United States Patent

[11] **3,549,087**

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[31] **No. 51329A/67**

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[54] **TEN KEY CALCULATING MACHINE**
6 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **235/60**
[51] **Int. Cl.** **G06c 29/00**
[50] **Field of Search** ..... 235/60TC, 60MULT, 63, 60GEN.

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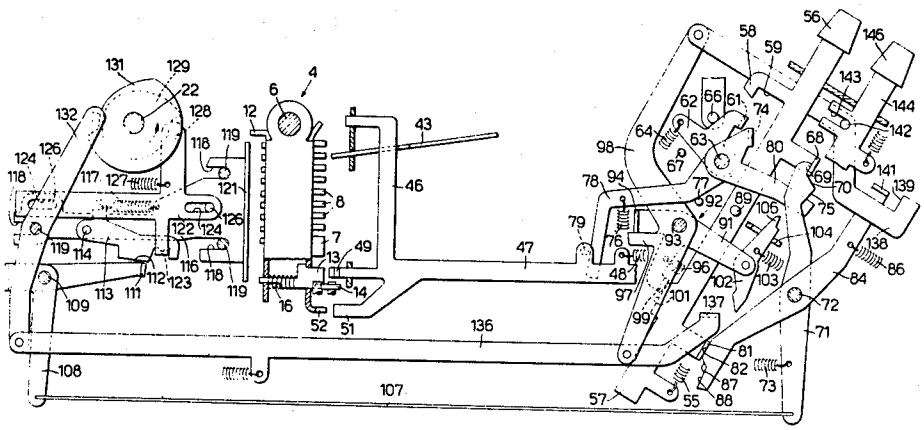
ABSTRACT: A ten key calculating machine comprising a transversely movable set up carriage, a first mechanism adapted to bring said carriage back to the transverse rest position and a second mechanism adapted to clear the amount set on said carriage is provided with a predisposing member adapted to be actuated manually to engage an element adapted to prevent the clearing of the carriage, said predisposing member being moreover adapted to cause said carriage instantaneously into the transverse position corresponding to the amount set therein.



