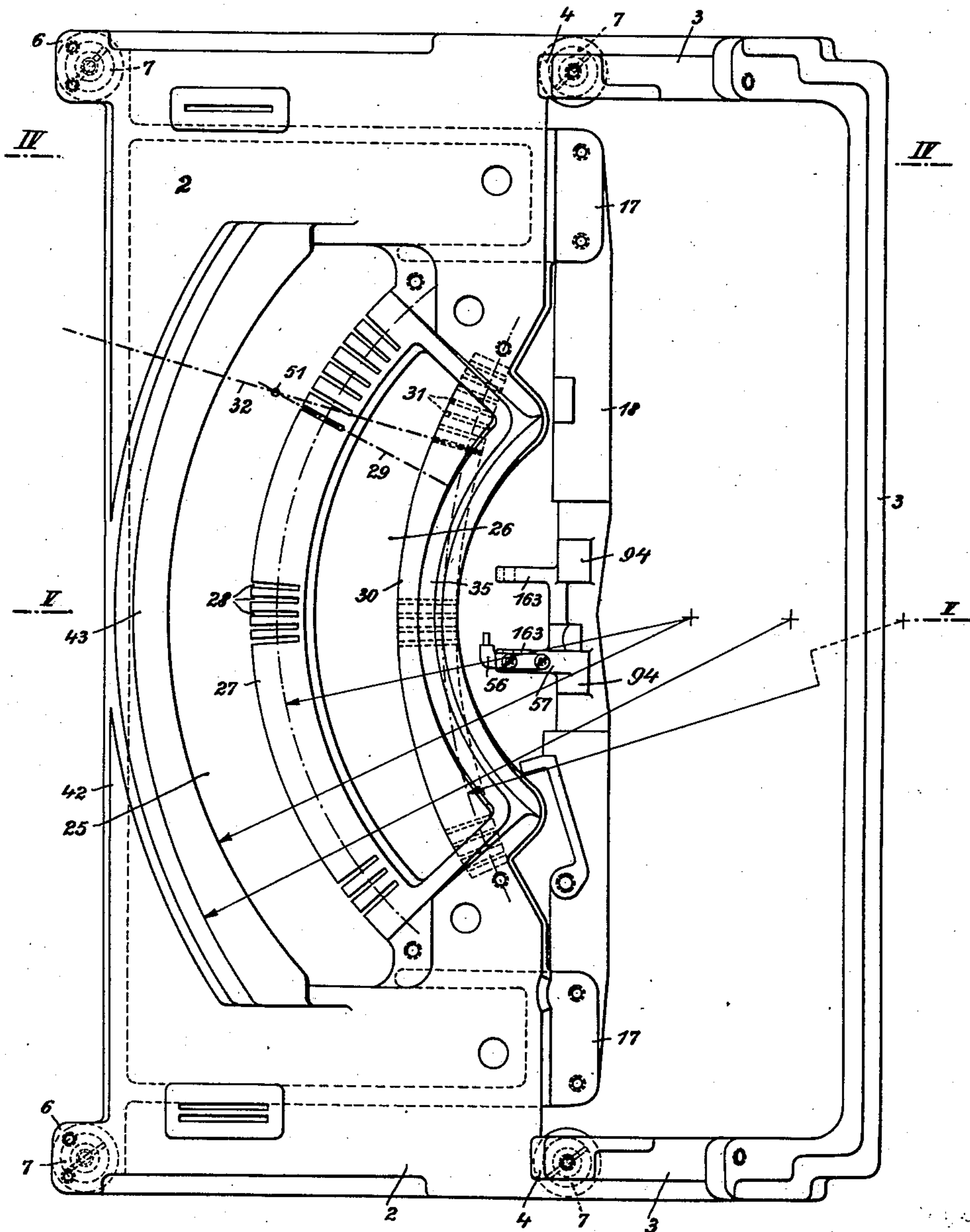
2,343,321

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5 Sheets-Sheet 2

Fig. 3.



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TYPEWRITING MACHINE

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5 Sheets-Sheet 3

Fig. 4.

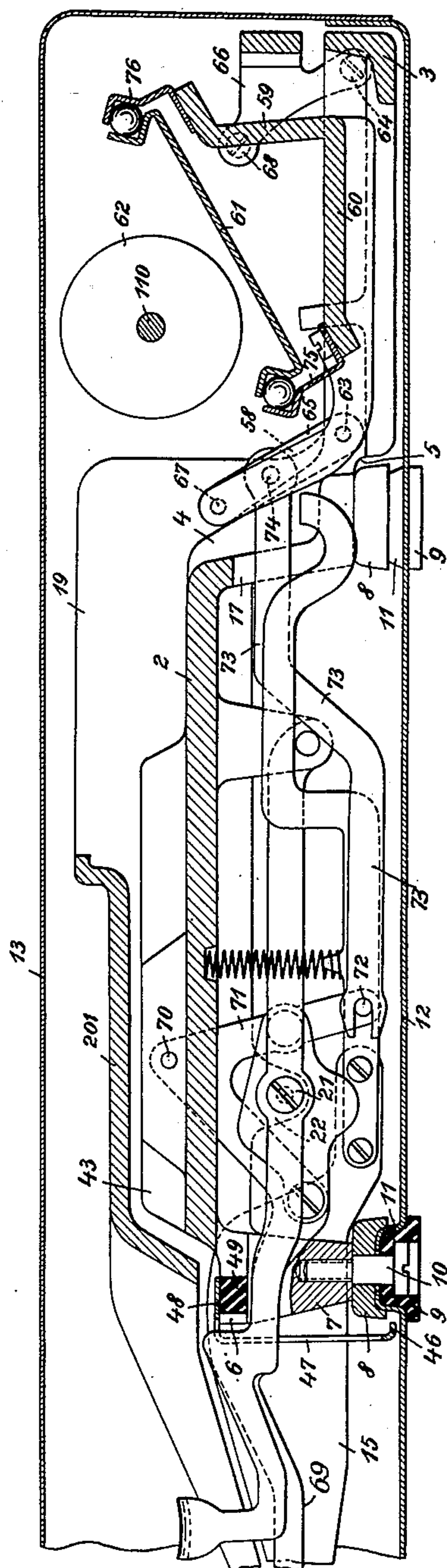
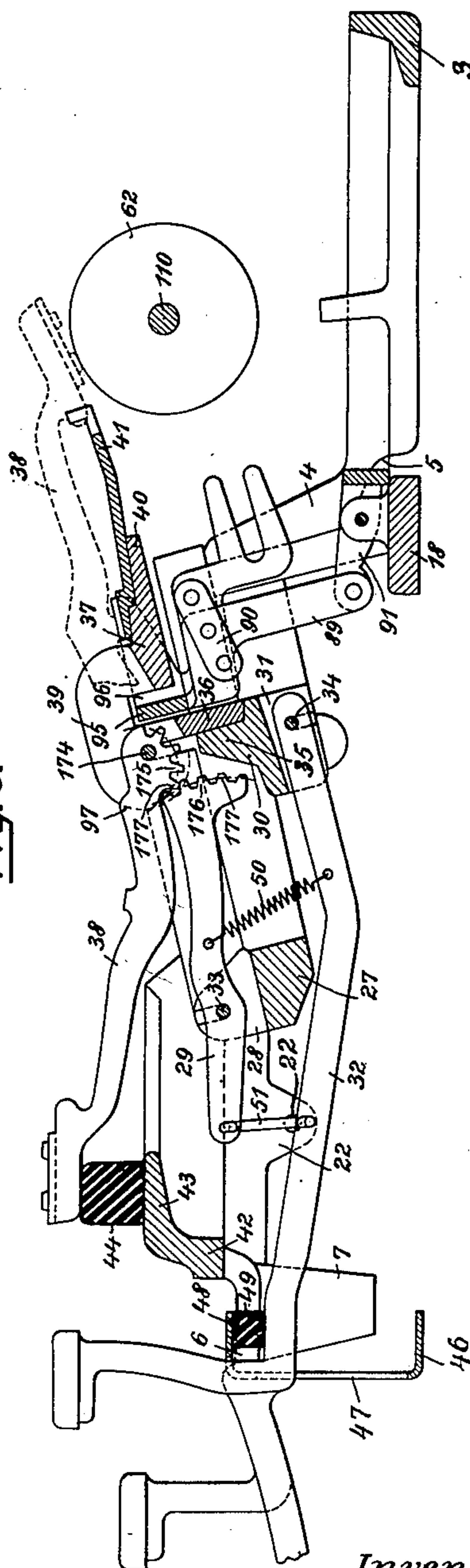


