Aug. 25, 1953 H. T. AVERY 2,650,027

KEYBOARD INTERLOCK

Filed May 5, 1951 2 Sheets-Sheet 1

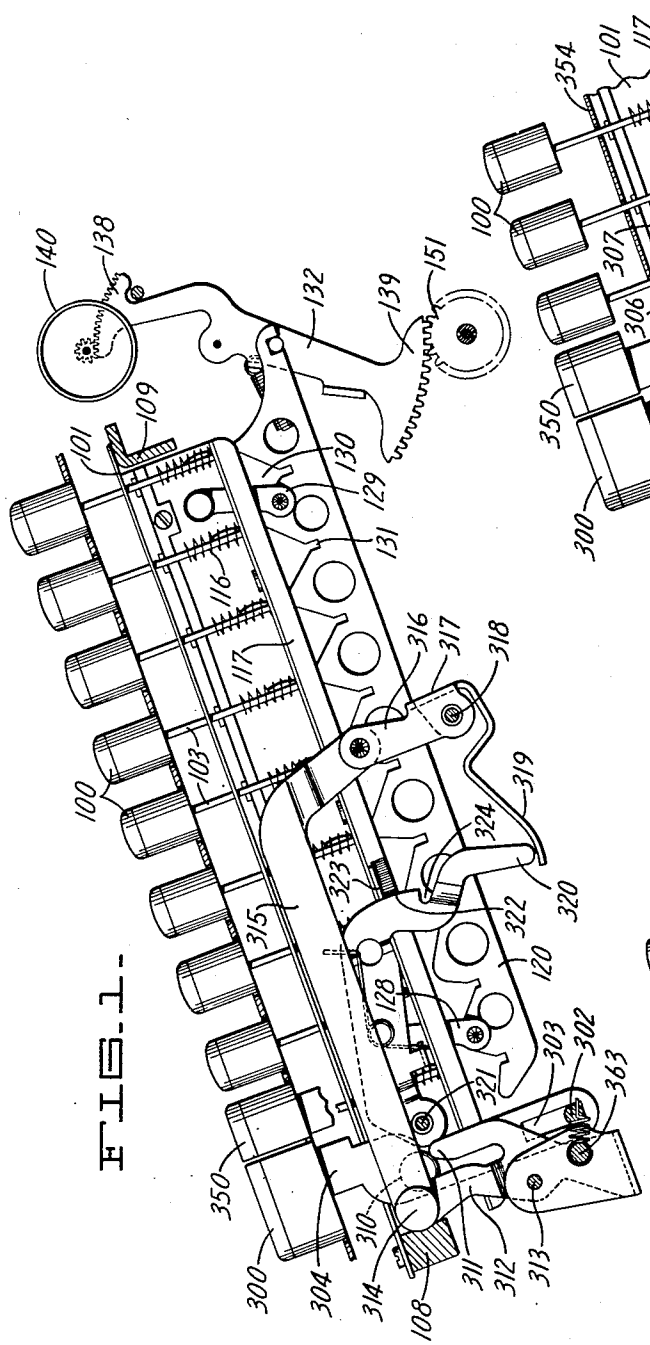


FIG. 1.

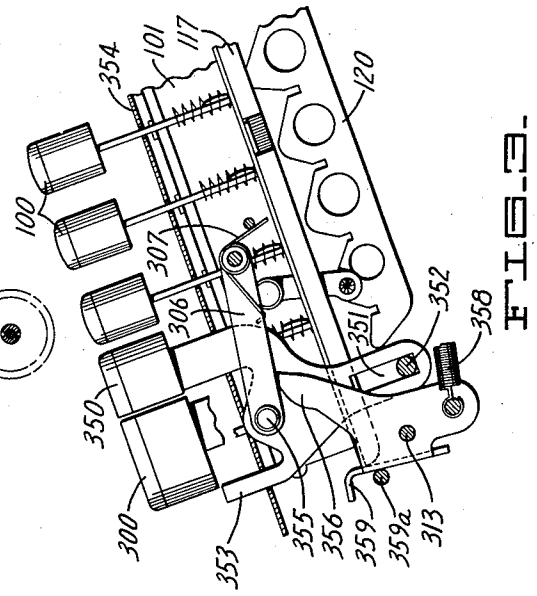


FIG. 3.

