Nov. 3, 1931. C. M. F. FRIDEN 1,830,161

CALCULATING MACHINE

Filed Oct. 15, 1925 8 Sheets-Sheet 1

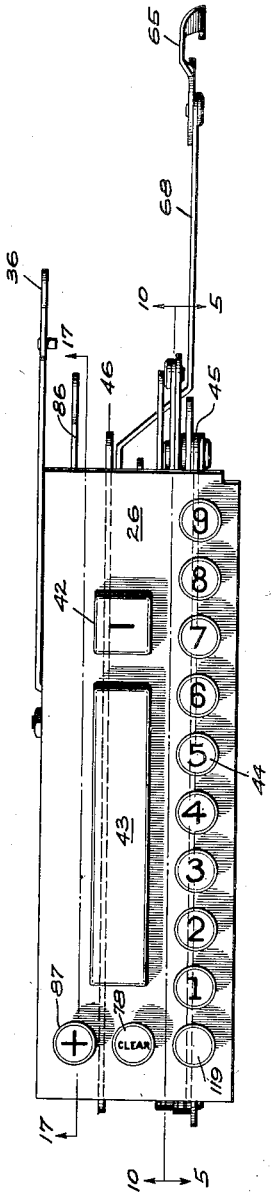

FIG. 1.

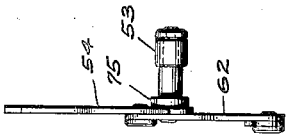

FIG. 12.

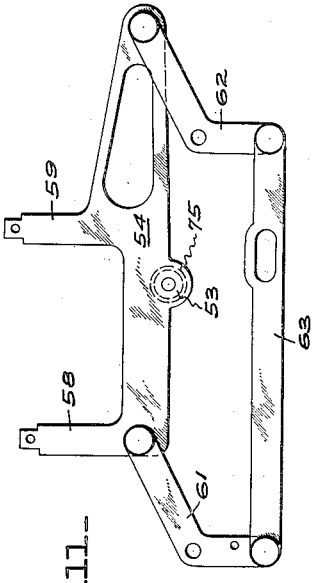

FIG. 11.

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CALCULATING MACHINE

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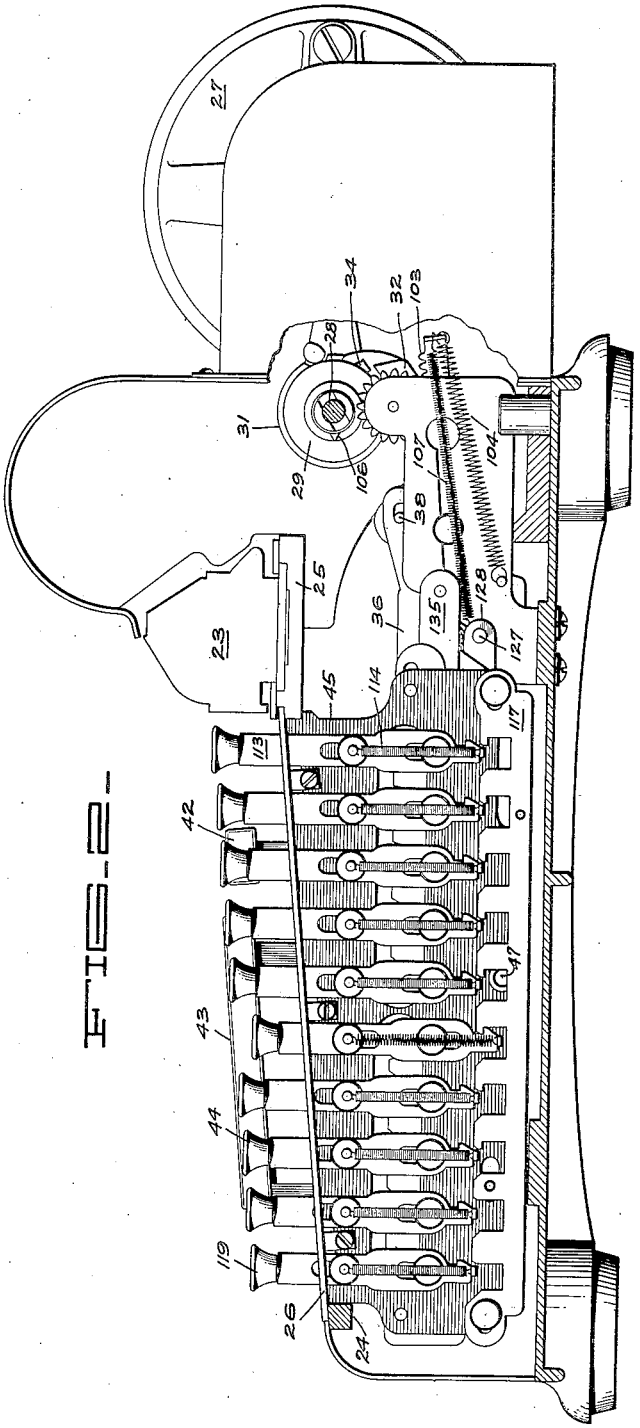

FIG. 2.