Fig. 5.



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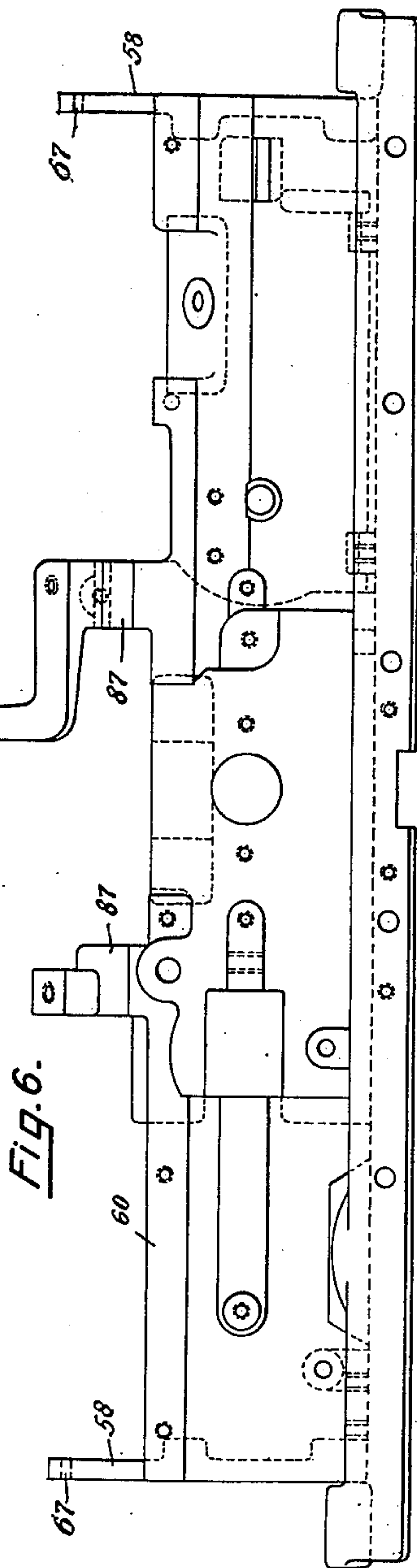
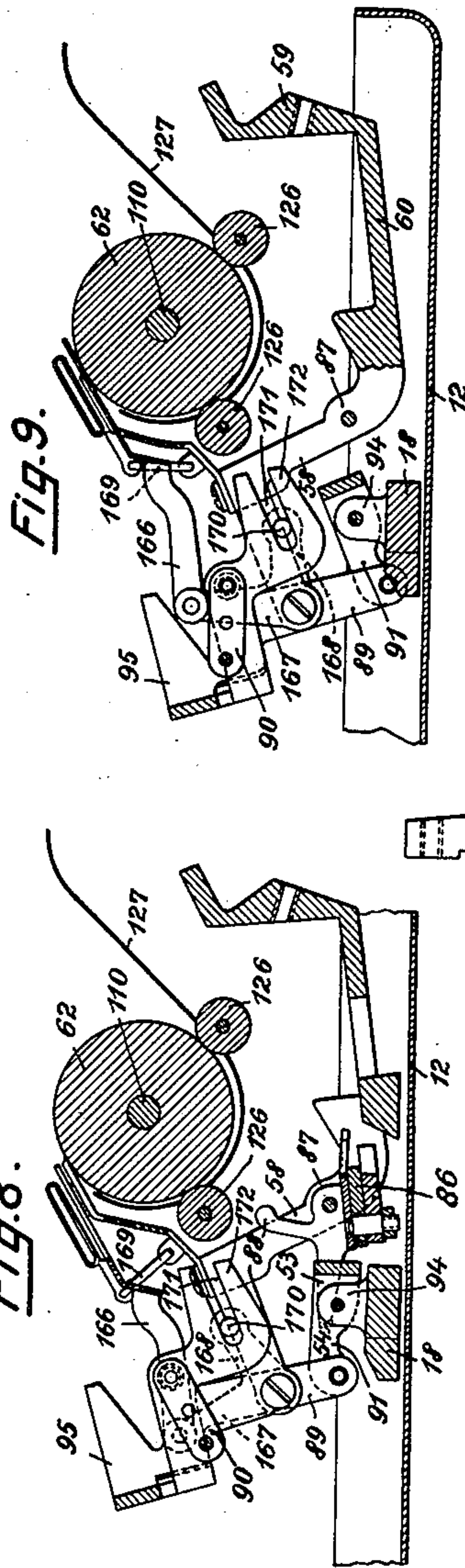
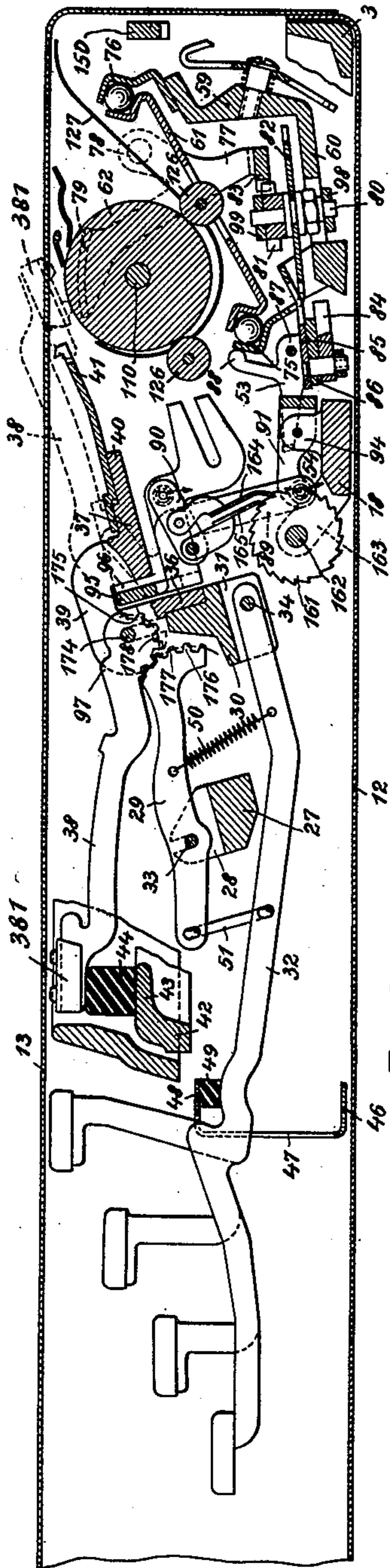
Fig. 7.