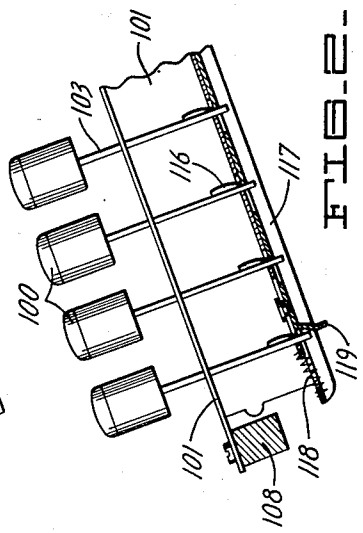


FIG. 2.

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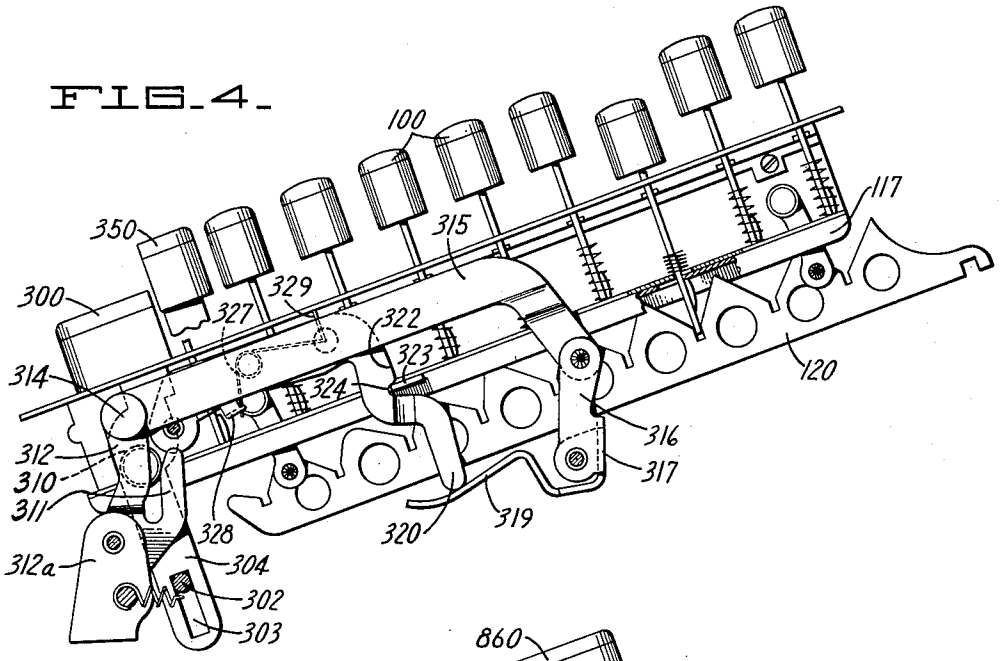
BY
Howard T. Austin.

Aug. 25, 1953 H. T. AVERY 2,650,027

KEYBOARD INTERLOCK

Filed May 5, 1951 2 Sheets-Sheet 2

FIG. 4.