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CALCULATING MACHINE

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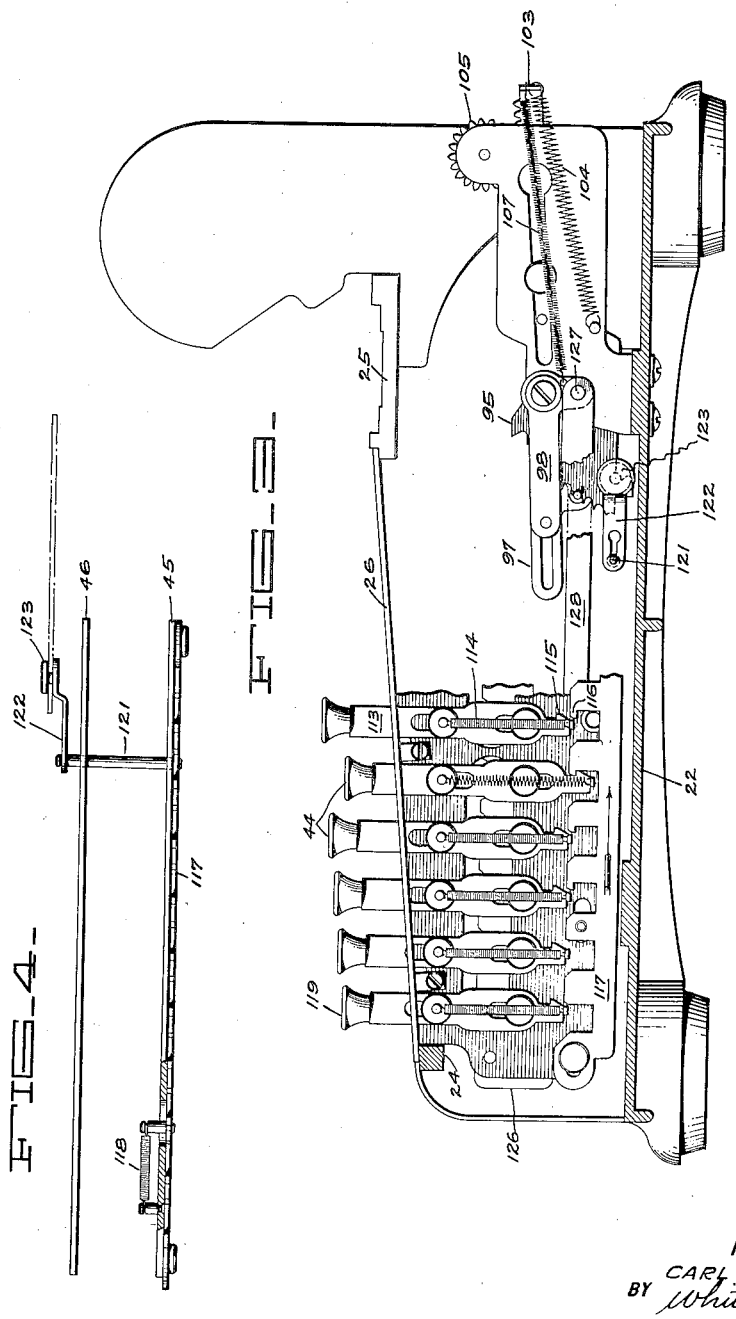

FIG. 3.

FIG. 4.

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CALCULATING MACHINE

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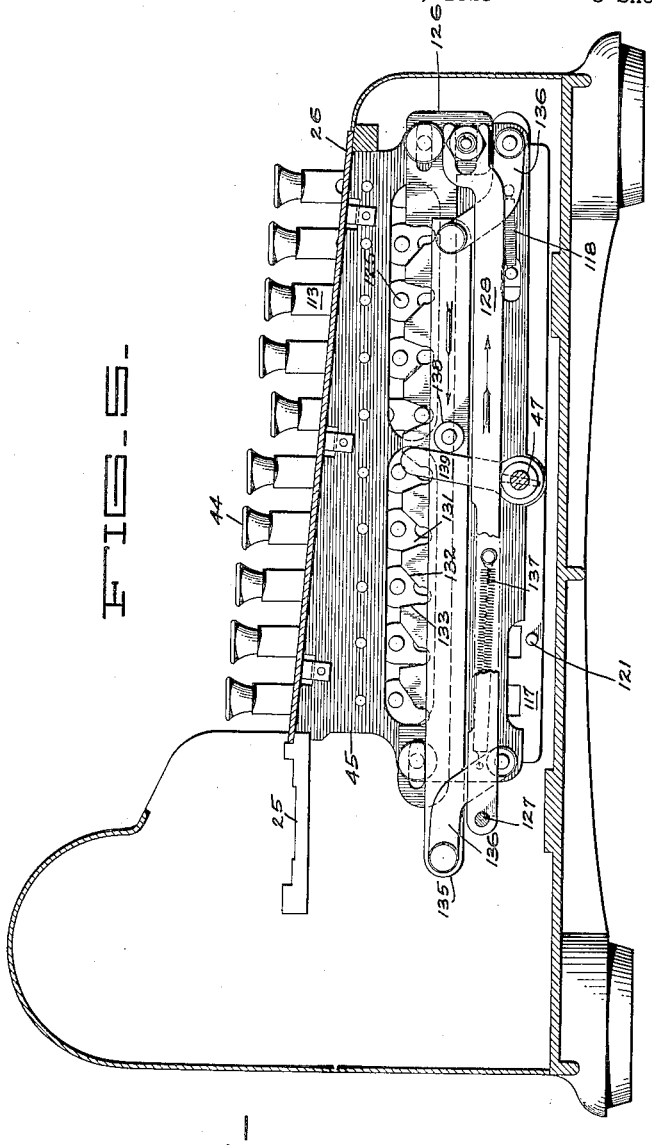

FIG. 5.