Fig. 8.

Fig. 6.

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TYPEWRITING MACHINE

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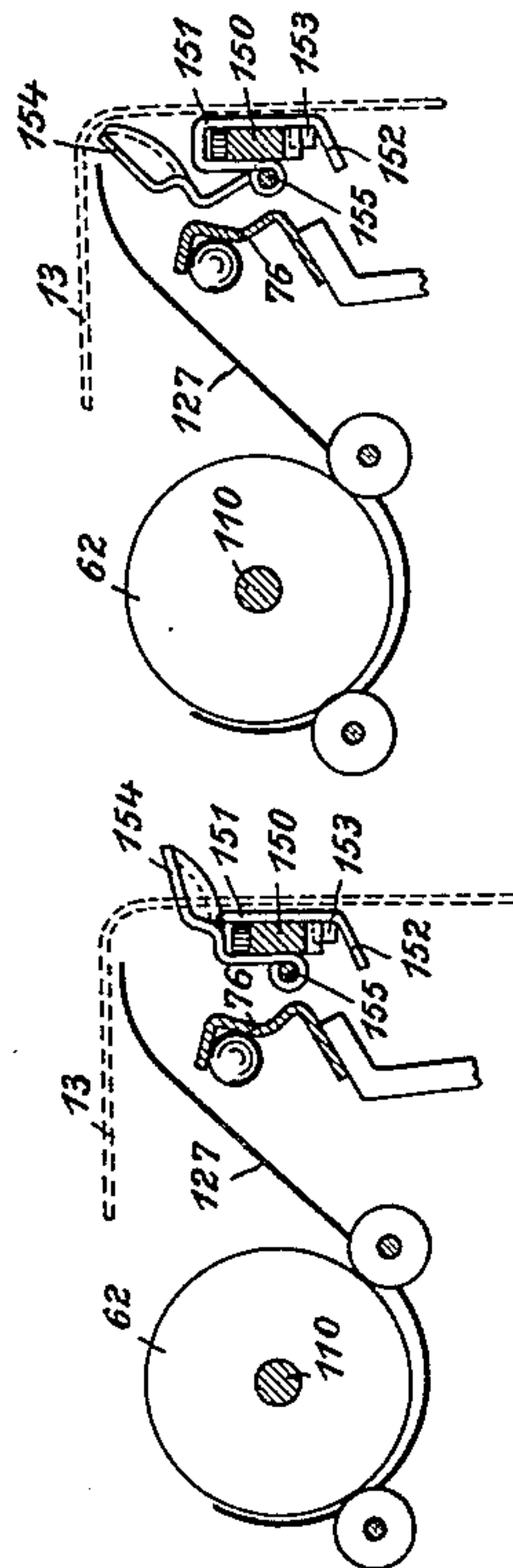
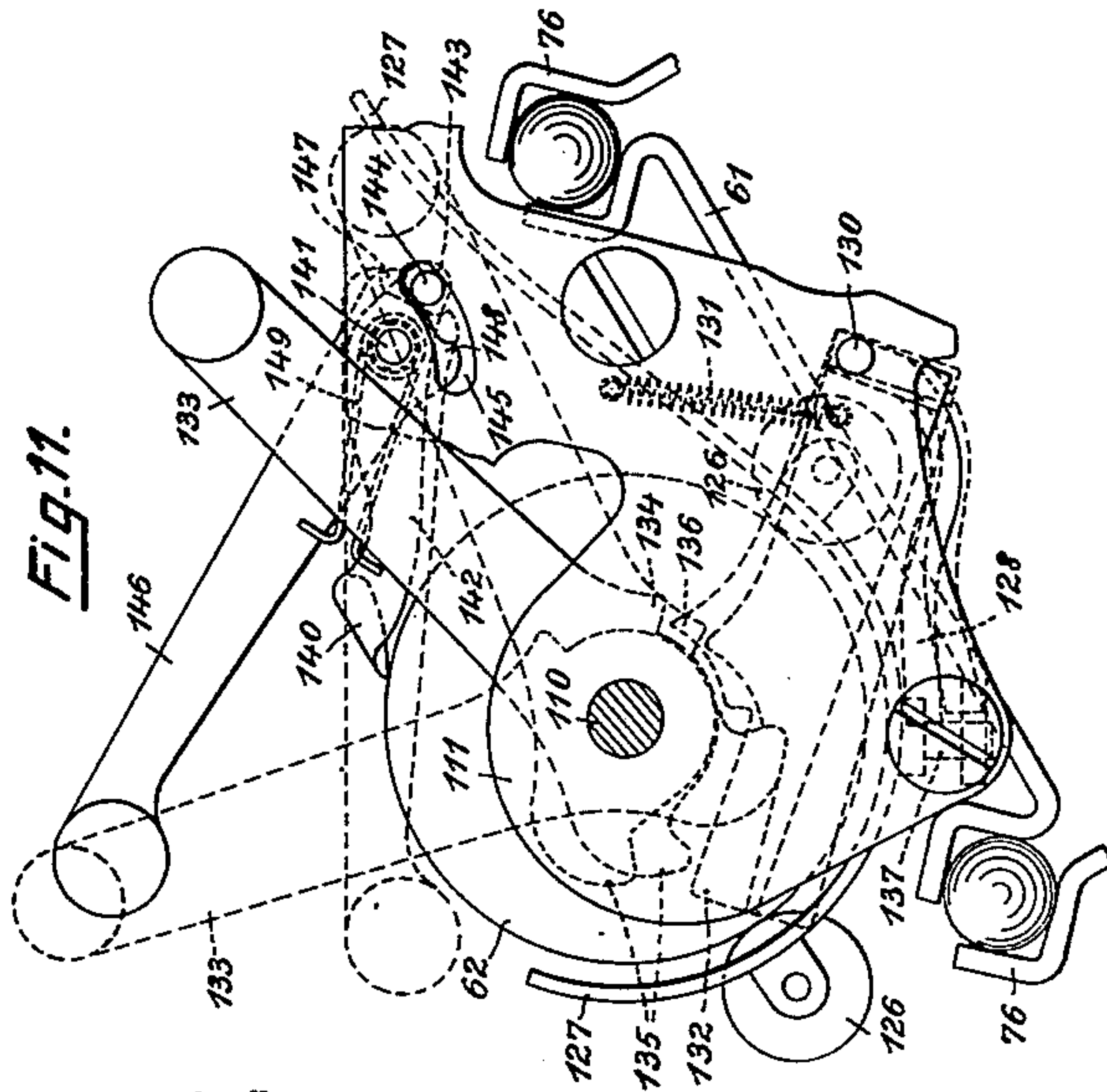
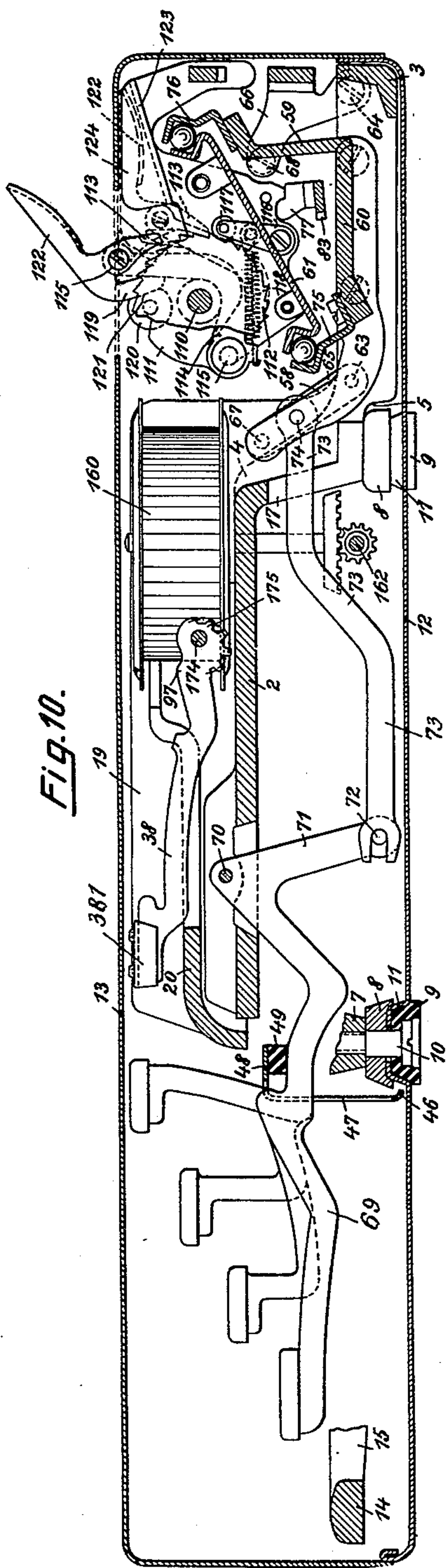


