Jan. 5, 1954 C. SCHRODER 2,664,987

TYPE-ACTION-CONTROLLED VARIED LETTER FEED

Filed Nov. 21, 1951 2 Sheets-Sheet 1

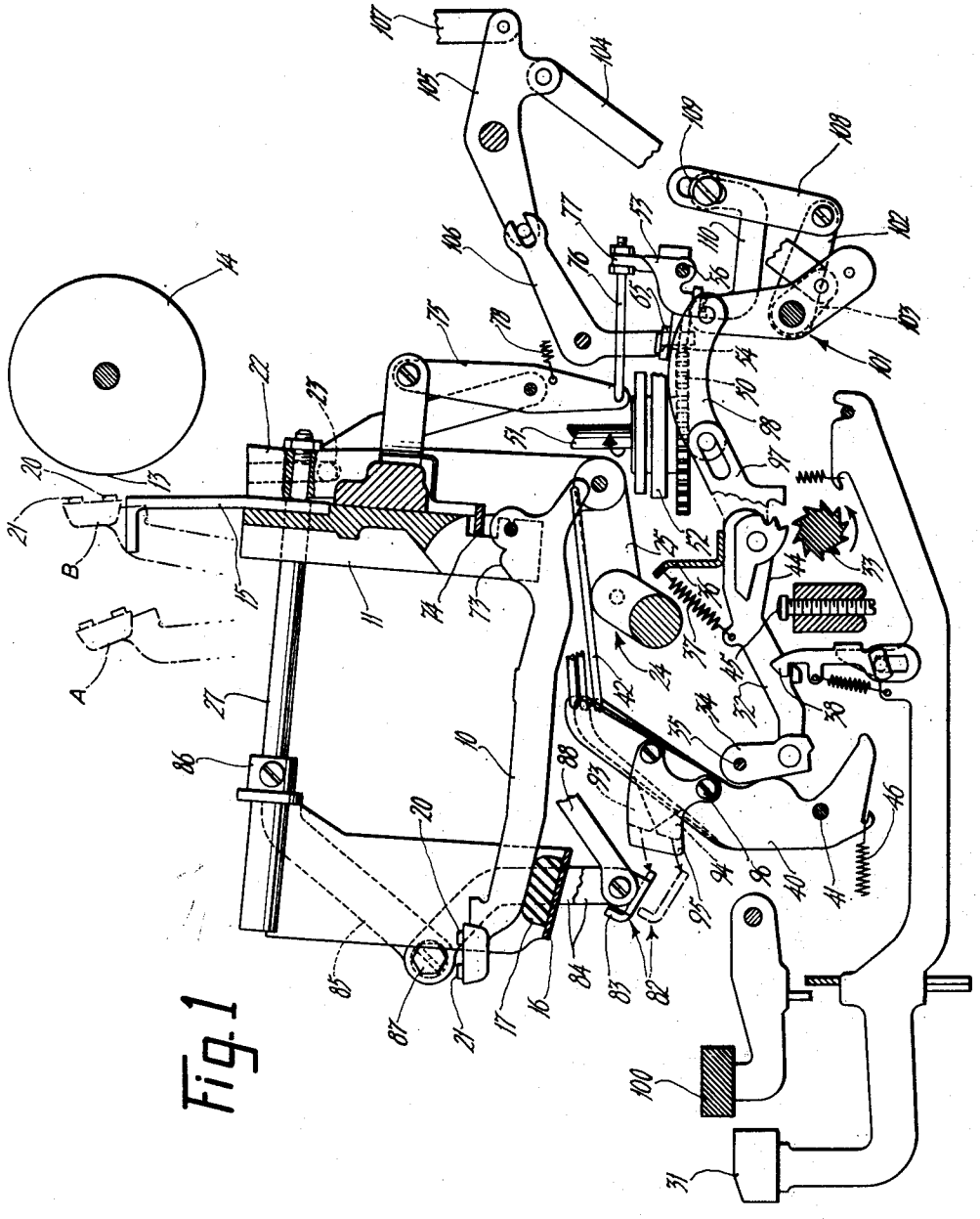


Fig. 1

INVENTOR.
CHARLES SCHRODER

BY Jesse A. Holton

ATTORNEY

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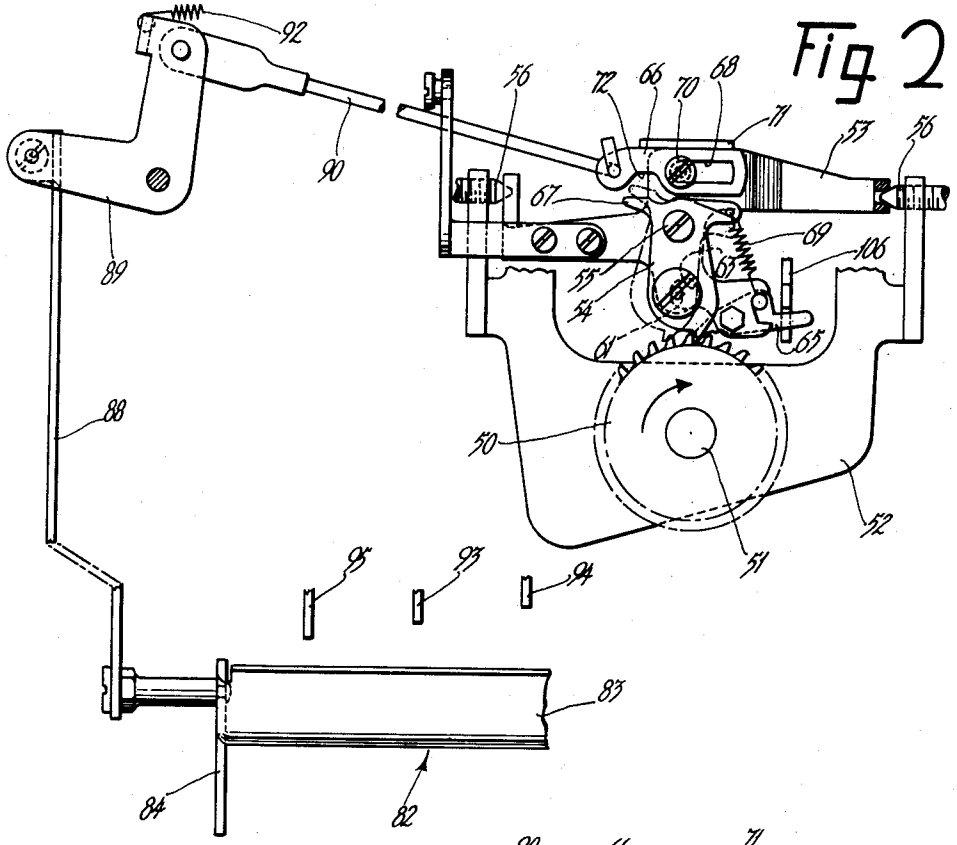


Fig. 2

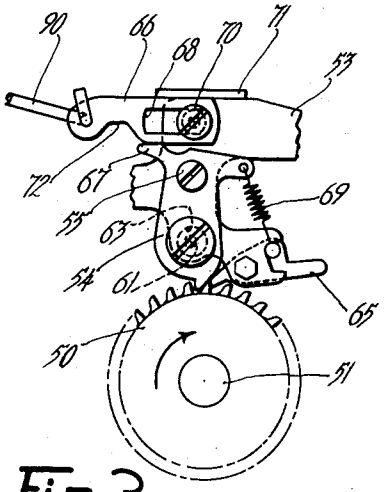


Fig. 3

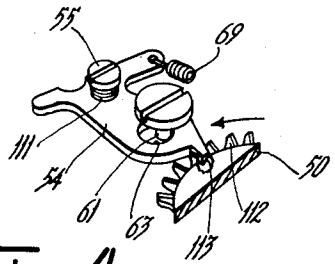


Fig. 4

INVENTOR.
CHARLES SCHRODER

BY

Jesse A. Holton

ATTORNEY

Patented Jan. 5, 1954

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TYPE-ACTION-CONTROLLED VARIED LETTER FEED

Charles Schroder, West Hartford, Conn., assignor to Underwood Corporation, New York, N. Y., a corporation of Delaware