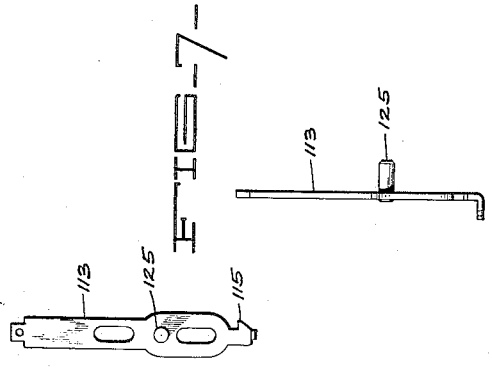

FIG. 5A.

FIG. 5B.

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FIG. 8.

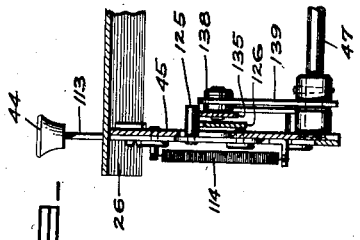

FIG. 9.

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CALCULATING MACHINE

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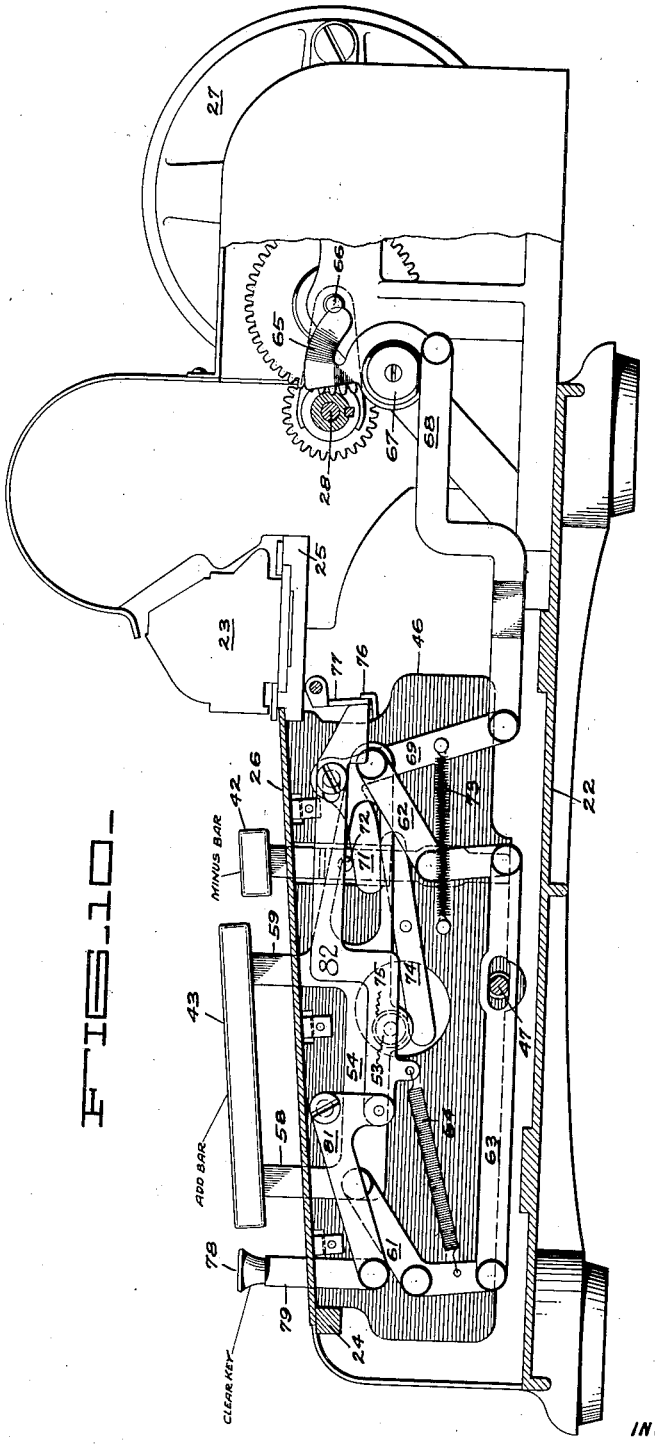

FIG. 10.

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CALCULATING MACHINE

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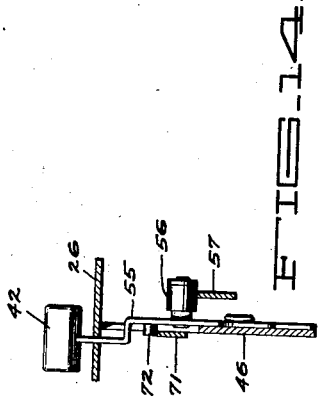