Fig. 13.

Fig. 12.

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UNITED STATES PATENT OFFICE

2,343,321

TYPEWRITING MACHINE

Leopold Ferdinand Pascher, Schweizertal, Germany; vested in the Alien Property Custodian

Application November 1, 1940, Serial No. 363,851
In Germany October 17, 1936

3 Claims. (Cl. 197—186)

My invention relates to improvements in type writing machines, and the object of the improvements is to provide a type writing machine which has small size and minimum weight, and which can be carried in a small envelope. With this object in view my invention consists in constructing various parts of the machine so that the said parts and other parts associated therewith occupy little space.

In carrying out the invention, the main part of the frame on which the type levers, the key levers, the intermediate levers and other parts are mounted is in the form of a bed which is located close to the said parts of the machine and accordingly a certain distance away from the bottom of the machine, the laminations or grooves between which the said levers are mounted being formed in the said bed. Thus, as distinguished from constructions in which the said laminations are provided on separate members suitably connected with one another, the said main part of the frame requires little space. Further, the frame may be made from comparatively thin material, because the structure of the frame in which the said parts are directly mounted is rigid.

The U-shaped front part of the frame which is located around the key board is not made integral with the said body of the frame, as is common in type writing machines now in use, but is pivotally mounted thereon on a horizontal transverse axis, and one of its side arms is connected with the escapement mechanism so as to have the function of a space key, the usual space key and its levers, which ordinarily are located below the key levers being dispensed with. Thus the front part of the said pivotal part is located close to the key board and, further, it is located substantially at the height of the lowermost row of keys so that the keys may be located close to the bottom of the machine. In my improved construction the length of the machine is reduced substantially by the breadth of the ordinary space key, and the height of the key board is reduced, because the key board is located near the bottom.

The space needed for the key board is further reduced by constructing the mechanisms controlled by the keys so that the resistance of the said mechanisms is slight. Therefore the stroke of the keys may be reduced in length. The resistance of the said parts operated by the keys is reduced, first, by an improved construction of the joint between the intermediate levers and the type levers, whereby the gear ratio of the said

joint is varied in the course of the downward movement of the keys, so that the transmission of the power is most effective, and, second, by mounting the universal bar so that the friction of the type levers acting thereon is reduced.