Application November 21, 1951, Serial No. 257,561

6 Claims. (Cl. 197—84)

1

This invention relates to typewriters and more particularly to typewriters embodying mechanism to effect letter feed substantially proportional to the width of the characters being typed.

Machines with provision for proportional letter feed are well known, but the structure in comparison with the conventional uniform letter-feed typewriters is relatively complex, wherefore due to the high cost relatively few typewriters are sold which embody proportional letter-feed mechanism.

It is the general object of the invention to provide a proportional letter-feed typewriter which is simple in structure, reliable in operation, and can be manufactured at very low cost.

Another object of the invention is to provide a proportional letter-feed typewriter which in most respects is structurally identical with conventional, uniform letter-feed typewriters, and embodies a minimum of mechanism differing therefrom.

It is a further object of the invention to provide a feed-regulating element directly on a case-shiftable unit, for operation by certain type bar actuating mechanisms only in the normal case position of said unit and for actuation by certain other type bar actuating mechanisms only in another case-shift position of said unit.

Now referring to the drawings:

Figure 1 is a sectional side elevation showing a typing mechanism and mechanism to produce proportional letter-feed,

Figure 2 is a bottom view of the proportional letter-feed mechanism of the invention, including a space-regulating mechanism, in a normal state,

Figure 3 is a fractional bottom view of the proportional letter-feed mechanism showing the space-regulating mechanism in an abnormal condition,

Figure 4 is a perspective view of a stepping dog in association with an escapement wheel.

The invention is embodied in the well-known Underwood all electric typewriter, the typing mechanism of which is disclosed in a patent to Yaeger, No. 2,254,764, dated September 2, 1941. This typing mechanism comprises a usual complement of type bars 10 mounted on a segment 11, and individually swingable from diversive position in front of a platen 14 to type against the platen 14 at a common typing point 13. As each type bar 10 approaches printing position, it enters a usual type guide 15 which reaches upwardly from the segment 11. The type bars rest normally in closely adjacent relation radially on a usual arcuate type bar rest 16 embodying a

2

cushion indicated at 17. Each type bar bears a lower case type 20 and an upper case type 21. Normally the segment 11 is in the position seen in Figure 1 and the lower case type 20 of any actuated type bar 10 will strike at the printing point 13. When it is desired to type by the upper case types 21, the segment 11 is shifted downwardly to a position in which the upper case types 21 will type at said typing point 13. For such downward shift of the segment 11, the latter is supported on a shift frame 22 which at each lateral side near the top is guided by a ball and raceway association indicated at 23 and which at the bottom is guided by a pivotally mounted bail 24 having two spaced arms 25 to which the shift frame is articulated. Conventional mechanism, not shown, is provided to case-shift the frame 22 and therefore the segment 11. The type bar rest 16 comprises a sheet metal strip of arcuate form having opposite ends curled around the front ends of studs 27 which reach forwardly at each side of the segment 11 from the case-shift frame 22. It will be seen that the case-shift frame 22, the segment 11, the type bar rest 16, and the studs 27 comprise a case-shiftable unit.

