Oct. 17, 1939. W. B. PAYNE 2,176,640

KEYBOARD CONSTRUCTION

Original Filed Dec. 28, 1933 2 Sheets-Sheet 1

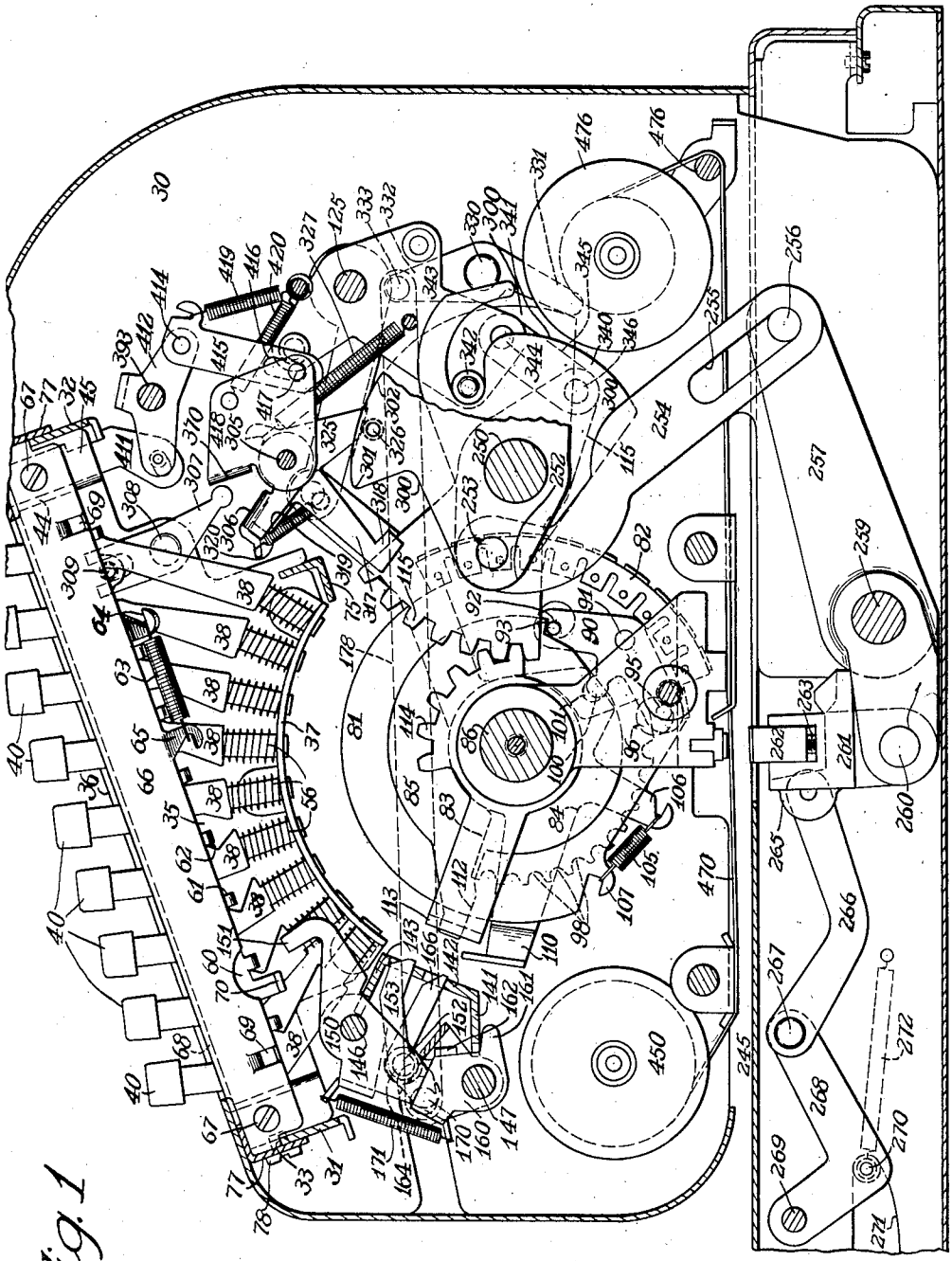


Fig. 1

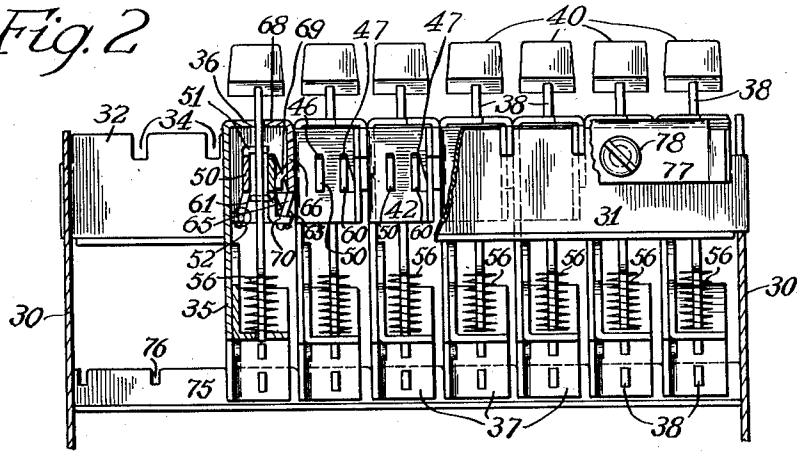
INVENTOR
Walter B. Payne
BY Cumpston & Shepard
his ATTORNEYS