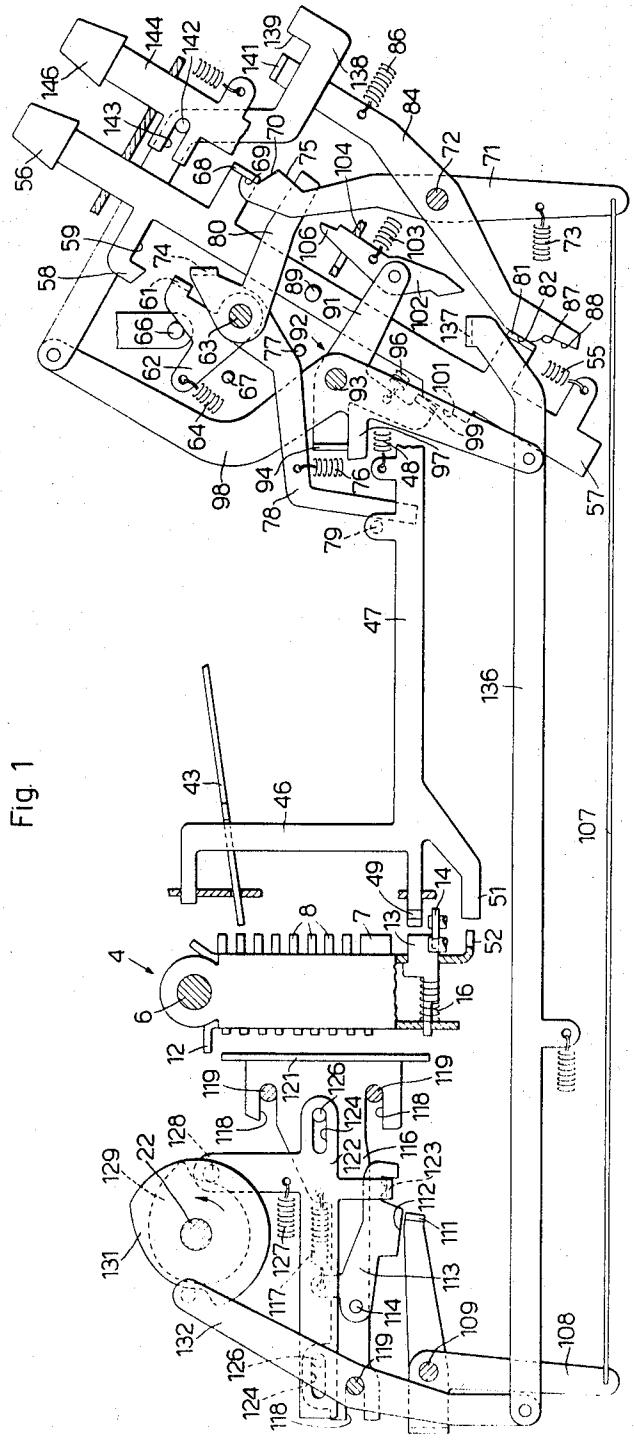


Fig. 1

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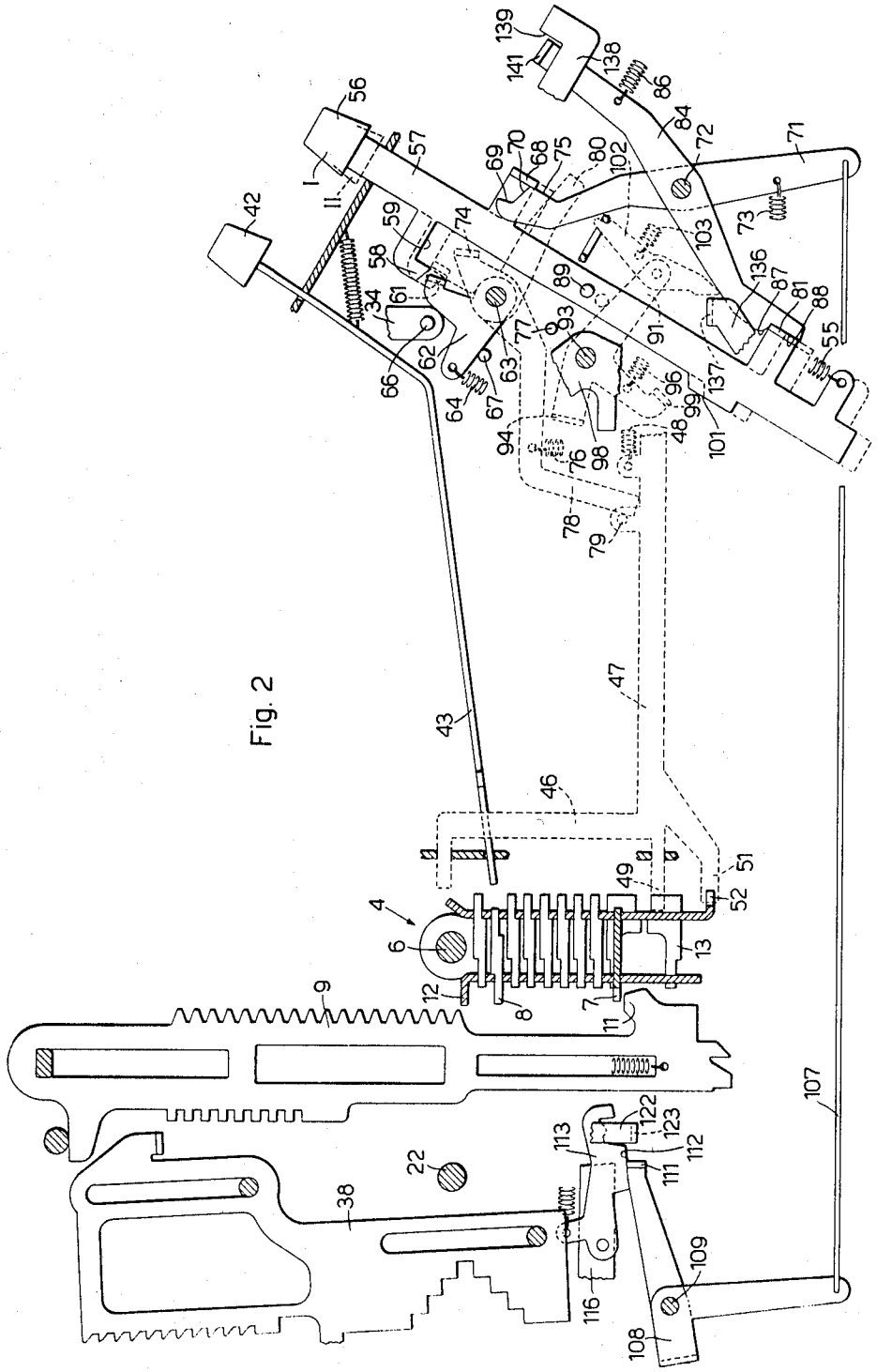