The type bars 10 are selectively operable to type, by operating mechanisms which for each type bar 10 include a key 31, a power actuator 32, an arm 34, a sub-lever 40 and a link 42. Said actuators 32 are at their front ends pivotally connected to said arms 34 and springs 37 bias the actuators 32 rearwardly and upwardly so that they normally occupy the position seen in Figure 1, wherein their rear ends bear upwardly against a bar 35 and are clear of a toothed power shaft 33. The latter extends across the full machine and is constantly turning in the direction indicated by an arrow when the machine is in use. For connecting the actuators 32 to the toothed shaft 33, that is to draw them down into engagement therewith, the keys 31 have each a hook element 38 normally overlying a protuberance on the related actuator 32. The arms 34 are pivoted on common, frame-supported pivot rod 35 and the sub-levers 40 are pivoted on a common, frame-supported pivot rod 41. As any power actuator 32 is drawn down under key control, it engages the toothed shaft 33, the actuator resultingly being power-moved forwardly and operating the arm 34. Motion from the arm 34 to the sub-lever 40 is transmitted by motion-accelerating rolling-contact and the related type bar 10 receives an operating stroke. The arms 40 are of graded lengths to reach to appropriate levels for connection by the wire links 42 to the related

type bars 19. The links 42 not only serve to transmit operating movements to the type bars 19, but provide an articulate connection to permit case-shifting of the type bar system and the unit which supports it, it being understood that the sub-levers 40 are pivotally supported on the frame by the rod 41. The arrangement is such that the type bars 19 are operable substantially with equal operating characteristic whether the type bar system is in upper or in lower case position. At a desired point in the movement of the type bar 19 toward the platen, a cam face 44 on the underside of the actuator engages a conventional means 45 which causes divorcement of the toothed actuator from the toothed shaft 33. The type bar 19, however, under the force of the momentum completes its typing movement and is thereafter returned by a spring 46 associated with the sub-lever 40.

The platen 14 is part of a usual paper supporting carriage, not shown, and is always under spring urge to travel in a letter-feed direction, that is, leftwardly. Movement of the carriage ensues under control of a letter-feed mechanism comprising an escapement wheel 50 fast on a shaft 51, and wherewith it is rotatable on the framework of the machine, the lower part of the shaft 51 having bearing support in a bracket 52. A gear pinion, not shown, on the upper end of the shaft 51 is meshing a gear-rack on the carriage also not shown, so that the escapement wheel 50 is constantly urged to turn in the direction indicated in the various views by an arrow.

The letter-feeding mechanism of the invention feeds the carriage a large increment in connection with typing most of the lower case and most of the upper case characters. In connection with a few lower case and a few upper case characters, said letter-feed mechanism feeds the carriage a smaller increment. Preferably the large increment feed assigned to most of the characters is double that of the smaller increments assigned to a few characters. Naturally, different character fonts and systems call for various treatment.

The stated letter-feed mechanism comprises for cooperation with the escapement wheel 50 an escapement dog 54 pivoted on a rocker 53 at 55 and normally checking the escapement wheel 50 against carriage-advancing rotation as in Figure 2. The said escapement rocker 53 is mounted to pivot on a horizontal axis between two pivot screws 56 that are provided on branches of the escapement bracket 52. The normal limits of the opposite pivotal movements of the dog 54 are provided by a shank 61 of a screw stud which is provided fast on the rocker 53, in conjunction with two opposite abutments afforded by a perforation 63 in the dog 54, the screw shank 61 being normally engaged by one side of the perforation as in Figure 2. The stated normal limits of movement of the dog 54 prevail for all typing strokes which are to be followed by a large or double increment feed-movement. In a manner to be described hereinafter, whenever a typing stroke calls for a small-increment feed-movement, the pivotal motion of the stepping dog 54 leftwardly of Figure 2 is foreshortened by the temporary placement of a stop slide 66 into the swinging path of a tail 67 of the dog 54, as illustrated in Figure 3. Said slide 66 is slidably supported on the escapement rocker 53 by a slot 68 provided therein, by a shouldered screw 70 in said slot and fast in the rocker 53, and by

