Oct. 9, 1962 J. E. THOMSON 3,057,449

TYPEWRITER

Filed March 21, 1960 17 Sheets-Sheet 1

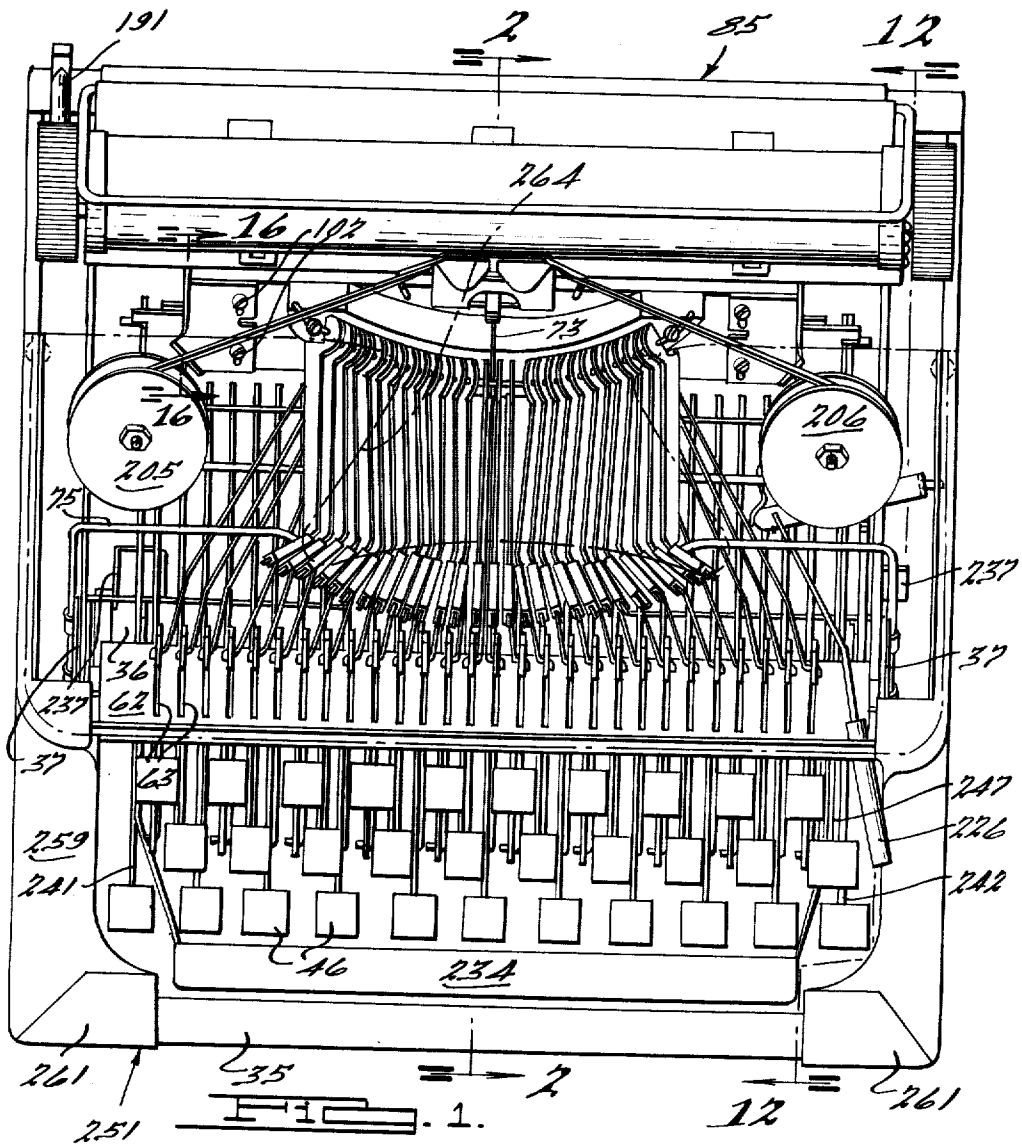

Fig. 1.

INVENTOR.
James E. Thomson.
BY
Harness, Dickey & Pierce
ATTORNEYS

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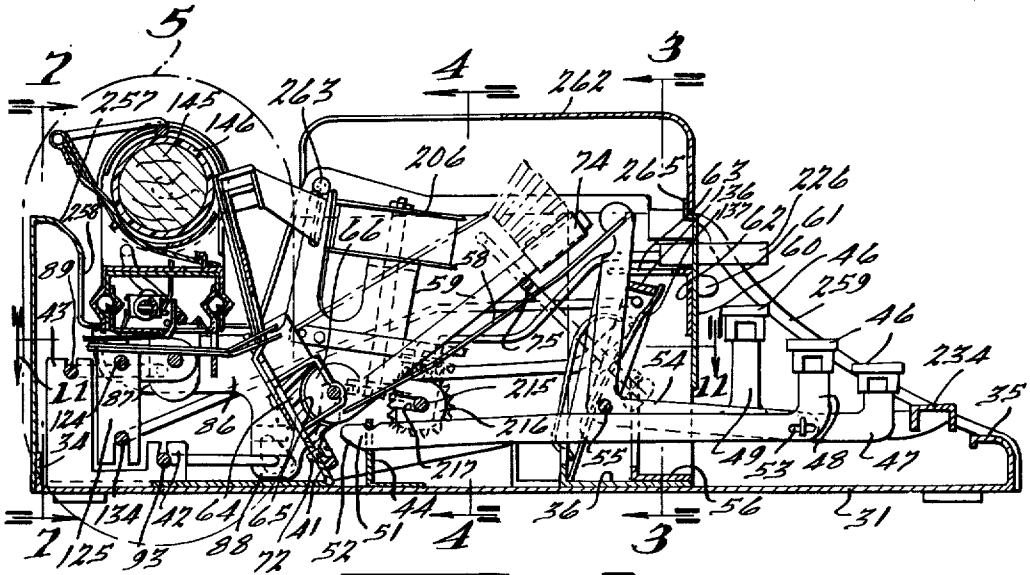

FIG. 2.

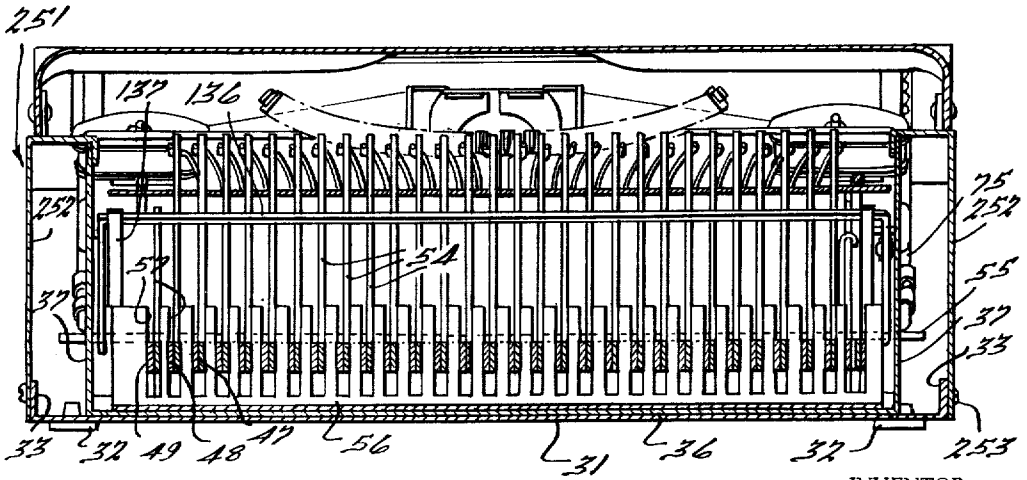

FIG. 3.

INVENTOR.
James E. Thomson
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Harness, Dickey & Pierce.
ATTORNEYS.

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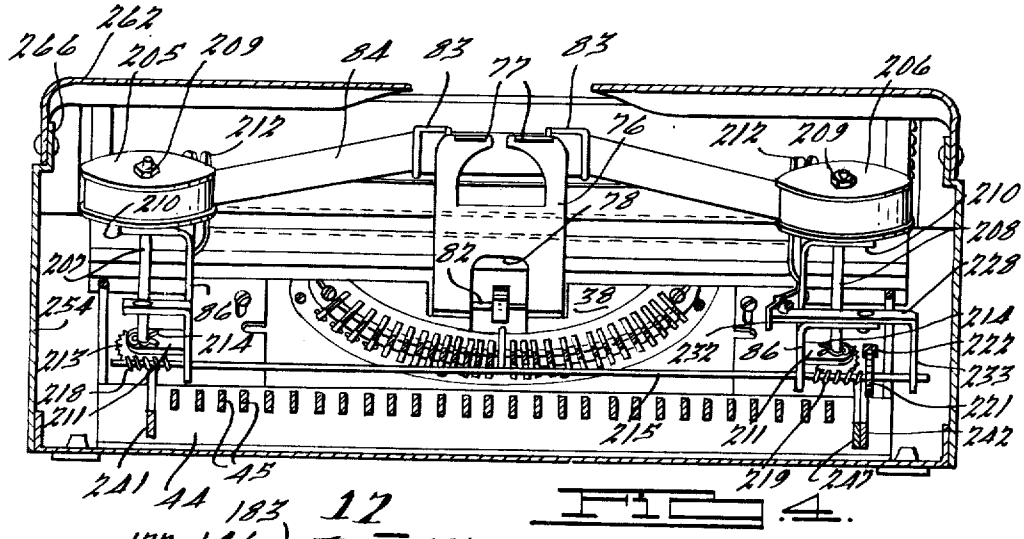

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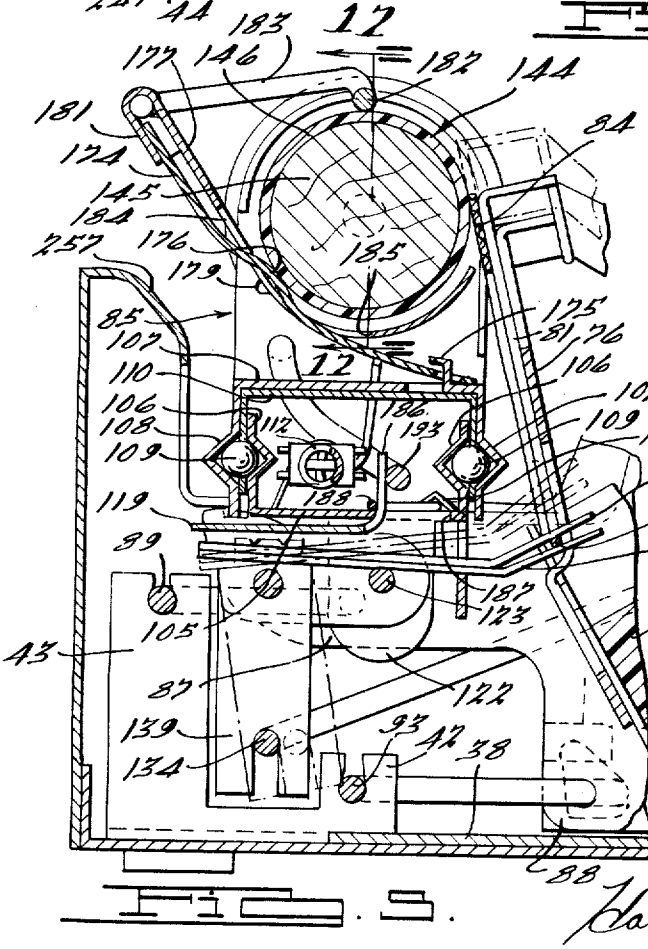

FIG. 5.

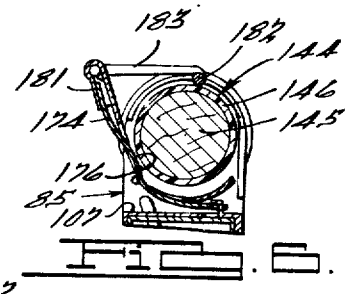

FIG. 6.

INVENTOR.
James E. Thomson
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Harness, Dickey & Pierce
ATTORNEYS.

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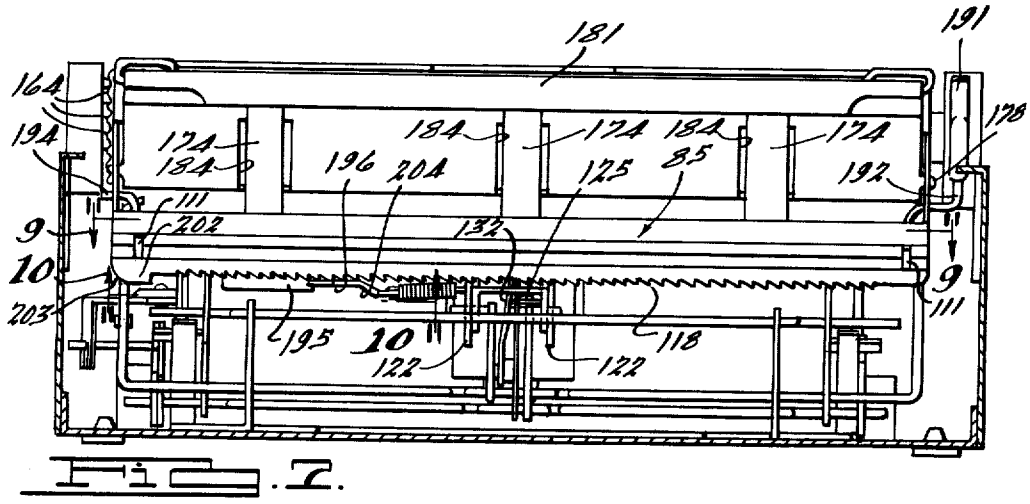

FIG. 7.

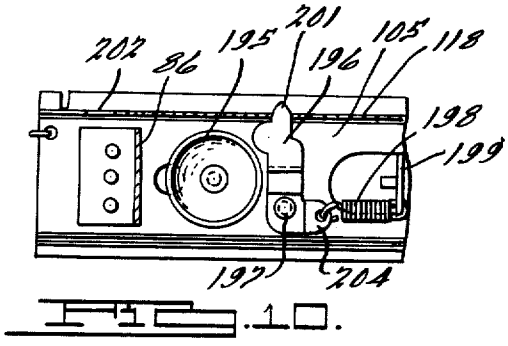

FIG. 10.

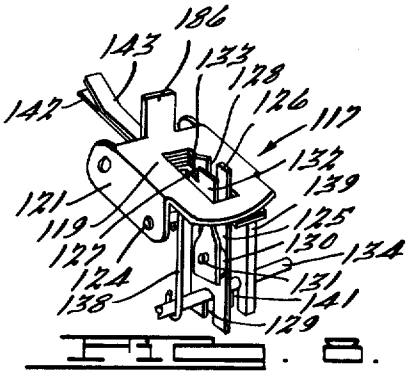

FIG. 8.

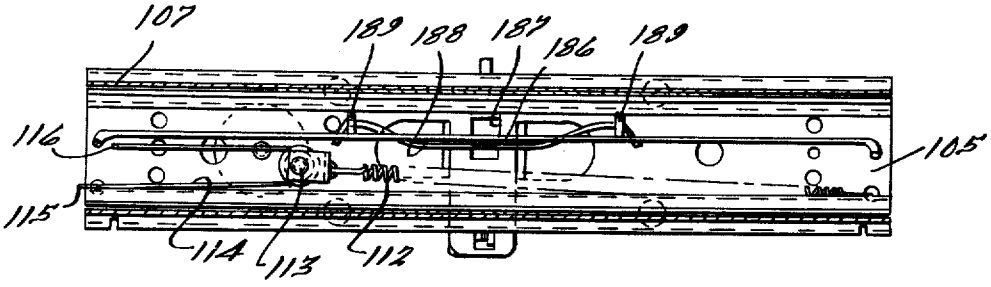

FIG. 9.

INVENTOR.
James E. Thomson
BY
Harness, Dickey & Pierce.
ATTORNEYS.

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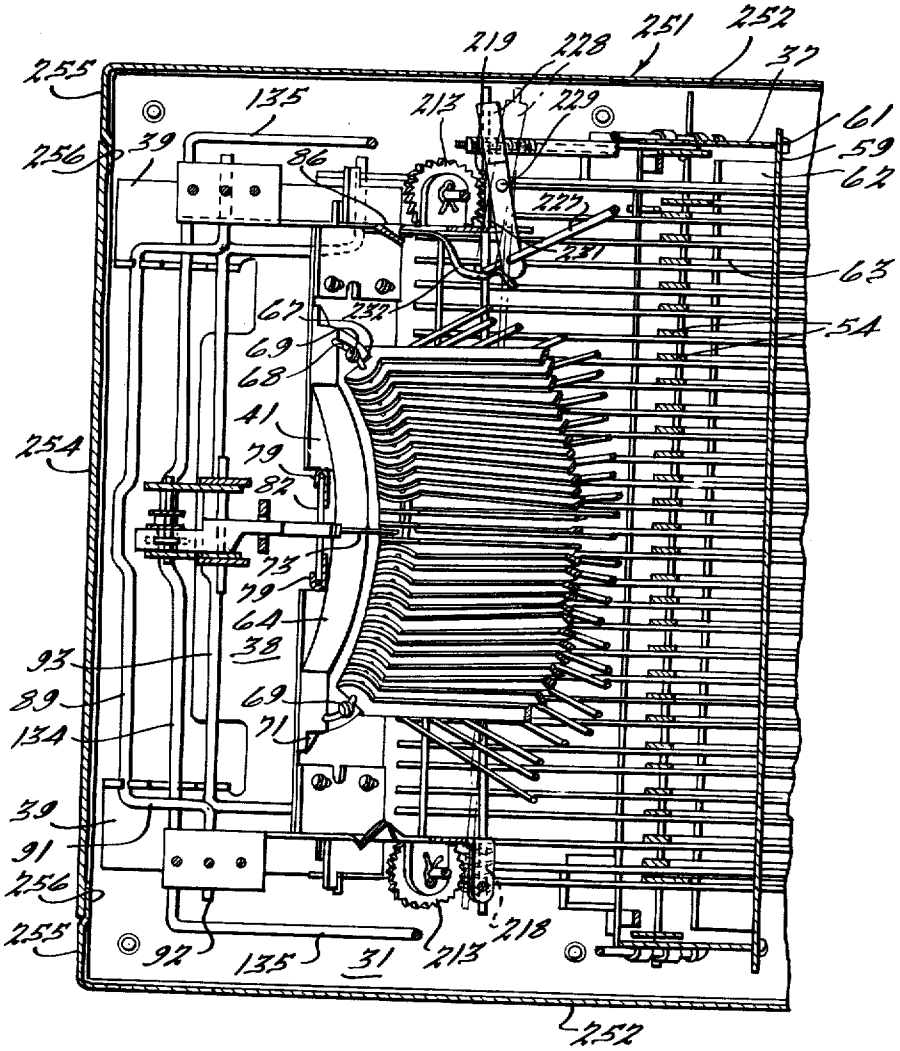

FIG. 11.

INVENTOR.
James E. Thomson.
BY
Harness, Dickey & Pierce,
ATTORNEYS.