Oct. 17, 1939. W. B. PAYNE 2,176,640

KEYBOARD CONSTRUCTION

Original Filed Dec. 28, 1933 2 Sheets-Sheet 2

Fig. 2



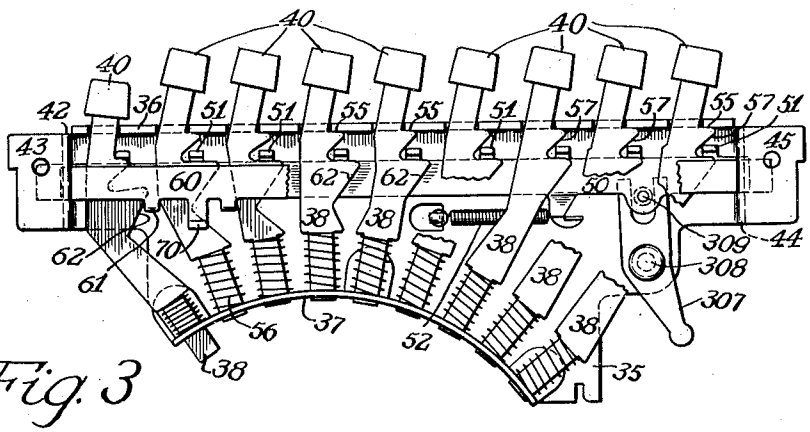


Fig. 3

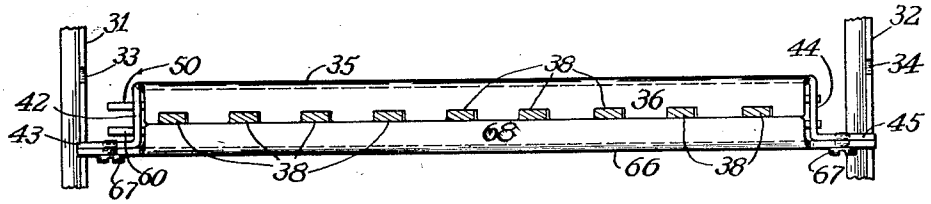


Fig. 4

INVENTOR
Walter B. Payne
BY Cumpston & Shepard
his ATTORNEYS

Patented Oct. 17, 1939

2,176,640

UNITED STATES PATENT OFFICE

2,176,640

KEYBOARD CONSTRUCTION

Walter B. Payne, Rochester, N. Y., assignor to The Todd Company, Inc., Rochester, N. Y., a corporation of New York

Original application December 28, 1933, Serial No. 704,328. Divided and this application February 8, 1937, Serial No. 124,709

6 Claims. (Cl. 235—60)

This invention deals with a keyboard for check writing machines, adding machines, computing or calculating machines of various types, and similar mechanisms.

An object of the invention is the provision of a generally improved and more satisfactory keyboard construction, applicable to many different types of machines, especially useful in connection with check writing machines.

Another object of the invention is the provision of a keyboard constructed of a series of denominational units or unitary assemblages, each of which may be bodily placed in or removed from the machine with which the keyboard is to be used.

A further object is the provision of an improved keyboard construction of simple and sturdy design, efficient and comparatively inexpensive to manufacture, and substantially foolproof in use.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a vertical section through a check writing machine having a keyboard construction in accordance with a preferred embodiment of the invention;

Fig. 2 is a front edge view of the keyboard, with parts in vertical section and parts broken away;

Fig. 3 is a side elevation of one of the keyboard units, with certain parts removed to show more clearly the construction beneath, and

Fig. 4 is a plan of one of the keyboard units and fragments of its associated supporting bars, with the key stems in horizontal section.

The same reference numerals throughout the several views indicate the same parts.

This application is a division of Walter B. Payne application No. 704,328, filed December 28, 1933, for Check writing machine. Certain features disclosed but not claimed in this present application are claimed in said application No. 704,328, which has become Patent No. 2,092,852, granted Sept. 14, 1937.

The keyboard construction of the present invention is here described, for the sake of example, in connection with a check writing machine. It is to be understood that this is only one of many possible illustrative embodiments of the invention, however, and the keyboard construction is not limited in its usefulness to check writing machines, but is applicable in general to various other machines in which keyboards are used, such as adding machines, multiplication machines, listing machines, and other types of accounting, computing, or calculating machines.

In the illustrative embodiment of the invention shown in the accompanying drawings, there are two spaced vertical frame plates **30** of rigid construction, one extending along each side of the machine from front to back. Secured to these frame plates and extending transversely across the machine from one side plate to the other, are two angle bars **31** and **32**. The angle bar **31** has a series of notches **33** extending downwardly from its upper edge, while the angle bar **32** has a similar series of notches **34** extending downwardly from its upper edge, corresponding notches **33** and **34** being alined with each other in planes substantially parallel to the side plates **30**, so that the front and rear ends of certain vertical plates forming a part of each keyboard unit may be inserted in and held by these notches **33** and **34**.

The keyboard units for the various denominations (such as units and tens of cents, units, tens, hundreds, thousands, etc. of dollars, and so forth) may be all alike. Each unit, one for each denomination, comprises a vertical plate **35** extending in a general direction forwardly and rearwardly of the machine and having its upper edge bent over as at **36**. The lower edge of each plate **35** is of concave arcuate shape, substantially concentric with a shaft **86** below it, and as fastened thereto a segment **37** likewise of arcuate shape, having slots through which the lower ends of the key stems **38** extend. Each key stem near its upper end is guided in a notch in the edge of the turned over part **36** of the plate **35** and extends upwardly beyond the plate **36** and is provided with a depressible head or key **40**.

Near the front end of each keyboard unit the plate **35** is offset laterally as at **42**, and then extends forwardly again as at **43** and into one of the notches **33** of the front angle bar **31**. A similar offset is provided at **44** near the rear end of the plate **35**, and the plate then continues rearwardly at **45** into the corresponding notch **34** of the rear angle bar **32**. The offsets **42** and **44** are each provided with slots or holes **46** and **47**, the former in a plane just to the left of the plane of the key stems **38**, and the latter in a plane just to the right of the plane of the key stems. The slots **46** are rectangular and receive the front and rear end portions of a key locking bar **50** which lies just to the left of the key stems **38** and is slidable longitudinally back and forth in its slots **46**.