an edge-guide 71 projecting from the rocker 53. Normally, and always when said typing operation calls for a large, that is double increment letter-feed space, said slide 66 is in the position seen in Figure 2, wherein the tail 67 is free to move unobstructedly into a notch 72 provided in the slide 66. At each operation of any type bar 19, the rocker 53 is momentarily given an anti-clockwise rocking motion in reference to the showing in Figure 1. This swings the stepping dog 54 downwardly free of the engaged escapement wheel tooth and at the same time a rotation-checking dog 65 pivotally carried on the rocker 53 is temporarily swung downwardly into the path of the escapement wheel tooth which the stepping dog 54 has just freed. The wheel-engaging end of the checking dog 65 then permits a fractional tooth movement of the escapement wheel 50 and at the same time the stepping dog 54 under the urge of a contractile spring 69 having opposite anchorage on the dogs 54 and 65, swings leftwardly as viewed in Figure 2 to the normal limit afforded by the perforation 63, predetermining a double-increment feed-movement of the carriage, or it swings to a foreshortened extent to the limit afforded by the slide 66, see Figure 3, predetermining in that case a small-increment feed-movement of the carriage. As the stepping dog 54 swings for predetermining a large increment movement, it swings to the extent represented in dot-and-dash lines in Figure 2, the dog 54 being then in position to be picked up by the second wheel tooth as the rocker 53 restores, and thus being instrumental to arrest the escapement wheel after a two-tooth travel of the escapement wheel. If the stepping dog 54 is only allowed to swing to the position seen in Figure 3, that is if it is intercepted by the operated slide 66, then it will be engaged upon the return of the rocker 53 by the escapement wheel tooth immediately trailing the last active one, wherefore the escapement wheel in that case is restricted to a single tooth advance.

The rocking motion is imparted to the escapement rocker 53 late in each typing stroke. To this end, in a conventional manner, the type bars 19 have each a shoulder 73 to operate a curved universal bar 74 rearwardly. Said universal bar is guided to move rearwardly in a well-known manner, to operate a bail structure 75 pivotally carried on the shift frame 22 and having a link connection 76 with an upreaching arm 77 of the escapement rocker 53. Said link connection 76 permits free case-shift movement of the bail structure 75 with the case shift frame 22. Spring means indicated at 78 serve to bias the universal bar 74 and connected parts leading to and including the rocker 53 to their normal positions seen in Figure 1, wherein the stepping dog 54 is in control over the movement of the carriage. The operation of the rocker 53 is momentary but of sufficient duration for the stepping dog 54 to swing to its appropriate regulated extent.

Efficient, simple and automatically active means is provided so that when an upper case or a lower case character is typed which calls for a small-increment feed-movement, there will occur automatically a shift of the space controlling slide 66 to the position seen in Figure 3, that is, the position predetermining a small-increment letter-feed movement. This means comprises a pivoted bail designated generally by the reference numeral 82 and comprising a transverse bar 83 and two upreaching spaced arms 84. For support of the bail 83 there is secured by col-