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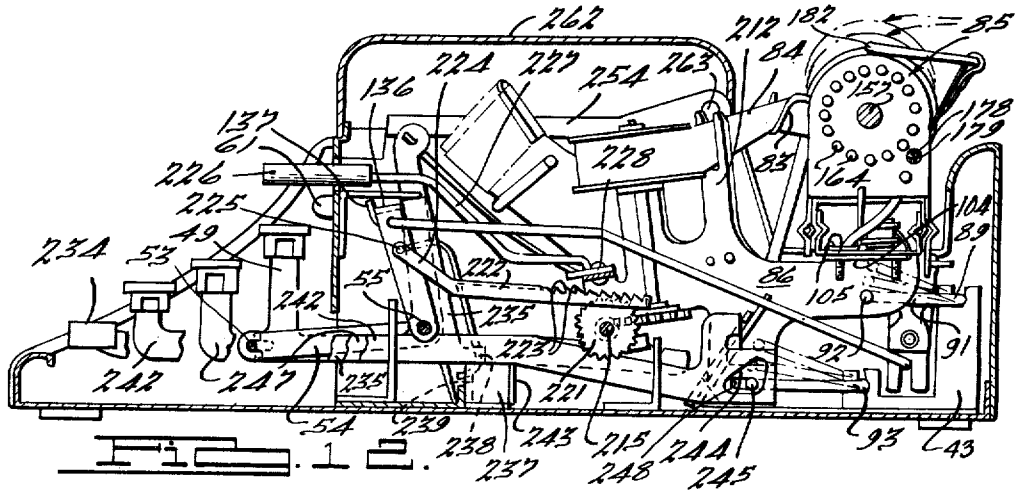

Fig. 12.

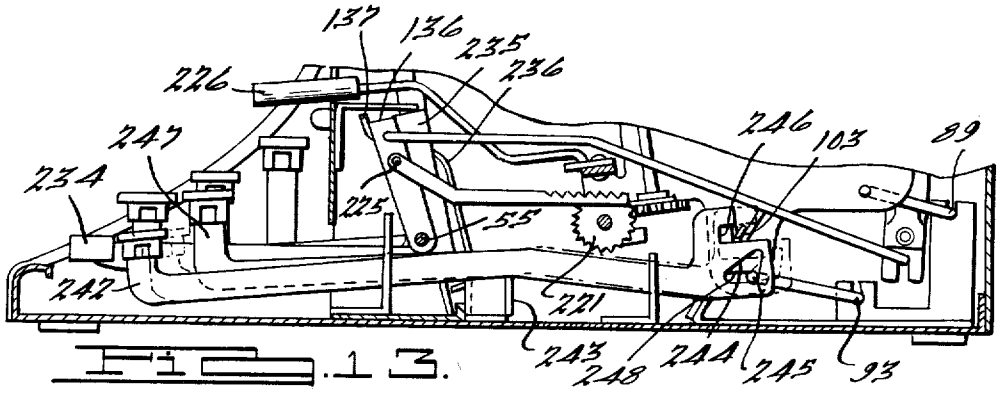

Fig. 13.

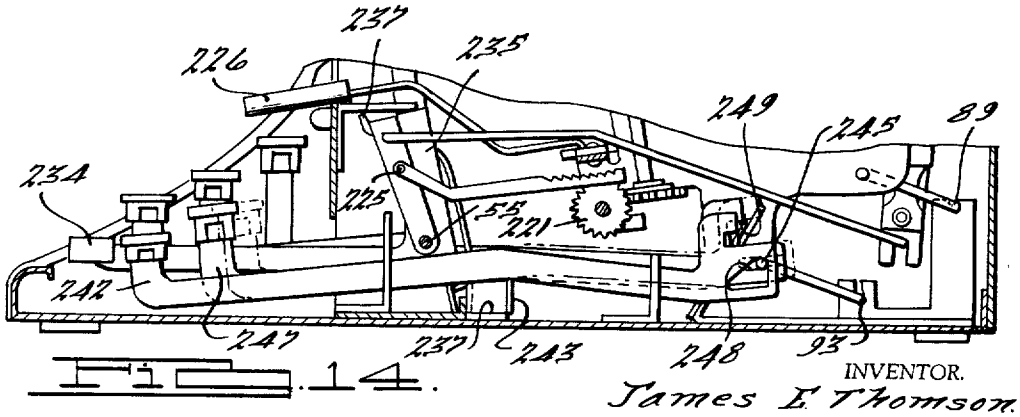

Fig. 14.

INVENTOR.
James E. Thomson
BY
Harness, Dickey & Pierce
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Oct. 9, 1962 J. E. THOMSON 3,057,449

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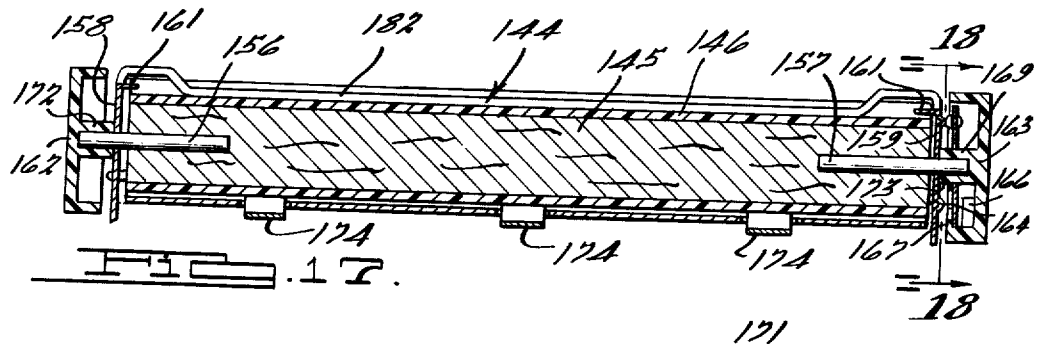
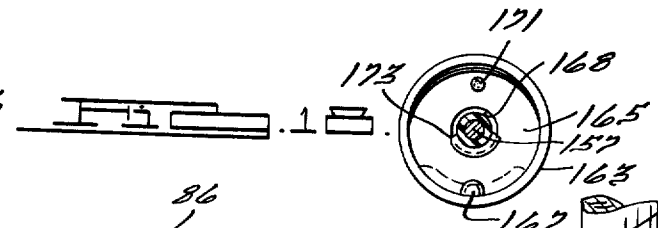


FIG. 17.



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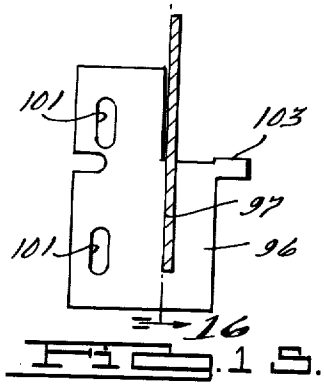
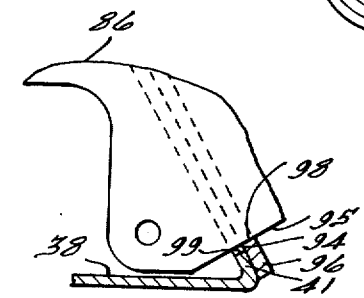


FIG. 15.



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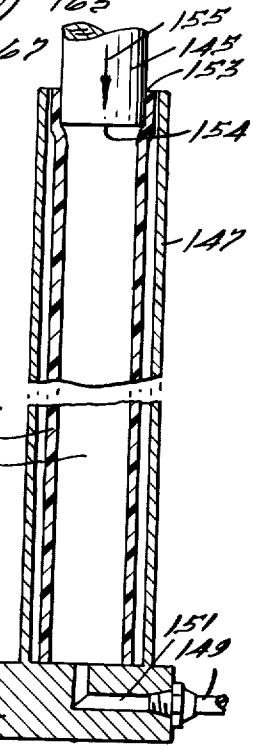

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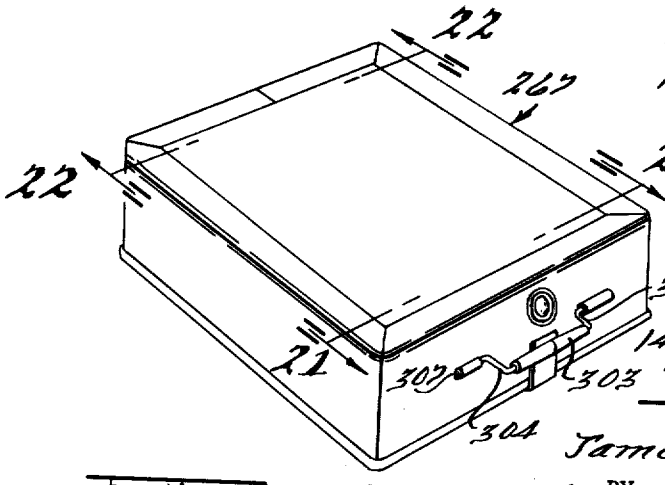

FIG. 20.

INVENTOR.
James E. Thomson
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Harness Dickey & Pierce.
ATTORNEYS

Oct. 9, 1962 J. E. THOMSON 3,057,449

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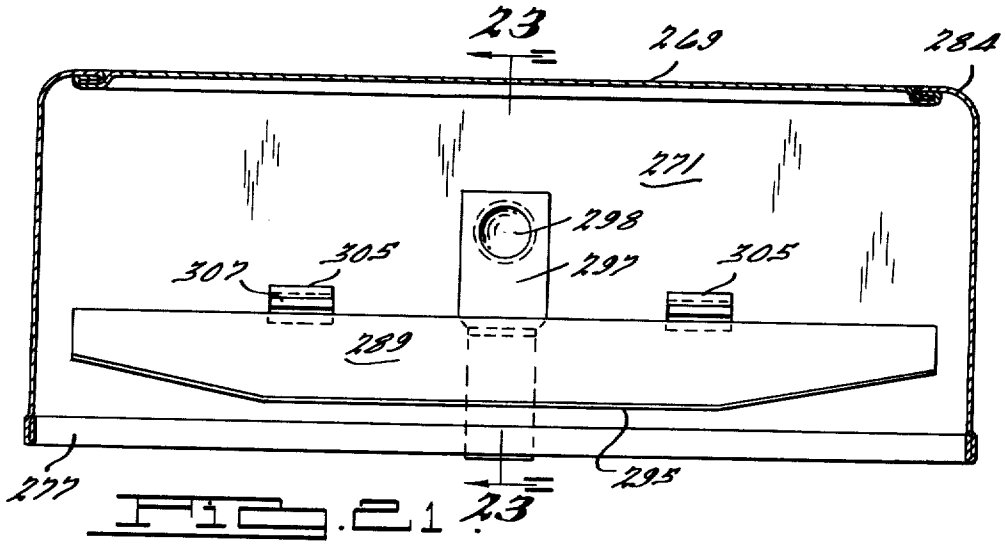

FIG. 21

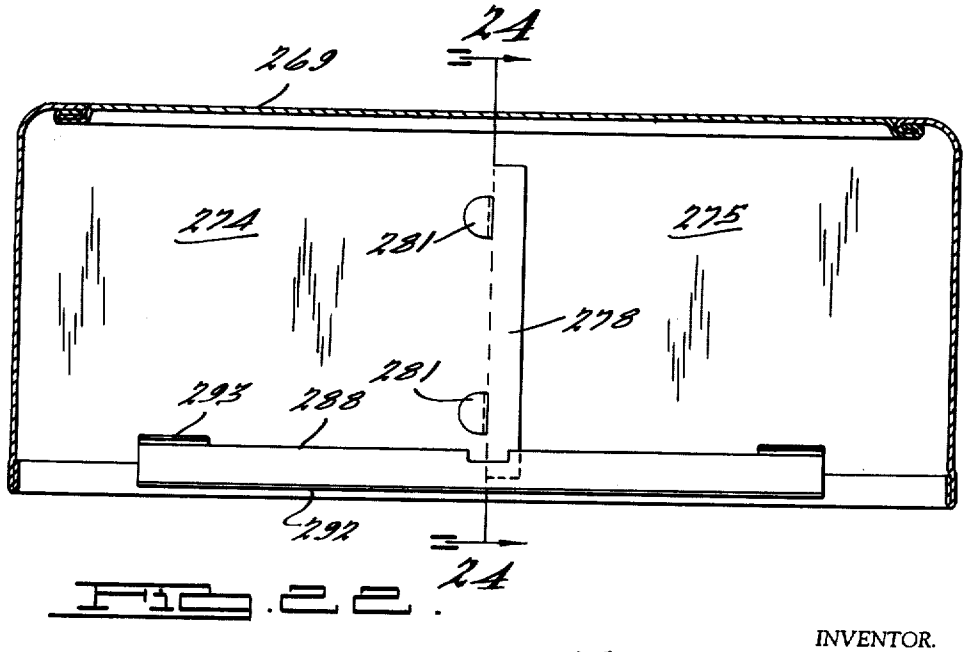

FIG. 22

INVENTOR.
James E. Thomson
BY
Harrison, Dickey & Price.
ATTORNEYS.

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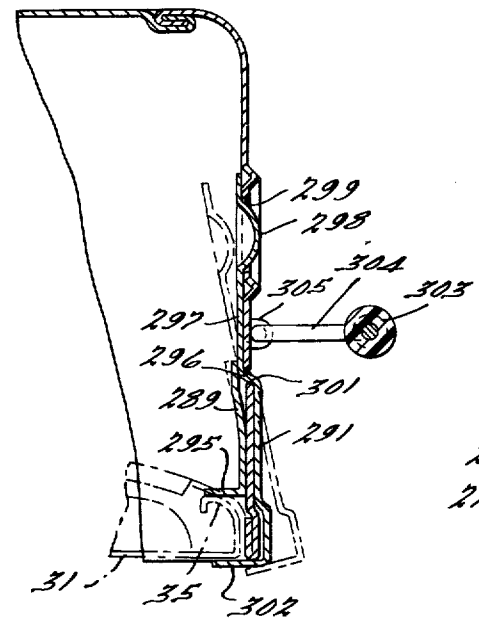
FIG. 23.



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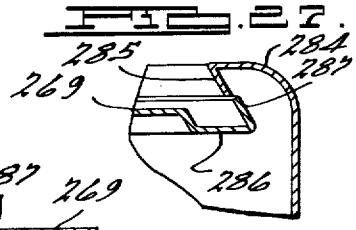

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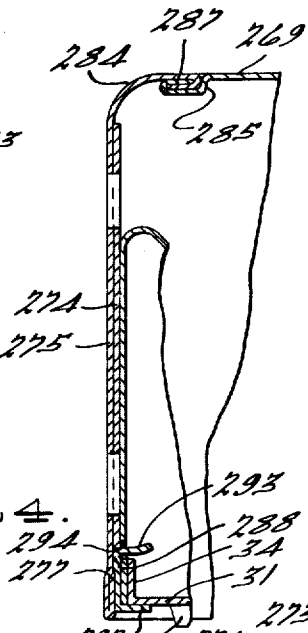

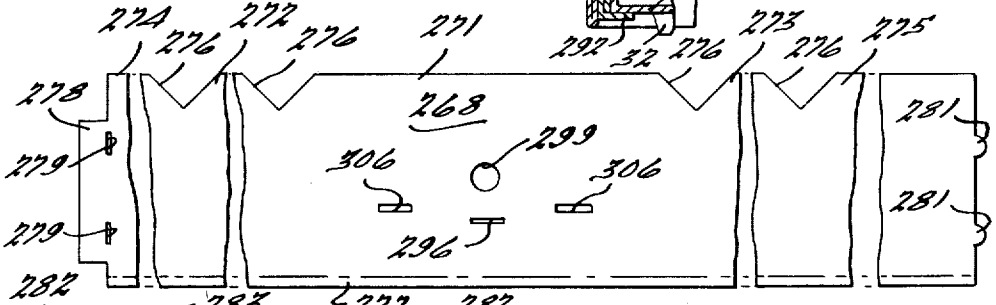

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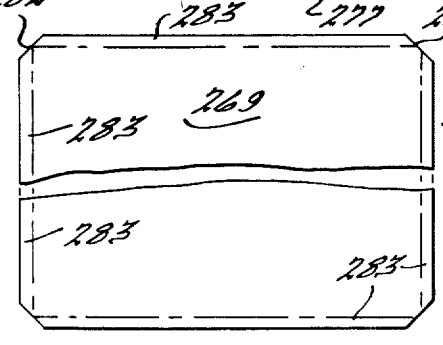

FIG. 26.

INVENTOR.
James E. Thomson
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Harness, Dickey & Pierce
ATTORNEYS

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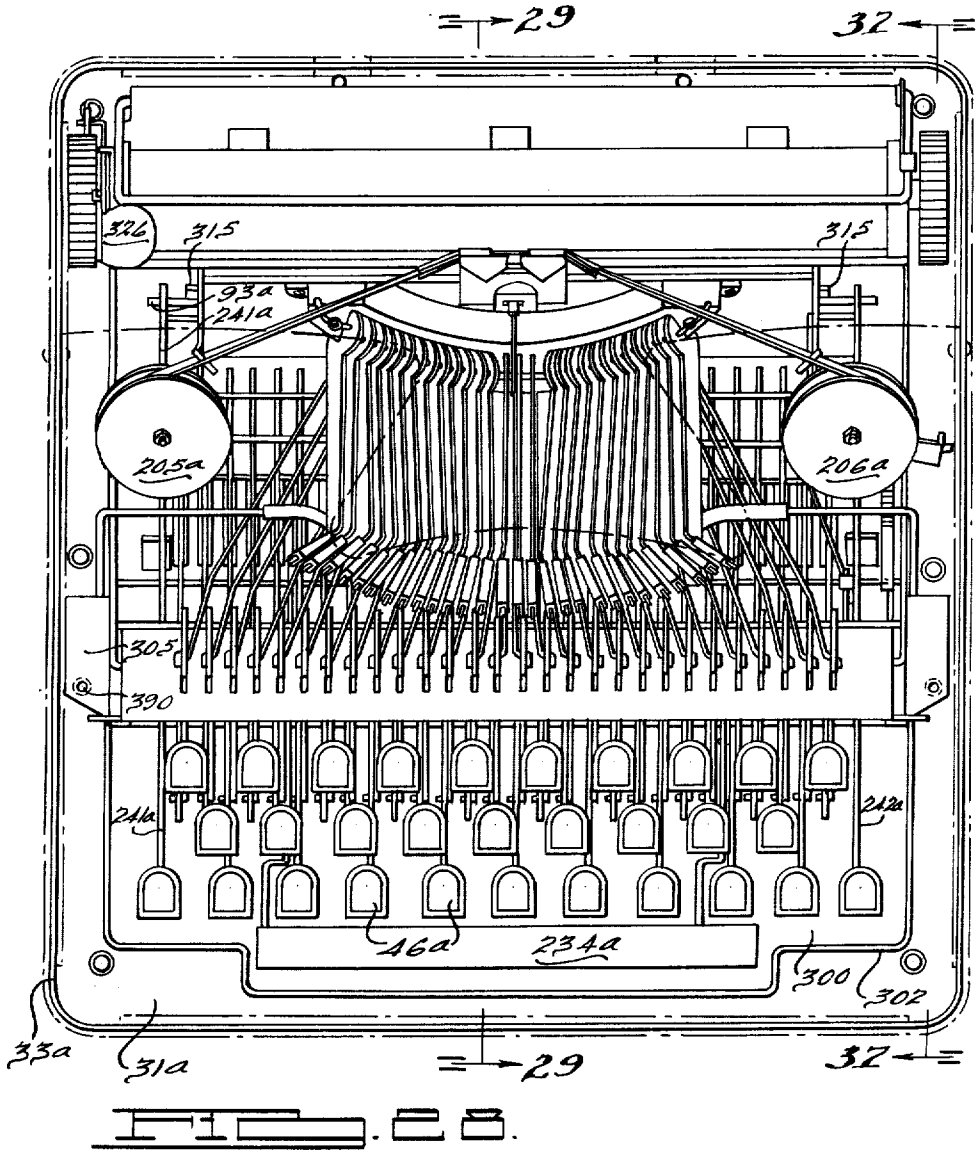

FIG. 28.