The locking bar 50 carries a series of laterally extending ears 51, one just to the rear of each key stem, and a coiled spring 52, secured at one end to the bar 50 and at the other end to an ear on the plate 35, tends to pull the locking bar 50 in a forward direction so that when any key is depressed the lug 51 associated with the stem of that key will snap over the top of a shoulder 55 formed on the key stem, to hold the key depressed against the force of a coiled spring 56 surrounding the lower end of each key stem and tending to push upwardly on the stem.

The shoulder 55 on each key stem is normally in contact with the lower side of the plate 36 and serves to limit the upward movement of the key stem under the influence of its spring 56. When any one key is depressed, the locking lug 51 of the locking bar 50, by snapping over the shoulder 55, holds and key in depressed position. If a second key in the same denomination (that is, in the same keyboard unit) be depressed, an inclined surface 57 on the key stem, just below the shoulder 55, will contact with one of the locking lugs 51 and force the locking bar 50 in a rearward direction, thus releasing any key previously depressed in this same denomination or bank of keys, although the newly depressed key will be locked in its depressed position.

Just to the right of each row of key stems, that is, on the opposite side of the plane of the key stems from the locking bar 50, is a control bar 60 having its front and rear end portions slidable in the slots 47 above mentioned, and having along its lower edge a series of laterally extending ears 61, one lying just to the rear of each key stem. Each stem has a second inclined cam surface 62 below the inclined surface 57, in position to cooperate with the adjacent ear 61. When any key in any particular denomination or bank of keys is depressed, the inclined cam surface 62 of the depressed key pushes rearwardly upon the adjacent ear 61 of the control bar 60 associated with that particular bank of keys, and moves this control bar 60 in a rearward direction against the influence of a spring 63, the rear end of which spring is fixed to a hook 64 on the control bar 60, and the front end of which spring is fastened to a hook 65 on a vertical plate 66 which overlies the control bar, occupying a vertical plane just to the right of the control bar when viewed from the front of the machine. The plate 66 is fastened at its ends, as by means of the screws 67, to the front and back offset portions 43 and 45 of the plate 35. The upper edge of the plate 66 is bent over at a right angle as at 68, to provide a ledge or shelf flush with that provided with the portion 36 of the plate 35. The portions 68 and 36 cooperate with each other to form a smooth top for each keyboard unit. The left hand edge of each portion 68 contacts with the right hand surfaces of the key stems and with the right hand edge of the plate 36 in the spaces between the key stems, and holds the key stems in place in their notches in the edge of the member 36, without interfering with free upward and downward movement of the key stems through those notches.

For ease of assembly, the slots 47 through which the ends of the control bar 60 extend are tapered from bottom to top and considerably wider at their bottom edges than the thickness of the control bar 60 as shown in Fig. 2. Thus, when any keyboard unit is removed from the machine and when the plate 66 is removed from the unit, the control bar 60 may be tilted slightly, pulling its lower edge in a direction away from the key stems far enough so that the ears 61 will slide over the surfaces of the key stems, and then the bar 60 may be slid longitudinally until one end is pulled out of its slot 47, after which the bar can be slid longitudinally in the opposite direction until its other end is pulled out of its slot. When the control bar 60 has been removed, each individual key stem 38 can then be readily removed simply by displacing its upper end laterally out of its notch in the plate 36 and then pulling the stem upwardly to release its lower end from its slot in the plate 37. When all of the key stems have been removed, the latching bar 50 may be moved longitudinally to a sufficient distance to release one end from its slot 46 and then its other end from its slot. Thus each keyboard unit may be conveniently removed as a whole from the machine with which it is used, and when so removed, can be readily disassembled in the manner above described, and reassembled by a reverse process. When the keyboard unit is assembled and the plate 66 is in normal position, ears 69 struck inwardly from the plate 66 near its lower edge lie against the right hand surface of the control bar 60 and hold it in proper position, preventing the bottom edge of it from tilting rightwardly in the wide bottom ends of its slots 47.

The control bar 60 may conveniently be used to control certain zero stop and blank stock mechanism. To this end, each control bar carries a downwardly extending ear having a rightwardly extending lug or projection 70 which has a position such as that shown in Fig. 1 when no key has been depressed in the denominational row or bank of keys associated with this particular control bar 60. When any key in this bank of keys has been depressed, the cam 62 on the stem of the depressed key, acting against the ear 61 on the control bar, moves the control bar rearwardly to position the ear 70 somewhat further rearwardly, in the position illustrated in Fig. 3. The different positions of this ear 70 may control the operations of suitable zero stop and blank stop mechanism.

It will be noted especially that the upper portions of the key stems 38, which are guided in the notches of the top plate 36, all extend in an upward direction substantially parallel to each other. The lower portions of the various key stems on any one bank, which are guided in slots in the arcuate plate 37, are not parallel to each other but are arranged approximately radially with respect to the arc of the plate 37. Thus, except for a few keys near the center of each bank, the lower part of the key stem which extends through the plate 37 is at an angle to the upper part of the key stem which extends through the notch in the plate 36. As each key is depressed, therefore, it has a somewhat tilting action, the upper part of the key moving downwardly in one direction and the lower part of each key moving at an angle thereto in a direction approximately radially of the plate 37 and approximately toward the shaft 86, which is the center of rotation of the controlling members which cooperate with the depressed key stems.

To increase the firmness and rigidity of the support of the keyboard units, there is provided, in addition to the angle bars 31 and 32, a third angle bar 75 extending across the machine from one side plate 30 to the other. This bar 75 has notches 76 in its upper edge cooperating with notches in the lower rear corners of the plates

35 of the various key banks, so that the notches interlock with each other. Each keyboard unit is supported primarily by the angle bars 31 and 32, in the notches of which it loosely rests, and it also has a third point of support on the angle bar 75, which prevents any transverse tilting of the unit and which also aids in holding it against movement in a forward or rearward direction.