lars 86 at each side of the type system to the studs 27 which support the type bar rest 16 a downward reaching bracket 85, the bail being pivoted on said brackets at points 87. The bail 82 partakes in the case shift movements of the aggregate case shift unit or frame constituted by the parts 11, 16, 22, 27 and 85, and, as seen in Figure 2, is connected with the space controlling slide 66 by a rearwardly extending link 88, a bell crank 89 and a transverse link 90. Said bell crank 89 is pivotally supported on the frame, and under the influence of a spring 92 associated therewith places the bail 82 and connected parts 90 and 66 under bias to restore to the normal position seen in Figure 2. In the normal, lower case position of the segment 11, the bail 82 is in a rearward position as seen in full lines in Figure 1, such position being established by the end engagement of the slide slot 68 with the screw 70 as shown in Figure 2. Any one of the type action sub-levers 40 which is in control of a type bar 10 having a lower case type 20 calling for a small-increment letter-feed movement is provided with a plate 93 forming a forward projection thereon to operate the universal bar member 82 only if the segment 11 is in the normal, that is, lower case position. Any sub-lever 40 which is in control of a type bar 10 having an upper case type 21 calling for a small-increment letter-feed movement is provided with a plate 94 forming a projection to operate the universal member 82 only if the segment 11 is in the downwardly shifted, that is the upper case position. This is because when the type bar segment 11 is in upper case position the universal member 82 is in the lowered position indicated in dot-and-dash lines in Figure 1. One or more of the sub-levers 40 which are related with type bars 10 calling for small-increment letter-feed in connection with both the types 20 and 21 may have a plate 95 providing a long-face projection for operation of the bail in either case shift positions of the segment 11. The plates 93, 94, and 95 are preferably attachable to the sub-levers 40 by screws 96 and all the levers 40 may be provided with screw holes for attachment of appropriate plates 93, 94, 95 on appropriate ones of the sub-levers. It follows thus that whenever a type bar operation is to be accompanied by a small-increment feed movement of the carriage the universal member or bail 82 is forwardly actuated and will position the control slide 66 for the stepping dog 54 to predetermine a small-increment feed movement of the carriage.

Inasmuch as the levers 40 reach upwardly to graded extents, those which are at the center of the machine have a greater angular movement than those which are progressively farther to the side. For this reason the plates 93, 94, 95 reach farther forwardly toward the universal member 82 at the sides of the machine than at the center, as may be visualized from Figure 2. The plates 93, 94, 95 are moreover arranged in relation to the universal member 82 so that the space controlling slide 66 is operated sufficiently to exercise control already over the escapement dog 54 as the type bar reaches the position A indicated in dot-and-dash lines in Figure 1. The actual operation of the escapement ensues at a later point in the type bar stroke, namely approximately when the type bar reaches the position indicated in dot-and-dash lines at B.

The tabulating mechanism may be similar in structure to the one disclosed in the patent to Helmond, No. 2,303,878, dated December 1, 1942,

but for releasing the carriage from letter-feed control a mechanism modified over that shown in said patent is provided. As in the tabulating mechanism of said patent, there is provided a tabulator power actuator. This actuator is similar to the type action actuators but includes a rearward extension 97 for actuating a link 98. The tabulator actuator, by means similar to the type action actuators, but not shown, is lowered into motion receiving relation with the toothed shaft 33 under control of a tabulator key 100. The forward movement of the tabulator actuator then results in the rocking of a shaft unit 101 comprising arms 102 and 103. The arm 103 is connected by a link 104 to a lever 105 which is in control of a throw-out lever 106 for the stepping dog 65. The lever 105 has upreaching therefrom a usual tabulator blade 107 for coaction with carriage-supported tabulator stops, not shown. From the arm 102 there reaches upwardly a short link 108 having a pin-and-slot connection 109 with an arm extension 110 of the escapement rocker 53. Said pin-and-slot connection 109 provides for transmittal of motion to said rocker 53 incidental to tabulating operations, but allows letter-feeding vibratory action of the escapement rocker 53 independently of the link 108. When the tabulator actuator is operated incidental to instituting a tabulation, the escapement rocker 53 is moved anti-clockwise in respect to Figure 1, moving thus the stepping dog 54 downwardly clear of the escapement wheel 50. As the escapement rocker 53 is so moved at tabulations, the temporary holding dog 65 swings at the same time downwardly into the plane of the escapement wheel 50, but provision is made to render it ineffective. This provision comprises the throw-out lever 106 which through the parts 105, 104 is connected to the shaft unit 101 and thus is operated at the institution of the tabulation. The said shaft unit 101 remains operated during the tabulation under control of conventional means, wherefore both the escapement dogs 54 and 65 are out of cooperative range with the teeth of the escapement wheel while the tabulation is in progress. At the conclusion of the tabulation the parts assume the position seen in Figure 2.