INVENTOR.
James E. Thomson.
BY
Harness, Dickey & Pierce
ATTORNEYS.

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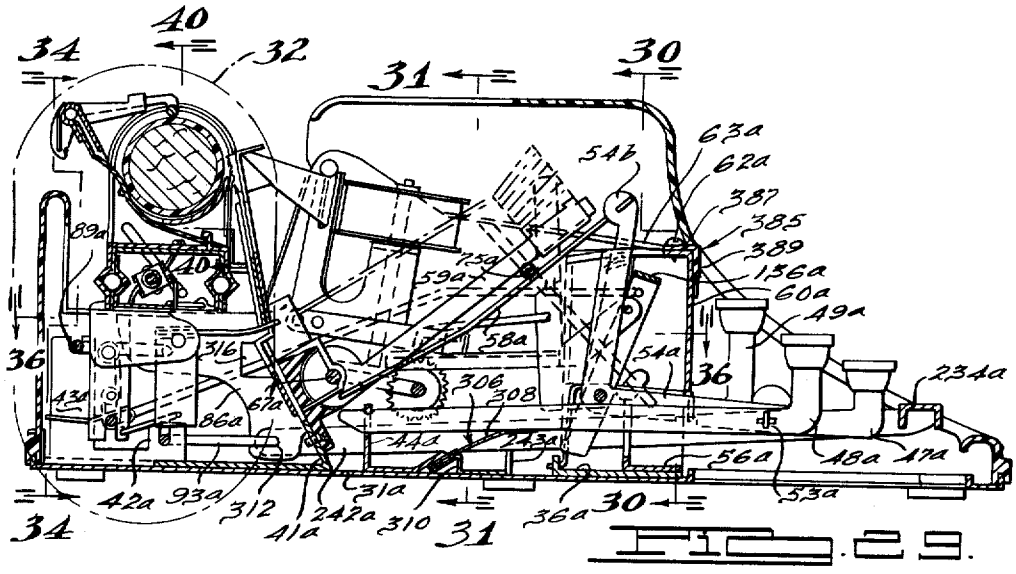

FIG. 29.

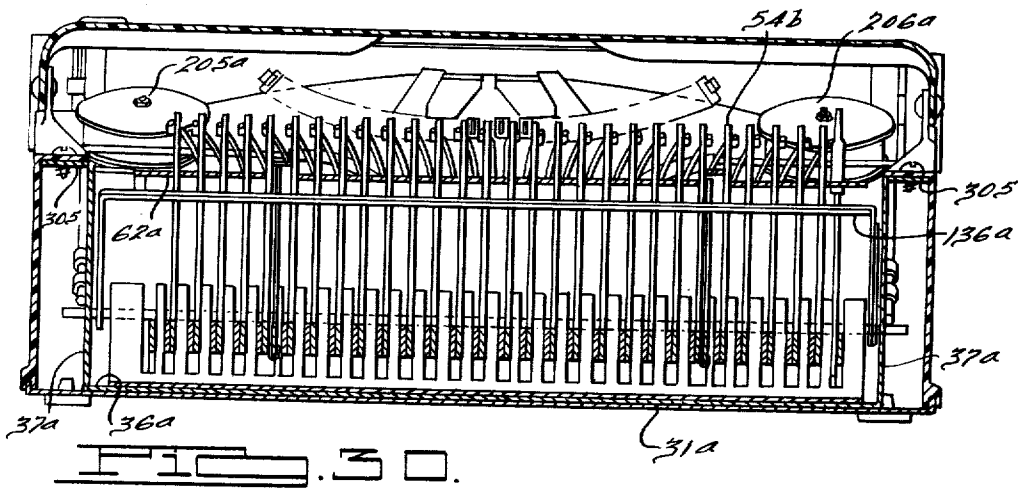

FIG. 30.

INVENTOR.
James E. Thomson.
BY
Harness, Dickey & Pierce
ATTORNEYS.

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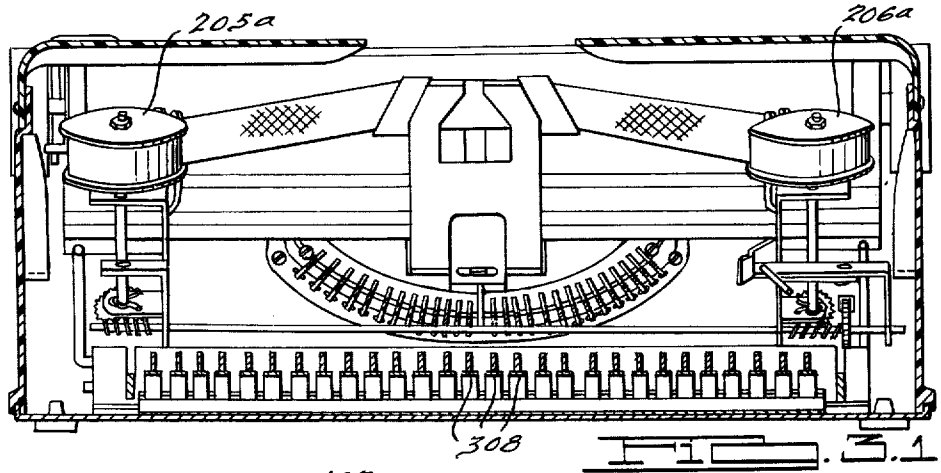

FIG. 3.1.

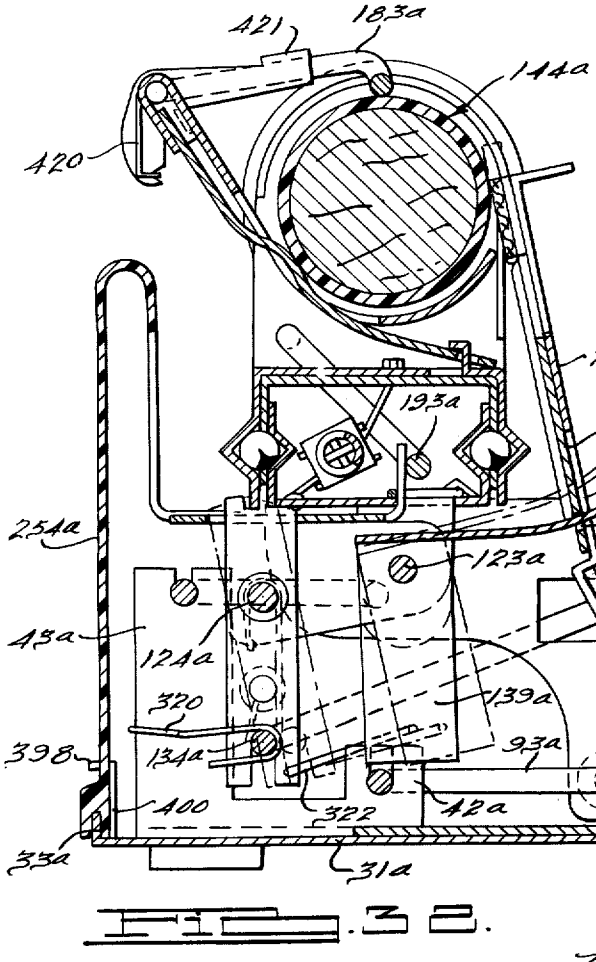

FIG. 3.2.

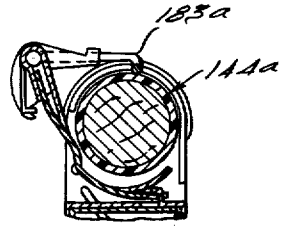

FIG. 3.3.

INVENTOR.
James E. Thomson.
BY
Harness, Dickey & Pierce
ATTORNEYS.

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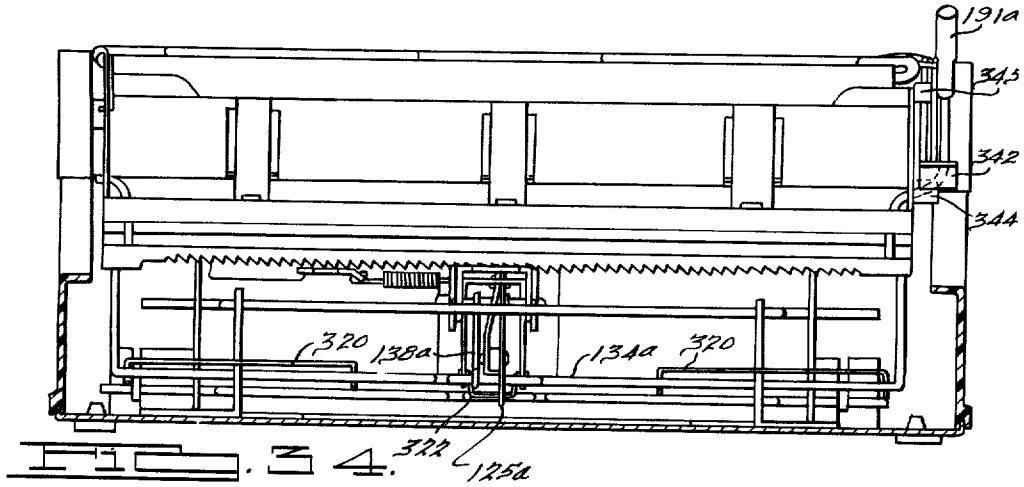

FIG. 34.

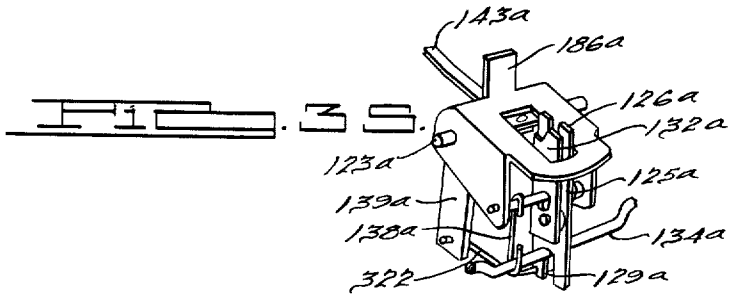

FIG. 35.

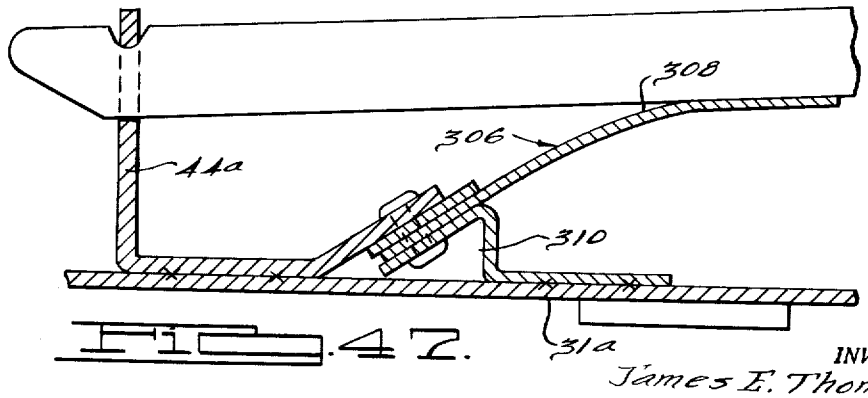

FIG. 47.

INVENTOR.
James E. Thomson.
BY
Harness, Dickey & Pierce
ATTORNEYS.

Oct. 9, 1962 J. E. THOMSON 3,057,449

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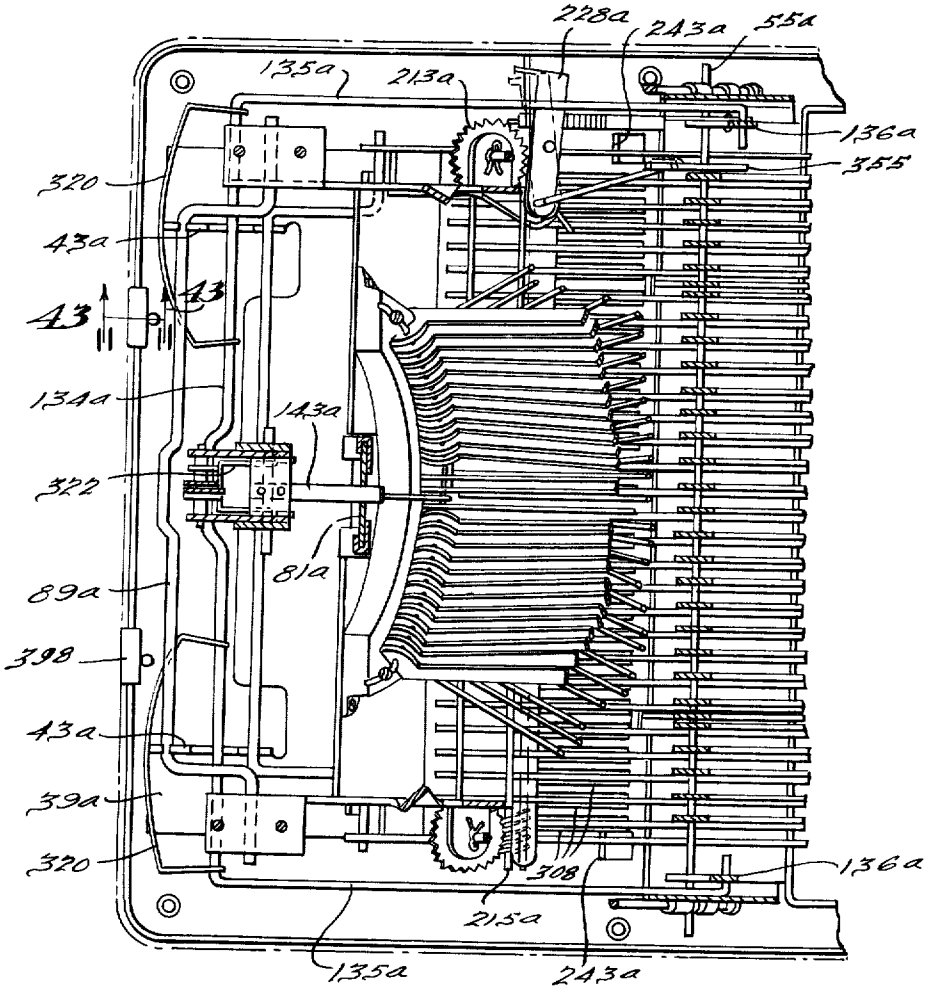

FIG. 36.

INVENTOR.
James E. Thomson.
BY
Harness, Dickey & Pierce
ATTORNEYS.

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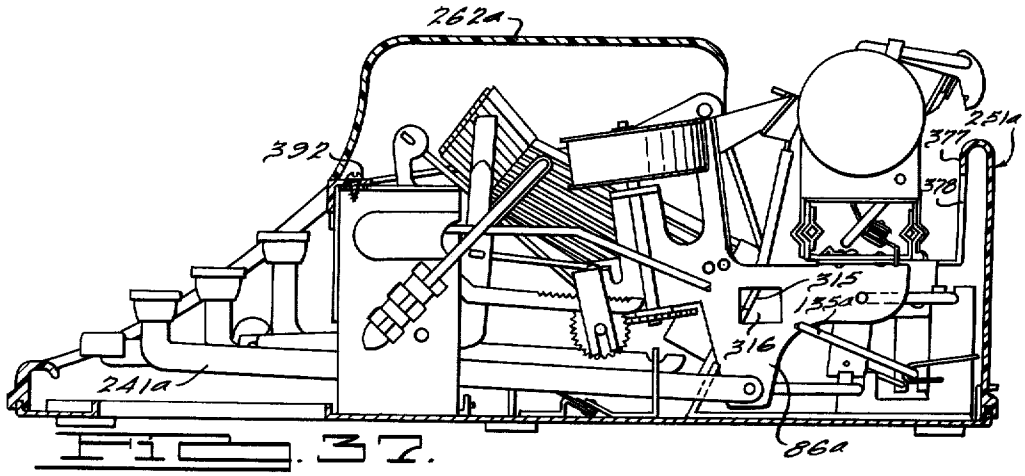

Fig. 37.

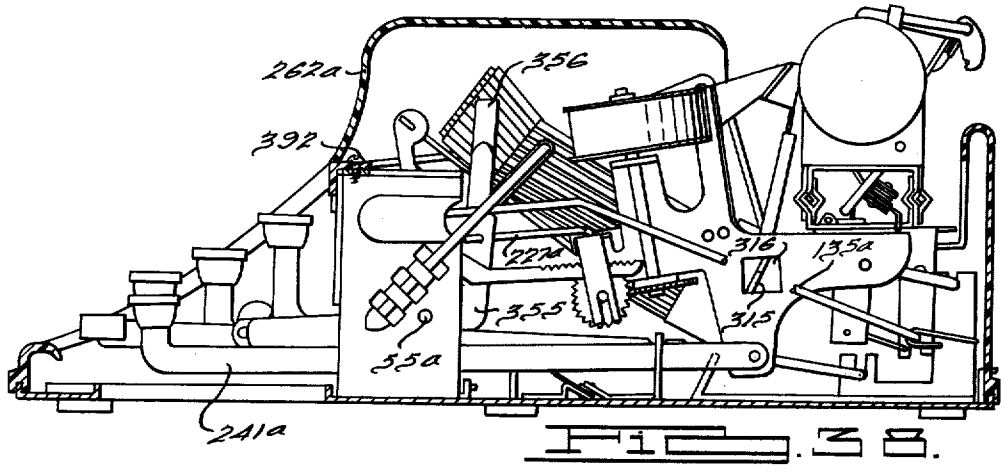

Fig. 38.

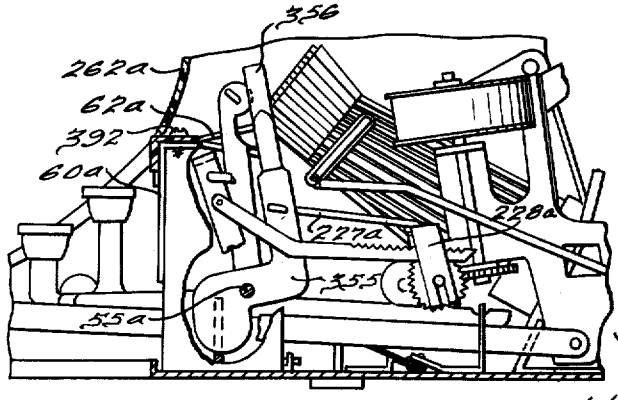

Fig. 39.

INVENTOR.
James E. Thomson,
BY
Harness, Dickey & Pierce
ATTORNEYS.