Fig. 2

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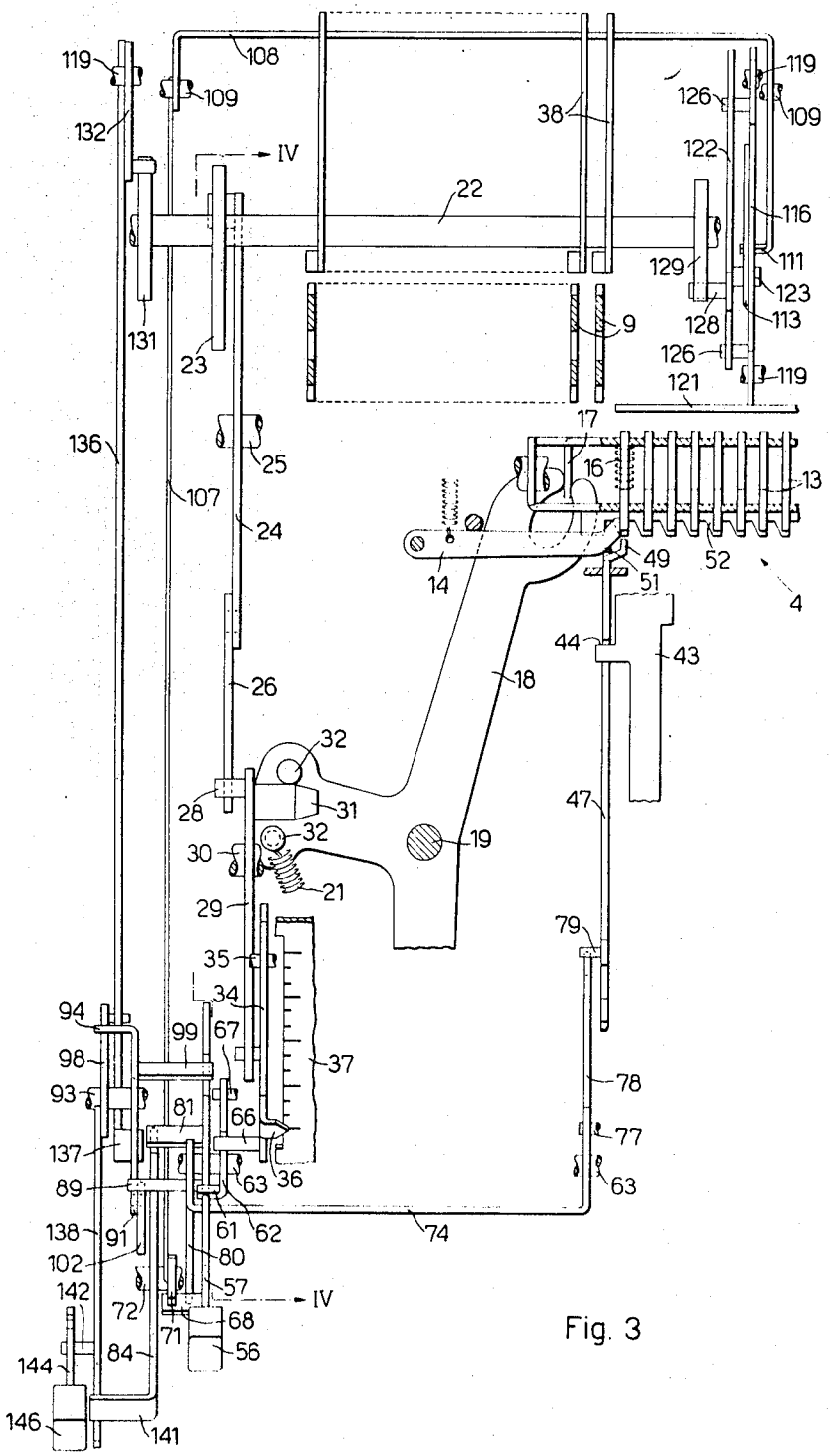