The keyboard units are held in place in the notches of the angle bars 31, 32, and 75, by means of angle bars 77 which have flanges overlying all of the keyboard units at their front and rear ends, and which are fastened to the angle bars 31 and 32 by any suitable means such as screws 78. When the angle bars 77 are removed, each keyboard unit may be readily taken out of the machine simply by lifting it upwardly out of its slots in the members 31, 32, and 75, there being no other parts to be disconnected.

Any desired number of these keyboard units may be employed, depending upon the number of denominations of digits or other values which it is desired to use in the machine with which the keyboard is associated.

The other parts of the mechanism, associated with or controlled by the keyboard, may be of any suitable construction. Merely as one possible illustrative embodiment of such mechanism, there is here shown a construction including a series of type carrying disks 81, one for each denominational bank of keys, each disk carrying a type segment 82 carrying a series of type faces representing digits from 1 to 9, inclusive, with a zero next to the figure 1. This type segment may be of any suitable form, such as that disclosed in Uhl and Wolfe Patent No. 2,011,092, granted August 13, 1935. A locking member 83 is associated with each type disk 81 on one side thereof, and a controller 84 is on the opposite side of the type disk from the locking member, and a driver 85 is on the opposite side of the controller from the type disk 81. All of these elements are mounted on a cross shaft 86 which is firmly secured at its opposite ends to the side plates 30. The locking member 83 remains stationary with respect to the shaft 86 during normal operation of the machine (though preferably being capable of some adjusting movement thereon) while the other elements 81, 84, and 85 are all mounted for rotation on the shaft 86 and normally rotate during the setting up of the numbers to be printed.

Each type disk 81 carries a latch 90 pivoted to the disk by a pivot 91 near the mid point of the latch. The latch is in a plane between the type disk 81 and the driver 85; that is, in the plane of the controller 84. The rear end of each latch 90 carries a pin 92 extending laterally into the plane of the driver 85 and arranged, under certain conditions to engage a shoulder 93 on the driver. The opposite or forwardly extending end of the latch 90 carries a pin 95 extending through a large hole 96 in the disk 81 and projecting to the opposite side of the disk, into the plane of the locking member 83. Under certain conditions, this pin 95 engages in any one of a series of notches 98 formed on a portion of the periphery of the locking member 83, thus locking the type disk 81 against further rotational movement about the shaft 86.

Each latch 90 has a third arm extending approximately radially inwardly from the pivot 91 toward the shaft 86, which arm has a rounded end 100 fitting in a notch 101 of the controller 84. When the controller 84 moves in a clockwise direction (when viewed as in Fig. 1) with relation to the disk 81, this tends to move the latch 90 in a counterclockwise direction about its pivot 91, thus tending to move the pin 92 approximately radially inwardly into the path of the shoulder 93. A spring 105, connected at one end to an arm 106 on the controller 84 and at the other end to a lug 107 on the type disk 81 constantly tends to move the controller in a clockwise direction with respect to the disk, and thus constantly tends to hold the pin 92 in the path of the shoulder 93. If the controller 84 be moved in a counterclockwise direction with respect to the disk 81, however, such movement will shift the latch 90 in a clockwise direction about its pivot 91, which will shift the pin 92 outwardly away from the shoulder 93 and shift the pin 95 inwardly into one of the locking notches 98, thus latching the type disk 81 to the stationary locking member 83 and holding the type disk stationary in the position at which it has been set.

Each of the controllers 84 of the various denominations is provided with an outwardly extending arm 110, the outer end of which is bent laterally, if necessary, to bring it into alinement with the particular bank of keys of the corresponding denomination.

Each driver 85 has an arm 112 which extends approximately radially outwardly to a point slightly beyond the periphery of the type disk 81. The ends of all of the arms 112 of all of the drivers of the various denominations are securely fixed to a bail 113, mounted for rotation on the shaft 86, and provided at one end with gear teeth 114 meshing with teeth on a gear segment 115 mounted for rotation on the main operating shaft 250.

When the segment 115 is operated in a counterclockwise direction from its normal rest position shown in Fig. 1, it turns the bail 113 in a clockwise direction from the position shown in Fig. 1, thus swinging all of the drivers 85 of all of the denominations in a corresponding clockwise direction. This swinging of the drivers is effective, through the latches 90, to carry all of the type disks 81 likewise in a clockwise direction until the arm 110 on each controller 84 is stopped and prevented from further movement, either by hitting a key stop (that is, a key stem 38 which has been depressed) or by hitting one of the blank stops or zero stops mentioned below. When the clockwise movement of the arm 110 is thus stopped, the latch 90 is unlatched from the shoulder 93 of the driver 85 and the pin 95 of the latch enters the appropriate notch 98 of the locking member 83, holding the type disk 81 and type segment 82 stationary during the remainder of the clockwise movement of the bail 113 and drivers 85.

It is apparent from the foregoing description that if there is no key stop to contact with the arm 110 of the controller 84 in any particular denomination, then the swinging of the bail 113 through its normal clockwise movement would carry the type disk 81 all the way around to its maximum extent of movement, which would take it to or slightly beyond the position for printing the numeral "9". But if no key has been depressed in any particular denomination, it is not desired to print the numeral "9" in that denomination. Nothing at all should be printed if no key has been depressed in any higher denomination and a zero should be printed if any significant digit is being printed in any higher denomination. This printing of zeros or print-

ing nothing at all is accomplished in the present illustrative embodiment of the invention by means of what may be called "zero stops" and "blank stops".