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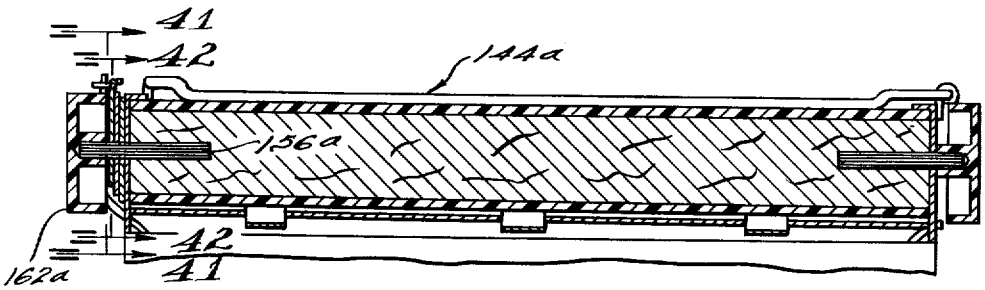

FIG. 40.

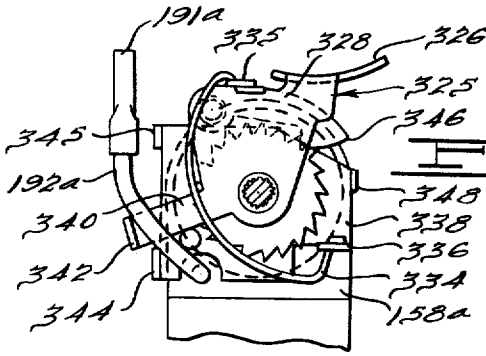

FIG. 41.

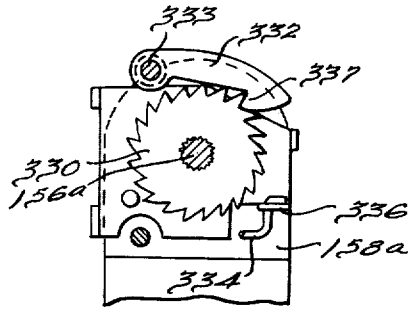

FIG. 42.

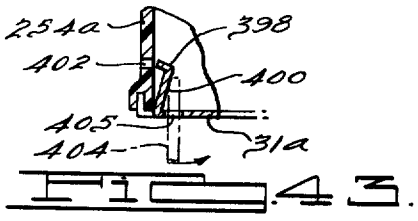

FIG. 43.

INVENTOR.
James E. Thompson.
BY
Harness, Dickey & Pierce
ATTORNEYS.

Oct. 9, 1962 J. E. THOMSON 3,057,449

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Fig. 44.

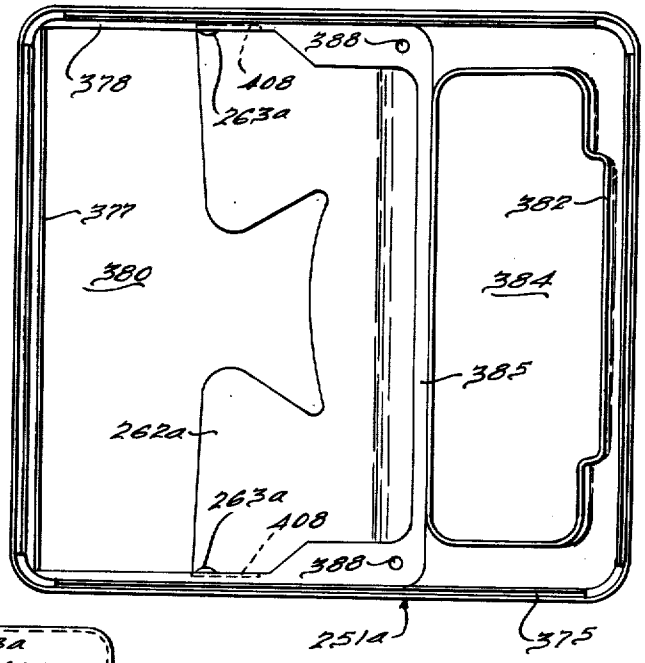


Fig. 45.

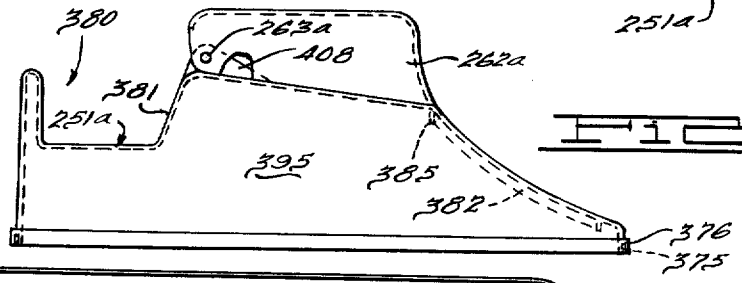
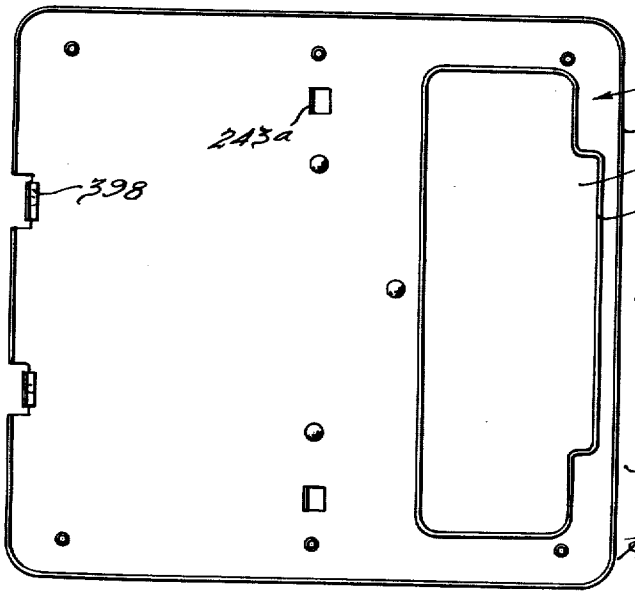


Fig. 46.



INVENTOR.
James E. Thomson.
BY
Harness, Dickey & Pierce
ATTORNEYS.

United States Patent Office 3,057,449 Patented Oct. 9, 1962

3,057,449

TYPEWRITER

James E. Thomson, Munith, Mich., assignor to Western Stamping Company, Jackson, Mich., a corporation of Michigan

Filed Mar. 21, 1960, Ser. No. 16,368
38 Claims. (Cl. 197—22)

This invention relates to typewriters, and more particularly to a construction and method of manufacture of relatively inexpensive typewriters usable both as toys and for school and home purposes.

This application is a continuation-in-part of application No. 691,340, filed October 21, 1957, now abandoned.

It is an object of the invention to provide a novel and improved typewriter construction which incorporates a standard keyboard and platen arrangement, together with ribbon feed, paper release and other features found on standard office machines but which nevertheless may be mass-produced at extremely low cost from inexpensively fabricated parts.

It is also an object to provide a novel typewriter construction of this type including an improved key lever linkage arrangement which reduces typing effort while permitting a low and compact shape for the machine housing.

It is another object to provide an improved typewriter construction of this nature which does not sacrifice accuracy of letter alignment, tracking, spacing or feeding, and permits adjustment to achieve optimum contact areas between the platen and type faces.

It is a further object to provide an improved typewriter of this nature which permits complete testing of the assembled machine on the production line without the necessity of first assembling the housing portions, thus facilitating adjustment of the parts during production.

It is also an object to provide an improved typewriter construction of the above character, including novel hanger and guide means for the type bars which are of high accuracy, are substantially less expensive than previously known constructions of this nature when produced in large quantity, and which have no wearing parts which might create maintenance problems.

It is another object to provide an improved typewriter construction of this nature which has a novel ribbon feeding and reversing mechanism of inexpensive and efficient construction.

It is a further object to provide an improved typewriter construction of this nature which includes a novel platen construction capable of being fabricated of inexpensive materials without sacrificing the smooth surface quality, resilience or wearing properties of the platen. In this connection, it is an object to provide a novel and improved method of assembly of the platen and platen core which enables the use of such inexpensive material.

It is also an object to provide an improved typewriter of this character including a novel platen ratchet construction which insures accurate feed movement for the platen and at the same time takes up any play between the platen ends and the supporting structure, thus maintaining accuracy of letter spacing.

It is another object to provide an improved typewriter construction having the above characteristics, which includes novel means for holding the paper against the platen, this means eliminating the need and expense of feed rollers and being easily retracted from their gripping position by a simple movement.

It is a further object to provide an improved carriage shift mechanism especially adapted for typewriters of the three position type and which includes means for automatically releasing the intermediate shift lock when it is desired to change to the upper shift position.

It is also an object to provide an improved carrying case in combination with a typewriter of the above character, which may be inexpensively fabricated and includes means for securely holding the typewriter while being easily detachable therefrom.

Another object of the invention is to provide an improved and extremely simple means providing independent spring action for each type bar and its associated key and linkage mechanism.

Still another object is to provide an improved and extremely simple and independent means, operable through the agency of a single lever on the carriage, for returning the carriage to the starting position after completion of a line of typing, and at the same time rotatively rolling the platen to position for the next line of typing.

A further object is to provide an improved composite casing structure formed partly of metal and partly of plastic, the parts of which are disposed in a mutually reinforcing relation and which provides a high degree of stiffness yet which is of inexpensive character, and which can be readily opened for access to the parts for lubrication or any necessary servicing.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description, taken in conjunction with the accompanying drawings.

In the drawings:

FIGURE 1 is a top plan view of the improved typewriter of this invention, with the lid removed, showing the general contour of the base and the keyboard arrangement;

FIGURE 2 is a cross-sectional view in elevation taken along the line **2—2** of FIGURE 1 and showing the key levers, carriage slide arrangement and other portions of the construction;

FIGURE 3 is a cross-sectional view in elevation taken along the line **3—3** of FIGURE 2 and showing the configuration of the universal bar;

FIGURE 4 is a cross-sectional view in elevation taken along the line **4—4** of FIGURE 2 and showing the type bar support and key lever fulcrum;

FIGURE 5 is an enlarged fragmentary cross-sectional view in elevation of the area marked **5** in FIGURE 2 and illustrating the bearing construction between the carriage and carriage rail as well as the connection between the paper gripping springs and the paper guide;

FIGURE 6 is a view of a portion of the mechanism illustrated in FIGURE 5 showing a paper gripping spring in released position;

FIGURE 7 is a cross-sectional view in elevation taken along the line **7—7** of FIGURE 2 and showing the escapement ratchet and associated mechanism;

FIGURE 8 is a perspective view of the escapement mechanism showing the ribbon guide actuating means;

FIGURE 9 is a cross-sectional plan view taken along the line **9—9** of FIGURE 7 and showing the carriage drive spring and associated parts;

FIGURE 10 is a fragmentary cross-sectional plan view taken along the line **10—10** of FIGURE 7 and showing the signal mechanism;

FIGURE 11 is a plan cross-sectional view taken along the line **11—11** of FIGURE 2 and illustrating parts of the ribbon feed mechanism;

FIGURE 12 is a cross-sectional view in elevation taken along the line **12—12** of FIGURE 1 and showing the shift key arrangement with the carriage in its lowest position;

FIGURE 13 is a view similar to FIGURE 12 showing the intermediate shift lever depressed;

FIGURE 14 is a view similar to FIGURES 12 and 13 with the upper shift lever depressed;

FIGURE 15 is an elevational view of one of the shift key lock brackets which also act as adjustable stops for the rest position of the carriage assembly;

FIGURE 16 is a fragmentary cross-sectional view in elevation taken along the line **16—16** of FIGURE 15 and showing the manner in which the part illustrated in FIGURE 15 acts as an adjustable carriage assembly rest;

FIGURE 17 is a fragmentary cross-sectional view in elevation taken along the line **17—17** of FIGURE 5 and showing the platen construction;

FIGURE 18 is a cross-sectional view in elevation taken along the line **18—18** of FIGURE 17 and showing the feed ratchet pawl spring;

FIGURE 19 is a cross-sectional view in elevation of an apparatus which illustrates the novel method of assembling the platen core and sheath;

FIGURE 20 is a perspective view of the novel typewriter carrying case shown in its closed position;

FIGURE 21 is a cross-sectional view in elevation taken along the line **21—21** of FIGURE 20 and illustrating the front retaining bar of the carrying case;

FIGURE 22 is a cross-sectional view in elevation taken along the line **22—22** of FIGURE 20 and showing the rear retaining bar of the case;

FIGURE 23 is a cross-sectional view in elevation taken along the line **23—23** of FIGURE 21 and showing the releasable catch on the carrying case;

FIGURE 24 is a cross-sectional view in elevation taken along the line **24—24** of FIGURE 22 and showing the manner in which the rear portion of the typewriter is retained by the rear retaining bar of the carrying case;

FIGURE 25 is a developed view of the metal blank which is to form the walls of the carrying case constructed according to the novel method of this invention;

FIGURE 26 is a plan view of the blank which forms the top of the carrying case in its unformed condition;

FIGURE 27 is a fragmentary view of an edge of the carrying case in semi-finished condition showing the manner in which the flanges of the parts shown in FIGURES 25 and 26 interfit.

FIGURE 28 is a view similar to FIGURE 1 showing another form of the invention, the entire upper portion of the casing being removed;

FIGURES 29 to 34 inclusive are views corresponding substantially to FIGURES 2 to 7 inclusive, showing the second form of the invention;

FIG. 35 is a detail perspective view similar to FIGURE 8, showing the escapement mechanism of the second form of the invention;

FIGURE 36 is a fragmentary sectional plan view corresponding to FIGURE 11, showing the second form of the invention;

FIGURE 37 is a sectional elevational view taken substantially on the line **37—37** of FIGURE 28 and looking in the direction of the arrows;

FIGURE 38 is a view similar to FIGURE 37, showing the shift lever depressed;

FIGURE 39 is a view taken similarly to but showing only a portion of the parts represented in FIGURE 37, and broken away to illustrate parts of the ribbon reverse mechanism, which is shown in a different position;

FIGURE 40 is a longitudinal sectional view of the platen and adjacent parts, corresponding to FIGURE 17 of the drawing of the first form of the invention;

FIGURES 41 and 42 are sectional details taken substantanally on the lines **41—41** and **42—42** respectively of FIGURE 40 and looking in the direction of the arrows:

FIGURE 43 is a sectional detail taken substantially on the line **43—43** of FIGURE 36 and looking in the direction of the arrows;

FIGURE 44 is a bottom plan view of the plastic upper case and lid assembly;

FIGURE 45 is a side elevational view of the same;

FIGURE 46 is a top plan view of the base plate; and

FIGURE 47 is an enlarged sectional detail of the cowle-type key lever spring and adjacent parts.

BASE, FRAME AND KEY LEVERS

Referring more particularly to the drawings, the illustrated embodiment of the invention comprises a base plate **31** having foot pads **32** therebelow, a pair of upwardly bent side flanges **33**, a rear flange **34** and an upwardly and inwardly bent front flange **35**. Secured to a forward intermediate portion of base plate **31** is a key lever supporting frame **36** of generally U-shaped configuration having a central leg resting on base **31** and a pair of upstanding side legs **37**. A carriage supporting frame **38** is secured to base **31** rearwardly of frame **36**. In plan, as seen in FIGURE 11, frame **38** has a generally U-shaped configuration with a pair of side legs **39** projecting rearwardly from the main frame portion which rests on base **31**. The forward portion **41** of base **38** is bent upwardly and rearwardly as seen in FIGURES 2 and 5, and the inner edges of rearwardly extending portions **39** of the frame each has a relatively short post **42** and a relative long post **43** spaced rearwardly of post **42**. A key lever fulcrum **44** is secured to base **31** forwardly of frame **38**, this fulcrum comprising a slotted bar extending across the base. The arrangement of slots **45** in fulcrum bar **44** is best seen in FIGURE 4, these slots being disposed in parallel upstanding relation.

The keyboard of the illustrated typewriter comprises three banks of keys **46**. Each key is adapted to operate a type bar having a type face with three characters, a lower case letter, an upper case letter and a numeral or other symbol, this arrangement being well known in the art. Three sets of key levers are provided for the three banks, a set of long key levers **47** for the front bank of keys, a set of intermediate length key levers **48** for the middle bank and short key levers **49** for the rear bank of keys. These levers have similar shapes with upstanding portions on which keys **46** are mounted at three different levels. The inner ends **51** of levers **47**, **48** and **49** fit within slot **45** of fulcrum bar **44** in such a manner as to permit limited pivotal movement of the levers about the upper edges of the slots while preventing the levers from being removed from the slots. The forward edges **52** of lever ends **51** may be formed in a sloping manner as seen in FIGURE 2 to permit assembly of the levers in the fulcrum slots.

Levers **47**, **48** and **49** are each provided with an elongated slot **53**, all these slots being transversely aligned at the position indicated in FIGURE 2. Slots **53** are disposed at about the position of the middle bank of keys and serve to connect the key levers with bell cranks **54** which are rockably mounted on a pivot rod **55** supported between legs **37** of key lever supporting frame **36**. A guide bar **56** of L-shaped cross section is secured to the central portion of frame **36** as seen best in FIGURE 3, has a plurality of open-ended slots **57** which serve to guide the key levers as well as their corresponding bell cranks **54**. Bell cranks **54** are of uniform shape, and their lower arms overlap portions of levers **47**, **48** and **49**. A link **58** is connected to the upper end of each bell crank as seen in FIGURE 2 and extends downwardly and forwardly, the end of each link being connected to a type bar **59**. The connection between each bell crank **54** and each key lever is by means of a tab on the forwardly projecting arm of each bell crank which projects through the corresponding slot **53** in the key lever, levers **49** having forwardly extending portions carrying slots **53** as seen in FIGURE 12.

A front housing plate **60** extends between the forward edges of upstanding legs **37** of frame **36** being secured thereto by tabs **61** on legs **37**, and an L-shaped guide bar **62** is secured to plate **60** and extends rearwardly therefrom. Guide bar **62** is provided with a plurality of slots

63, as seen in FIGURES 1, 2 and 11, for guiding the upstanding legs of bell cranks 54.

In operation, depression of a key 46 will cause its corresponding key lever 47, 48 or 49 to be rocked clockwise in FIGURE 2 about fulcrum bar 44, causing corresponding blockwise rotation of bell crank 54 about pivot rod 55. It will be noted that the key levers all extend below pivot rod 55 so that the pivot rod will not interfere with depression of the keys. During this movement the key lever and bell crank will be guided by the corresponding slots 56 and 63 of guide bars 55 and 60 respectively. It should be observed that the construction is extremely compact and affords a high mechanical advantage for easy typing with approximately equal effort required for all the keys.