Fig. 3

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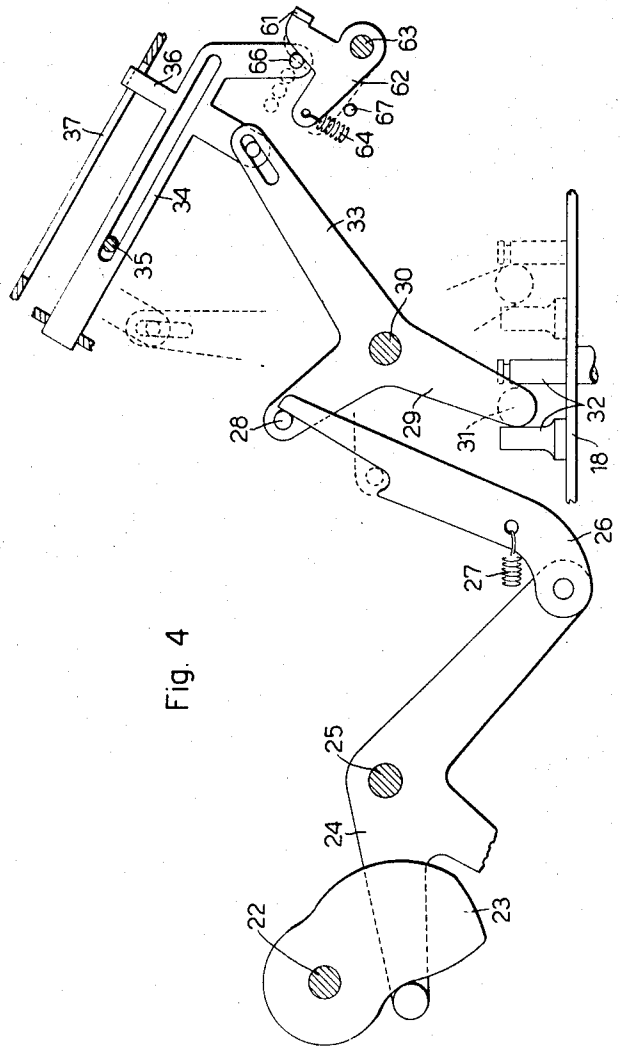

Fig. 4

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TEN KEY CALCULATING MACHINE

BACKGROUND OF THE INVENTION

This present invention relates to a ten key calculating machine, comprising a setting carriage movable step by step on each setting of a numeral key, a mechanism for transferring the quantity set up on the carriage to a calculating mechanism and returning the carriage to its inoperative position, and a clearing mechanism for then clearing the amount set on the carriage.

The invention is concerned with the problem of enabling the quantity set up on the carriage to be used more than once, e.g. for calculating squares and higher powers.

Various calculating machines of the aforesaid type are known. In one known calculating machine, the setting carriage is set from the reduced keyboard by means of a setting device actuated by a cyclic actuating mechanism. The latter is moreover adapted to actuate means for clearing the amount set in the first cycle following an operative cycle, the carriage retaining the amount set after the end of the operative cycle. This calculating machine is particularly complicated because of the actuating mechanism.

In another known calculating machine, a store comprising pinions is connected to the setting carriage to retain the amount set and control a series of actuating members during successive operative cycles. This calculating machine is also complicated, in this case because of the supplementary store.

SUMMARY OF THE INVENTION

These and other drawbacks are obviated by the calculating machine according to the invention.

The present invention provides a ten key calculating machine, comprising a setting carriage movable transversely step by step from an inoperative position on each setting of a numeral key to a set position determined by the number of times a key is set, a first mechanism adapted to be actuated cyclically to transfer the quantity set up on the carriage to a calculating mechanism and return the carriage to the inoperative position, a clearing mechanism adapted to be actuated cyclically to clear the amount set on the carriage after it has been brought back to the inoperative position, and a manually actuable presetting member adapted to render the said clearing mechanism inoperative and to control resetting means for bringing the carriage back instantaneously to the said set position.

The invention will be described in more detail, by way of example with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial longitudinal section from the left of a calculating machine embodying the invention;

FIG. 2 is a second partial longitudinal section from the left of the calculating machine of FIG. 1 in a working position;

FIG. 3 is a partial plan view of the calculating machine of FIG. 1;

FIG. 4 is another partial longitudinal section from the left taken on the line IV–IV of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

In this description the terms front, forward, rear, left and right are used in reference to a person viewing the machine from the keyboard. Thus, as seen in FIG. 1, keys **56** and **146** are toward the front of the machine while shaft **22** is toward the rear. Also, as illustrated in FIG. 3, key **146** is toward the left side of the machine while carriage **4** is shown toward the right side.

The calculating machine comprises a setting carriage **4** (FIG. 1) movable transversely on a bar **6** and furnished with a series of orders each comprising a stop **7** for the digit zero and eight stops **8** for the digits from one to eight. The stops **7** and **8** can be set rearwards to arrest the upward travel of a series of

actuating members **9** (FIG. 2) each of which is provided with a spur **11** which engages the stop which has been set. The carriage **4** is moreover provided with a flange **12** adapted to arrest the travel of the actuating member **9** for the digit nine in the case of an order where no stop has been set.