Extending across the machine below the front end of the keyboard is a somewhat channel-shaped member having a bottom flange 141, a middle flange 142, and a top flange 143. The ends of the middle flange 142 may be bent over to form ears lying against and attached to the side plates 30 of the machine.

Two cross shafts extend across the machine, the shaft 146 being near the top of the channel and the shaft 147 near its bottom. On the upper shaft 146 are rotatably mounted a series of levers 150, one beneath each keyboard unit. Each lever has a portion bent back into somewhat U-shape form or bail-form, so that each lever has two spaced bearings on the shaft and is firmly supported thereon. The upper flange 143 of the channel member is notched to receive the levers 150 and holds the levers against movement in a direction longitudinally along the shaft 146, while permitting them to oscillate to the required extent on the shaft 146.

At the upper rear edge of each lever 150 is a nose 151 so positioned that when the control lug 70 on the control bar 60 is in its forward position (as shown in Fig. 1) the nose 151 can pass by this lug 70 without contacting with it. When any key in any particular denomination has been depressed, then the control lug 70 of that denomination, having been moved rearwardly to the position shown in Fig. 3, lies in the path of the nose 151 and prevents further upward movement of this nose.

Slightly below and forwardly of the shaft 146, each lever 150 has pivoted to it, at 152, an arm 153 which extends rearwardly through a slot in the middle portion 142 of the channel member, and which forms a zero stop for cooperation with the arm 110 of the controller 84 of that particular denomination. The zero stops 153 lie in the vertical planes of the respective key stops 38, and each zero stop is one space forwardly of the "1" key stop of its same denomination. This corresponds with the placing of the type characters on the type segment 82, on which the "0" type is next to the "1" type.

It is desired not to print zeros in denominations above the highest significant digit, except in the case of the units of dollars denomination and the units and tens of cents denominations, in which three denominations it is customarily desired to print zeros even if there is no significant digit in any of the denominations higher than these three. To avoid printing useless zeros, blank stop levers 160 are provided, one for each denomination above the units of dollars denomination, but none for units of dollars nor units or tens of cents. Each of these blank stop levers 160 is pivotally mounted on the shaft 147 and is of U-shaped form so that it has two spaced bearings on the shaft. The edges of each lever are engaged in notches in the lower flange 141 of the channel member to hold the levers 160 against movement longitudinally along the shaft. Each lever has a tail 161 extending rearwardly beneath the flange 141 to limit motion of the lever in a counterclockwise direction when viewed as in Fig. 1. The right hand side plate of each of the U-shaped levers 160 also has an ear 162 overlying the rear edge of the left hand side plate of the next lever to the right, that is, the lever corresponding to the next lower denomination. Hence, if any lever 160 is held in its normal rest position shown in Fig. 1, the ears 162 on this lever and on the levers to the right of it will hold all levers to the right of it in the same position, but will not affect the ability of the levers to the left of it to move in a clockwise direction from their normal rest positions.

On the left hand side plate of each U-shaped lever 160 is an upward extension 164 to which is pivoted a blank stop arm 166 by a pivot which is directly behind the pivot 152 in Fig. 1 of the drawings and which, therefore, is indistinguishable from the pivot 152 in this figure. The blank stop arm 166 extends rearwardly through a slot in the middle flange 142 of the channel member, and the rear end of this arm lies in the same vertical plane with the rear end of the zero stop 153 and of the key stems 38 of the same denomination. When any blank stop lever 160 is turned in a counterclockwise direction to the limit of its motion in that direction, to the normal rest position shown in Fig. 1, then its connected blank stop arm 166 is withdrawn to the ineffective position shown in Fig. 1. But when any lever 160 is turned in a clockwise direction from the position shown in Fig. 1, then its connected blank stop arm 166 is thrust rearwardly to an effective position in the path of the controller arm 110 of that denomination, so as to stop this controller arm one step in advance of the zero stop arm 153 of the same denomination, or two steps in advance of the "1" key stop of that same denomination.

The type segments 82 end just beyond the "0" printing type, so that in the next step beyond this type there is no printing type, and the type disk 81 is cut away to provide an open space immediately beyond the "0" type. Thus if the type disk 81 and its type segment 82 are positioned one step in a counterclockwise direction from the position in which the zero is alined with the printing platen, there will be no type alined with the printing platen. Since the blank stop arm 166 lies one step in advance of the zero stop arm 153, it is seen that contact of the controller arm 110 with the projected blank stop 166 will have the effect of stopping rotation of the type disk 81 one step before the zero type is brought into alinement with the platen. Thus in this denomination there will be no numeral printing type set at the printing line.

A tail 170 projects downwardly and forwardly from each zero stop lever 150 and into the open space within the U-shaped blank stop lever 160 of the same denomination, in such manner that when the lever 150 is turned in a clockwise direction, the tail 170 will engage a part of the lever 160 and turn the latter in a counterclockwise direction. A spring 171 is connected at its lower end to an ear on the lever 160 and at its upper end to an ear on the lever 150 of the same denomination. This spring constantly tends to turn the lever 150 in a counterclockwise direction and the lever 160 in a clockwise direction about their respective shafts 146 and 147 when viewed as in Fig. 1.

Suitable mechanism not forming a part of the present invention and which need not be described in detail herein, is provided for holding the levers 150 and 160 in the normal rest positions shown in Fig. 1. This mechanism, early in each operation of the machine, releases the levers 150 and 160 and allows them to tend to turn under the influence of their springs 171. In each denomination in which one of the keys 40 has been

depressed, the ear 70 will be in the path of the nose 151 on the lever 150, and when the lever is released by the above mentioned mechanism, it will turn only a slight distance in a counterclockwise direction, under the influence of its spring 171, until the end of the nose 151 moves into contact with the ear 70. This slight movement of the lever 150 will be insufficient to project the zero stop 153 to an effective position. Also, the tail 170 of the lever 150 will hold the lever 160 of the same denomination and prevent it from turning far enough to project the blank stop 166 to an effective position. Thus neither the zero stop 153 nor the blank stop 166 will be projected in any denomination in which a key 40 has been depressed.