FIG-14-

FIG-13-

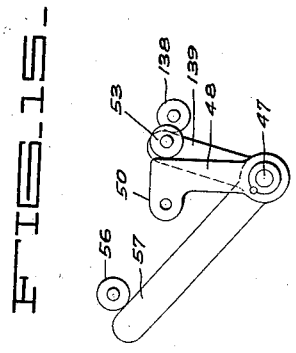

FIG-15-

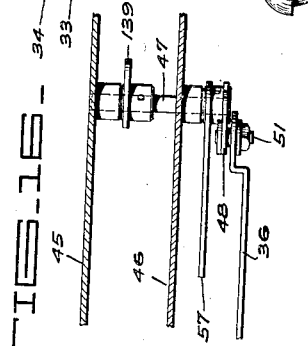

FIG-16-

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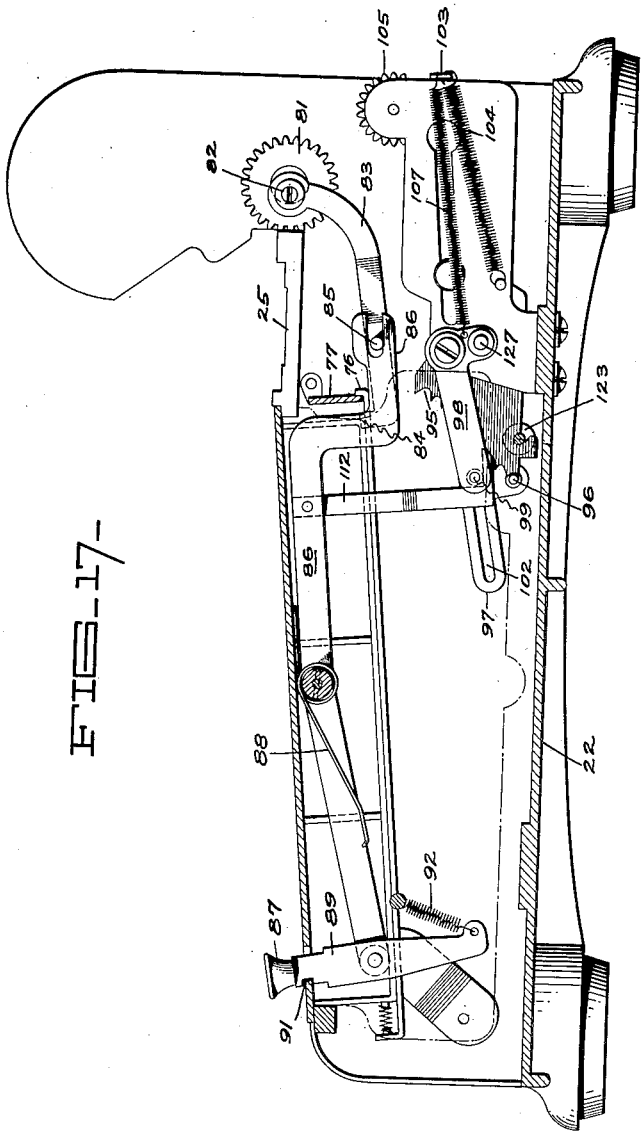
FIG. 17.



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UNITED STATES PATENT OFFICE

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CALCULATING MACHINE

Application filed October 15, 1925. Serial No. 62,558.

The invention relates to motor driven calculating machines adapted to perform the operations of addition, subtraction, multiplication and division, and particularly to improvements in the calculating machine disclosed in my Patent Number 1,643,710 issued September 27, 1927. Such patent discloses a motor driven calculating machine having an electric motor and a rotary actuator and means between the actuator and the motor for controlling the number of revolutions of the actuator. A clutch or power transmission mechanism is interposed between the motor and the actuator and by controlling the clutch, the number of rotations of the actuator is controlled.

The present invention relates particularly to the control unit, which is associated with the clutch for the rotation of the actuator for the performance of the different problems in calculation. The control unit embodies keys for controlling the revolutions of the actuator under varying conditions of operation. A plurality of value keys of different numerical value, from 1 to 9, are provided, and by depressing one of these keys the motor rotates the actuator a number of times corresponding to the value of the depressed key, and then the actuator is stopped. Another key is provided which when depressed causes rotation of the actuator in a direction to perform problems in addition, and a control key is provided in association with the addition key, so that the rotation of the actuator is limited either to one rotation or is permitted to rotate as long as the addition key is held depressed. There is also provided a subtraction key, which when depressed causes rotation of the actuator in the opposite direction and this key is also associated with the control key, so that depression of the subtraction key may result in one rotation only of the actuator or may permit the actuator to rotate as long as the substraction key is held depressed.

The present invention relates to improvements in the control unit, making the unit more durable and accurate, more positive in operation and improving its characteristics and construction generally.

The calculating machine disclosed in my prior patent and to which the present control unit is applicable, comprises a rotary actuator and a plurality of keys for introducing values into the actuator. The depression of a key introduces a value corresponding to the numeral of the key, into the rotatable actuator and rotation of the actuator serves to transfer these values into the counter, to effect the calculating operation. The values introduced into the actuator are transmitted, on rotation of the actuator, to the figure discs of the counting mechanism, which, for the purpose of making direct action of the selected values on the figure discs of highest value possible, is disposed in parallel displaceable relation to the values selecting mechanism axis. The present invention does not relate to the construction of the actuator or to the means for introducing the values into the actuator and reference is made to my prior patent for a disclosure of the complete machine. The present invention relates to the control of the rotation of the actuator to effect the solution of problems in calculation and the disclosure of the drawings in this application is limited to the present invention.

An object of the invention is to improve and simplify the control mechanism for controlling the number of rotations of the actuator and the unit provides means whereby the number of rotations may be controlled automatically or by the action of the operator by holding a key depressed for the proper time.

Another object of the invention is to provide means for positively moving the automatic rotation control device from one position directly to another position, so that such device does not move through zero position when different keys are successively depressed.

Another object of the invention is to combine all of the rotation controlling devices in a unit, which is set into the machine as a whole, thereby greatly simplifying the assembly of the machine.

The invention possesses many other advantageous features, some of which with the foregoing, will be set forth at length in the following description, where I shall outline in full that form of the invention which I

have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one embodiment of my invention, but it is to be understood that I do not limit myself to such form, since the invention, as set forth in the claims, may be embodied in a plurality of forms.