Each order of the carriage **4** moreover comprises an escapement stop **13** which can be set to control the transverse displacement step by step of the carriage. To this end, the first unset stop **13** normally bears against an escapement dog **14** (FIG. 1). The stop **13** of the highest order of the carriage **4** is provided with a compression spring **16** (FIG. 1) adapted to carry the stop **13** forward again immediately after it has been set.

The carriage **4** moreover has a bent lug **17** (FIG. 3) engaging in the forked end of a lever **18** pivoted at **19** on the base of the calculating machine and subjected to the action of a spring **21**, which therefore tends to move the carriage towards the left.

Moreover, the calculating machine comprises a main shaft **22** adapted to rotate cyclically in a counterclockwise direction. Fixed on the main shaft **22** is a cam **23** (FIG. 4) for actuating a first mechanism cyclically to bring the carriage **4** back to the right to the inoperative position. To this end, a lever **24** bears against the cam **23**, being pivoted on a fixed pin **25** and carrying a pawl **26** pivoted to the end of one of its arms. A spring **27** holds the pawl **26** in contact with a stud **28** on a lever **29** pivoted on a fixed pin **30**. Another stud **31** on the lever **29** engages between two pins **32** carried by an arm of the lever **18** (FIG. 3). The lever **29** (FIG. 4) is moreover provided with an arm **33** connected by means of a pin and slot to a slider **34** slidable on a fixed pin **35** and in a slot in the frame of the machine. The slider **34** is provided with a projection **36** adapted to indicate on a scale **37** (FIG. 3) the number of orders set on the carriage **4**.

The calculating machine moreover comprises a store formed by a series of sliders **38** (FIG. 2) which are movable vertically and disposed behind the series of actuating members **9**. The transfer of an amount, for example the multiplier, to the sliders **38** takes place during a cycle of the machine by engaging the sliders **38** with the actuating members **9** in the manner described in the U.S. Pat. No. 3,005,585.

The calculating machine moreover comprises a keyboard in which each numeral key **42** (FIG. 2) is adapted to set a corresponding stop **7** or **8** by means of a corresponding setting slider **43**. The setting sliders **43** are aligned in a single vertical column and are disposed in front of the column of stops **7**, **8** of the highest order when the carriage is in the inoperative position.

Each slider **43** (FIGS. 1 and 2) is adapted to push to the rear, by means of a shoulder **44** thereon (FIG. 3), a universal bar **46** carried by a longitudinally slidable slider **47** (FIG. 1) normally urged forward by a spring **48**. The bar **46** is provided with a finger **49** adapted to set the first unset stop **13** and with a second finger **51** adapted to engage a rack **52** carried by the carriage **4** (FIG. 3) and having a pitch equal to the transverse step of the carriage.

The calculating machine moreover comprises a presetting member formed by a key **56** (FIG. 1) fast with a shank **57** and urged to the inoperative position shown in FIG. 1 by a spring **55**. The shank **57** is provided with a bent projection **58** and with a shoulder **59** which are adapted to cooperate with a lug **61** of a lever **62** pivoted on a fixed spindle **63**. The lever **62** is normally caused, by the action of a spring **64**, to bear against a pin **66** on the slider **34**. The anticlockwise movement of the lever **62** is arrested by a fixed pin **67**.

The shank **57** is also provided with a bent lug **68** against which there bears a shoulder **69** of a lever **71** pivoted at **72** and subjected to the action of a spring **73**. The lever **71** is provided with an inclined edge **70** and with a second shoulder **75** which are both adapted to cooperate with the lug **68**. The latter is also adapted to cooperate with an arm **80** of a bail **74** also pivoted on the spindle **63** and normally caused to bear, under the action of a spring **76**, against a fixed pin **77**. The bail **74** is

provided with another arm 78 which cooperates with a pin 79 on the slider 47. The bail 74 and the slider 47 constitute the means which bring the carriage 4 back instantaneously into the transverse position corresponding to the amount set therein, as will be explained more fully hereinafter.

The shank 57 is provided with another bent lug 81 against which there normally bears, under the action of a spring 86, a shoulder 82 of a lever 84 pivoted at 72. The lever 84 is moreover provided with a curved shoulder 87 and with an edge 88 which are both adapted to cooperate with the lug 81.