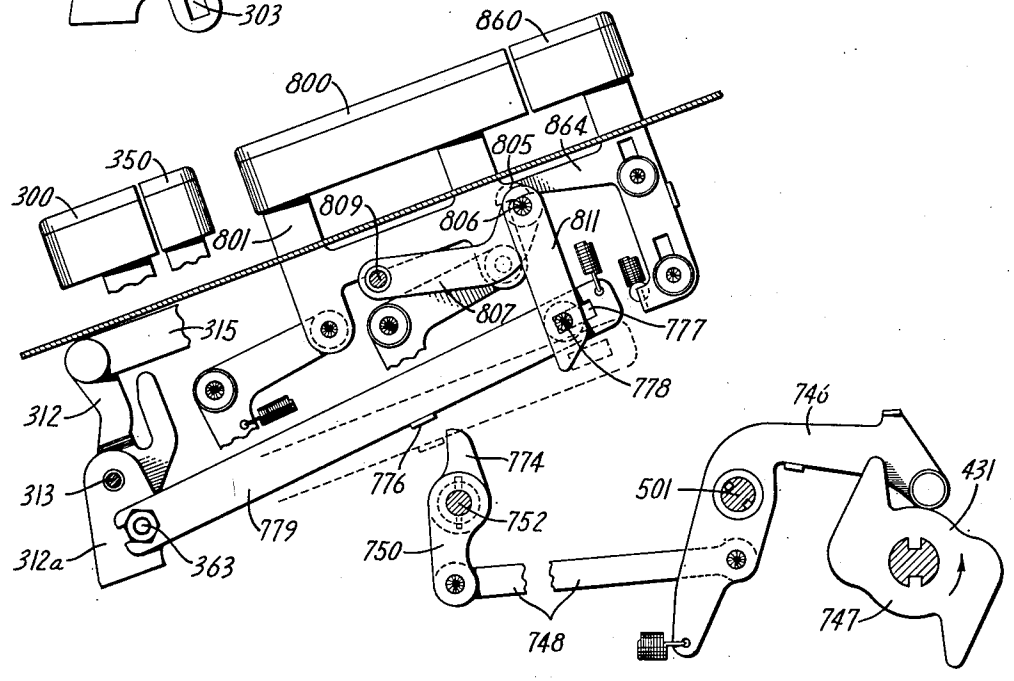


FIG. 5.

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KEYBOARD INTERLOCK

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2 Claims. (Cl. 235—130)

1

The present invention relates to calculating machines having a "key-set" keyboard such as disclosed in the Patent No. 2,216,659, issued October 1, 1940, and has particular reference to improved mechanisms for preventing clearance of any selected orders of the keyboard either by the keyboard clear key or by the automatic clearing mechanism. The invention also contemplates the provision of means for overcoming the clearance preventing means to cause clearance of any one or more orders of the keyboard or to clear the entire keyboard.

Values are introduced in a key-set calculating machine by depressing selected value keys which are retained in depressed position and then automatically released as an incident to a single cycle actuation of the numeral wheels initiated by the plus or minus keys. The entire keyboard may also be cleared by a master keyboard clear key, or an erroneously depressed value key may be released either by depressing another value key in the same column or by depressing a column clear key.

According to the present invention a factor is "locked" in the keyboard by holding a combination "clear or lock" key in depressed position while the value which is to be locked is entered into the keyboard after which the clear or lock key is released. This disables the keyboard release mechanism with respect to the locked value keys so that neither the subsequent depression of the clear or lock key nor the operation of the automatic release mechanism is effective to release the locked keys.

After a factor is locked in the keyboard other value keys may be depressed, these keys being merely "latched" in depressed position and adapted to be released by the keyboard clear or lock key, or by the automatic release mechanism during a calculation, while retaining the constant factor in locked condition.

It will be evident that a single depression of the clear or lock key serves first to release the keys which have been merely latched in depressed position, and additionally, to lock the value entry keys which are depressed while the clear or lock key is held depressed. Ordinal clear keys are provided which release a key from either latched or locked condition and a master "unlock" key is provided to release all of the keys regardless of whether they are in latched or locked condition.

A factor may also be locked in the keyboard by holding the values keys in depressed position during a single addition or subtraction operation, thus disabling the keyboard clear mechanism to prevent release of these keys during subsequent additions or subtractions as is described hereinafter.

2

A main object of the invention is to improve the factor locking mechanism of a calculating machine.