Referring to said drawings:

Figure 1 is a top or plan view of the control unit.

Figure 2 is a side elevation of the calculating machine disclosed in my prior patent, showing the control unit in its environment, the number 4 key of the automatic revolution control being depressed.

Figure 3 is a side elevation of the machine, a portion of the control unit being broken away to disclose the selection trip slide.

Figure 4 is a plan view of the lock-bar assembly and release connection, the selection trip slide being shown in broken lines.

Figure 5 is a vertical section of the machine taken on the line 5—5 Figure 1, with the number 4 key depressed, showing its action on the selection bar and the release bar.

Figure 6 is a side elevation of a key stem, and Figure 7 is an end elevation of a key stem.

Figure 8 is a cross section taken on the line 5—5 Figure 1, with the selection bar and the release bar in normal position.

Figure 9 is a cross-section of the control unit taken on the line 9—9 Figure 8.

Figure 10 is a vertical section through the control unit taken on the line 10—10 Figure 1. The minus key is shown depressed.

Figure 11 is an elevation of the addition key assembly.

Figure 12 is a side elevation of the addition key assembly.

Figure 13 is an elevation of the machine showing the control unit in position, the minus key being depressed and the associated parts being in corresponding positions.

Figure 14 is a detail end elevation of the minus key.

Figure 15 is a diagrammatic view of the clutch release levers in normal position, showing the relative positons of the rollers for operating said levers.

Figure 16 is a fragmentary plan view of the release levers on the operating shaft.

Figure 17 is a vertical section through the machine taken on the line 17—17 Figure 1.

The calculating machine shown in the drawings and in which the control unit of the present invention is incorporated, comprises a suitable base 22 having side plates between which the selecting, counting and controlling mechanism devices are arranged. These devices include a counting mechanism arranged on a longitudinally displaceable carriage 23, a counting mechanism actuator (not shown) which, upon rotation, causes the values entered therein to become effective in operating the counting mechanism, keys for entering the selected values into the drum (not shown), keys for determining the duration or extent of rotation of the drum, and other devices for controlling the actuation of the keys, the selecting mechanism, the counting devices and the control devices. The machine contains all of the elements necessary to quickly and accurately perform the operations of addition, subtraction, multiplication and division and these operations are performed automatically by the depression of keys. The machine is provided with a cover plate disposed between the side plates and arranged on the cover plate and preferably toward the left side thereof are the banks of keys which form the keyboard for entering values into the actuator. The cover plate is usually made in two pieces, one piece comprising the keyboard for entering values into the actuator, and the other piece comprising the control unit. Extending across the machine, between the side plates, is a fixed cross bar 24 and the fixed carriage track 25, and the top plate or cover plate 26 of the control unit rests on these fixed transverse members.

The actuator is driven by an electric motor 27 which is connected to the driving shaft 28 of the clutch 29 through a speed reducing gearing. The clutch 29 is of the same construction as is disclosed in my prior patent above identified and the clutch housing 31 is connected to the driven shaft which is in turn connected to the actuator through a suitable reversible gearing. The clutch 29 comprises a power transmission mechanism which is controllable to cause rotation and stopping of the actuator. Rotation of the clutch housing 31 is controlled by the lever 32, the end 33 of which enters an aperture in the clutch housing and contacts with a dog 34 therein, thus disconnecting the driving shaft from the housing. The end of the lever 33 disposed in the aperture in the clutch housing operates to stop the actuator in neutral or full cycle position. The clutch control lever 32 is normally held by the spring 35, so that the end 33 thereof is disposed in the aperture in the clutch housing. A latch bar 36 is provided for rocking the lever 32 against the pull of the spring 35 to release the clutch housing and cause engagement between the driving shaft and the clutch housing, as is clearly set forth in my aforesaid prior patent. The latch bar 36 is provided on its end with a notch 37 in which a pin 38 on the clutch control lever 32 engages, so that backward movement of the latch bar (Figure 13) causes the clutch lever 32 to rock to cause engagement of the clutch. The clutch control lever 32 is relased and is returned into engagement with the clutch by the spring 35, upon upward movement of

the rear end of the latch bar 36, such upward movement moving the side of the notch 37 out of contact with the pin 38, thus releasing the clutch control lever. When the latch bar 36 is again released, it falls so that the notch again engages the pin 38, the latch bar 36 having in the meantime moved forward under the influence of the spring 41, so that subsequent rearward movement of the latch bar causes the lever 32 to rock to again cause engagement of the clutch.

The control unit is provided with a starting control subtraction key 42, a starting control addition key or bar 43 and a plurality of starting control multiplication keys 44 of different numerical value from 1 to 9, and all of these keys are connected with the latch bar 36, so that depression of any one of the keys will cause the clutch control lever 32 to rock, to engage the clutch and release the clutch housing.