The shank 57 is moreover equipped with a pin 89 adapted to cooperate with an arm 91 of a lever 92 pivoted at 93 and provided with a bent lug 94 normally bearing, under the action of a spring 96, against a projection 97 of a crank 98 also pivoted at 93. The lever 92 is provided with a second bent lug 99 adapted to cooperate with a shoulder 101 of the shank 57. Furthermore, a latch 102 normally bearing, under the action of a spring 103, against a fixed plate 104 is pivoted to the front end of the arm 91. The latch 102 is provided with a tooth 106 adapted to cooperate with the plate 104.

The lever 71 is connected by means of a tie rod 107 to a bail 108 pivoted at 109 and provided with a bent lug 111 against which a shoulder 112 of a latch 113 normally bears under the action of a spring 117. The latch 113 is pivoted on a pin 114 on a slider 116 provided with three slots 118 allowing the slider to shift longitudinally on three corresponding pins 119 fixed in the frame of the machine. Fixed to the front end of the slider 116 is a clearing plate 121. The plate 121 (FIG. 3) lies behind the carriage 4 in the inoperative position thereof.

A further slider 122 (FIG. 1) is provided with a bent lug 123 normally in engagement with the latch 113 of the slider 116, and with two slots 124 sliding on two pins 126 on the slider 116. The slider 122 is provided with a pin 128 caused by the action of a spring 127 to bear against a cam 129 on the main shaft 22. The slider 116, the plate 121 and the slider 122 form a mechanism which actuated cyclically to clear the amount set on the carriage 4, while the latch 113 is an element adapted to render the mechanism inoperative, as will be seen better in the course of the description.

On the shaft 22 there is moreover fixed a cam 131 with which a lever 132 cooperates, said lever being fulcrumed on one of the pins 119 and being connected by means of a connecting rod 136 to the crank 98. The connecting rod 136 is moreover provided with a bent lug 137 adapted to cooperate with the latch 102.

Also connected to the crank 98 is a slider 138 provided with a shoulder 139 adapted to cooperate with a bent lug 141 on the lever 84. Moreover, the slider 138 is provided with a pin 142 engaged in a slot 143 in the shank 144 of a drive key 146 adapted to control the starting of the multiplication and to preset in known manner the release of the product and the transfer thereof to the sliders 38.

The calculating machine operates in the following manner.

The key 56 is used essentially to raise a given amount to a power. The amount is set on the carriage 4 (FIG. 2) by means of the numeral keys 42 and the sliders 43 by pushing the stops 7 and 8 to the rear. The sliders 43 push the universal bar 46 to the rear and the universal bar pushes a stop 13 to the rear each time, by means of the finger 49, so that the carriage 4 (FIG. 3) can advance to the left step by step.

With the advance of the carriage 4 to the left, the lever 18 turns in a counterclockwise direction and, in this way, causes the lever 29 (FIG. 4) to turn in a counterclockwise direction. In this way, the slider 34 is shifted to the rear, sliding the projection 36 along the scale 37 (FIG. 3) to indicate to the operator the number of orders set.

The lever 62 (FIGS. 2 and 4), now longer restrained by the pin 66, bears against the pin 67, bringing the lug 61 into the path of the projection 58 of the shank 57.

At the end of the setting operation and before a multiplier transfer key is depressed, the key 56 is depressed until the shank 57 is arrested by the projection 58 striking the lug 61 in the position shown in solid lines in FIG. 2. At the same time, the lug 81 leaves the shoulder 82 and, owing to the action of the spring 86, the lever 84 jumps in a clockwise direction and locks the shank 57 in the depressed position by means of the shoulder 87, which is disposed above the lug 81. Moreover, the shoulder 101 of the shank 57 is brought out of the path of the lug 99 of the lever 92.

Furthermore, the lug 68 of the shank 57 leaves the shoulder 69 and, by acting on the inclined edge 70, causes the lever 71 to rotate in a counterclockwise direction. The tie rod 107 is then pulled forward and the lever 108 consequently turns in a counterclockwise direction. The lug 111 of the lever 108 raises the latch 113 out of engagement with the lug 123, thereby rendering the slider 116 and the plate 121 independent of the slider 122.

On depression of the multiplier key, a cycle of the shaft 22 starts during which the amount which has been set is transferred from the carriage 4 to the sliders 38.

At the beginning of the cycle, the cam 131 causes the connecting rod 136 to move forward through the action of the lever 132, and the connecting rod 136, in turn, causes the crank 98 to turn in a counterclockwise direction. Due to the action of the spring 96, the lever 92 follows a counterclockwise rotation of the crank 98 and causes the lug 99 to be arrested against the shank 57 in the path of the shoulder 101. Moreover, the crank 98 carries the slider 138 along to the rear and, by means of the shoulder 139, this slider causes the lever 84 to turn in a counterclockwise direction, thereby releasing the lug 81 from the shoulder 82. Owing to the action of the spring 55, the key 56 is locked by the lug 99 of the lever 91 engaging behind the shoulder 101.