The height of the machine is further reduced by mounting the carriage in a novel way. The aforesaid main part of the frame, which is located a certain distance above the bottom of the machine, is connected with a rear extension which is located close to the said bottom, and the frame on which the carriage is mounted is located close to the said rear extension of the main frame, the said carriage frame being shiftable on the said extension longitudinally of the machine for shifting the platen for upper and lower case printing. In the following the said frame on which the carriage is mounted will be described as a rockable plate. The said plate might be slidable on tracks provided by the said extension. However, I prefer to use the usual links for supporting the rockable plate, because thereby the resistance opposed to the shifting movement is lessened. The said links are supported with their bottom ends on the said rear extension of the frame, and they are directed upwardly therefrom and jointed with their top ends, one to arms extending upwardly from the said rockable plate and the other one to an upwardly directed portion of the plate.

The size of the machine is further reduced by reducing the space needed for the keys, and for this purpose the vertical stroke of the keys is reduced. However, such reduction of the stroke tends to increase the force needed for depressing the keys, and therefore the mechanisms controlled by the keys are constructed so that the power needed for the operation of the said mechanisms is reduced, and as a result the operation of the keys is just as easy as the operation of keys having normal stroke.

By the depression of the keys the type levers must be accelerated so that they strike on the paper with a certain force. Further, by the keys the letter spacing mechanism must be released, and the ribbon must be vibrated and fed. These operations are transmitted through the universal bar. The power needed for operating the said universal bar is largely a function of the friction between the universal bar and the type lever engaging the same. In my improved machine the said friction is avoided by guiding the universal bar so that the path of the part of the universal bar engaged by the type levers is the same as that of the engaging portions of the type levers.

Further, the connection between the key levers and the type levers is constructed so that the transmission of the power to the type levers is particularly effective. It has heretofore been proposed to connect the type levers with the intermediate levers by eccentric toothed segments constructed so that the gear ratio is gradually increased as the type lever approaches the platen. In my machine this construction is further improved as will be explained hereinafter.

Other improvements all resulting in a reduction of the size of the machine will appear from the following description.

For the purpose of explaining the invention an example embodying the same has been shown in the accompanying drawings in which the same reference characters have been used in all the views to indicate corresponding parts. In said drawings

Fig. 1 is a side elevation of the machine partly in section taken on the line I—I of Fig. 2,

Fig. 2 is a top plan view of Fig. 1,

Fig. 3 is a top plan view on an enlarged scale showing the frame,

Fig. 4 is a sectional elevation taken on the line IV—IV of Fig. 3 and showing in addition the space key lever, the shift key lever and a part of the carriage,

Fig. 5 is a sectional elevation taken on the line V—V of Fig. 3 and showing in addition a part of the type lever mechanism,

Fig. 6 is a detail plan view showing the frame or plate on which the carriage is mounted,

Fig. 7 is a sectional elevation taken on the line VII—VII of Fig. 2 showing the type lever mechanism, the carriage, the platen and a part of the ribbon feeding mechanism,

Figs. 8 and 9 are sectional elevations similar to that shown in Fig. 7 showing the ribbon vibrator and its operating mechanism in different positions,

Fig. 10 is an elevation partly in section showing the paper feeding mechanism in different positions,

Fig. 11 is an elevation showing the paper holding devices, and

Figs. 12 and 13 are diagrammatical elevations showing the end stops of the carriage.

In the example shown in the drawings the frame of the machine comprises a substantially horizontal plate 2 located substantially at the height of the main bearings of the operative parts of the machine, and a rear portion 3 located at a lower height than the said plate 2 and at the bottom of the machine and connected with the plate 2 by rearwardly and downwardly inclined arms 4 located at the sides of the frame.

The arms 4 are formed with shoulders 5, and the forward end of the plate 2 is provided with ears 6 cast integral with downwardly directed lugs 7. The bottom faces of the lugs 7 and the shoulders 5 are disposed at the same level, and the said lugs and the shoulders 5 are supported on cushioned feet. As shown in Fig. 4 the said feet comprise two disks 8 and 9 of resilient material fixed respectively to the lugs 7 and the arms 4 by means of screws 10. The lower disks 9 are partly embedded in cup-shaped portions 11 of a bottom plate 12 forming a part of an envelope or casing the top part or lid of which has received the reference character 13. The said envelope does not form a part of the machine but is used for protecting the same from injury and dust. The disks 9 extend downwardly beyond the said bottom plate 12 so as to support

the said plate in spaced relation from the table or another support. The head of the screw 10 is sunk in a socket formed in the disk 9. By this construction the frame 2 is insulated relatively to the table and also relatively to the bottom plate 12, and the transmission of vibrations caused by the operation of the machine to the bottom plate 12 and to the table is prevented.

In machines now in use the frame is provided with a bail extending forwardly and around the key board, the said bail being made integral or rigidly connected with the body of the frame. In my improved machine the said bail is a U-shaped member separate from the body of the frame, and it comprises a rail 14 and side arms 15 pivotally mounted on the frame at 16. The bail constitutes the space key as will be described hereinafter.

To a pair of arms 17 directed downwardly and rearwardly from the plate 2 a transverse bar 18 is fixed.

To the sides of the frame 2 side plates 19 are fixed by means of screws 21 fixed to ears 22 and to the arms 4, and the said plates are connected by a top plate 20.

The plate 20 is formed with two cut-out portions 25 and 26 accommodating the type lever mechanism. Between the said cut-out portions there is a segment 27 which is formed with radial slots 28 in which the intermediate levers 29 are mounted, and at the rear of the cut-out portion 26 there is a second segment 30 which is formed at its bottom side with slots 31 to accommodate the rear ends of the key levers 32, the said intermediate levers 29 and key levers 32 being pivotally mounted respectively at 33 and 34 in a manner known in the art. The said segments 27 and 30 are cast integral with the plate 2, so that they reinforce the said plate and compensate for the weakening thereof resulting from the cut-out portions 25 and 26 (Fig. 3).

On its upper face the segment 30 is formed with a segmental rib 35 disposed concentrically of the segment 27 (the segment having the intermediate levers 29 mounted thereon), and to the said rib 35 a rib 36 of a segment 37 is secured on which the type levers 38 are mounted, the ribs 35 and 36 being in close engagement with each other so as to be reinforced one by the other. The segment 37 is formed with radial slots providing laminations 39, the said laminations being located above the ribs 35 and 36 and extending forwardly and rearwardly therefrom. At its rear the segment 37 is formed with a segmental flange 40 to which a type guide 41 is fixed. By mounting the type lever segment 37 on the key lever segment 35 in the manner described by means of the downwardly directed rib 36 room is gained at the rear of the said segments for accommodating the mechanism controlling the movement of the carriage as will be described hereafter.