Another object is to release a locked factor by depressing a master unlock key.

Another object is to unlock selected orders of a locked factor by depressing respective ordinal clear keys.

Still another object is to lock a factor in the keyboard by holding the values keys in depressed position during a plus or minus calculation.

Other objects and advantages will become apparent from the following detailed description of the invention, in which:

Fig. 1 is a right side view showing the rightmost order of the keyboard together with the keyboard clear or lock key and related mechanisms.

Fig. 2 is a right side view showing an ordinal clear key and a fragment of the key section associated therewith.

Fig. 3 is a right side view showing the unlock key and associated devices.

Fig. 4 is a right side view showing a value entry key and the clear or lock key in depressed position with mechanism operable by these keys to disable the ordinal clearing mechanism for the depressed value entry key.

Fig. 5 is a right side view of the plus and minus keys and associated devices for operating the keyboard clearing mechanism.

Value entry mechanism

The value entering mechanism includes ordinal rows of keys **100** (Fig. 1) and associated mechanisms, one order of which is shown, and by means of which the numeral wheel actuators (not shown) are adjusted in accordance with the values selected. Briefly, the depression of a key **100** moves an associated ordinal selection bar **120** toward the right a number of increments corresponding to the value of the key depressed, the bar **120** rocking a lever **132** counterclockwise a proportional amount and through a gear segment **138** rotating a factor indicator numeral wheel **140** to display the value selected. At the same time, a second gear segment **139** on lever **132** rotates a gear **151** to set an actuator adjustment control mechanism in accordance with the value selected.

In each order the keys **100** are mounted for up and down sliding movement in a channel frame **101** (see also Fig. 2) fixed to the transverse ma-

chine frames 108 and 109. A latching slide 117 similar to a slide bearing the same reference number in the Patent No. 2,216,659, and urged to the right by a spring 118, is provided with each row of keys for holding a key in depressed position. A lug 116 is formed on each keystem 103 for cooperation with the slide and when a key is depressed the lug first moves the slide toward the right against the tension of spring 118 until the lug is depressed below the slide, whereupon the slide snaps back over the lug and holds the key depressed.

The depression of a key 100 moves a selection bar 120 (Fig. 1) toward the right by an amount representative of the value of the key, the bar being suspended from the channel frame 101 by means of parallel links 128 and 129 and having ten V shaped notches 130 terminating in U shaped notches 131 adapted to receive the bottoms of the keystems. The spacing between adjacent notches 131 is slightly less than the spacing between the keystems with each notch 131 lying spaced a number of increments from its keystem corresponding to the value of the key; therefore, depression of the number 1 key, through impingement of the key upon the rightmost shoulder of the V shaped notch 130, cams the selection bar 120 one increment toward the right, while depression of the 9 key cams the selection bar nine increments toward the right. The latching of a key in depressed position by the latching slide 117 causes the bottom of the keystem to hold the selection bar in its adjusted position, and through mechanism including gear 151, the bar 120 adjusts an actuator associated therewith in accordance with the value of the key depressed.

An erroneously depressed key 100 may be released by depression of another value key 1 to 9 in the same row thus causing the lug 116 of the second key to move the latching slide 117 toward the right to effect release of the erroneously depressed key before latching down the second key. The zero key 100 (Fig. 2) also carries a lug 116 for moving the slide 117 to its "release" position but this key cannot be latched in depressed position since the slide 117 carries a downwardly bent lip 119 which extends below the top of the lug 116 of the zero key even when the latter is in depressed position thus preventing the slide from snapping back over the lug. The zero key 100 therefore serves only to release any depressed key in its respective order. The value keys 1 to 9 are released from the latching slides 117 during actuation initiated by the plus and minus keys, as is explained hereinafter.

The parts bearing the reference numerals 100 to 151 and 746 to 864 are shown and described in the last mentioned Patent No. 2,216,659; whereas, the parts bearing the reference numerals 300–359 are new in the present specification. For a more detailed description of the operation of the old parts referred to in the present disclosure reference is made to the above patent.