Towards the end of the cycle, the cam 23 (FIG. 4) causes the lever 18 (FIG. 3) to rotate in a clockwise direction by means of the lever 24 and the lever 29, thus returning the carriage 4 to the right. Immediately afterwards, the cam 129 (FIG. 1) causes the slider 122 to be moved forward. As the key 56 has made the slider 116 independent of the slider 122, the plate 121 does not, however, clear the amount set in the carriage 4.

At the end of the cycle, the cam 131 carries the connecting rod 136 back to the rear by means of the lever 132. The crank 98 then turns in a clockwise direction, followed by the lever 92, which therefore brings the lug 99 out of the path of the shoulder 101. The key 56 can now return to the inoperative position shown in FIG. 1, whereby the latch 113 again engages the lug 123. The amount previously set remains set in the carriage 4, while the escapement stop 13 of the highest order, being held forward by the spring 16, is engaged by the escapement dog 14 and holds the carriage 4 in its right-hand (inoperative) transverse position.

Since, with the carriage in its inoperative position, the pin 66 holds the lug 61 of the lever 62 out of the path of the projection 58, by now depressing the key 56 again the shank 57 can perform a stroke longer than the preceding one until the shoulder 59 encounters the lug 61 (FIG. 2). During the first part of the stroke of the key 56, the lug 68, acting on the inclined edge 70, causes the lever 71 to turn in a counterclockwise direction. Through the tie rod 107 and the bail 108, the lever 71 disengages the latch 113 from the lug 123, as in the preceding case. During the second part of the stroke of the key 56, the lug 68 slides along the shoulder 75 of the lever 71 and engages the arm 80 of the bail 74. This bail turns in a clockwise direction and acts on the pin 79 through the arm 78 and shifts the slider 47 to the rear. The finger 49 therefore again sets the stop 13 of the highest order of the carriage 4 (FIG. 3), which consequently jumps to the left until the first stop 13 following the lowest order set encounters the escapement dog 14, whereby the amount set in the slide can be used as a multiplier. The lever 18 is thus rotated in a counterclockwise direction and the pin 66 of the slider 34 leaves the lever 62 (FIG. 4). The latter, however, is unable to turn in a counterclockwise direction because the projection 58 of the shank 57 is locking the lug 61.

During the second part of the stroke of the key **56**, the pin **89** (FIG. 2) causes the lever **92** to turn in a clockwise direction, thus moving the lug **99** away from the shoulder **101**. The lever **92** remains locked in the new position reached by the latch **102**, which, on being lowered, brings the tooth **106** into engagement with the fixed plate **104** and locates its lower end in the path of the lug **137** of the connecting rod **136**.

Furthermore, the lever **84** jumps in a clockwise direction, carrying the shoulder **87** into the path of the lug **81**, which in any case arrests the edge **88**.

When the key **56** is released, the shank **57** is arrested by means of the lug **81** against the shoulder **87** of the lever **84**, thus reassuming the position already described in the case of the setting operation and shown in solid lines in FIG. 2. The lever **92**, however, stays in its turned position, with the lug **99** detached from the shoulder **101** because of the latch **102**.

If we now assume that the raising of the amount set to a power is being limited to squaring only, the usual multiplication start key, which is not shown in the drawings, is depressed. At the beginning of the first multiplication cycle, the connecting rod **136** is shifted forward by the cam **131** and causes the crank **98** to turn in a counterclockwise direction. The crank **98** carries the slider **138** to the rear and, by means of the shoulder **139**, this slider causes the lever **84** to turn in a counterclockwise direction. The shoulder **87** of the lever **84** leaves the lug **81** and the key **56** immediately returns upward to the inoperative position. The lever **71** is now turned in a clockwise direction by the spring **73** and the latch **113** again engages the lug **123** (FIG. 1), reconnecting the slider **122** to the slider **116**.

Moreover, by means of the lug **137**, the connecting rod **136** causes the latch **102** to turn in a counterclockwise direction the latch leaving the plate **104** and thus enabling the spring **96** to bring the lug **99** back into contact with the shoulder **101** of the shank **57**.

At the end of the last multiplication cycle, after the return of the carriage **4** to the right, the cam **129** pushes the slider **122** and the plate **121** forward and the plate **121** clears the amount set.