The front part 42 of the plate 2 is provided with a flange 43 which extends upwardly and rearwardly from the part 42 and into the space between the intermediate levers 29 and the type levers 38, the said flange reinforcing the plate 2. Along the upper face of the said flange 43 a segmental cushion 44 is fixed which provides a support for the type levers 38.

A U-shaped key lever guide 46 depends from the lateral ears 6 and is formed with vertical slots 47 in which the key levers are guided. To the upper flange 48 of the said guide a cushion

49 is fixed which is engaged by the key levers 32 when restored to their normal positions by springs 50.

The segment 27 on which the intermediate levers 29 are mounted, the key lever segment 30 and the type lever segment 37 are disposed in parallel planes which are inclined relatively to the horizontal main part 2 of the plate at an angle not more than 15°. A certain inclined position of the said segments is desirable, because thereby the printing line on the platen is visible to the operator, and the type lever mechanism may be arranged to operate more satisfactorily without strain. The said inclination of 15° is sufficient for these purposes, and it is so small that it permits the frame, the segments and their slots to be manufactured by die-casting in a single operation and to be removed from the mould after casting. Also the intermediate levers 29 and the rear portions of the key levers 32 are inclined substantially at an angle of 15° from the horizontal, so that they are substantially parallel to the planes of the segments 27 and 30.

As appears from Fig. 3, the segments 27 and 37 carrying respectively the intermediate levers and the type levers are concentric to each other. But the key lever segment 30 is curved along a larger radius than the type lever segment 37 mounted thereon, and its length is substantially the same as that of the segment 27. The front ends of the intermediate levers 29, including those located at the sides of the machine, are located substantially vertically above the key levers 32, as appears from Fig. 3 indicating the said levers 29 and 32 in broken lines, and the intermediate levers 29 are substantially alike in shape. Thus the links 51 connecting the key levers and the intermediate levers are in groups likewise substantially alike in shape, and they are substantially perpendicular to the corresponding key levers and intermediate levers. The necessary slight differences of their lengths may be given thereto by slightly bending or stretching the same. Further, the lengths of the intermediate levers from the pivots thereof to the ends where the links are jointed are substantially alike, and the resistance opposed to the depressing of the levers is substantially the same all over the key board. In this respect my improved machine is distinguished from known machines in which the intermediate levers located at the middle of the machine have lengths largely different from those of the lateral intermediate levers, for insuring uniform strokes of the keys. Another advantage of my improved construction is that a small number of tools are needed for manufacturing the intermediate levers and the links.

Another advantage of my improved construction of the key lever segment 30 is the following: If the key lever segment were concentric to the segment of the intermediate levers and the type lever segment, the slots for the key levers would be close to each other, and therefore the laminations or separating fingers would be thin and weak. Further it would be necessary to bend the forward ends of the key levers inwardly, and the front ends of the said key levers would describe arcuate paths so that they would not be properly guided in the guide 46. If the key lever segment were rectilinear, the differences in the lengths of the intermediate levers located at the middle of the machine and at the sides thereof would be too great.

Referring now particularly to Fig. 4, the rear portion 3 of the frame provides a support for a frame 60 on which the carriage 61 and the platen 62 are mounted. The said frame 60 is in the form of a plate of angular cross-section and it has a horizontal portion 60 and an upwardly directed rear portion 59, as is best shown in Figs. 4 and 6.

At its front side and at its right and left hand ends, the horizontal portion 60 of the frame carries integrally cast and upwardly directed arms 58. On pivot bolts 63 and 64 links 65 and 66 are mounted upon the rear portion 3 of the main frame 2, and these links engage the top ends of the arms 58 and 59 at 67 and 68. Thus the plate 60 is pivotally supported on the rear portion 3 of the main frame 2 so that it may be shifted forwardly and rearwardly from one to the other case position. By connecting the links 65 and 66 to the upper ends of the arms 58 and of the portion 59 of the plate, the said links may be supported on the frame part 3 near the bottom of the machine. For shifting the frame 60 a shift key lever 69 is pivotally mounted on the main frame 2 at 70, and the said shift key lever is provided with a downwardly directed arm 71 a pin 72 of which engages in the bifurcated front end of a rod 73 jointed to one of the arms 58 at 74, as is best shown in Figs. 4 and 10. Thus, when the shift key lever 69 is depressed the rod 73 is shifted rearwardly thus swinging the frame 60 and the platen 62 in rearward and slightly upwardly inclined direction. The direction of the said shifting movement depends on the inclined position of the links 65 and 66 and corresponds to the inclined position of the types 381 engaging the platen 62, the inclined position appearing from Fig. 7 showing in dotted lines a type lever engaging the platen. In the median positions the type levers are substantially perpendicular to the links 65 and 66.

On the rockable plate 60 tracks 75 and 76 are mounted on which the carriage is movable. To provide a broad support for the said carriage without increasing the length of the machine the said tracks and the carriage are inclined rearwardly and upwardly, the rear track 76 being located above and at the rear of the pivots 68, while the track 75 is located near the bottom of the frame 60.

In Fig. 7 I have shown the letter spacing mechanism which is constructed as follows: On a pivot bolt 80 fixed to eyes 98 and 99 of the rockable plate 60 a gear wheel 81 and an escapement wheel 82 are mounted. The gear wheel 81 is in mesh with a rack 83 carried by the carriage 61. The escapement wheel 82 is adapted to be alternately engaged by dogs 84 and 85 controlling the step by step letter spacing movement of the carriage 61, as is known in the art. The said dogs are mounted on a rocker 86 pivotally mounted on arms 87 projecting forwardly and upwardly from a median part of the plate 60 and acted upon by a spring (not shown) urging a finger 88 of the rocker against the track 75. The rocker has two forwardly directed arms 53 and 54. The arm 53 is in position to be engaged by an arm 55 (Fig. 2) carried by a segmental universal bar 95, and the arm 54 is in position to be engaged by a lever 103 connected with the space key. The said universal bar is carried by a bail 89 pivotally mounted on a pair of arms 91 and an arm 90, the arm 90 being pivotally mounted on a bracket 56 fixed to a lug 57 of the transverse bar 18 and extending rearwardly from the said bracket, and

the arms 91 being pivotally mounted on lugs 94 of the bar 18. The universal bar 95 engages a cut-out portion 96 made in the laminations 39 and extends into position for engagement with noses 97 formed on the type levers 38. The reason for mounting the bail 89 in the manner described on two links 90 and 91 extending respectively rearwardly and forwardly from their pivots is to move the upper face of the universal bar 95 exactly in the same direction as the noses 97 engaging the said universal bar so that the resistance opposed to the movement of the type levers moving the universal bar is reduced to a minimum and the stroke of the type levers may be reduced.