Keyboard clear or lock key

The keyboard clear or lock key 300 (Figs. 1 and 4) serves two purposes: (1) it releases all keys 100 which have been latched in depressed position, and (2) if key 300 is held depressed while a value is entered into the keyboard, the value keys 100 are locked in depressed position in such a manner that subsequent depression of the key 300 is ineffective to release the locked keys; therefore, when some of the keys 100 are in locked condition and others are merely in latched condition, the depression of the clear key 300 releases only the latched keys.

Key 300 is guided for up and down sliding movement by means of a fixed pin 302 residing within a slot 303 cut in the keystem 304. Additional support is provided for key 300 by a lever, not shown, but similar to a lever 306 (Fig. 3), pivotally connected to the framework of the machine. A spring 307 connected to lever 306 urges the key to raised position.

Reverting again to the clear or lock key 300 and its function of releasing the keys 100 which have been latched in depressed position by the latching slide 117, the clear or lock key carries a roller 310 (Fig. 1) which overlies a finger 311, laterally offset from a lever 312 pivotally mounted to the framework at 313 and spring urged in a counterclockwise direction. The upper end of lever 312 has a pivotal connection 314 with one end of a link 315, which is pivotally connected at its other end to an upstanding arm 316 of a transverse bail 317. The bail 317 is pivotally mounted at opposite ends upon the framework of the machines as at 318 and has a plurality of ordinarily arranged extensions 319 each of which underlies a respective ordinal release lever 320. Each release lever 320 is pivotally mounted upon a respective ordinal channel frame 101 at 321 and has a camming surface 322 underlying an ear 323 projecting laterally from the latching slide 117. It will be obvious that upon depression of the clear or lock key 300 the roller 310 rocks the finger 311 clockwise as seen in Fig. 4, and through link 315 and arm 316 rocks bail 317 clockwise, thus causing extensions 319 to rock the release levers 320 counterclockwise. At such time the camming surface 322 on the release lever moves the ear 323 and the latching slide 117 toward the right to release any depressed key 100. When the notch 324 in lever 320 becomes aligned with ear 323, the ear snaps into the notch to hold the lever in its raised position when the extensions 319 return to the initial position shown in Fig. 1, upon release of the key 300.

The depression of key 300 therefore clears the keyboard and also locks the release levers 320 in what is termed hereinafter as a "disabled" position. The release levers each remain in disabled position until a key 100 is subsequently depressed which moves the latching slide 117 toward the right to effect release of an associated lever 320, after which the slide snaps back over the lug 116 and latches the depressed key 100 in depressed position.

When a release lever 320 stands in disabled position as shown in Fig. 4, a torsion spring 327 having one end connected to an ear 328 on lever 320 and the other end 329 projecting through a hole in the lever 320, is compressed through contact of its upper end 329 with the underside of the channel frame 101. The spring 327 insures the prompt return of the release lever 320 to its initial position when it is released from the slide 117.

The foregoing description of the clear or lock key 300 has been directed to its function of releasing any value keys 100 which are latched in depressed position, while the description immediately following concerns the manner in which the key 300 is used in locking a factor in the keyboard. The latter objective is accomplished by holding key 300 depressed while the factor

which is to be "locked" in the keyboard is entered therein. It will be obvious that as long as key 300 is held depressed, the extensions 319 hold the release levers 320 in the disabled positions shown in Fig. 4. In this condition of the parts, the depression of any value key 100 and the consequent reciprocation of its slide 117 during depression of the value key merely moves ear 323 out of and back into engagement with notch 324 to hold lever 320 in its disabled position and at the same time the slide 117 locks the key 100 in depressed position. Since the release lever is locked in disabled position, the subsequent depression of the clear or lock key 300 and the rocking of the clear bail 317 is ineffective to rock the disabled release lever and does not release the key 100 from what is termed hereinafter a "locked" condition. The arrangement described above is provided in each order, and therefore any one or more keys may be locked in depressed position.