TYPE BAR MECHANISM AND HANGER

Type bars 59 are pivotally supported by a hanger 64 secured to inclined forward portion 41 of carriage supporting frame 38. Hanger 64 comprises an integral arcuately-shaped member which is preferably fabricated of a plastic material and thus may be mass-produced be injection molding or other techniques which permit the attainment of close tolerances while eliminating the necessity of machining operations. In its cross-sectional shape, as seen best in FIGURE 2, hanger 64 may be considered to be in the form of a block having a plurality of arcuate recesses 65 for the reception of the rounded lower ends 66 of type bars 59. Slot 65 are on imaginary radii extending from the point at which the type faces engage the platen in order to accommodate the circular guide portions 66 of type bars 59 while still maintaining accurate alignment of the type bars as they move from retracted position to typing position. In this connection, it should be noted that the hanger, being of plastic material and therefore adapted to be injection molded, may be formed without burrs at the locations of slots 65 which might interfere with the action of the type bars. A pivot wire 67 of arcuate shape passes through circular guide portions 66 of type bars 59 and is disposed within a slot 68 in the forward face of hanger 64. The depth of slot 68 is such that wire 67 will project slightly above the slot, and a pair of screws 69 are threadably mounted in the ends of hanger 64, the heads of these screws frictionally engaging the wire ends to hold the wire in position. A mounting flange 71 is formed on hanger 64, and a plurality of screws 72 serve to fasten this flange to frame portion 41 as seen in FIGURE 2. An additional retaining clip 73 is mounted on the midportion of hanger 64 for holding wire 67 in position.

The outer ends of type bars 59 are provided with type faces 74 each having three characters as described above. The upper ends of type bars 59 are supported in their retracted position by a type bar rest 75 which is best seen in FIGURE 1. This rest is in the form of a wire secured to upwardly extending legs 37 of frame 36 and having a curved central portion which cradles type bars 59 in an arcuate row as seen in FIGURE 1 so that all type bars have approximately the same travel distance between their retracted and typing positions. A bootjack or type bar guide 76 is secured to upwardly inclined portion 41 of frame 38 as seen in FIGURE 4, the bookjack having a pair of upper fingers 77 with portions extending toward each other to provide a guide for the type bars as they approach their typing positions. The lower portion of bookjack 76 is recessed as indicated at 78, and a pair of inwardly directed side flanges 79 are provided on the bookjack as seen in FIGURE 11. A ribbon guide 81 is supported by bookjack 76 for vertical movement, the ribbon guide comprising a U-shaped wire the side legs of which are retained by flanges 79 of the bookjack. The lower central leg 82 of ribbon guide 81 extends across recess 78, and the upper ends of the ribbon guide have looped portions 83 for the reception of a ribbon 84.

CARRIAGE ASSEMBLY

The carriage assembly is generally indicated at 85 and comprises a pair of carriage brackets 86 which are supported for parallelogram movement by carriage supporting frame 38. The shape of carriage brackets 86 is best seen in FIGURES 2 and 12. Each bracket comprises a rearwardly extending arm 87 and a downwardly extending arm 88. A rear torsion link 89 comprising a bent wire has a central portion rockably supported by posts 43 of frame 38 and a pair of forwardly projecting side legs 91 which have outwardly projecting end portions 92 passing through apertures in legs 87 of brackets 86. A forward torsion link 93 is similarly formed, being supported by posts 42 and connected to arms 88 of brackets 86. The configuration of torsion links 89 and 93 is best seen in FIGURE 11. The arrangement is such that links 89 and 93 are swingable between a lower position shown in FIGURE 12, and intermediate position shown in FIGURE 13, and an upper position shown in FIGURE 14, so that brackets 86 will follow an arcuate translatory path. It should be noted that the path of travel of carriage assembly 85 from its rest position of FIGURE 2 to its upper position is approximately parallel to a type face 74 when the latter is in its typing position, thus insuring maximum typing contact in all positions of the carriage.

Novel means are provided for preselecting the lower or rest position of brackets 86 so that carriage assembly 85 may be accurately adjusted to insure maximum contacting area between type faces 74 and that portion of ribbon 84 which is tangent to the platen. Brackets 86 are disposed within a pair of slots 94 at the outer ends of frame portion 41, as indicated in FIGURE 16. The lower portion of each bracket 86 is provided with an inclined stop edge 95, and a pair of rest plates 96 are secured to frame portion 41 adjacent slots 94 for engagement with stop edges 95 of brackets 86. The shape of plate 96 is shown in FIGURE 15 which illustrates a single rest plate, the other plate being a mirror image of the one shown. Each plate 96 is provided with a slot 97 which overlies and is aligned with slot 94 of frame portion 41. However, the inner end 98 of slot 97 will normally be above the inner end 99 of slot 94. A pair of elongated attaching slots 101 are provided in each plate 96 for securing the plate to frame portion 41 by screws 102, as seen in FIGURE 1. In this manner, it will be seen that the rest position of carriage assembly 85 may be adjusted by moving both plates 96 up or down. Each plate 96 is further provided with a shift key lock tab 103, the purpose of which will be described later.

The upper edges of bracket arms 87 have outwardly extending flanges 104 as seen in FIGURE 12, and a carriage rail 105 is secured to and supported by these flanges. Rail 105 comprises an intermediate web portion and a pair of upstanding race portions 106, seen best in FIGURE 5. A carriage 107 is disposed above rail 105 and has a pair of races 108 overlying races 106, ball bearings 109 being disposed within the two pairs of races. A cage 110 which is shorter than carriage 107 is disposed beneath the carriage for maintaining proper spacing of ball bearings 109. A pair of stops 111, shown in FIGURE 7, are formed at the opposite ends of carriage 107, these stops being engageable with the edges of cage 110 to provide margin stops for the carriage. As seen in FIGURE 9, a tension coil spring 112 is secured at one end to carriage rail 105 and at the other end to a pulley 113. A cord 114 has one end secured at 115 to rail 105, passes through pulley 113 and is secured at its other end 116 to carriage 107. Spring 112 thus serves to urge carriage 107 to the right in FIGURE 9.

UNIVERSAL BAR AND ESCAPEMENT MECHANISM

The escapement mechanism of the illustrated typewriter is generally similar to that described in Patent No. 2,705,553 issued April 5, 1955 to the present appli-

cant and is generally indicated at **117** in the figures. An elongated escapement ratchet **118** is formed along the lower edge of the rear race flange **108** of carriage **107**, the teeth on ratchet **118** being of sawtooth shape so as to ride freeely over the escapement pawls during return movement of the carriage. Escapement mechanism **117** comprises a cage **119** having an upper central portion and a pair of downwardly extending side portions **121**. Carriage rail **105** is provided with a pair of downwardly extending ears **122**, and the forward ends of cage portions **121** are pivoted between ears **122** by a pin **123**. A pawl supporting pin **124** is carried between the forward ends of cage portions **121**, and a relatively rigid escapement pawl **125** is mounted on this pin. Pawl **125** is in the form of a flat leaf having an upper portion **126** which extends through an opening **127** in the central portion of cage **119**. An open-ended slot **128** is provided in upper end **126** of pawl **125**, and the lower end of pawl **125** is provided with another open-ended slot **129**. A spacer **130** is mounted on a pin **131** carried by pawl **125**, and secured to pawl **125** by pin **131** is a second escapement pawl **132**, this pawl being of relatively thin springlike material and being spaced from pawl **132** by spacer **130**. The upper end of pawl **132** projects through opening **127** and is notched as indicated at **133**. The form of pawl **132** is such that the upper end thereof will normally tend to separate from the upper end **126** of pawl **125**, and the width of opening **127** is such that this spacing is limited to approximately one tooth space of ratchet **118**. Notch **133** is misaligned with slot **128** in pawl **125** so that one pawl or the other will always engage ratchet **118**.

The means for actuating pawls **125** and **132** comprises a universal bar link **134** which has a central portion disposed within slot **129** of pawl **125**. As seen best in FIGURE 11, side legs **135** of universal bar link **134** extend forwardly and are connected to a universal bar **136** of inverted U-shape. The lower ends of the side legs of universal bar **136** are pivoted on rod **55**, and the universal bar extends along the forward edges of the upper arms of bell cranks **54** so that upon clockwise movement of any one of these bell cranks universal bar **136** will be rocked clockwise as seen in FIGURE 2. This movement will cause rightward movement of universal bar link **134** as seen in FIGURE 2, thus rocking escapement pawls **125** and **132** in a counterclockwise direction about pivot pin **124**.

Assuming the parts are initially in a position such that pawl **132** is engaged by a tooth of ratchet **118**, rocking of the pawls will cause notch **133** of pawl **132** to be aligned with the ratchet, thus permitting pawl **132** to spring away from pawl **125**. At this time, the upper end **126** of pawl **125** will hold the carriage from further movement. Two leaf springs **137**, best seen in FIGURE 2, are secured at their lower ends to the ends of frame **36**, pass over rod **55** and engage universal bar **136** at its upper end. Upon release of pressure upon a key **46** or the spacer bar as discussed below, springs **137** will tend to return universal bar **136** in a counterclockwise direction to its original position. This will cause clockwise rotation of pawls **125** and **132** in FIGURE 2, and notch **128** of pawl **125** will become aligned with ratchet **118**, whereupon spring **112** will move the carriage. The succeeding tooth of ratchet **118** will engage the upper end of pawl **132** and will move this pawl back against pawl **125**, so that the carriage will be brought to rest in the next space position. It will thus be seen that upon each clockwise and counterclockwise movement of universal bar **136** as seen in FIGURE 2, carriage **107** will be indexed one space. A retaining clip **138** may be provided for holding universal bar link **134** within recess **129** at the lower end of pawl **125**.

Means are also provided for lifting ribbon guide **81** each time universal bar **136** is rocked clockwise in FIGURE 2. This means comprises a ribbon guide actuating lever **139** which is mounted on pivot pin **124** and extends therebelow, having a recess **141** which receives universal bar link **134**. The upper end of lever **139** supports a pair of overlapping cantilever leaf springs **142** and **143**, which are secured thereto and extend forwardly as seen best in FIGURE 5. The forward ends of these leaf springs receive the lower central portion of ribbon guide **81** therebetween. When lever **139** is rocked counterclockwise in FIGURE 5 from the solid line to the dot-dash line position, leaf springs **142** and **143** will likewise move to their dot-dash line positions, raising ribbon guide **81** as indicated in FIGURE 5. Return movement of lever **139** will result in downward withdrawal of the ribbon guide. It should be noted that both raising and lowering of the ribbon guide will be accomplished in a yieldable manner by leaf springs **142** and **143**, thus preventing damage to the parts should movement of the ribbon guide be obstructed.

PLATEN, FEED MECHANISM AND PAPER GRIPS

The platen is generally indicated at **144** and comprises a core **145** of wood or similar material and a sheath **146**. In the illustrated embodiment of the invention, the sheath comprises a cylinder of plastic material such as a vinyl compound which may be inexpensively manufactured by an extrusion process. The invention includes a novel method for mounting sheath **146** on core **145**, this method being illustrated in FIGURE 19. A fixture **147** may be provided to carry out the method, this fixture having a base **148** and being of cylindrical shape, the internal diameter of the fixture being somewhat larger than the final diameter of platen **144**. A conduit **149** for compressed air is connected to a passageway **151** in base **148** which leads to the chamber **152** defined by the upwardly extending cylindrical fixture **147**. Sheath **146** is manufactured so as to have an original unstressed internal diameter which is somewhat less than the diameter of core **145**. The sheath is placed in chamber **152** and core **145** placed above the sheath and at the upper end thereof. Compressed air or other fluid is fed through conduit **149** and tends to rush past the narrow annular opening between the upper edge **153** of sheath **146** and the lower surface **154** of core **145**. This compressed air will tend to spread apart the upper edge **153** of sheath **146**, thus permitting core **145** to be pushed down into the sheath by a force applied in the direction of arrow **155**. As core **145** is forced down into the sheath, the compressed air will cause the sheath to be spread apart in the area of lower end **154** of the core, so that the core may be completely inserted in the sheath which will tightly grip the core after the fluid pressure is reduced. It has been found that by use of this novel method platen **144** may be inexpensively manufactured without the necessity of grinding or otherwise finishing sheath **146** in order to obtain a satisfactory platen surface. Sheath **146**, when manufactured of plastic material by an extrusion process, may be made with a smoothly finished outer surface which will be completely acceptable for typing purposes.

As seen in FIGURE 17, platen **144** is provided with a pair of projecting pins **156** and **157** which are rotatably supported by a pair of ears **158** and **159** respectively formed at the opposite ends of carriage **107**. The outer edges **161** of these ears may be inturned to provide curved guard flanges around the ends of platen **144**. Fixed to the outer ends of shafts **156** and **157** are a pair of knobs or handles **162** and **163** respectively. As seen in FIGURES 7 and 17, ear **159** is provided with a plurality of evenly spaced feed ratchet teeth **164**, these teeth being formed by embossing the sheet metal ear so that the rounded teeth project toward knob **163** which is of hollow construction. An annular leaf spring **165** is mounted within knob **163** and fixed to the internal surface of the knob rim by a projection **166** and a tab **167** formed on the interior of the rim, spring **165** being gripped between elements **166** and **167**. For this purpose, knobs **162** and **163** are preferably constructed of a plastic material which will enable the parts to be so formed. Spring disk **165** is provided with

an internal clearance aperture **168** through which hub **169** of knob **163** projects. The outer portion of spring disk **165** remote from its securing point to the knob is provided with a button or pawl **171** which is engageable with the rounded feed ratchet teeth **164** formed on ear **159** of the carriage. The formation of spring **165** is such that button **171** is continually pressed against teeth **164**, the spacing of the teeth being such that the button will be locked in position between any two adjacent teeth. In this manner, even feed movement of the typewriter platen is accomplished. It will be observed that spring **165** will urge platen **144** to the right with respect to carriage **107**, thus causing hub **172** of knob **162** to engage ear **158**. In this manner, the platen will be held in a constant axial position with respect to carriage **107**, preventing deviations which might occur if the platen were permitted axial play with respect to the carriage. In order to prevent spring **165** from inadvertent separation from knob **163** during assembly, a portion **173**, of hub **169** may be upset as seen in FIGURES 17 and 18, this portion engaging the inner edge of spring **165**.

The paper gripping means comprises a plurality of spaced leaf springs **174**, three such springs being shown in the illustrated embodiment. The configuration of each spring is seen best in FIGURE 5, the lower end of the spring being loosely connected to carriage **107** by a tab **175** bent up from the carriage. The central portion of each gripping spring **174** is provided with an upwardly bent rounded portion **176** which engages platen **144**. A paper guide **177** of elongated shape and curved configuration extends between ears **158** and **159**, being pivotally connected to the ears by a pair of tabs **178** inserted in apertures **179** in the ears, as best seen in FIGURES 5, 7 and 12. The lower portion of paper guide **177** is arcuately shaped concentrically with platen **144** and slightly spaced therefrom, the upper portion of the guide being of flat configuration and having a bent-over flange **181**. The main portion of flange **181** is spaced from the upper portion of guide **177** as seen in FIGURE 5, but the end portions of the flange are pressed tightly against the guide in order to grip a bail **182**. This bail comprises a rod which extends across platen **144** as seen in FIGURE 17 in order to hold the upper portion of a sheet of paper which is in typing position. The end portions **183** of bail **182** extend rearwardly from the main portion and are inturned, their ends being gripped by the end portions of paper guide flange **181** in such a manner as to permit rocking of the bail between a holding position, as seen in FIGURE 12, and an upper or retracted position.

The upper ends of leaf springs **174** are disposed between flange **181** and the main portion of paper guide **177**, as seen in FIGURES 5 and 6. The paper guide is provided with three clearance apertures **184** within which the intermediate portions of springs **174** are disposed, thus permitting gripping portions **176** of the leaf springs to engage the paper which is in typing position. The disposition of flange **181** with respect to tabs **175** is such that leaf springs **174** when in normal position will be curved as seen in FIGURE 5, thus causing gripping portions **176** of the springs to exert sufficient pressure on the paper to hold it securely in position.

When it is desired to release the pressure on the paper in order to adjust it on the platen, it is merely necessary to swing paper guide **177** from the position shown in FIGURE 5 to that shown in FIGURE 6. This may be done by gripping the upper edge of the paper guide with the fingers and swinging the guide clockwise on its pivotal supports. When this is done, the lower edges **185** of apertures **184** will engage the adjacent portions of springs **174**, deflecting these springs into a position which is more bowed than previously. The upper ends of springs **174** may slide with respect to flange **181** during this movement, and the result will be, as seen in FIGURE 6, that gripping portions **176** of the springs will be withdrawn from contact with the paper on platen **144**. After the paper has been adjusted, it will merely be necessary for the operator to release his grip on paper guide **177**, thus permitting springs **174** to return to their normal position as seen in FIGURE 5. The construction thus provides a simple and efficient paper gripping means which eliminates the need for rollers, obivates expensive machining operations and will not cause damage or marking of the paper, since the gripping pressure of springs **174** may be easily adjusted during manufacture to suit requirements.

Means are provided on carriage assembly **85** for permitting carriage **107** to be returned at the end of each typed line. Cage **119** of escapement mechanism **117** has an upwardly projecting tab **186** which extends through a clearance aperture **187** in carriage **107**, as seen in FIGURE **5**. A wire spring **188** is secured at its opposite ends to the upper surface of carriage rail **105** as seen in FIGURE 9 by a pair of tabs **189** formed on the carriage rail. This spring extends across aperture **187** and is engageable with tab **186** on cage **119**, urging the tab to the right as seen in FIGURE 5 and thus tending to lift cage **119** about its pivotal support **123**. This action will tend to hold pawls **125** and **132** in engagement with ratchet **118**. However, when carriage **107** is moved to the left as seen in FIGURE 7, the sawtooth-shaped teeth on ratchet **118** will slide over pawls **125** and **132**, causing cage **119** to rock slightly downwardly about pivot **123** as seen in FIGURE 5 as each tooth passes over the pawls. After the carriage has been returned to the left hand margin position, spring **188** will hold cage **119** and pawls **125** and **132** in escapement position.

In order to release escapement mechanism **117** from the carriage for tabular purposes or to free the carriage for some other reason, a tabular handle **191** is provided, the position of this handle being visible in FIGURE 7, at one end of the carriage. Handle **191** is mounted on one end **192** of a rod **193** which extends between carriage rail **105** and carriage **107**, as seen in FIGURE 5. End **192** of rod **193** and its opposite end **194** are pivotally supported by ears **158** and **159** of carriage **107**, and the offset central portion of rod **193** is engageable with tab **186** of escapement cage **119**. The arrangement is such that when handle **191** is swung upwardly (out of the paper as seen in FIGURE 7) rod **193** will move to the left in FIGURE 5, swinging cage **119** downwardly about pivot **123** and thus releasing the carriage. Release of handle **191** will permit cage **119** to return through the urging of spring **188**. In this manner the carriage may be quickly and easily released by a typist without the necessity of reaching behind the typewriter.

Means are also provided for signaling the arrival of the carriage at the end of a line. This means includes a bell **195** mounted on the underside of carriage rail **105**, as seen in FIGURE 10. A hammer **196** is pivotally mounted at **197** adjacent bell **195**, a spring **198** being engageable with one end of the hammer, the other end of spring **198** being secured to carriage rail **105** by means of a bracket **199**. A projection **201** on hammer **196** extends beyond ratchet **118** of carriage **107** and is engageable by a downwardly projecting shouldered portion **202** at one end of the ratchet, as seen in FIGURE 7. With this arrangement, as carriage **107** reaches the end of each line shoulder **202** will engage projection **201**, swinging hammer **196** clockwise in FIGURE 10. As the hammer is swung, projection **201** will be suddenly released by shoulder **202** as the latter passes the projection, and spring **198**, which will have been tensioned by the clockwise movement of the hammer, will snap the hammer quickly in a counterclockwise direction so that it will strike bell **195**. Upon return movement of carriage **107**, the rounded cam portion **203** of shoulder **202** will engage projection **201** of the hammer, urging hammer **196** downwardly as seen in FIGURE 7. Pivot **197** which supports the hammer is preferably a loose type of pivot, and arm **204** of the hammer, to which spring **198** is connected, is bent downwardly as seen in FIGURE 7, the spring thus tending to urge the hammer

into an upward position as seen in FIGURE 7. Thus, cam **203** will cause hammer **196** to move downwardly temporarily, and the hammer will be lifted up into its original position by spring **198** after shoulder **202** passes projection **201**.