In those denominations (above the units of dollars) in which no key has been depressed, however, the ear 70 will not lie in the path of the nose 151 of the lever 150, and when the above mentioned mechanism releases the levers 150 and 160, their springs 171 will turn the lever 150 a substantial distance in a counterclockwise direction, projecting the zero stop 153 to an effective position in the path of travel of the member 110. Unless one of the keys 40 has been depressed in some higher denomination, the spring 171 will also turn the lever 160 to project the blank stop 166 to an effective position. The member 110 will contact with the blank stop 166 before it reaches the zero stop 153, of course, so that the type segment 82 of this particular denomination will be maintained in a blank or non-printing position, notwithstanding the fact that the zero stop 153 is projected as well as the blank stop 166.

If, however, one of the keys 40 has been depressed in any higher denomination, the ear 70 on the control bar 60 of that higher denomination will prevent a turning movement of the lever 150 of that higher denomination, and the tail 170 of the lever 150 will hold the lever 160 of that higher denomination against clockwise turning, and the ears 162 on the levers 160 of that higher denomination and the lower denominations will prevent the levers 160 of all lower denominations from turning in a clockwise direction, and thus prevent the projection of the blank stops 166 of all lower denominations, but without interfering with the projection of the zero stops 153 in those lower denominations in which no key 40 is set.

The side plates 30 of the machine are provided with horizontal slots 245 extending from the front of the machine a considerable distance toward the rear and lying in a horizontal plane just beneath the effective printing surfaces of the type members 82. The check, draft, or other instrument to be printed is placed in these slots so that it underlies the printing types in known manner.

The machine is provided with the main operating shaft 250 journaled for rotation in the side frame plate 30 and having a suitable handle or crank by which it may be turned. A crank arm 252 is secured to the shaft 250 and is pivoted at 253 to the upper end of a link 254, the lower end of which has a long slot 255 embracing a cross shaft 256 secured to the rear ends of a pair of arms 257 pivotally mounted near their forward ends on a shaft 259 secured in the frame plates. The arms 257 extend slightly forwardly beyond the shaft 259 and are pivoted at 260 to a platen carrier 261 in which a platen 262 is held by suitable adjusting screws 263.

An ear 265 on the platen carrier is pivoted to the rear end of a link 266, the front end of which is pivoted at 267 to the rear end of another link 268, the front end of which is rotatably mounted on a cross shaft 269. A stud 270 projects from the left side of the lever 268 through a slot 271 in the side plate of the machine. A spring 272, connected at one end to the stud 270 and at the other end to a fixed point of the machine, constantly tends to turn the arm 268 in a counterclockwise direction about the shaft 269, the extreme counterclockwise position of the arm being determined by contact of the stud 270 with an edge of the slot 271.

By moving the stud 270 leftwardly when viewed as in Fig. 1, moving the pivot 267 downwardly and forwardly, the ear 265 on the platen carrier 261 is pulled forwardly and the platen carrier is swung in a counterclockwise direction about its pivot 260 to an accessible position wherein the upper or printing face of the platen 260 may be observed and cleaned, if necessary. When the parts are in their normal rest positions shown in Fig. 1, the platen is directly beneath the printing line of the type segments 82.

When the main operating shaft 250 is turned to operate the machine, the links 254 are forced downwardly. In the first part of the downward movement, the slots 255 simply slide over the shaft 256, without causing corresponding movement of the arms 257. Later, the upper ends of the slots 255 come into contact with the shaft 256, and further downward movement of the links 254 causes turning of the arms 257 in a clockwise direction around the shaft axis 259, raising the forward ends of the arms, thus raising the pivots 260 and the platen carrier 261 with the platen 262, bringing the upper surface of the platen up forcibly against the bottom of the check or other sheet of paper which has been inserted in the slot 245 and thus causing a printing impression to be made on the upper surface of the paper, by whatever movable types 82 and other types (fixed or movable) happen to be set at the printing line at that time.

Other operating parts of this illustrative embodiment of the invention may include a disk 300 fixed to and turning with the shaft 250 and having a sharp corner or shoulder 301 approximately at the highest point of the disk when it is in normal idle position of rest. A smooth cam surface 302 concentric with the shaft 250 extends around the periphery of the disk for a considerable distance in one direction from the shoulder 301.

Slightly above the disk 300 is a shaft 305 extending transversely across the machine. A key locking bail 306 is rotatably mounted on this shaft. Each denominational unit of the keyboard is provided near its rear end with a lever 307 pivoted at 308 to the plate 35 and having a forked upper end engaging a pin 309 on the locking bar 50. The lower end of the lever 307 is in position to be engaged by the bail 306 as the latter swings about the shaft 305.

An arm 317 having a hook shaped end 318 is rotatably mounted on the shaft 305 near the right hand end of the bail 306 and has an extension 319 lying beneath the bail. A spring 320 connected at one end to the bail and at the other end to the arm 317 tends to keep the bail in contact with the portion 319 of the arm.

The hooked end 318 of the arm 317 lies in the plane of the disk 300 slightly in advance of the corner 301 when the parts are in normal rest position as shown in Fig. 1. When it is attempted to turn the disk 300 forwardly, or in a counter-

clockwise direction when viewed as in Fig. 1, then the corner 301 after turning through a short distance will engage the hooked end 318 and be prevented from moving any further unless the arm 317 has meanwhile been elevated to bring its end 318 out of the path of travel of the corner 301 of the disk.