After a factor is locked in the keyboard, key 300 is released and if it is then desired to enter other values into the keyboard, the second entry is made without holding the key 300 depressed, thus merely latching down the second set of keys. The latched keys comprising the second entry may subsequently be released by depression of the clear key 300 without effecting release of the locked factor.

Obviously, the depression of the 0 key 100 in each order and the consequent reciprocation of its respective latching slide 117 releases any depressed key 100 in its order regardless of whether it is in latched or locked condition and at the same time permits the disabled release lever 320 to return to the position in Fig. 1. The separate depression of each ordinal clear key 100 to clear the entire keyboard, however, would require excessive time and effort, and therefore the simplified means described immediately below are provided for simultaneously releasing all depressed keys 100 regardless of whether they are in locked or latched condition.

Unlock key

The "unlock" key 350 (Fig. 3) is supported for up and down sliding movement by means of a pin and slot arrangement 351, 352 and also by an extension 353 of the key which projects through a guide slot 354 in the framework of the machine. Spring 307 urges lever 306 and key 350 to raised position as previously mentioned, the pin 351 limiting the upward movement of the key. A roller 355 carried by key 350 overlies a finger 356 formed as a rearward extension of a transverse bail 359. The bail is pivotally mounted on shaft 313 and a similar mounting is provided on the opposite end of the bail which extends across and in front of the forward ends of the latching slides 117. A spring 358 urges the bail counterclockwise to the extent permitted by the fixed stop 359*a*. Depression of the unlock key 350 therefore, rocks the finger 356 and the bail 359 clockwise about pivot 313 and the bail moves the slides 117 rearwardly of the machine thus releasing all locked or latched keys 100 and permitting the disabled release levers 320 to return to the position shown in Fig. 1.

Automatic keyboard clearance during addition and subtraction

Depression of the plus bar 800 (Fig. 5) or the minus bar 860 initiates a single cycle of addition or subtraction, respectively, and also conditions mechanisms described below, which are operative during the calculating cycle to rock the previously mentioned lever 312 clockwise. This rocks the bail 317 (Fig. 4) and the extensions 319 clockwise and releases all depressed keys 100 except those in the orders where the release levers 320 are held in disable positions.

The depression of either the plus bar 800 or the minus bar 860 causes the engagement of a setting, or program, clutch (not shown) in the manner described in the Patent No. 2,216,659 and which clutch is limited to a single cycle of rotation. Means are provided under the control of this clutch for adjusting the machine for positive or negative registration, respectively, in accordance with which key is depressed and also for locking the numeral wheel actuators (not shown) in accordance with the previous adjustment thereof by the value entering mechanism. The setting clutch performs other auxiliary functions, described in the last mentioned patent, and then causes engagement of the main actuator drive clutch which remains engaged for only a single cycle of operation and drives the numeral wheels in accordance with the value previously entered into the machine.

The above mentioned locking of the numeral wheel actuators in adjusted positions permits the keyboard to be cleared of the values entered therein so that the next factor may be entered in the keyboard during the current calculating cycle.

For this purpose a cam 747 (Fig. 5) is rotated 180° by the setting clutch, and through a follower 746, mounted on shaft 501, moves a link 748 rearwardly of the machine, thus rocking an arm 750 and a shaft 752 counterclockwise. Shaft 752 also carries a second arm 774, and when a link 779 stands in its dotted line position as described in the next paragraph, the arm 774 engages ear 776 on the link thereby moving the link forwardly of the machine. Link 779 is pivotally connected at 363 to an extension 312*a* of previously mentioned lever 312 (Fig. 1) and rocks the same clockwise in the same manner as if the clear or lock key 300 had been depressed thereby releasing all value keys 100 in latched position but not affecting the keys 100 which are in locked condition.