Referring to Figure 4, the stepping dog 54 is so mounted on the escapment rocker 53 that additionally to being capable to execute its normal stepping movements it has also capacity to swing on the rocker 53 downwardly out of the way of the escapement wheel teeth. This is to facilitate carriage return movement as will be made clear presently. To lend the dog 54 the stated capacity, the head of its pivot stud 55 is spaced away therefrom, and a light spring 111 in compression between the stud head and the dog keeps the latter resiliently against the bottom of the rocker 53. Also to give said dog the said capacity, the head on the screw shank 61 is normally spaced from the dog 54. Whenever the carriage is moved in return direction, the escapement wheel 50 turns as indicated by the arrow in Figure 4 and beveled back sides 112 of the escapement wheel teeth cam the escapement dog 54 vertically out of the way, the latter having a beveled face 113 for engagement by the bevels 112.

Having explained the nature and objects of the invention, and having specifically described a machine embodying the invention in its preferred form, what is claimed is:

1. In a typewriting machine having a station-

ary structure and a letter-feeding carriage, the combination with a letter-feed mechanism for said carriage which is normally conditioned for operation to feed the carriage a certain feed increment and which is conditionable for operation to feed the carriage a different feed increment, of a case-shaftable frame, a type carrier operable on said case-shiftable frame to print by a lower case type or by an upper case type depending on whether said frame is in a lower or in an upper case position, a member carried directly on said case-shiftable frame for operation substantially transversely to the direction in which said frame is case-shiftable, means to operate said type carrier in either case position of said frame and including in train with said type carrier, a sub-lever, means pivotally mounting said sub-lever on the stationary structure, a rigid projection on said sub-lever arranged to operate said member only in one case position of said frame, means operable by said member to condition said letter-feed mechanism to give forth upon its operation the said different feed increment, and means to operate the conditioned letter-feed mechanism responsive to the operation of said type carrier, said letter-feed means being conditioned by operation of said member before its operation.

2. In a typewriting machine having a stationary structure and a letter-feeding carriage, the combination with a letter-feed mechanism for said carriage which is normally conditioned for operation to feed the carriage a certain feed increment and which is conditionable for operation to feed the carriage a different feed increment, of a case-shiftable frame, a series of type carriers operable on said case-shiftable frame to print by lower case types or by upper case types depending on whether said frame is in a lower or in an upper case position, a universal member extending transversely of the machine, means movably mounting said universal member directly on said frame for bodily case-shift movement therewith and for operation substantially transversely to the direction in which said frame is case-shiftable, means to operate said type carriers selectively in either case position of said frame and including in train with each type carrier a key-responsive sub-lever, said sub-levers arranged in a transverse row and pivotally movable on the stationary structure transversely to said universal member, a rigid projection on only some of said sub-levers to operate said universal member only in one case position of said frame, means operable by said universal member to condition said letter-feed mechanism to give forth upon operation of the latter the said different feed increment, and means to operate the conditioned letter-feed mechanism responsive to the selective operations of the type carriers, said letter-feed means being conditioned by operation of said universal member before its operation.

3. In a typewriting machine having a stationary structure and a letter-feeding carriage, the combination with a letter-feed mechanism for said carriage which is normally conditioned for operation to feed the carriage a certain feed increment and which is conditionable for operation to feed the carriage a different feed increment, of a case-shiftable frame, a series of type carriers operable on said case-shiftable frame to print by lower case types or by upper case types depending on whether said frame is in a lower or in an upper case position, a universal member extending transversely of the machine, means movably mounting said universal member directly on said frame for bodily case-shaft movement therewith and for operation substantially transversely to the direction in which said frame is case shiftable, means to operate said type carriers selectively in either case position of said frame and including in train with each type carrier a key-responsive sub-lever, said sub-levers arranged in a transverse row and pivotally movable on the stationary structure transversely to said universal member, rigid projections on only some of said sub-levers to operate said universal member only in one case position of said frame, rigid projections on only some of said sub-levers to operate said universal member in the other case position of said frame, means operable by said universal member to condition said letter-feed mechanism to give forth upon operation of the latter the said different feed increment, and means to operate the conditioned letter-feed mechanism, comprising, a universal bar operable by the type carriers as they approach printing position.