The arm 317 is fixed to another arm 325 which, when in normal rest position, engages a pin 326 projecting laterally from one face of the disk 300. A spring 327 tends to turn the arms 317 and 325 in a clockwise direction when viewed as in Fig. 1, but such movement is resisted and prevented by contact of the end of the arm 325 with the pin 326 when the parts are in normal rest position.

As the operating handle or other operating means connected to the main shaft 250 is operated to turn this shaft in a counterclockwise direction when viewed as in Fig. 1, it turns the disk 300 forwardly, and almost immediately the pin 326 rides out from under the arm 325 allowing the spring 327 to turn the arms 317, 319 and 325 in a clockwise direction when viewed as in Fig. 1. This throws the bail 306 upwardly against the depending ends of the levers 307 of each keyboard unit. In this position, the hooked end 318 of the arm 317 is lifted up out of the path of the corner 301 on the disk 300, so the disk may continue rotation as movement of the shaft 250 is continued. As soon as the corner 301 of the disk passes under the end 318, the end then rides on or close to the concentric surface 302 of the disk, which surface prevents the end 318 from being depressed. In this manner, all of the keys are locked in the positions to which they are set, for the bail 306 holds all of the locking bars 50 in their forward positions, and the cam surfaces 57 on the key stems prevent the key stems from being depressed so long as the locking bar 50 is held in its forward position by the contact of the bail 306 with the levers 307.

If a key should become stuck in a partially depressed but not fully depressed position, this will prevent operation of the machine through the interlocking mechanism above described. If a key is depressed part way but not sufficiently far so that the lug 51 on the locking bar 50 snaps over the shoulder 55 on the key stem, then the locking bar 50 would be held somewhat rearwardly of its normal rest position, with the result that the lower end of the lever 307 connected to that locking bar would be held somewhat forwardly of its normal position of rest. When the pin 326 moves out from under the arm 325, the spring 327 would tend to move the bail 306 as usual but the bail would contact with the misplaced arm 307 before it had turned to its normal extent, and the travel of the bail would be stopped in a position in which the end 318 of the arm 317 was still in the path of travel of the corner 301 of the disk 300. The shaft 250 could not be turned any further and this would indicate to the operator that something was wrong, whereupon he would investigate and discover that one of the keys was partially but not fully depressed.

While one disk 300 has been referred to above in order to simplify the description, the preferred illustrative embodiment of the machine preferably includes two such disks 300, which may be of substantially identical construction, one mounted just to the left of the right hand side plate 30 and the other just to the right of the left hand side plate 30.

Pivoted on the inner surface of the left hand side plate 30 at 330 is a lever having a lower end 331 in the plane of the left hand disk 300 to be engaged thereby and an upper end 332 pivotally connected at 333 to the rear end of a link 178, the forward end of which is connected to the mechanism controlling the zero stops and blank stops as above described. Substantially at the beginning of the rotation of the main shaft 250 the lower corner of the disk 300 leaves the arm 331 and allows this arm to turn in a clockwise direction about its pivot 330, thus permitting the link 178 to move rearwardly under the influence of a suitable spring connected to it, and of the springs 171 of the zero stop and blank stop mechanism, and this in turn permits the zero stop arms to move in the manner previously described.

With the keys now locked against accidental movement by means of the bail 306 and with the zero stops and blank stops set in proper position, the type elements may now be rotated to set them in proper position for printing, by further rotation of the main shaft 250. This setting of the type elements may be accomplished by fixing to the main shaft 250 a cam 340 having a surface 341 for engaging a follower roller 342 on a lever 343 mounted for free turning movement on the shaft 125. The lever 343 is pivoted at 344 to a link 345 the other end of which is pivoted at 346 to the gear segment 115. The relative positions of the pivots 344 and 346 are such that the pivot 344 lies slightly rearwardly of a straight line drawn from the pivot 346 to the shaft 125, when the parts are in normal rest position.

As the main operating shaft 250 is rotated in a counterclockwise direction, the follower roller 342 in contact with the cam surface 341 is forced in an upward and forward direction, turning lever 343 in a counterclockwise direction about its pivot 125. This movement of the lever 343 first pushes down slightly on the link 345 which moves the teeth on the segment 115 slightly upwardly and, through the gear teeth 114, moves the bail 113 slightly downwardly. As movement of the lever 343 is continued upon further rotation of the shaft 250, the pivot 344 passes its dead center position and pulls upwardly on the link 345 moving the gear teeth on the segment 115 downwardly and swinging the bail 113 upwardly and rearwardly to set the type disks in accordance with the numbers set up on the keyboard. The slight movement of the bail in the reverse direction at the beginning of movement of the shaft 250 allows time for the zero stop and blank stop mechanism to operate properly before the controller arms 110 begin to move upwardly, so that the blank stops and zero stops will be properly positioned before the arms 110 reach them.

During this movement of the main shaft 250 the crank arms 252 thereon have been moving the links 254 downwardly. Finally, after the type disks have been set to their proper position, the upper ends of the slots 255 in the links 254 come into contact with the shaft 256 and operate the platen to perform a printing operation as above described.

After printing has taken place, the main shaft 250 turns in a reverse or clockwise direction back to its normal rest position shown in Fig. 1, restoring all of the parts to their normal rest positions through a reverse process. Also, unless a repeat key has been set, the reverse movement of the shaft 250 releases all of the denominational keys of the keyboard, so that their springs 56 force them back to their elevated or unset position.

To accomplish this release of the keys, there is

provided a clearing bar 370 mounted for rotation on the same shaft 305 with the locking bail 306 and lying to the rear of the levers 307. Suitable mechanism is provided for moving the bar 370 in a counterclockwise direction around its shaft 305 during the reverse or clockwise movement of the shaft 250, unless the repeat key has previously been depressed. This counterclockwise movement of the bail 370 will press the lower ends of all of the levers 307 forwardly, moving the upper ends rearwardly, which will shift all of the locking bars 50 rearwardly, releasing the lugs 51 from the shoulders 55 on the key stems and allowing all of the key stems to be moved upwardly to their unset position by the force of their springs 56.