In Figure 13 I have shown the connection between the latch bar 36 and the subtraction key 42 and the addition key 43. Secured to and depending from the cover plate 26 are two spaced vertical plates 45 and 46 upon which the various elements of the control unit are mounted. Journaled in the two plates 45 and 46, adjacent the bottom thereof, is a transverse shaft 47 (Figs. 13, 15 and 16). Secured to the shaft 47 is an arm 48, having an upright portion 49 and a horizontal portion 50. The forward end of the latch bar 36 is connected to the horizontal portion 50 by a bolt 51, the end of the latch bar being provided with an elongated slot 52 so that the position of the latch bar with respect to the arm 48 may be adjusted to insure the proper operation of the latch in conjunction with the pin 38 on the clutch control lever 32. The latch bar 36 is connected to the arm 48 by a pivotal connection, so that the latch bar may be moved vertically at its outer end to engage and disengage the pin 38. Disposed in front of the upright portion 49 of the arm 48 is a roller 53, which is mounted on the key frame 54 of the addition key 43 and normally this roller is in contact with the front face of the upright portion 49 of the arm. Depression of the key 43 causes the roller 53 to move downward and backward, as will be hereinafter set forth, thus moving the arm 48 backward to cause the latch bar 36 to release the clutch housing and engage the clutch.

In Figure 13 the subtraction key 42 is shown depressed and the arm 48 and the latch bar 36 are shown in operative position. When the key 42 is released, the latch bar 36 moves forwardly and the arm 49 moves to bring the front surface thereof into contact with the roller 53. The subtraction key 42 (Fig. 14) is mounted on a stem 55 which is mounted on the plate 46 and, mounted on the stem, is a roller 56 which is positioned to engage the inclined arm 57 which is secured to the shaft 47 (Fig. 16). Downward movement of the key 42 therefore moves the end of the arm 57 downward, rotating the shaft 47 and causing the arm 48 to move the latch bar 36 to disengage the clutch housing and cause engagement of the clutch.

The addition control key 43 is mounted on a frame 54 (see Figures 10 and 11) which is made long to accommodate the long key bar, the frame being provided with two shanks 58 and 59 on which the key bar is mounted. The stem carrying the roller 53 is secured to the frame 54 (Fig. 12), the roller being positioned to lie in the path of the upright portion of the arm 48 (Fig. 13). The frame 54 is mounted so that it is given a backward and downward movement upon the depression of the key. This is accomplished by supporting the frame at its ends in the levers 61 and 62, fulcrumed intermediate their ends on pins secured to the plate 46 and having their lower ends connected by the link 63. The bar 43 is normally held in elevated position by the spring 64 connected to the lever 61. This construction provides a sturdy, stable mounting for the key bar 43 and causes depression of the key bar to move the roller 53 backwardly and downwardly.

Interposed between the clutch and the actuator is a reversing gear which is moved to cause clockwise or counterclockwise rotation of the actuator. This reversing gear is normally held in one position by a spring, as is disclosed in my prior patent, this position serving to cause rotation of the actuator in a direction to accomplish addition and multiplication. Therefore, when the addition bar 43 is depressed, there is no shifting of the reversing gear. When it is desired to perform problems in subtraction or division, the subtraction bar 42 is depressed and means are provided whereby depression of this bar causes the reversing gear to be shifted to produce reverse rotation of the actuator. The shifting of the reverse gear is accomplished by means of a cam 65 engaging a slot in the gear shifting rod 66, as disclosed in my prior patent. Means are provided whereby the depression of the subtraction key 42 moves the cam 65 to shift the reversing gear. The cam 65 is journaled on the hub 67 and is oscillated by the link 68 connecting the cam lever with the bell-crank lever 69 which is fulcrumed on the plate 46. The horizontal arm 71 of the bell-crank lever underlies a pin 72 on the subtraction key stem 55 so that depression of the subtraction key rocks the lever 69 to move the cam 65 to shift the reversing gear. In Figure 10 the subtraction key has been depressed and the cam 65 moved to shift the gear. The subtraction key is returned to elevated position by the spring 73 connected to the bell-crank lever 69, this spring serving also to shift the cam 65 to addition position.

Means are provided for preventing either of the keys 42 or 43 from being depressed when the other is depressed so that only one of these keys may be depressed at a time. Fulcrumed on the plate 46 is a rocking lever 74, one end of which is disposed below a hub on the addition key frame 54 and the other end of which is disposed below the horizontal arm 71 of the bell-crank lever 69. This rocking lever 74 is arranged so that when the subtraction key is depressed the lever is rocked to bring the opposite end thereof into contact with the hub 75 of the addition key frame, thereby preventing the addition key from being depressed. Similarly when the addition key 43 is depressed the lever 74 is rocked to bring the opposite end thereof into contact with the horizontal arm 71 of the bell-crank lever 69, which horizontal arm lies directly below and in contact with the pin 72 on the stem of the subtraction key 42, thereby preventing the subtraction key from being depressed.

The control unit also embodies means for clearing the keyboard or, in other words, releasing the depressed keys which introduce the values into the actuator. These keys are held in depressed position by spring-pressed slides 76, as disclosed in my prior patent, and a gate 77 is associated with all of the slides, so that by rocking the gate all of the slides are moved to release the depressed keys. The gate is moved by the clearance key 78, the stem 79 of which is connected to the bell-crank lever 81 which is connected at its other end to the slide 82, which at its rearward end is in contact with the gate 77. The slide 82 is normally held in forward position by the spring 64 and, depression of the key 78 moves the slide 82 backward to rock the gate 77 and thus release the depressed keys.