RIBBON SUPPORT, FEEDING AND REVERSING MECHANISM

Typewriter ribbon **84** is fed between two spools **205** and **206** which may be of standard typewriter construction. These spools are removably mounted on posts **207** and **208** respectively, being held on the posts by nuts **209** or similar securing means as seen in FIGURE 4. Carriage assembly brackets **86** are provided with pairs of spaced outwardly extending ears **210** and **211** through which shafts **207** and **208** extend, the ears thus supporting the shafts for rotational movement. Brackets **86** are also provided with a pair of upwardly extending angularly bent forked ribbon guides **212**, best seen in FIGURES 4 and 12, for guiding ribbon **84** adjacent spools **205** or **206**. The lower ends of shafts **207** and **208** are provided with toothed wheels **213** immediately below ears **211** of brackets **86**, and cotter pins **214** are mounted on shafts **207** and **208** immediately above ears **211** to hold the shafts against axial movement.

The means for driving ribbon **84** includes a ribbon drive shaft **215** extending across the interior of the typewriter above the key levers and supported by a pair of forwardly extending tabs **216** on brackets **86**, these tabs having rearwardly facing open-ended slots **217** as seen in FIGURE 2 within which shaft **215** is disposed. Fixedly mounted on shaft **215** are a pair of helical wires **218** and **219**, these wires being adjacent shafts **207** and **208** respectively. Wires **218** and **219**, which may in practice simply be standard coil springs, act as worms in that they have the same pitch as, and are adapted to mesh with, toothed wheels **213** for rotating the ribbon shafts. The sense of turning of worm **218** is opposite that of worm **219**, so that with shaft **215** intermittently rotated in the same direction, shafts **207** and **208** will be driven in opposite directions, these shafts being driven alternately depending on which of the two worms **218** and **219** is engageable with its corresponding toothed wheel **213**. In the illustrated embodiment, worm **218** is so arranged that it will rotate spool **205** counterclockwise as seen in FIGURE 1, whereas worm **219** will rotate spool **206** clockwise in FIGURE **1**.

The means for driving shaft **215** comprises a toothed ratchet wheel **221** fixed to one end of the shaft and engageable by a reciprocating pawl member **222**, as seen in FIGURES 4 and 12. Pawl **222** may be of channel-shaped cross section, thus being retained on ratchet **221**, and teeth **223** of the pawl are preferably pressed or stamped from the central portion of the pawl in a sawtooth shape such that movement of pawl **222** to the right as seen in FIGURE 12 will cause clockwise rotation of shaft **215**, while retraction of pawl **222** to the left will cause teeth **223** thereof to ride over the teeth of ratchet **221**. Pawl **222** may be formed of sheet metal and has an arm **224** extending from one end thereof, this arm being pivotally connected at **225** to a side leg of universal bar **136**. Upon counterclockwise swinging of the universal bar **136** as seen in FIGURE 12, pawl **222** will be retracted to the left, and upon return movement of the universal bar under the urging of springs **137**, shaft **215** will be rotated to advance the ribbon.

In order to reverse the ribbon, a handle **226** is provided which projects through an aperture in front housing plate **60**. This handle is connected by a bent rod **227** with a lever **228** pivotally supported at **229** on a tab **231** extending from one of brackets **86**, as seen in FIGURE 11. A detent leaf spring **232** is secured at one end to bracket **86** and is engageable at its outer end with lever **228** to hold the lever in either one of two positions, as shown in the solid and dot-dash lines of FIGURE 11. The opposite end of lever **228** has a down-turned portion **233** having an aperture into which the adjacent end of shaft **215** extends, as seen in FIGURE 4. The end of lever **228** which is engaged by spring **232** is rounded so that the spring exerts an overcenter action on the lever. With this arrangement, movement of lever **228** to its solid line position in FIGURE 11 will cause worm **219** to engage its corresponding toothed wheel **213** while movement of lever **228** to its dot-dash line position will cause worm **218** to mesh with its wheel. In order to insure proper engagement in either drive position, the inner ends of slots **217** which support shaft **215** are so located that they will alternately act as fulcrums for the rocking movement of shaft **215** between its positions.

It should be observed that the illustrated construction of the ribbon drive is extremely inexpensive since no machined parts are required even though a reversing gear drive is provided. Moreover, since worms **218** and **219** will be resiliently urged against their corresponding toothed wheels **213**, manual rotation or adjustment of spools **205** and **206** will still be permitted, worms **218** and **219** yielding as their corresponding toothed wheels are rotated.

SPACE BAR AND SHIFT MECHANISM

A space bar **234** is provided along the forward edge of the keyboard, as seen in FIGURE **1**, this bar being secured to a pair of bell cranks **235** at the opposite ends thereof which are pivotally supported by rod **55**. The upper ends of these bell cranks are engageable with universal bar **136**, as seen in FIGURE 12, and a wire spring **236** is engageable with one of the bell cranks, urging space bar **234** into its upper position. The lower end of spring **236** is fixed to one of a pair of fulcrum brackets **237** whch are fixed to base plate **31** adjacent the opposite side edges thereof, as seen in FIGURE 1 immediately behind frame **36**. A projection **238** on one bell crank **235** is engageable with a stop **239** on one fulcrum bracket **237**, as seen in FIGURE 12, limiting the upward movement of spacer bar **234**.

Means are provided for shifting carriage assembly **85** from its normal rest position upwardly to an intermediate shift position as indicated partially in dot-dash lines in FIGURE 12 and an upper shift position indicated partially in double dot-dash lines in this figure. As stated previously, the intermediate shift position enables typing of capital letters while the upper shift position permits the use of numerals and other characters formed on type faces **74**. Two intermediate shift levers **241** and **242** are provided at opposite ends of the keyboard, as indicated in FIGURE 1. Fulcrum brackets **237** are provided with flanges **243** as indicated in FIGURES 12 to 14, and levers **241** and **242** are supported by the upper edges of these flanges, being guided by slots in guide bars **44** and **54**. The inner ends of levers **241** and **242** are provided with triangularly shaped openings **244** as seen in FIGURE 12, and a pair of outwardly projecting ends **245** on lower torsion hinge **93** project through these openings. With this arrangement, as seen in FIGURES 12 and 13, downward movement of the forward end of either shift lever **241** or **242** will cause shifting movement of carriage assembly **85** to its dot-dash line position.

The disposition of the parts is such that rod ends **245** are normally in the wider portions of triangular openings **244**, as seen in solid lines in FIGURES 12 and 13. Means are provided for locking the carriage assembly in its intermediate shift position, this means including slotted portions **246** at the ends of levers **241** and **242** above triangular openings **244**. These slots are adapted to engage the pair of projections **103** which are formed on adjustable carriage stops **96**, as seen in FIGURE 15, this engagement being accomplished by sliding the shift lever to the right as seen in FIGURE 13 and thus assuming the dot-dash position shown in this figure.

An upper shift lever **247** is also provided, this lever

being adjacent the right-hand intermediate shift lever **242** as seen in FIGURE 1. Lever **247** has a slot **248** within which adjacent rod end **245** is disposed. Lever **247** is pivotally supported by flange **239** seen in FIGURE 12, this flange being a somewhat greater distance from rod end **245** than are flanges **243** which support levers **241** and **242**. Depression of lever **247**, as seen in FIGURE 14, will thus raise carriage assembly **85** a greater distance than will depression of either of the intermediate shift levers.

Means are provided for automatically unlocking an intermediate shift lever which may be in locking position when the carriage is shifted to its upper shift position. As seen in dot-dash lines in FIGURE 13, rod end **245** will be disposed at the narrow end of triangular opening **244** when either shift lever **241** or **242** is in locking position. When lever **247** is depressed, rod end **245** will be raised and will cam intermediate shift lever **241** or **242** to the left as seen in FIGURES 13 and 14, since the rod end will engage the sloping upper surface of triangular opening **244**. After lever **247** has been fully depressed, the carriage may be locked in its upper shift position by sliding this lever to the right as indicated in dot-dash lines in FIGURE 14. A slot **249** is provided at the top of the inner end of lever **247**, this slot being engageable with projection **103** in the same manner as slot **246** of lever **242**. To return carriage assembly **85** to its normal position, the shift levers are released, whereupon the carriage assembly will drop by its own weight into a postion in which it is supported by stop edges **98** of rest brackets **96**. The intermediate and upper shift positions will be determined by engagement of either stop **103** with the appropriate shift lever.

It should be observed that since all the positions of carriage assembly **85** are determined by the positions of rest plates **96**, the relative locations of the lower, intermediate and upper shift positions will not vary even when plates **96** are adjusted to achieve maximum typing clarity. When carriage assembly **85** is in its intermediate or upper shift position, ribbon guide **81** will be correspondingly shifted upwardly, since the ribbon guide is supported by leaf springs **142** and **143** of escapement mechanism **117**. As seen in FIGURE 4, clearance recess **78** of bootjack **76** is made sufficiently large to permit oscillation of leaf springs **142** and **143** when the carriage assembly is in either of its shift positions.

HOUSING AND OUTER CASE

A housing generally indicated at **251** is provided for the typewriter, this housing being securable to side flanges **33** of base plate **31** as seen in FIGURE 3. Housing **251** comprises a pair of side walls **252**, the lower edges of which are connected to flanges **33** by fasteners such as screws **253**. A rear plate **254** is secured to inbent rear flanges **255** on side walls **252** by tabs **256** as seen in FIGURE 11. The upper edges **257** of rear wall **254** and flanges **255** may be inturned as indicated in FIGURE 2, and recesses **258** are provided in the side walls for movement of carriage **108**. The forward portions of side walls **252** are preferably provided with curved flanges **259**, seen best in FIGURE 2, for access to the keyboard, the forward ends of the side walls having inturned flanges **261** which overlie flange **35** of base plate **31** as indicated in FIGURE 1. A lid **262** is pivoted at **263** to the upper edges of side walls **254** as shown in FIGURE 12, this lid having a clearance recess indicated by dot-dash lines at **264** in FIGURE 1 for the type bars. In its normal position, lid **262** will be supported by flanges **265** and **266** along the tops of front wall **60** and side walls **254**, respectively, as indicated in FIGURES 2 and 4. When the lid is raised, free access may be had to type faces **74** for cleaning purposes.

It should be noted that housing **251** does not serve to support any operative portions of the typewriter chassis. The latter may thus be completely preassembled and tested without assembling housing **251** to the chassis, thus permitting convenient access to all portions of the machine during the testing and adjustment. Likewise, should any maintenance be necessary on the machine, housing **251** may be completely removed simply by unscrewing fasteners **253** and lifting the housing from the chassis.

The invention also includes a novel outer case or cover generally indicated at **267** which may be used for carrying or storage purposes. The cover and its novel method of manufacture are illustrated in FIGURES 20 to 27. The case is preferably constructed by providing a sheet metal side wall blank **268**, seen in its original shape in FIGURE 25, and a sheet metal top blank **269** seen in its unformed shape in FIGURE 26. Blank **268** comprises a front wall section **271**, a pair of side wall sections **272** and **273** contiguous with section **271**, and a pair of rear wall sections **274** and **275** contiguous with sections **272** and **273** respectively. V-shaped notches **276** are provided along one edge of blank **268** between the various sections. A hem section **277** is provided along the lower edge of blank **268**, and the outer edges of sections **274** and **275** have portions intended to be interlocked when the blank is formed. More particularly, the outer edge of section **274** has a rectangular projection **278** formed with a pair of slots **279**, while the outer edge of section **275** has a pair of tabs **281** adapted to be inserted in slots **279**.

Top blank **269** is of rectangular shape in its unformed condition and has corners **282** which are cut at 45°. The top blank also has four wall-engaging sections **283** along its four edges.

In order to assemble case **267**, hem **277** of wall blank **268** is bent upwardly as indicated in FIGURES 21 and 22, and the blank is then bent at the locations of notches **276** to provide four rounded corners joining the walls. Tabs **281** are interlocked with slots **279** as indicated in FIGURE 22. The upper portions of the four walls, indicated at **284** in FIGURE 27, are then bent inwardly so as to form rounded upper portions along the walls closing notches **276**, and the outer edges **285** of these upper portions are bent inwardly to form acute angles with portions **284** as seen in FIGURE 27.

Cover blank **269** is provided with a downwardly formed portion **286** adjacent its four edges and upwardly bent portions **287** outwardly of portions **286**, portions **287** forming acute angles with respect to portions **286** as seen in FIGURE 27. The relative dimensions of the parts are such that blank **269** may be inserted in the bottom of the formed wall blank and slipped over portions **285** thereof as indicated in FIGURE 27. After this is done, the parts are pressed together so that portions **285** and **287** will interlock as indicated in FIGURE 24. Because of the downwardly deflected portions **286** of blank **269**, the top of case **267** will be flush with the rounded upper portions of the walls, this being indicated in FIGURES 20 and 24. A smoothly finished cover may thus be provided without the necessity of machining operations and by sole utilization of stamped sheet metal parts.

Means are provided for engaging case **267** with the typewriter for carrying purposes. This means includes a stationary rear retaining clip **288**, a front positioning bar **289**, and a pivoted clasp **291**. The shape of retaining clip **288** is best seen in FIGURES 22 and 24, this clip comprising an elongated member having a lower flange **292** and a pair of spaced upper tabs **293**. Clip **288** is secured to the interior of the lower rear edge of case **267**, and flange **292** is adapted to underlie the rear edge of base plate **31** as seen in FIGURE 24. A pair of slots **294** are formed in rear wall **254**, and tabs **293** are adapted to be inserted in these slots which are located immediately above flange **34** of base plate **31**. The rear of case **267** will thus be held to the rear of the typewriter when retaining clip **288** is in its operative position. Foot pads **32** are sufficiently thick, as seen in FIGURE 24, to per-

mit the typewriter to rest on a flat surface when cover **267** is in position.

Positioning bar **289** is secured to forward wall **271** of case **267** and has a lower flange portion **295** engageable with front flange **35** of base plate **31**, as seen in FIGURE 23. Clasp **291** has a longitudinal cross sectional shape best seen in FIGURE 23 and is adapted to be held within a slot **296** formed in front wall **271** of case **267**. More particularly, clasp **291** is of generally rectangular shape, with an upper portion **297** disposed within the case and having a protuberance **298** forming a button which is adapted to be pushed by an operator through a clearance aperture **299** formed in front wall **271** of case **267**. A central offset portion **301** of clasp **291** is disposed within slot **296**, the lower end of the clasp having a rearwardly projecting finger **302** which is adapted to underlie the front edge of base plate **31** when the clasp is in its retaining position.

The upper edge of bar **289** overlaps slot **296**, as seen in FIGURE 24, so that when clasp **291** is swung to its retracted or dot-dash line position, the central portion of bar **289** will be deflected slightly as indicated in dot-dash lines, thus providing a spring force tending to return clasp **291** to its solid line position. Bar **289** and clasp **291** thus cooperate in a novel manner to releasably secure case **267** to the typewriter after the rear end of the case has been engaged with the typewriter by clip **288**.

A carrying handle **303** on U-shaped handle bars **304** is secured to front wall **271** of case **267** by means of a pair of tabs **305** formed on the upper edge of bar **289**, these tabs projecting through a pair of apertures **306** formed in wall **271**. Tabs **305** are engageable with outwardly projecting ends **307** on handle bars **304**, the outer ends of the tabs re-entering apertures **306** and being bent upwardly as seen in FIGURE 21. Tabs **305** thus serve to pivotally support handle bars **304** so that the handle may be swung flat against the case.

OPERATION

The purpose of this portion of the specification is to review the overall operation of the typewriter in order to indicate the cooperation between the various elements and sub-assemblies, the detailed operation of various portions of the machine being included in foregoing portions of the description. With the typewriter completely assembled and case **267** removed, a sheet of paper may be inserted in typing position by inserting one edge of the paper behind platen **144** and turning either knob **162** or **163** so that the paper is frictionally drawn around the platen. During this movement, paper gripping springs **174** will maintain the paper in frictional engagement with the platen, the paper being guided by the arcuate portion of paper guide **177** until its leading edge appears in front of the platen. Bail **183** may be lifted, the leading edge of the paper slipped under the bail, and the bail replaced.

Carriage **107** is then moved to the right as seen in FIGURE 1 until the paper is properly located with respect to bootjack **76**. If it is desired to bring carriage **85** completely to one end, movement will be continued until left hand stop **111** on carriage **107** engages the adjacent edge of bearing cage **110**. During this movement, ratchet **118** will ride over escapement mechanism **117**, spring **188** yielding as cage **119** is urged slightly downwardly with the passage of each ratchet tooth over the escapement pawls. Should it be desired to adjust alignment of the paper, paper guide **177** will be swung forwardly, causing edges **185** thereof to engage the lower portions of paper gripping springs **174**, momentarily withdrawing these springs from gripping engagement with the paper as seen in FIGURE 6.

In typing lower case letters, a key **46** will be struck, causing the corresponding key lever to swing clockwise in FIGURE 2 about fulcrum bar **44**. This will cause clockwise swinging of the connected bell crank **54**, the latter tensioning link **57** to swing the connected type bar **58** into typing position. Bell crank **54** will also swing universal bar **136** clockwise in FIGURE 2, thus causing link **134** to rock escapement pawls **125** and **132** counterclockwise as seen in FIGURE 5 to the dot-dash line position. This movement will also cause ribbon actuator **139** to rock counterclockwise in FIGURE 5, lifting ribbon guide **81** together with ribbon **84** in front of the advancing type face. As notch **133** of spring pawl **132** becomes aligned wtih ratchet **118**, pawl **132** will spring away from pawl **125**, the latter pawl being engageable with the ratchet tooth to hold the carriage in position.

As key **46** is released, the corresponding key lever and bell crank will return to their normal positions with type bar **58** and universal bar **136** under the influence of springs **137**. During its advancing and retracting movement, type bar **58** will be guided by rotation of its guide portion **66** within the corresponding guide recess **65** in hanger **64**. As escapement pawls **125** and **132** return to their previous position, notch **128** of pawl **125** will become aligned with ratchet **118**, while the unnotched portion of spring pawl **132** comes into the path of the next ratchet tooth. Carriage **107** will thus be advanced by spring **112** to the next typing position.

In order to type a capital letter, either intermediate shift lever **241** or **242** will be depressed. This will lift carriage assembly **85** until the shift lever engages corresponding stop **103**; the carriage may be locked in its intermediate shift position by sliding movement of the key lever as seen in FIGURE 13. If a numeral or other symbol is to be typed, upper shift lever **247** will be depressed, causing the intermediate shift lever to be cammed into its unlocking position as seen in FIGURE 14.