4. In a typewriting machine having a stationary structure and a letter-feeding carriage, the combination with a letter-feed mechanism which is operable to feed the carriage varying letter-feed increments, of a case-shiftable frame, a series of type carriers operable on said frame to print by lower case types or by upper case types depending on whether said frame is in a lower or in an upper case position, means to operate said type carriers selectively in either case position of said frame and including in train with each type carrier a sub-lever movable fore-and-aft in the machine, said sub-levers arranged in a transverse row on the stationary structure, and means associated with said letter-feed mechanism and differentially operable under control of the type carrier operating means to cause said letter-feed means to feed the carriage at varying letter-feed increments, said associated means comprising, a universal member extending transversely of the machine, means movably mounting said universal member on said frame for bodily case-shift movement therewith and for operation thereon substantially transversely to the direction in which the frame is case-shiftable, rigid projections on some of said sub-levers and in operative registration with the universal member only in one case position of said frame, and rigid projections on some of said sub-levers and in operative registration with the universal member only in the other case position of said frame.

5. In a typewriting machine having a stationary structure and a carriage supporting a platen, the combination with a letter-feed mechanism which is operable to feed the carriage varying letter-feed increments, of a case-shiftable unit, an arcuate array of pivoted type bars carried on said unit and operable thereon to print by lower case types or by upper case types depending on whether said unit is in a lower or in an upper case position, a downwardly curved type bar rest in front of the platen and comprising part of said unit, means to operate said type bars selectively in either case position of said unit and including in train with each type bar a substantially upright sub-lever swingably forward in the machine, and a link connecting the upper end of the sub-lever with the type bar, said sub-levers arranged in a transverse row on the stationary structure underneath the arcuate array of type bars, and means associated with said letter-feed mechanism and dif-

ferentially operable under control of the type bar operating means to cause said letter-feed means to feed the carriage at varying letter-feed increments, said associated means comprising, a bail member extending transversely of the machine closely in front of said sub-levers and below the array of type bars and having laterally to each side of said type bar array an upreaching arm, means mounting said bail member by its arms directly on said unit for bodily case-shift movement therewith and for pivotal operation thereon substantially transversely to the direction in which the unit is case-shiftable, rigid projections on some of said sub-levers and in operative registration with the bail member only in one case position of said unit, and rigid projections on some of said sub-levers and in operative registration with the bail member only in the other case position of said unit.

6. In a typewriting machine having a stationary structure and a letter-feeding carriage, the combination, with a letter-feed escapement which is normally conditioned for operation to feed the carriage a certain increment, of a type case-shiftable frame, a series of type carriers operable on said frame to print by lower case types or by upper case types depending on whether said frame is in a lower or in an upper case position, means to operate said type carriers selectively in either case position of said frame and including

in train with each type carrier a sub-lever movable fore-and-aft in the machine, said sub-levers arranged in a transverse row on the stationary structure, means operable to condition said escapement for operation to feed the carriage at a different increment, a bail member extending transversely of the machine and carried on said frame for bodily case shift movement therewith and for pivotal operation thereon substantially transversely to the direction in which the frame is case-shiftable, projections fast on some of said sub-levers and in operative registration with the bail member only in one case position of said frame, projections fast on some of said sub-levers and in operative registration with said bail member only in the other case position of said frame, said bail member operable by the projections of the sub-levers to condition said escapement for said different feed increment, and a universal bar, operable by any type carrier approaching the printing position, to operate the escapement.

CHARLES SCHRODER.

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