Means are also provided for automatically releasing the depressed keys when desired, and this means is operated to release the keys during the first cycle of operation of the actuator. Arranged within the machine and suitably connected to the actuator so that it rotates synchronously therewith is a gear 81 (Fig. 17) having an eccentric hub 82 on which is journaled an arm 83 which is provided at its free end with a tooth 84 which reciprocates as the gear 81 rotates. The arm 83 is provided intermediate its ends with a pin 85 which engages in a slot in the end of the lever 86. The lever 86 is adjustable to raise the pin 85 to bring the plane of oscillation of the tooth 84 in o intersection with the gate 77, so that as the tooth 84 is reciprocated it will move the gate and the slides 76 and release the depressed keys. The position of the lever 86 is controlled by the key 87 which has two vertically adjustable positions. When the key 87 is in its elevated position the tooth 84 oscillates below the gate 77 and does not actuate the gate. This is the position of the key 87 when operations in multiplication are performed. In such position the keyboard is not cleared during the first cycle of operation of the actuator. When it is desirable to perform problems in addition or subtraction, it is desirable to clear the keyboard at each cycle of operation and to accomplish this the key 87 is depressed and latched in depressed position, moving the lever 86 to bring the path of reciprocation of the tooth 84 into intersection with the gate 77, so that the gate is rocked and the keys released during the first cycle of operation of the actuator. The key 87 is normally held in elevated position by the spring 88 engaging the lever 86. The stem 89 of the key is pivoted to the lever 86 and is provided with a notch 91 which engages the edge of a slot in the cover plate 26 to hold the key 87 depressed. A spring 92, connected to the lower end of the key stem 89, holds the key stem in engagement with the edge of the groove in the cover plate.

The calculating machine as shown in my prior patent and to which the present invention is applicable is provided with a trip slide for tripping or raising the rear end of the latch lever 36 to release the clutch control lever 32 at the end of a selected predetermined number of rotations of the actuator. Movement of the trip slide 95 serves to raise the rear end of the latch bar 36 and the trip slide is moved by a pin 96 carried by the slide bar 97 which is positioned in variable angular positions, depending upon the predetermined number of rotations of the actuator, by the lever 98, which is provided with a pin 99 engaging in a slot 102 in the slide bar 97. The slide bar 97 is connected to a rack 103 which is restrained against movement by the spring 104 and which is moved in a step-by-step movement by the pinion 105 which is in engagement with the rack bar. The pinion is moved one step for each rotation of the actuator by the tooth 106 (Fig. 2), secured to the clutch housing 31. Therefore, the slide bar 97 which carries the pin 96 is moved one step for each rotation of the actuator, and, by variably positioning the slide bar 97, a different number of steps of movement are required before the pin 96 comes into engagement with the step face of the slide plate 95, and the next rotation of the actuator causes the pin 96 to move the slide plate 95 and thereby disengage the latch bar 36 from the clutch control lever 32.

Normally the slide bar 97 is in depressed position, being normally held in this position by the spring 107 which is connected to the lever 98 which is in turn connected to the slide bar 97. When the slide bar 97 is in normal depressed position the pin 96 is positioned in zero position, that is, one station below the number 1 position, in which

number 1 position it is shown in Figure 17. When the pin 96 is in this zero position it may oscillate through one step of movement moving the slide 95 for less than a full step as set forth in my Patent Number 1,643,710, thus preventing operation of the trip slide latch.

The rack bar 103 is held in advanced position by a spring pressed latch, as shown in my prior patent, and means are provided for disengaging the latch from the rack bar so that the pinion 105 will not advance the rack bar more than one step as fully described in my application for patent Serial Number 62,557. The present invention embodies means for positioning the pin 96 so that it will not engage the trip slide plate 95 during repeated revolutions of the actuator, thereby permitting the actuator to be given any desirable number of rotations by holding depressed either of the keys 42 or 43. Secured to the lever 86 and engaging under the pin 99 is a hook member 112 which is raised when the key 87 is depressed and which is lowered when the key 87 is in its elevated position. When the key 87 is in its elevated position and the pin 99 is lowered, the pin 96 lies below the number 1 step on the face of the slide plate 95, so that reciprocation of the pin 96 through one step of movement will not cause movement of the trip plate 95. The key 87 is in its elevated position when problems in multiplication and division are to be performed, so that, in performing these problems either of the keys 42 or 43 may be held depressed and the actuator will rotate as long as the key is held depressed in the same manner as in the machine shown in my Patent Number 1,643,710. In performing problems of addition and subtraction, it is desirable to stop the actuator after one rotation and when this is desirable the key 87 is depressed, raising the pin 96 into position with respect to the number 1 step on the face of the slide 95 as shown in Fig. 17. Oscillation of the pin 96 through one step of movement will therefore cause movement of the slide 95 which operates to raise the latch lever 36 and cause the clutch control lever 32 to engage the clutch housing. The stepped face of the slide plate 95 is cut away below the number 1 step to provide space in which the pin 96 may oscillate without causing operative movement of the plate, as disclosed in my said patent. The unit is also provided with a series of keys 44 ranging in value from 1 to 9, and these keys serve to position the pin 96 to automatically control the number of revolutions of the actuator. Depression of the key valued 8, for instance, will position the pin 96 in front of the eighth step on the slide plate 95, so that on the eighth rotation of the actuator the latch bar 36 will be raised and the clutch housing stopped. The stems 113 of the keys 44 are mounted on the plate 45 and are normally held in elevated position by springs 114 attached to the lower ends of the key stems. Means are provided for holding the depressed keys in depressed position (Fig. 3). Each key stem 113 is provided on its lower end with a hook 115 which is adapted to engage under a complementary hook 116 on the key retaining slide 117. This slide is mounted on the plate 45 and is normally held in forward position by the spring 118 (Fig. 4). When a key is depressed the slide is moved rearwardly and then springs forwardly under the influence of the spring to bring the hook 116 over the hook 115 on the key, thus retaining the key in depressed position. The slide 117 is not provided with a hook in association with the stem of the number 1 key, so that the number 1 key is not held depressed. The operation of the machine is so rapid that when the number 1 key is depressed the operation is almost immediately completed and if a retaining hook were provided in connection with this key and pressure was not released from the key immediately upon its depression, the key would not be released at the end of the calculating operation, because such operation would be completed and the key releasing means would have been actuated prior to the release of pressure on the key. The key 119 at the forward end of the bank of keys 44 is a clearance key and its function is to move the slide 117 to cause the release of any keys 44 which may be held depressed.