In order to space, space bar **234** will be depressed, causing universal bar **136** to rock clockwise in FIGURE 2 and thus operating the escapement mechanism. In order to feed the paper to the next line, either knob **162** or **163** is grasped and platen **144** rotated while carriage **107** is returned. This will cause button **171** of spring pawl **165** to travel over feed ratchet teeth **164**. During typing, universal bar **136** will rock counterclockwise in FIGURE 2 upon release of each key lever or of the space bar, causing ribbon feed pawl **222** to engage ratchet **221** and rotating shaft **215** to drive either toothed wheel **213**, depending upon the position of shaft **215**. This will cause feeding of ribbon **84**, since the corresponding ribbon spool **205** or **206** will be rotated to take up the ribbon. If it is desired to reverse the ribbon, ribbon reverse handle **226** will be operated to shift drive shaft **215** in order to disengage one of the worms **218** or **219** and engage the other worm. Should it be desired to shift carriage **107** to a particular position with respect to bootjack **76**, carriage release handle **191** will be swung forwardly, causing carriage release bar **193** to swing cage **119** downwardly as seen in FIGURE 5 and permitting the carriage to be freely adjusted.

In the form of the invention shown in FIGURES 28 to 47 inclusive, parts corresponding to those already described are designated by like reference characters distinguished by the addition of the letter *"a"* and many of these will not require detailed redescription. In this form of the invention, although the key and lever system and type bar actuating mechanism are generally similar, a number of important further improvements are incorporated.

The sheet metal base plate **31***a* is provided with a peripheral flange **33***a* extending entirely thereabout and turned upwardly a short distance, such flange being continuous, as best shown in FIGURES 28 and 46, the plate being rounded at the corners. In the area underlying the keyboard section the base plate is blanked out to provide an opening **300** underlying the complete keyboard. This not only permits greater travel of the keys and spacer bar, but permits stiffening the base by the provision of a continuous upturned flange **302** surrounding the opening **300**.

The upwardly projecting arms **54***b* of the bell cranks **54***a* are guided in slots **63***a* formed in a rearwardly bent flange portion **62***a* integral with the vertical transverse front plate portion **60***a*. Front plate portion **60***a* is rigidly secured at its ends to side supports **37***a*. This arrangement will be seen to eliminate the necessity for the separate slotted guide member **62** employed in the construction first illustrated (FIGURE 2). Uprights **37***a* are integral with a plate portion **36***a* secured as by welding to the base **31***a*. The upper ends of supports **37***a* are turned outwardly to provide horizontal flanges **305**. Flanges **305** provide means for attachment of the plastic upper case structure **251***a*, as will presently be described.

The key levers **47***a*, **48***a*, **49***a* are similarly pivoted at their rear ends in an upstanding flange portion **44***a*, and interconnected in similar fashion to the bell cranks **54***a* which in turn actuate the type bars **59***a*, to which they are interconnected by wire links **58***a*. Each key lever together with its interconnected type bar is individually urged toward and returned to the rest position, a comb-type leaf spring member **306** being provided having a plurality of spring fingers **308**, one of which is positioned and stressed to bear upwardly against the bottom of each of the key levers. Spring element **306** is attached by means of a supporting bracket **310** to the base member **31***a* and extends transversely beneath levers **47***a*, **48***a*, **49***a*, the spacing of the spring fingers **308** corresponding to the spacing of such levers. The resilient upward force exerted upon each key lever in this manner is transmitted through the coupling portion at **53***a* to the corresponding bell crank **54***a* and tends to rock the latter in a direction to urge the type bars downwardly toward the retracted position against the rest **75***a*. The force tending to return the type bars results from the fact that the link **58***a*, as shown in FIGURE 29, is connected to the type bar below the fulcrum at **67***a* in each instance.

By virtue of the provision of the individual leaf spring fingers **308**, the universal bar **136***a* is not relied upon to return the type bars and keys, but functions in a similar fashion to the universal bar **136** of the first embodiment to actuate the escapement mechanism and the ribbon advance, the relatively stiff leaf springs **137** which bias the universal bar **136** of the first form of the invention being omitted. In place of the leaf springs **137**, relatively light wire springs of the bow type are provided, designated **320** and best shown in FIGURE 36. Two such springs are provided, the central portion of each spring bearing and reacting forwardly against one of the supporting posts **43***a*. At both ends both of the springs **320** are provided with return bent portions which are hooked over and react rearwardly against the escapement actuating bar **134***a*. The side arm portions **135***a* of the escapement actuating bar are connected in similar fashion to the universal bar **136***a*. Thus the universal bar and the escapement are actuated in similar fashion whenever any of type keys or the spacer bar **234***a* is actuated. The springs **320** need only be strong enough to return the escapement and the universal bar, and so may be much lighter than the springs **137** of the first form of the invention. Springs **320** take up all clearance in the escapement mechanism. The leaf spring fingers **308** may also be light. In the final portion of the travel of the type bars, when the type portions are close to the bootjack, the two spring means **306** and **320** augment each other, and as each type key is released, the return force tending to move the type bar away from the bootjack is at a maximum. This has a strong tendency to prevent pileup of the type bars. This tendency is also minimized by the fact that a constant spring force always tends to return each key and type bar at all times.

In this form of the invention the carriage has only a single shift. This arrangement is suitable for use with type which may be all upper case, so that shifting for capitals is not required, the shift being used only for numerals, punctuation, fractions, special characters and the like. With this arrangement also no shift lock is required, and both shift keys, **241***a*, **242***a* are directly pivoted at their rear ends to the carriage frame **86***a*. For this purpose the rear end of each shift key lever is apertured, as indicated at **312**, and pivotally overfitted upon a projecting laterally bent end of the wire guide link and torsion arm member **93***a*. The shift levers are fulcrumed on tongue portions **243***a* integrally bent upwardly from the base plate **31***a*. No binding can occur at this point because of the ability of such levers to slide lengthwise on the flat tops of the tongues **243***a*. The limits of upward and downward shifting movement of the carriage are fixed by two tongue portions **315**, one projecting laterally from and integral with each end of frame panel **41***a*. Tongues **315** project into rectangular apertures **316** in the shiftable carriage supporting frame side plate portions **86***a*. As shown in FIGURE 37, when the carriage is down in its normal typing position it is located by engagement of the upper edges of openings **316** with the tops of tongues **315**, while when the carriage is shifted upwardly by depression of one of the shift levers as **241***a*, as shown in FIGURE 38, the lower edges of openings **316** engage the bottoms of tongues **315**.

The ribbon lifter-guide member **81***a* is formed of sheet metal in this form of the invention, rather than of wire as in the first embodiment, and is similarly slidable in the bootjock **76***a*. Near its lower extremity the lifter-guide member is provided with a slot **82***a* into which a resilient lifter arm **143***a* projects. The arm **82***a* is rigidly attached to the top bight portion of an inverted U-shaped actuating lever **139***a*. Actuating lever **139***a* is separately pivoted upon the escapement release pivot pin **123***a*, rather than upon the escapement pivot pin **124***a* as in the first embodiment, and extends downwardly in generally parallel relation to the escapement leaves **126***a*, **132***a*. Arm **139***a* is actuated by escapement leaf **126***a* through the agency of a U-shaped wire link **322** which is pivotally connected at its ends to the arms of actuating lever **139***a* and to the lower end of escapement leaf **126***a*, respectively. By virtue of this arrangement, the ribbon lift travel is relatively independent of the extent of angular rocking movement of the escapement, despite the necessity for locating pivot points **123***a*, **124***a*, and the position of the apertured portion **82***a* of the ribbon lifter, the locations of which are dictated by other factors and are relatively unchangeable. For example, as best shown in FIGURE 32, in this arrangement the effective length of actuating arm **139***a* is less than the distance between pivot **124***a* and the point of connection of link **322** to escapement arm **126***a*. Thus the lifting travel of the ribbon lifter is reduced, and is just sufficient to clear the letters for observation by the typist, and the force required to operate this part of the mechanism is correspondingly reduced.

At the left end of the carriage I preferably provide a mechanism for facilitating return of the carriage and simultaneously rolling the carriage to advance the paper into position for the next line of typing. Referring to FIGURES 34, 40, 41 and 42, I provide at the left end of the carriage a finger piece generally designated **325** having a curved finger portion **326** which, together with the left side of the finger piece, is contoured for convenient and comfortable actuation by the thumb and fingers of the left hand of the typist. A flat side portion **328** of the finger piece **325** extends downwardly between the platen knob **162***a* and the platen, and is freely pivoted on the platen shaft **156***a*. Between the flat portion **328** of the finger piece and the platen is a ratchet wheel **330** fast on the shaft **156***a* and thus secured to rotate with the platen. A pawl **332** pivoted to the finger piece as on pin **333** is engageable with the teeth of the ratchet wheel. The finger piece is urged counterclockwise, as viewed in FIGURE 41, by a bow spring **334** hooked at its upper end to a tab **335** on the finger piece, extending rearwardly partially around and beneath the hub of the platen knob,

and hooked at its lower end in a fixed tab **336** which is bent laterally outwardly integrally from a plate portion **338** secured to the left end plate **158***a* of the platen supporting portion of the carriage. It will be seen that when the finger portion **326** is depressed, the pawl orbits clockwise, as viewed in FIGURE 41, so that its toothed extremity **337** may ride over and engage the next tooth of the ratchet. At the same time a lug **342** on an arm **340**, also integral with the finger piece **325**, engages and lifts the escapement release arm **192***a* corresponding to the arm **192** of the first form of the invention, releasing the escapement so that the carriage may be moved to the right. As best shown in FIGURE 41 the lug **342** is transversely bent to lie behind the arm **192***a*. Arm **192***a* is so curved and the lug portion **342** is so positioned that when the finger piece **326** is depressed, lever **192***a* is swung forwardly. Clockwise movement of the finger piece is limited by a tab **345** engageable by arm **340** at the limit of downward movement of the finger piece. As the finger piece completes its downward movement, an inclined nose portion **346** of the pawl **332** rides up on another fixed tab **348** carried by plate **338**, lifting the pawl from the ratchet. Thus if the finger piece is held down, the platen can be freely rolled by means of one of the platen knobs without restraint by the pawl. When the finger piece is released, however, the pawl again falls into engagement with the ratchet piece and as the finger piece returns in a counterclockwise direction as viewed in FIGURE 41 it acts through the pawl to roll the platen in the same direction to move the paper upwardly for the next line of type. While the finger piece is depressed the carriage can also be pushed to the right to the position required to commence another line of typing, while when the finger piece is released, in addition to rolling the platen, the arm **342** moves downwardly, permitting the escapement to reengage, to hold the carriage at the proper starting position. Counterclockwise movement of the finger piece is arrested by engagement of arm portion **340** with another tab **344** carried by plate **338**. Although the ribbon feeding mechanism is similar to that employed in the first disclosed embodiment, and the ribbon reversing lever **228***a*, corresponding to the lever **228** is similarly actuatable by means of a link **227***a* to shift the position of the worm shaft **215***a* to drive one or the other of the ribbon-feeding worm wheels **213***a* in similar fashion, the link **227***a*, instead of extending through the front of the case, as in the first embodiment, is pivotally attached to an actuating lever **355** pivoted on the bell crank pivot rod **55***a* and projecting upwardly inside the case behind the guide **62***a*. Lever **355** is fitted with a suitable terminal handle portion **356** at its upper extremity which is readily accessible when the lid **262***a* is raised. Thus the ribbon can easily be reversed simply by lifting the lid and pushing the finger piece **356** toward the front or rear.

As best shown in the bottom plan view, FIGURE 44, the plastic case, generally designated **251***a*, is molded in one piece, and is provided with a continuous thickened bottom edge **376** having an upwardly reentrant downwardly opening groove **375** therein which extends entirely around the bottom of the case except for short interrupted areas at the corners. The groove is proportioned to snugly overfit upon the upturned base flange **33***a* when the case **251***a* is fitted upon the base, as brought out in the several cross-sectional views. The thickened lower portion of the case and other disclosed features thereof promote stiffness, and the design of the case also coacts with the base plate to stiffen the entire structure. At its upper edges and around all of the openings formed in the casing **251***a* inward and return bent flanges are provided. In the area of the rear opening **380** where the side walls are cut away or depressed for carriage clearance, as indicated at **381**, the flanged portions are designated **377** and **378**, rear flanged portion **377** being bent downwardly, while the side flange portions **378** project horizontally inwardly. Downturned flange portions **382** also surround the front keyboard opening **384**. The side walls **395** of the casing structure are joined between the two openings **380–384**, by a straight, integral, transverse tying portion **385** of right angular cross-section. The tying portion **385** has a horizontal top web **387** overlying frame flanges **305** and also overlying the bell crank and has a vertical front web **389** which lies flat against the front face plate portion **60***a*. The horizontal web **387** of the angular section **385** forms an uninterrupted continuation of the side flanges **378** and at its juncture with such side flanges is provided with apertures **388**, in an area overlying the outturned flanges **305** of the frame uprights **37***a*. Flanges **305** are provided with apertures **390** which are tapped or adapted to receive self-tapping screws **392** projected through the openings **388**, **390**. Such openings are positioned to be aligned when the casing is assembled on the base plate. It will be noted that the holes **388** lie relatively close to the stiff vertical side walls **395** of the casing, and the parts are so proportioned that when the screws **392** are tightened, the entire upper casing portion **251***a* is pulled down tightly, the bottom slots **375** being thereby forced down snugly on the base flange **33***a*, and the tightening force of the screws being transmitted through the side walls **395** in compression, and exerting tension on uprights **37***a*. The case is also tightly secured to the base plate at the rear by means of tongues **400**, as will be brought out, and thus, although only two screws are used, the securance and the mutual reinforcing effect of the case and base are very effective. The plastic case structure and the base plate **31***a* form a box assembly of great rigidity, which strongly resist twisting or bending of the base and of the associated mechanism of the typewriter and preventing misalignment, malfunctioning or binding of the working parts.

The rear connection between the base and the plastic case referred to above is provided by a pair of tongues **400** upstanding from and integral with the base plate near its rear edge and rearwardly bent integral holding lug portions **398**. Tongues **400** are inset from the rear edge of the base defined by the flange **33***a* a distance corresponding to the wall thickness of the vertical rear wall portion **254***a* of the plastic casing. In the position to be engaged by the lugs **398** slots **402** are formed in wall **354***a*, through which the tongues **398** may project, to tightly secure the casing to the rear wall, as shown in FIGURE 32. As brought out in FIGURE 43, the securing tongues **400** are, prior to assembly of the casing upon the base, bent inwardly to lie at an angle slightly less than ninety degrees with respect to the main portion of the base plate **31***a*. In assembly the case may thus be overfitted upon the base without interference by the lugs **398**. When the case is properly and fully fitted upon the flange portions **33***a*, slots **402** register with lugs **398**, and in order to secure these parts the workman simply projects a drift, indicated in dotted lines at **404**, through an appropriately positioned hole **405** in the base plate adjacent each tongue, so that the end of the drift lies against the inner face of the tongue **400**. By rocking the drift counterclockwise as indicated by the arrow in FIGURE 43 each tongue is thus bent to the perpendicular position, thereby forcing the lugs **398** into the slots **402** as shown in FIGURE 32.

The cover **262***a* may also be formed of plastic, and is hingedly connected, as by loose rivets **263***a*, to tongue portions **408** cast integrally with and extending upwardly from casing portion **251***a*.

In this form of the invention paper bail **183***a* is urged toward the platen to paper-engaging position by a hairpin spring **420** reacting thereupon through an arm **421**.

Certain of the working parts are separately attached to spaced portions of the base plate **31***a*, and must coact with one another and maintain relative alignment at positions spaced above the base plate. Thus any twisting or bending of the base plate creates unavoidable misalignment and malfunctioning or binding. The presence

of the mutual bracing effect of the flanges 33*a* and the rigid plastic sidewalls and backwall of the housing extending perpendicularly with respect to and firmly tied to the base plate effectively prevents undue twisting and bending of the base plate even under considerable abuse, the sidewalls also being highly resistant to bending forces imposed thereon by efforts to twist the entire box-like structure formed by the base plate and housing.

It will thus be seen that a novel and improved typewriter construction has been provided which is especially adapted for inexpensive mass production techniques and at the same time incorporates many features usually found only in expensively built machines. The arrangement of the parts is such that the machine is of inherently rugged construction, thus making it especially desirable for use by children.

While it will be apparent that the preferred embodiments of the invention disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In a typewriter, a base plate, supporting and enclosing means including housing portions attached to said base plate and extending above and tending to define and to obscure a mechanism section located in an area overlying mid and rear portions of said base plate, said housing portions including a wall portion demarcating the front of said mechanism section and the rear of an unobscured keyboard section forward of said mechanism section, means in said mechanism section including a key lever supporting frame carried by said base plate, a carriage supporting frame carried by said base plate rearwardly of said key lever supporting frame, a plurality of key lever linkages including bellcranks pivotally supported by said key lever supporting frame, each bellcrank including an actuating arm projecting forwardly from said key lever supportingu frame to a position forwardly of said wall portion, and each bellcrank also including an upwardly projecting actuated arm behind said wall portion, key levers fulcrumed in and extending forwardly from said mechanism section, each of said key levers being paired with, and extending into said keyboard section beside one of said actuating arms, means in said keyboard section directly pivotally connecting each of said key levers to its paired actuating arm, means comprising transversely extending slotted guiding and stiffening portions also carried by said base plate for guiding and spacing said bellcranks and said paired key levers and actuating arms, a carriage in said carriage supporting frame, a plurality of type bars movable to and from said carriage, and means operatively connecting said actuated arms to said type bars.

2. A typewriter as defined in claim 1 wherein the forward portion of said carriage supporting frame extends upwardly, a type bar hanger secured to said upwardly extending frame portion, said type bars being rockably mounted on said hanger, cooperating guide surfaces on said type bars and hanger for guiding said type bars during movement to and from their typing position, a carriage assembly supporting said carriage and shiftably mounted on said carriage supporting frame, stop means secured to said upwardly extending frame portion, said stop means being engageable by a portion of said carriage assembly to define the carriage assembly rest position, and means for adjusting said stop means on said frame to vary the rest positon of said carriage.

3. In a typewriter, a base plate, a U-shaped key lever supporting frame secured to said base plate, a carriage supporting frame secured to said base plate rearwardly of said key lever supporting frame, a key lever fulcrum bar secured to said base plate between said frames, a plurality of key levers pivotally engageable with said fulcrum bar and extending forwardly therefrom, a pivot rod extending between and supported by the upstanding legs of said key lever supporting frame, a plurality of bell cranks pivoted on said rod and connected to said key levers, a hanger, a plurality of type bars pivoted on said hanger, links connecting said bell cranks and said type bars, a carriage assembly supported by said carriage supporting frame, and means permitting relative movement between said carriage assembly and hanger.

4. In a typewriter, a base, a carriage assembly movably supported by said base, a stop member extending upwardly from said base, said carriage assembly having a portion engageable with said stop member to define the rest position of said carriage assembly, means for adjusting said stop member to vary said rest position, a shift lever for upwardly shifting said carriage assembly, and a shift lever stop on said stop member defining the shift position of said carriage assembly.

5. The combination according to claim 5, said carriage assembly including a bracket, an upwardly extending plate supporting said stop member, a slot in said plate receiving said bracket, and a slot in said stop member aligned with said first, the rest position of said carriage assembly being defined by the engagement of said bracket with the bottom of said second slot.