The rack 83 is mounted on a pair of arms 77 pivotally mounted on the side plates 111 of the carriage at 78, the said arms being formed with finger pieces 79. Thus the rack 83 may be retracted from the gear wheel 81, if it is desired to shift the carriage to the right or left independently of the escapement wheel.

As has been stated above, the bail 14, 15 forming the front part of the frame 2 acts as the space key. For this purpose it is operatively connected with the letter spacing mechanism as will now be described.

To a rearwardly extending part of one of the arms 15 an arm 100 is secured which is connected with a spring 101 urging the arm 100 downwardly and tending to elevate the rail 14. The rear end 102 of the arm 100 is located below an arm of the aforesaid transverse lever 103 pivotally mounted on the transverse rail 18 at 106, and the opposite end of the lever 103 is located above the arm 54 of the rocker 86. Thus, when the bail 14, 15 is depressed the rocker 86 is operated for alternately carrying the dogs 84 and 85 into and out of engagement with the escapement wheel 82.

From the above description it appears that the pivotally mounted bail 14, 15 has the function, first, of protecting the keys from injury, and second of operating the letter spacing mechanism. In machines now in use the space key is mounted on a key lever located below the type key levers. In my improved machine the side arms of the bail 14, 15, which has the function of a space key, are located laterally of the key board, and therefore room is gained below the type key levers, which thus may be located near the bottom of the machine, whereby the height of the machine is reduced as compared to machines now in use.

Further, the length of the machine is reduced by providing a single rail 14 which forms the space key and also confines the type keys at the front side.

In some cases I prefer to protect the bail 14, 15 at its sides, so that the operator does not grasp the said bail 14, 15, for example when he desires to lift the machine at its front end. In this case I provide the side members 19 of the casing 20 enclosing the machine with forwardly extending arms 104 which extend substantially to the front side of the rail 14. Preferably the said arms are provided with inwardly directed flanges 105 covering the side arms 15, which therefore are not engaged by the hands of the operator grasping the front part of the machine for lifting the same.

In Fig. 10 I have shown the line spacing mechanism. It is constructed so that it occupies little space when the casing 12, 13 is closed, the said mechanism being constructed so that its operating lever which in one of its operative posi-

tions projects outwardly from the space bounded by the lid 13 of the casing, is pressed into the said space by the lid placed on the casing.

The platen 62 is mounted on an axle 110 rotatable in the end plates 111 of the carriage 61. To the said axle a ratchet disk 112 is secured adapted to be engaged by a dog 113 pivotally mounted on a lever 114 mounted on one of the said end plates 111 at 115. On the said end plate 111 an arm 116 is pivotally mounted which carries a roller 117 adapted for engagement with the ratchet disk 112. A spring 118 attached to the arm 116 and to the lever 114 urges the roller 117 into locking engagement with the ratchet disk and tends to turn the lever 114 anticlockwise. A spring (not shown) attached to the dog 113 and to the lever 114 urges the said dog into engagement with the teeth of the ratchet disk. The dog is made integral with a heel 119 which normally bears on a disk 120 mounted on the said end plate 111. The said disk is formed with a segmental cut-out portion 121, and it is adapted to be adjusted for engagement with the heel 119 either with the said cut-out portion 121 or with an unmutated part of its circumference. Further, the dog is made integral with a finger piece 122. The end plate 111 carries a laterally bent portion 123 operable by the finger of the operator for shifting the carriage to the right, and providing an end stop for the finger piece 122. A flange 124 directed upwardly from the portion 123 provides a support for the hand of the operator and assists in placing the carriage on the machine.

The line spacing mechanism is used as follows: By the pressure of the finger on the finger piece 122 the dog 113 and its heel 119 are turned clockwise, the heel 119 riding on the disk 120 and the dog 113 being brought into engagement with the ratchet disk 112. Upon further depression of the finger piece the lever 114 is turned about its pivot bolt 115 against the action of the spring acting thereon, until the finger piece 122 engages the stop 123. By such movement the ratchet disk 37 is turned a distance corresponding to the distance between two consecutive lines or one and a half times said distance, depending upon whether the heel 119 of the finger piece 122 contacts the unmutated circumference of the line space control disk 120, or the mutilated or reduced portion 121. Thus, the platen may be turned for writing with single spaces between two lines, or for writing with spaces one and a half times the width of a single space. Further, by twice operating the finger piece 122 the paper may be printed upon with lines spaced apart a distance of three single line spaces.

As appears from Fig. 10, in the normal position the finger piece 122 is directed upwardly and rearwardly and it projects above the space confined by the lid 13 of the box. When the said lid is placed in position the finger piece 122 and the lever 114 are turned clockwise into the position in which the finger piece bears on the stop 123. Thus the height of the casing 12, 13 and the parts of the machine placed therein are reduced to a minimum.

In a similar way, the paper feeding device is constructed so that it occupies little space, and for this purpose the levers controlling the operation thereof are constructed so that they are pressed downwardly by the lid as it is being placed on the casing. In the construction shown in Fig. 11 the paper is pressed into engagement with the platen 62 by means of rolls 126 mounted for ro-

tation in slots formed in a paper guiding apron 127. The paper apron is guided on the carriage by means of pins 137 fixed thereto and engaging in bores of the carriage, and it is urged towards the platen to press the rollers 126 into engagement with the paper placed thereon by a bail 128 pivotally mounted on the end plates 111 of the carriage 61 at 130 and acted upon by a spring 131 attached to the said bail and to the adjacent end plate 111. The bail 128 is connected with a lever 132 located laterally of the platen and in position for being acted upon by a paper releasing lever 133 pivotally mounted on the axle 110 of the platen. When the paper is in position to be printed upon, in which it is pressed against the platen by means of the rollers 126, the said releasing lever is in the position shown in Fig. 11 in full lines in which it projects upwardly beyond the top of the lid 13. The said lever is formed with two noses 134 and 135. When it is rocked from the position shown in full lines to the right its nose 134 engages a nose 136 formed on the lever 132 and rocks the said lever and the bail 128 connected therewith downwardly to withdraw the apron 127 and the rolls 126 away from the platen. When the lever 133 is released the parts are returned into the position in which the rolls 126 press the paper on the platen by means of the spring 131. When the lid is placed on the machine it engages the lever 133 and forces the same downwardly until finally the said lever is within the space bounded by the closed casing.