Assuming, on the other hand, that it is desired to raise the amount set to a power greater than two, after depressing the key **56** as described in the preceding case, instead of depressing the multiplication start key, the key **146** (FIG. 1) is depressed. This carries the multiplication start key along with it in known manner and arranges the transfer of the product from the adder to the sliders **38** in manner known per se, thus causing the product to assume the function of multiplier.

Moreover, by means of the slot **143** and the pin **142**, the key **146** causes the slider **138** to turn in a clockwise direction. In this way, at the beginning of each multiplication cycle, when the connecting rod **136** is shifted forward and the slider **138** is shifted to the rear, the shoulder **139** does not encounter the lug **141** of the lever **84**. The lever **84** then keeps the shoulder **87** in the path of the lug **81** of the shank **57**. The key **56** now returns upward only partially and, at the end of the cycle of release of the total, remains locked in the position reached at the beginning of the drive cycle started immediately after the setting operation, whereby the multiplier remains set in the carriage.

If it is necessary to continue the operation of raising to a power beyond the third power, it is sufficient first to depress the key **56** for the residual stroke adapted to shift the slider **47** to the rear and to bring the carriage **4** back to the left with the amount set retained, and then to depress the key **146** again.

At the end of the raising to successive powers, on the other hand, the last of the series of multiplication cycles is started by means of the normal multiplication start key. The slider **138** then encounters the lug **141** of the lever **84**, which releases the key **56**. The key **56** can return upward immediately, because the lug **99** is held away from the shoulder **101** by means of the latch **102**. The latch **113** finally reengages the lug **123**, whereby in the last multiplication cycle the plate **121** clears the amount set in the carriage **4**.

It is understood that various modifications may be made to the calculating machine which has been described without departing from the scope of the invention. For example, the key **56** can be capable of starting the multiplication directly and of prearranging the transfer of the product to the sliders **38**, thus further simplifying the store. Moreover, the amount set in the carriage may be used for purposes other than raising to a power.

I claim:

1. A 10-key calculating machine having a set up carriage movable transversely step by step from a rest position on the setting of each numeral key, a first mechanism adapted to be actuated cyclically to bring said carriage back to said rest position and a second mechanism adapted to be actuated cyclically to clear the amount set up on said carriage after it has been brought back to said inoperative position, wherein the improvement comprises:

a. an element adapted to render said second mechanism inoperative;

b. a predisposing member adapted to be displaced manually to a first position to engage said element; and

c. control means controlled by said member when displaced to a second position for bringing said carriage back instantaneously into the transverse position corresponding to the amount set therein upon actuation of said first mechanism.

2. A calculating machine according to claim **1**, wherein said carriage carries in each order a column of settable stops, one of which cooperating with an escapement dog, the stop of the highest order cooperating with said dog being settable momentarily and returning resiliently to rest each time, comprising in combination:

d. means conditioned by said carriage when located in said rest position to enable said predisposing member to be displaced past said first position to said second position, said control means being then adapted to set said stop of the highest order.

3. A 10-key calculating machine having a stop pin carriage movable transversely step by step from a rest position on the setting of each numeral key, a cyclically rotatable main shaft, a first mechanism operable by said main shaft to bring said carriage back to said rest position, wherein the improvement comprises:

a. a plate for resetting the set stop pins of said carriage;

b. means operable by said main shaft for actuating said plate after said carriage has been returned to said rest position;

c. a latch pivotally mounted on said plate and normally latched with said actuating means;

d. a predisposing key depressible through a first stroke to unlatch said latch from said actuating means; and

e. and control means controlled by said predisposing key when depressed through a second stroke past said first stroke for bringing said carriage back instantaneously into the transverse position corresponding to the amount set therein upon operation of said first mechanism.

4. A calculating machine according to claim **3**, comprising in combination:

f. a first locking member normally adapted to lock said key in the position corresponding to said first stroke;

g. means operable by said shaft to render inoperative said first locking member at the beginning of the cycle of said shaft; and

h. and a second locking member operable to prevent the return of said key until after the action of said shaft on said actuating means.

5. A calculating machine according to claim **4**, comprising in combination:

i. means for storing an amount;

j. a storing key depressible to control the transfer of said amount to said storage means; and

k. means controlled by said storing key to prevent the action of said shaft on said first locking member.

6. A calculating machine according to claim **4**, comprising in combination:

i. a third locking member adapted to be actuated by said predisposing key during said second stroke to prevent the action of said second locking member, said third locking member being rendered ineffective by said shaft at the beginning of the cycle.