6. In a typewriter, a carriage assembly, means supporting said carriage assembly for movement between a lower rest position and a shift position above said rest position, a pair of forwardly extending brackets on said carriage assembly, an upwardly extending plate forward of said carriage assembly, a pair of slots in said plate, said brackets being disposed within said slots, a pair of adjustable carriage stops having slots aligned with said first-mentioned slots, said carriage stops being adjustably secured to said plate to vary the rest position of said carriage assembly, an outwardly extending shift lever stop on one of said carriage stop members, a shift lever connected to said carriage assembly, and a portion on said shift lever engageable with said shift lever stop to define the shift position of said carriage assembly.

7. In a typewriter, a key lever supporting frame, a plurality of key lever linkages supported by said frame, an upwardly extending plate rearwardly of said key lever supporting frame, a hanger secured to said plate, a plurality of type bars pivoted on said hanger and carrying type faces, means connecting said key lever linkages and said type bars, the type bars being movable between a retracted position and a typing position, a carriage assembly, means supporting said carriage assembly for movement in a direction substantially parallel to the position of said type faces when in typing position, and stop means on said plate engageable by said carriage assembly to define the lower rest position of said carriage assembly.

8. The combination according to claim 7, said carriage assembly supporting means comprising two pairs of posts, a parallelogram linkage connecting said posts and carriage assembly, a shift lever engageable with said carriage assembly, and means carried by said plate and engageable by said shift lever to define an upper shift position of said carriage assembly.

9. In a typewriter, a key lever supporting frame, a plurality of key levers supported by said frame, an upwardly and rearwardly inclined plate rearwardly of said key lever supporting frame, a hanger secured to said plate, said hanger comprising an elongated arcuate plastic block having a plurality of radial slots, a plurality of type bars, guide portions at the inner ends of said type bars, said guide portions being disposed within said slots, the slots being of a width such that said type bars will be guided between their retracted position and typing position, a wire extending through said guide portions and supported by and secured at its opposite ends to said hanger, a carriage assembly supported rearwardly of said type bars, and means permitting relative shifting movement between said carriage assembly and hanger.

10. In a typewriter, a carriage having a pair of upstanding ears at the opposite ends thereof, a cylindrical platen disposed between said ears and having a pair of projecting shafts rotatably supported by said ears, a knob secured to the outer end of one of said shafts, a platen ratchet comprising a series of protrusions formed on the ear adjacent said knob and facing the knob, an annular leaf spring having a portion of its outer edge secured to said knob, and a projection on said spring engageable with said protrusions.

11. The combination according to claim 10, said knob having an annular space between the hub and rim portions thereof, said spring being disposed within said space, and peened-over portions on said hub and rim for securing said spring to said knob.

12. The combination according to claim 10, further provided with a second knob secured to the outer end of said other shaft, said spring urging said second knob against its adjacent ear, whereby the axial position of said platen with respect to said carriage will be yieldably maintained.

13. In a typewriter, a carriage rail, a carriage slidably mounted on said rail, a pair of ears extending upwardly from the opposite ends of said carriage, a cylindrical platen, means rotatably supporting said platen between said ears, a paper guide comprising a plate pivotally supported between said ears, the lower portion of said paper guide being arcuately shaped, the upper portion of said paper guide being flat, the paper guide being rockable between a normal position in which said arcuate portion is substantially concentric with said platen and a paper releasing position in which said arcuate portion is swung away from said platen, a plurality of paper gripping leaf springs in parallel relation, the lower end of each spring being connected to said carriage, the upper end of each spring being connected to the upper edge of said paper guide, and a plurality of clearance apertures in said paper guide, intermediate portions of said springs being disposed within said clearance apertures and engageable with said platen, the edges of said apertures being engageable with said springs when said paper guide is swung to its paper releasing position to cause disengagement of said springs from said platen.

14. In a typewriter, a carriage assembly including a carriage rail, a carriage slidably mounted on said rail, a pair of upstanding ears at opposite ends of said carriage, a cylindrical platen pivotally supported between said ears, said platen including a pair of stub shafts extending through said ears, a pair of knobs mounted on the outer ends of said stub shafts, at least one of said knobs having a hub, a rim, and an annular space between the hub and rim, an annular leaf spring disposed within said space and fixed to said hub and rim at one portion thereof to form a cantilever spring, a circular spacing ratchet comprising a plurality of protrusions on the adjacent carriage ear, a projection carried by the outer portion of said spring and engageable with said ratchet, said spring urging said other knob towards its adjacent ear, a paper guide comprising a plate having a flat upper portion and a curved lower portion, said paper guide being pivoted between said ears, said lower paper guide portion partially surrounding said platen, a plurality of paper gripping springs movably secured at their lower ends to said carriage and at their upper ends to the upper portion of said paper guide, a plurality of clearance apertures in said paper guide whereby said springs will normally engage said platen, and paper gripping portions on said springs, said paper guide being swingable between a normal position in which said paper gripping portions are engageable with a paper on said platen and a release position in which edges of said apertures engage said springs to force said paper gripping portions of the springs away from the platen.

15. In a typewriter, a carriage assembly comprising a carriage rail and a carriage slidably mounted thereon, means urging said carriage in one direction on said rail, an escapement mechanism connecting said carriage rail and carriage, said escapement mechanism including a pair of pawls rockably mounted on a common pivot, means for rocking said pawls to initate escapement movement of said carriage, a bootjack, a ribbon guide mounted for vertical sliding movement on said bootjack, and ribbon guide actuating means mounted on said common pivot and rockable with said pawls, said last-mentioned means being connected to said ribbon guide whereby the ribbon guide will be lifted during said rocking movement.

16. In a typewriter, a carriage assembly comprising a carriage and a carriage rail, means urging said carriage in one direction on said rail, an escapement mechanism connecting said carriage and rail, said mechanism including a cage and pawl means supported by said cage, a bootjack supported independently of said carriage assembly, a ribbon guide carried by said bootjack and moveable between a retracted position and a typing position, an arm pivotally mounted in said cage, means connecting said arm and ribbon guide, a plurality of key lever linkages, and means responsive to movement of one of said key lever linkages for rocking said arm from a position in which said ribbon guide is in its retracted position to a position in which said ribbon guide is in its typing position.

17. The combination according to claim 16, said connecting means between the pivoted arm and ribbon guide comprising a pair of leaf springs in overlapping relation, said leaf springs engaging opposite sides of a portion of said ribbon guide, whereby said leaf springs will yieldably urge said ribbon guide in either direction of movement.

18. The combination according to claim 16, said ribbon guide comprising a wire of generally U-shaped configuration having a lower central leg and a pair of side legs slidably supported by said bootjack, and ribbon retaining portions on the upper ends of said side legs, said connecting means between the rockable arm and ribbon guide engaging the lower central leg of said ribbon guide.

19. In a typewriter, a carriage assembly movable between a lower position, an intermediate shift position, and an upper shift position, an intermediate shift lever swingably and shiftably mounted adjacent said carriage assembly, the carriage assembly being movable from its lower position to its intermediate position in response to swinging of said intermediate shift lever from a first to a second position, means responsive to shifting of said intermediate shift lever when in its second position for locking said carriage assembly in said intermediate position, an upper shift lever, said carriage assembly being movable to its upper shift position in response to movement of said upper shift lever from a first to a second position, and means responsive to movement of said upper shift lever from its first to its second position when said intermediate shift lever is in its locked position for unlocking said intermediate shift lever.

20. In a typewriter, a carriage assembly movable between a lower position, an intermediate shift position, and an upper shift position, an intermediate shift lever for moving said carriage assembly from its lower position to its intermediate position, means for locking said carriage assembly in its intermediate position, an upper shift lever for moving said carriage assembly to its upper shift position, and means responsive to movement of said upper shift lever when said carriage assembly is locked in its intermediate shift position for unlocking said carriage assembly.

21. The combination according to claim 20, said last-mentioned means comprising a pin on said carriage assembly, and a cam surface connected to said locking means, said pin being engageable with said cam surface when said carriage assembly is moved from its intermediate to its upper shift position to unlock said locking means.

22. In a typewriter, a carriage assembly movable be-

tween a lower position, an intermediate shift position, and an upper shift position, an intermediate shift lever and an upper shift lever swingably and shiftably mounted adjacent said carriage assembly, a pin on said carriage assembly, a triangular aperture at the inner end of said intermediate shift lever, a slot at the inner end of said upper shift lever, said pin projecting through said aperture and slot, notched portions on said levers, and means engageable by said notched portions upon shifting of either of said levers for locking such lever in its shifted position, the locking position of said intermediate shift lever being such that said pin is located in the narrow portion of said triangular aperture, whereby movement of said carriage assembly to its upper shift position will cause said pin to engage the upper inclinded edge of said triangular aperture to cam said intermediate shift lever to its unlocked position.

23. In a typewriter, a carriage assembly moveable between a lower position, an intermediate shift position, and an upper shift position, an intermediate shift lever pivotally and slidably mounted adjacent said carriage assembly, the carriage assembly being moveable from its lower position to its intermediate position in response to swinging of said intermediate shift lever, means carried by said intermediate shift lever for locking said carriage assembly in its intermediate position in response to sliding movement of said intermediate shift lever, an unlocking cam surface carried by said intermediate shift lever, an upper shift lever movably mounted adjacent said carriage assembly, said carriage assembly being movable to its upper shift position in response to pivotal movement of said upper shift lever, and means carried by said carriage assembly and engageable with said unlocking cam surface when said intermediate shift lever is in its locked position to cause said intermediate shift lever to slide to its unlocked position as said carriage assembly moves to its upper shift position.

24. In a typewriter, a plurality of banks of key levers, each bank having a row of keys at the forward ends thereof, the main portions of all key levers extending rearwardly and being pivotally supported, a plurality of bell crank levers pivoted on an axis transverse to said key levers, each of said bell cranks having a first arm extending upwardly from said pivot axis and a second arm extending forwardly form said pivot axis alongside a key lever, connections between said key levers and the second arms of said bell cranks, the connections of all levers being in alignment, a universal bar engageable with the forward edges of said first arms, spring means connected to and urging said universal bar rearwardly, type bars pivoted rearwardly of said bell cranks, and links between the first arms of said bell cranks and said type bars.

25. In a typewriter, a plurality of banks of keys, key levers supporting said keys and extending rearwardly therefrom, a combined front housing plate and key lever supporting frame structure including a front housing plate portion located immediately behind said key banks, pivotal supports for said key levers spaced substantially rearwardly of said structure, a plurality of bell cranks mounted in said structure on a pivot axis transversely of said key levers, each bell crank having a first arm extending upwardly behind said housing plate portion and a second arm extending forwardly from said structure, aligned connections between said key levers and the second arms of said bell cranks forwardly of said structure, type bars pivoted rearwardly of said bell cranks, and links between the first arms of said bell cranks and said type bars.

26. The combination according to claim 25, further provided with means having a plurality of guide slots supported by said structure and extending rearwardly from said front housing plate portion, the first arms of said bell cranks being disposed within said guide slots.

27. The combination according to claim 25, said typewriter being further provided with a base and means having a plurality of guide slots supported by said base and extending upwardly therefrom, one key lever and the second arm of one of said bell cranks being disposed within each of said guide slots.

28. In a typewriter, a plurality of key levers, each lever having an upstanding forward portion for supporting a key and a substantially straight rearwardly extending main portion, a fulcrum bar extending transversely adjacent the ends of said key lever main portions, a plurality of slots in said fulcrum bar, the ends of said key levers being disposed within said slots, a plurality of bell cranks on a common pivot axis extending transversely to said key levers, a first arm on each bell crank extending upwardly from said pivot axis, a second arm on each bell crank extending forwardly from said pivot axis alongside a key lever, motion-transfer connections between said second arms and their corresponding key levers, a universal bar engageable with the forward edges of said first arms, spring means urging said universal bar rearwardly, type bars pivoted rearwardly of said bell cranks, and links between the first arms of said bell cranks and said type bars.

29. In a typewriter, first, second and third sets of key levers, each lever having an upwardly extending portion for supporting a key and a rearwardly extending main portion, the upwardly extending portions of said first, second and third sets being progressively higher, the rearwardly extending portions of said first, second and third sets being progressively shorter, means for pivotally supporting the ends of said main key lever portions, a plurality of bell cranks on a common pivot axis extending transversely to said key levers, each bell crank having a first arm extending upwardly from said pivot axis and a second arm extending forwardly alongside a key lever, connections between said second arms and said keys levers, a universal bar engageable with the forward edges of said first arms, spring means connected to and urging said universal bar rearwardly whereby said key levers will be urged upwardly, said third set of key levers each having a forward extension, the connections between said key levers and bell cranks being located adjacent the upwardly extending portions of said second set of key levers and including the forward extensions of said third set of key levers, type bars pivoted forwardly of said bell cranks, and links connecting the first arms of said bell cranks and said type bars.

30. In a typewriter, first, second and third sets of key levers, each lever having an upwardly extending portion for supporting a key and a rearwardly extending main portion, the upwardly extending portions of said first, second and third sets being progressively higher, the rearwardly extending portions of said first, second and third sets being progressively shorter, means for pivotally supporting the ends of said main key lever portions, a plurality of bell cranks on a common pivot axis extending transversely to said key levers, each bell crank having a first arm extending upwardly from said pivot axis and a second arm extending forwardly alongside a key lever, connections between said second arms and said key levers, said third set of key levers each having a forward extension, the connections between sadi key levers and bell cranks being located adjacent the upwardly extending portions of said second set of key levers and including the forward extensions of said third set of key levers, type bars pivoted forwardly of said bell cranks. and links connecting the first arms of said bell cranks and said type bars.

31. A typewriter construction or the like comprising a sheet metal base plate, operative mechanical elements separately secured to spaced portions of said base plate, said elements having working portions coacting with one another at positions spaced from the base plate, and wherein the relative alignment of said working portions must be maintained within predetermined limits, said base plate having rigid marginal flange portions extending upwardly a short distance therefrom, a non-metallic housing structure having side walls substantially aligned with said marginal flange portions and having a slotted bot-

tom over-fitted upon said marginal flange portions, said side walls extending upwardly substantially perpendicularly to said base plate, and securing means holding said housing structure downwardly with respect to said base plate.

32. A typewriter construction or the like comprising a sheet metal base plate, operative mechanical elements separately secured to spaced portions of said base plate, said elements having working portions coacting with one another at positions spaced from the base plate, and wherein the relative alignment of said working portions must be maintained within predetermined limits, said base plate having marginal flange portions extending upwardly therefrom, a non-metallic housing structure having side walls substantially aligned with said marginal flange portions and having a bottom slotted conformably to and over-fitted upon said marginal flange portions, said side walls extending upwardly substantially perpendicularly to said base plate, and securing means holding said housing structure downwardly with respect to said base plate, said securing means including holding portions extending upwardly from said base plate adjacent to said marginal flange portions and inter-engaged with said side walls, said housing having transverse upper wall portions spaced from said side walls, and additional securing means secured to said transverse upper wall portions and extending downwardly therefrom and attached to the base plate.

33. A typewriter construction or the like comprising a sheet metal base plate, operative mechanical elements secured to said base plate at different positions upon the latter, said elements coacting with one another at positions spaced from the base plate, marginal flange portions extending upwardly from said base plate, a non-metallic housing structure having walls slotted at their lower ends and overengaging both sides of said marginal flange portions, said side walls extending upwardly substantially perpendicularly to said base plate, and securing means holding said housing structure downwardly with respect to said base plate, said housing structure having a thickened bottom edge, the slotted portion being formed in said thickened edge.

34. In a typewriter construction or the like having a frame, a transversely slidable carriage, and a platen rotatable in the carriage upon an axis parallel to the path of sliding movement of the carriage, means for manipulating the carriage and platen to enable sliding the former and rotating the latter in a single actuating motion, comprising a ratchet wheel fast and coaxial with respect to the platen at one end of said carriage, and a common actuator for said ratchet wheel and carriage comprising a finger piece loosely swingable about the common axis of said platen and ratchet wheel, a pawl on the finger piece operatively engageable with the ratchet wheel in one direction only of relative rotation of said finger piece and ratchet wheel, means limiting angular movement of said finger piece at two extreme positions, spring means biasing said finger piece to one of said two positions, the directing of biasing actuation of said spring means corresponding to that in which said pawl is operatively engageable with said ratchet wheel, whereby said finger piece may be rotated in one direction independently without actuating said platen, and while effort is exerted longitudinally of the platen through said finger piece to actuate the carriage, and whereby upon subsequent release of said finger piece the platen is actuated in a rotary direction by said biasing means acting through said finger piece and pawl.

35. An construction as defined in claim 34 including biasing means for advancing the carriage during typing, and escapement mechanism permitting said carriage to advance only through limited increments during typing, means carried by the carriage for completely releasing the escapement to permit unimpeded movement of the carriage in either direction, and means interconnecting said last named means with said finger piece for actuating said means for completely releasing said escapement when the finger piece is rotated in said direction of independent rotation.

36. In a typewriter construction or the like including a sheet metal base plate, means carried by the base plate for supporting a plurality of type bars for swinging movement about fixed axes, key mechanism supported by said base plate for actuating said type bars, a carriage, supporting and guide means for the carriage secured to said base plate at positions spaced from said type bar supporting means, and including a pair of spaced side supports for said carriage, said supporting and guide means for the carriage permitting shifting movement of the carriage structure in a direction perpendicular to the base plate, and stop means carried partly by said supporting means for said type bars and partly by said side supports for said carriage and limiting such shifting movement.

37. Means as defined in claim 36 wherein said supporting means for said type bars comprises a sheet metal panel secured at its lower extremity to the base plate and projecting angularly upwardly therefrom between said side supports, said panel and said side supports having interengageable abutment portions permitting lost motion therebetween and defining said stop means.

38. In a typewriter construction or the like including a supporting frame structure having a lower portion comprising a substantially flat base plate and adapted to rest upon a flat support, type bars, key levers pivotally supported from said base plate for selectively actuating the type bars, said key levers being arranged in a substantially horizontal row extending across but located somewhat above the bottom of the frame structure, means for biasing the type bars and key levers to retracted positioning, including a multi-leaf spring structure comprising an integral comb-like spring having resilient individual tooth-like spring having resilient individual tooth-like spring portions spaced conformably to and bearing upwardly against said key levers, said spring structure being carried by and extending transversely of said lower portions of said frame structure, the spring structure being substantially flat and attached to said base plate in inclined position with said tooth-like portions extending angularly upwardly therefrom, means including bell cranks interconnecting said key levers and type bars, a carriage, a platen supported by said carriage for supporting a typing sheet in operative relation to the type bars, biasing means for moving the carriage in one direction during typing, and and escapement mechanism for controlling such movement in desired increments, linke means interconnecting said bell cranks and escapement mechanism for actuating said escapement mechanism concurrently with actuation of the type bars and key levers, including a universal bar extending transversely of said bell cranks and engageable and rockable thereby in response to actuation of any one of such bell cranks, and biasing means for said escapement mechanism and universal bar independent of said previously mentioned spring structure.

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Disclaimer

3,057,449.—*James E. Thomson*, Munith, Mich. TYPEWRITER. Patent dated Oct. 9, 1962. Disclaimer filed Oct. 17, 1977, by the assignee, *Western Stamping Corporation.*

Hereby enters this disclaimer to claim 9 of said patent.

[*Official Gazette January 17, 1978.*]