The lever 133 is adapted to be rocked anticlockwise and into the position shown in dotted lines. In this position the nose 135 engages the left hand end of the lever 132 and forces the same downwardly and into the position in which the rolls 126 are out of engagement with the paper. In this position of the lever 133 the nose 135 has been moved beyond its dead center, so that the spring 131 is not able to force the lever 132 upwardly and thereby to throw the rolls 126 into engagement with the paper. Thus the parts are held in their positions when the operator releases the lever 133, so that the operator has both hands free for pulling the sheet from around the platen or rearranging the same on the platen.

For holding the upper part of the paper on the platen 62 a blade 140 is provided which is formed with two arms 142 mounted on pivot bolts 141 fixed to the end plates 111 of the carriage, one arm of a U-shaped spring 149 fixed to one of the pivot bolts 141 engaging the said blade and urging the same towards the platen. On the said pivot bolt 141 an arm 146 is loosely mounted which is formed with two noses 147 and 148 straddling a pin 144 fixed to a heel 143 of one of the arms 142 of the blade 140, and engaging in a slot 145 made in the adjacent end wall 111. The other arm of the U-shaped spring 149 engages the lever 146 and urges the same clockwise to engage the nose 147 with the pin 144. When the lever 146 is turned clockwise by hand the nose 147 engages the pin 144 and lifts the blade 140 away from the paper, thus permitting the said paper to be adjusted on the platen. When the lever 146 is turned anticlockwise the blade 140 is again brought into engagement with the paper by the arm of the spring 149 acting thereon. The lever 146 may be further turned anticlockwise and into the position shown in dotted lines by placing the lid on the casing. In this position the lever 146 is confined within the said lid.

At the rear of the carriage a toothed rail 150 is fixed to the frame of the machine, which carries two end stops 151 one at either end of the carriage, the said stops being formed with fingers 152 adapted to be engaged by a part of the carriage. The said end stops are provided with noses 153 engaging in the teeth of the rail, and they are adapted to be pushed downwardly against the action of a spring (not shown) for causing the noses 153 to disengage the teeth of the rail to permit adjustment of the end stops along the toothed rail to determine the widths of right and left hand margins to be left on the paper. For thus shifting the end stops downwardly finger pieces 154 are hinged to the end stops at 155. As is shown in Fig. 12, the finger pieces normally project rearwardly from the rail 150, and they are adapted to be turned inwardly into the position shown in Fig. 13, in which they are confined within the lid placed on the casing of the machine.

From the above description it appears that those parts of the machine which normally project from the main parts of the machine, viz., the line spacing lever 122, the lever 133 for retracting the rolls 126 away from the platen, the lever 146 controlling the blade 140, and the finger pieces 154 connected with the end stops 151 may be brought into positions within the spaces left between the operative parts of the machine, so that the space encompassed by the casing when placed on the machine is small.

The ribbon winding and unwinding spools 160 are driven by means of a ratchet disk 161 fixed to a shaft 162 mounted in arms 163 extending downwardly from the rear part of the frame 2. The ratchet disk 161 is engaged by a pawl 164 carried by the link 90, and by a stationary pawl 165 fixed to the arm 56.

The ribbon vibrator 166 is jointed to one arm 167 of a bell crank lever 167, 168 and to a link 169. A pin 170 carried by the arm 168 engages in a slot 171 in an arm 172 forming a part of the bail 89. Thus, when the said bail is moved downwardly the arm 172 carries along the pin 170 so that the ribbon vibrator 166 is moved rearwardly and upwardly.

The type levers 38 are connected with the intermediate levers 29 by means of eccentric gear segments 175 and 176 made integral with the said levers. In Fig. 7 the pitch lines 177 and 178 have been indicated in dashes and dots. In the normal position of the type levers the points of contact of the pitch lines are at their farthest distance from the axis 174 of the type levers, so that the gear ratio of the intermediate levers 29 and the type levers 38 is comparatively slight. As the keys are depressed the points of contact of the pitch lines come nearer the axis 174 of the type levers, so that the gear ratio and therefore the acceleration of the type levers are increased. In my improved construction, in the final position, in which the type levers engage the paper the said points of contact are close to the said axis 174, the root lines of the teeth of the type levers approaching the said pitch lines, while the distance that the ends of the teeth extend outside the pitch lines is increased accordingly. The said distance may be increased so far that the teeth converge to a point. Thus, in my improved construction the pitch line is brought near the axis 174. In the initial positions of the type levers the roots and the outer ends of the teeth have the normal positions relatively to the pitch lines, and the height of the root and head por-

tions extending respectively inwardly and outwardly from the pitch lines of the teeth is made as large as possible, in order to increase the duration of engagement of the teeth.

With this design of the gears 175 and 176 the gear ratio is comparatively small at the beginning of the movement of the type levers, so that the keys have easy movement. In the course of the downward movement of the keys the gear ratio gradually increases, so that the acceleration and the final velocity of the type levers is high. Further, by thus causing the pitch line to approach the axis 174, the universal bar 95 may be disposed close to the said axis. Therefore the type levers act on the said universal bar during a comparatively large fraction of their total paths, the said fraction being substantially the same as in machines of the type in which the type levers are moved through an angle of about 90°, while in my improved machine the stroke of the type levers is about 160°.

I claim:

1. In a type writing machine, comprising the type levers, the key levers, the intermediate levers, and a frame provided with slotted segments providing bearings respectively for said type levers, key levers and intermediate levers, the bearings of said intermediate levers and type levers being concentric, the bearings for said key levers being curved along a larger radius than the bearings of said type levers, and the lengths of the segments carrying the intermediate levers and key levers being substantially alike.

2. In a typewriting machine that includes in its structure a frame and type levers, key levers, and intermediate levers pivotally mounted in the frame, the improvement herein described which consists in a segmental member fixed to the frame, which segmental member is formed with a segmental rib in close engagement with and fixed to said frame, and a second segmental member extending rearwardly from the upper portion of said rib to provide a free space below the same and at the rear of said rib, said second segmental member being formed with radial slots in which said type levers are immediately mounted.

3. In a typewriting machine that includes in its structure a frame and type levers, key levers, and intermediate levers pivotally mounted in the frame, the improvement here described which consists in a segmental plate integrated with the frame and equipped on its upper side with a plurality of upward extending laminations that define a plurality of radially grouped slots, the type levers being arranged in such slots, the segmental plate being formed with a cut-out portion, and letter-spacing mechanism that includes a universal bar extending from below upward through such cut-out portion of the segmental plate and at its upper end extending across the paths of pivotal movement of all of said type levers.

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