Link 779 (Fig. 5) is moved to its dotted line position by depression of the plus and minus keys and for this purpose the plus and minus keystems 801 and 861, which are mounted for up and down sliding movement in a convenient manner, have respective extensions 805 and 864 overlying a pin 806 forming a pivotal connection between a lever 807 and a link 811. Lever 807 is pivotally connected to the framework of the machine at 809 while link 811 carries a pin 778 residing within a slot 777 in the link 779. Depression of the plus key 800 or the minus key 860 therefore is effective through a respective keystem extendsion 805 or 864, the pin 806 and link 811 to move link 779 to its dotted line position with ear 776 lying in front of the previously described arm 774. The depression of the plus or minus key initiates a corresponding cycle of operation and the plus and minus key linkage is locked in operative position by means (not shown) until arm 774 has completed its counterclockwise rocking movement to release the latched keys 100 all as is shown and described in the previously mentioned Patent No. 2,216,659. After the keys 100 are released the plus and minus key linkage is released for return to the initial position shown. The slot 777 in link 779 permits movement of the link by the clear key 300 without affecting the pin 778 or link 811.

It will be evident that a factor may be locked in the keyboard by holding the value keys 100 in depressed position while a plus or minus operation is being performed, since link 779 rocks lever 312 clockwise during the plus or minus operation and therefore locks the release levers 320 in disabled position in the same manner as if the clear or lock key 300 had been depressed.

Summary

The calculating machine of the present invention is provided with a keyboard in which a factor may be entered and locked against release so that a constant factor may be used for a series of problems. This is done in either one of two ways: (1) the clear or lock key 300 is held depressed while the locked factor is entered, or (2) the value keys are held depressed while the machine performs a plus or minus calculation.

After one value is locked in the keyboard a second value may be entered into other portions of the keyboard and released at the end of each specific calculation. Such manipulation of the keyboard is desired, for example, where products are to be separately accumulated, in two different parts of the register, one accumulation resulting from a series of multiplications involving a constant multiplicand factor and the other product resulting from a series of multiplications in which the multiplicand changes for each multiplication. In such a case the depression of the clear key 300 at the end of a multiplication releases the value keys 100 which are merely latched down but does not release the locked keys.

After one factor is locked in the keyboard a second factor may be locked therein, if so desired, merely by entering the second value and locking it in the keyboard in either one of the two ways described for the first factor, and such entry and locking of the second factor does not affect the first locked factor.

Any one of a plurality of locked keys may be cleared merely by depressing the appropriate ordinal clear key, or the entire keyboard may be cleared by depressing the unlock key 350.

I claim:

1. In a calculating machine having a keyboard comprising a plurality of rows of numeral keys, digital actuators selectively settable by said keys, selective locking and releasing means for said keys comprising a key locking member for each row of keys and having a key locking and a key releasing position, spring means for urging said member to its key locking position, a device associated with each member movable from a first to a second position and operable during such movement to move said member to key releasing position and thereafter to release the member for movement to its locking position by said spring means, means common to all of said devices to move the latter to their second positions, a control key for initiating operation of said digital actuators, mechanism responsive to depression of said key to operate said common means, and retaining means including a part of said member and a part of said device operable upon the movement of the device to its second position to retain the device in said second position.

2. In a calculating machine having a keyboard comprising a plurality of rows of numeral keys, digital actuators selectively settable by said keys, selective locking and releasing means for said keys comprising the combination of a key locking member in each row of keys having a key locking and a key releasing position, spring means for urging said member to its key locking position, a device associated with each member, means for moving each member to key release position, said means comprising a camming surface on each device and a projection on each member operable during the movement of the device from a first to a second position to move said member to key release position, means common to all of said devices to move the latter to their second positions, a control key for initiating operation of the digital actuators, an operating connection established by depression of said control key to control operation of said common means, and retaining means including said projection on the key locking member and a shoulder adjacent said camming surface on the device operable in response to movement of the device to its second position to retain the device out of the range of the releasing movement of the common means.

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