Means are provided for moving the slide 117 at the end of the calculating operation to release the depressed keys (Figs. 3 and 4). Secured to the slide 117 is a pin 121 to which is connected an arm or finger 122 which is provided on its end with a stud 123 which seats in a notch in the selection trip slide 95. When the selection trip slide is moved in the direction to trip the latch lever 36, the slide 117 is simultaneously moved and the depressed key 44 is released.

Each key stem 113 is provided with a laterally extending pin 125 which overlies a notch in the differential bar 126, which is slidably mounted on the plate 45 (Fig. 5). This slide 126 is moved longitudinally to different differential positions upon the depression of one of the keys 44. The slide 126 is connected to the pin 127 (Fig. 3) on the end of the lever 98 by the link 128 which is adjustably connected to the front end of the slide 126. By connecting the link 128 to the front end of the slide, angular variations in the position thereof, due to the movement of the pin 127 about the fulcrum of the lever 98, are reduced to a minimum, thereby preventing error in the machine. By adjustably connecting the link 128 to the slide 126, adjustment of the machine in assembly is rendered simple and it is not necessary to work to extremely close limits in the manufacture of the parts associated with the slide 126.

The slide 126 is provided on its upper surface with a plurality of notches 131, there being one notch associated with each numeral key 44. The notches are provided at their bases with sockets adapted to receive the pins 125, to accurately position the slide 126, and the sides of the respective notches are inclined to different degrees to cause proper movement of the slide upon depression of a key, regardless of the prior position of the slide. One side of each notch 131 is given an inclination corresponding to the value of the associated key and the other side 132 of the notch is given an inclination corresponding to the complement of the value of the associated key. Depression therefore of any key causes positive movement of the slide to the proper differential position from the prior differential position, thereby eliminating the necessity of returning the slide 126 to zero position when a key is depressed after another key has already been depressed. Errors in setting the keys are frequently made and this arrangement permits the correction of the errors with the least possible effort and at the same time positively positions the control device. The slide is therefore positively moved and the actuating pin 96 associated with the selection trip slide, is also positively moved to differential position upon the depression of any key 44.

Means are also provided which operate upon the depression of one of the numeral keys 44 for moving the latch bar 36 to disengage the clutch housing and permit rotation of the actuator. Arranged at the side of the slide 126 and directly below the pins 125 is a bar 135 which is supported on the parallel links 136 and which is normally held in elevated position in contact with the pins 125 by the spring 137. Due to the inclination of the links 136, depression of a key 44 causes a backward and downward movement of the bar 135 and this backward and downward movement is employed to move the latch bar 36. Mounted on the parallel motion bar 135 is a roller 138 which bears against the front face of a lever 139 which is secured to the shaft 47, to which the arm 48 is secured. Depression of a numeral key 44, therefore, causes the lever 139 to be rocked in a direction to move the latch bar to disengage the clutch control lever 32 from the clutch housing.

The control unit of the present invention therefore contains all of the control mechanism required for the operation of the calculating machine. Depression of any of the numeral keys 44 will cause the actuator to rotate a number of times represented by the value of the depressed key and then come to a stop in full cycle position, the depressed key being released during the last cycle of operation. This is particularly valuable in performing problems in multiplication since the multiplier is known, but is of no particular value in performing problems in division since the quotient is the unknown quantity. With the key 87 in elevated position, depression of addition key 43 will cause the actuator to rotate in one direction for the length of time that the key is held depressed. Depression of the subtraction key 42 will cause the actuator to rotate in the opposite direction for the length of time during which the key 42 is held depressed. When the key 87 is in the depressed position, rotation of the actuator, which is caused by depression of either of the keys 42 or 43, is limited to one rotation. When the key 87 is depressed, the keyboard, for entering values into the actuator, is cleared during the first cycle of operation of the machine, and when the key 87 is in its elevated position, the keyboard is not cleared and may be subsequently cleared by the depression of the clearance key 78.

I claim:

1. In a calculating machine having an actuator and a motor for driving the actuator, means for controlling the movement of the actuator comprising power transmission mechanism between the motor and the actuator, a lever operative to release or restrain said mechanism, a latch bar associated with said lever and adapted to engage and move the lever to release position, a transverse shaft, an arm secured to the shaft and to which the latch bar is connected, a starting control key associated with said arm, a second arm secured to said shaft, a second starting control key associated with the second arm, a third arm secured to said shaft and a plurality of actuator revolution controlling keys associated with said third arm.

2. In a calculating machine having keys for entering values into the machine, an actuator for introducing the entered values into the counting mechanism and slides for holding the depressed keys in depressed position, a gate associated with and arranged to move the slides to release the keys, an arm movable in time with the actuator and adapted to engage or pass the gate, a lever engaging the arm and arranged to positively move the arm from engaging to passing position and vice versa, a depressible key connected to said lever and means for holding the key in depressed position.

In testimony whereof, I have hereunto set my hand.

CARL M. F. FRIDEN.