It is desirable to have a clearing key which will release or unset all of the previously depressed denominational keys of the entire keyboard, so that a number set up in the keyboard by mistake can be eradicated or unset. Accordingly, a clearing bar or key may be provided with a downwardly extending stem or arm 411 pivotally connected to one end of a lever 412 pivotally mounted on the shaft 393. The other end of the lever 412 is pivoted at 414 to a link 415 having a slot 416 embracing a pin 417 on one end plate 418 of the clearing bar 370. A spring 419 connected to the link 415 pulls downwardly on the pivot 414 and thus resiliently holds the clearing key stem or arm 411 in its uppermost position. Another spring 420 pulls rearwardly on the end plate 418. If the clearing bar or key connected to the stem or arm 411 be depressed, this will swing the forward end of the lever 412 downwardly, raising the rear end of this lever and the pivot 414, pulling upwardly on the link 415, raising the pin 417, stretching the springs 419 and 420, and swinging the bail 370 in a counterclockwise direction about its shaft 305 when viewed as in Fig. 1. The bar 370 will thus push forwardly on the rear ends of all of the levers 307, moving the locking bars 50 of all denominations in a rearward direction and releasing all of the keys in just the same manner as though the clearing bail 370 had been operated through the regular clearing mechanism from the shaft 250. When the bail is operated by the regular clearing mechanism this does not move the clearing key connected to the stem 411, since the pin 417 may rise in the slot 416 without affecting the parts 411 and 412.

The machine is equipped with suitable inking means, such as an inked ribbon interposed between the type members and the check or other piece of paper to be printed upon. A front ribbon spool 450 may be provided near the front of the machine to hold a supply of ribbon which is drawn from this roll and extended rearwardly as at 470, under the printing types, thence passing around a guide roller 475 and upwardly to a winding spool 476 turned in any suitable manner to move the ribbon as required.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is, therefore, not to be limited to the precise details described, but is intended to cover all variations and modifications thereof falling within the spirit of the invention or the scope of the appended claims.

I claim:

1. A denominational keyboard comprising a series of separate denominational units arranged side by side, transverse supporting members at the front and back ends of said units on which said units rest, another supporting member extending transversely materially below and substantially parallel to a plane passing through said front and back supporting members, each of said denominational units having a substantially rigid downward extension engaging said other supporting member, said other supporting member having means holding the downward extension of each unit against movement in a direction along said other supporting member, and removable plates normally overlying the front and rear margins of all of said denominational units to hold them all against upward displacement from said supporting members, said denominational units resting loosely upon said supporting members so that when said plates are removed, any one of said denominational units may be readily removed simply by lifting it upwardly off of said supporting members.

2. A denominational keyboard unit comprising a series of key stems representing different digits of one denomination, said stems lying substantially in a common plane, a longitudinally movable bar lying along side all of said stems and having a series of projections extending into the plane of said stems, walls having slots therein for receiving opposite ends of said bar, said slots being of such dimensions that said bar may be moved laterally away from said stems sufficiently to remove said projections from the plane of said stems, so that said bar may then be moved longitudinally to a sufficient distance to remove one end thereof from one of said slots, and removable means for holding said bar relatively close to said key stems to maintain said projections in the plane of said stems.

3. A machine comprising a series of keys representing different values, said keys being selectively settable, a control bar having a series of projections, one in the path of each key of said series so that when any key of said series is set, said control bar will be moved thereby, said control bar also having a stop controlling projection thereon, a movable stop member, and a movable control member for controlling the position of said stop member, said control member being so placed with respect to said control bar that when said control bar is in the position it occupies when no key of said series is set, said stop controlling projection thereon is out of the path of movement of said control member, and when said control bar has been moved to a different position by the setting of any key of said series, said stop controlling projection thereon lies in the path of movement of said control member to restrain said member against movement to a position effective to place said stop member in an effective position.

4. A denominational keyboard comprising a series of separate denominational units arranged side by side, transverse supporting members at the front and back ends of said units on which said units rest, another transverse supporting member arranged substantially parallel to the front and back supporting members, and means detachably carried by said front and back supporting members for overlying portions of said denominational units to retain them against removal from said supporting members.

5. A denominational keyboard comprising a series of separate denominational units arranged side by side, each of said units having extending portions at the front and back ends thereof, transverse supporting members at the front and back ends of said units having spaced notches

in which said extending portions of said units normally rest, another transverse supporting member arranged substantially parallel to the said front and back supporting members, said denominational units each having a downward extension normally engaging said other supporting member, and means carried by said front and back supporting members and overlying portions of said units substantially at the front and rear ends thereof for holding said extending portions of said denominational units in the notches of said front and back supporting members.

6. A denominational keyboard unit comprising a key holding member having a substantially vertical side flange and a top flange at approximately a right angle thereto, said top flange having spaced notches in an edge thereof, an arcuate member forming a bottom for said holding member and having a series of openings therein, a series of key stems representing different values and arranged approximately in a common plane, each of said key stems having its upper portion engaged in one of said notches and its lower portion extending through one of said openings, and a retaining member having one portion forming substantially a lateral prolongation of said top flange of said holding member to hold said key stems in said notches and having another portion forming a substantially vertical side flange approximately parallel to said side flange of said holding member and spaced laterally therefrom throughout the intermediate portions of both of said side flanges, one of said side flanges having a laterally offset portion at each end, the two offset portions lying substantially in a common plane substantially parallel to the intermediate portion of said one of said flanges between said offset portions and on the opposite side of the plane of said key stems from said intermediate portion, the other of said side flanges being approximately straight throughout its length and being seated upon said offset portions.

WALTER B. PAYNE.