

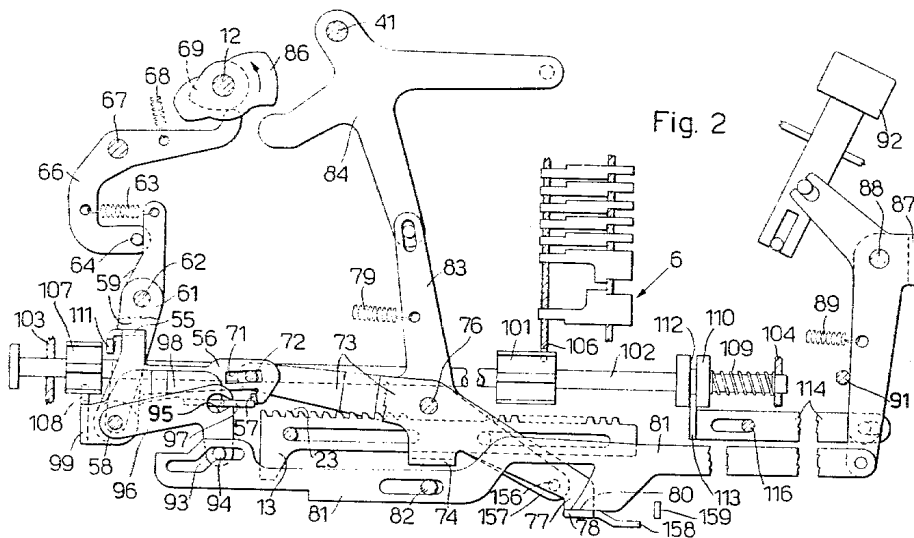
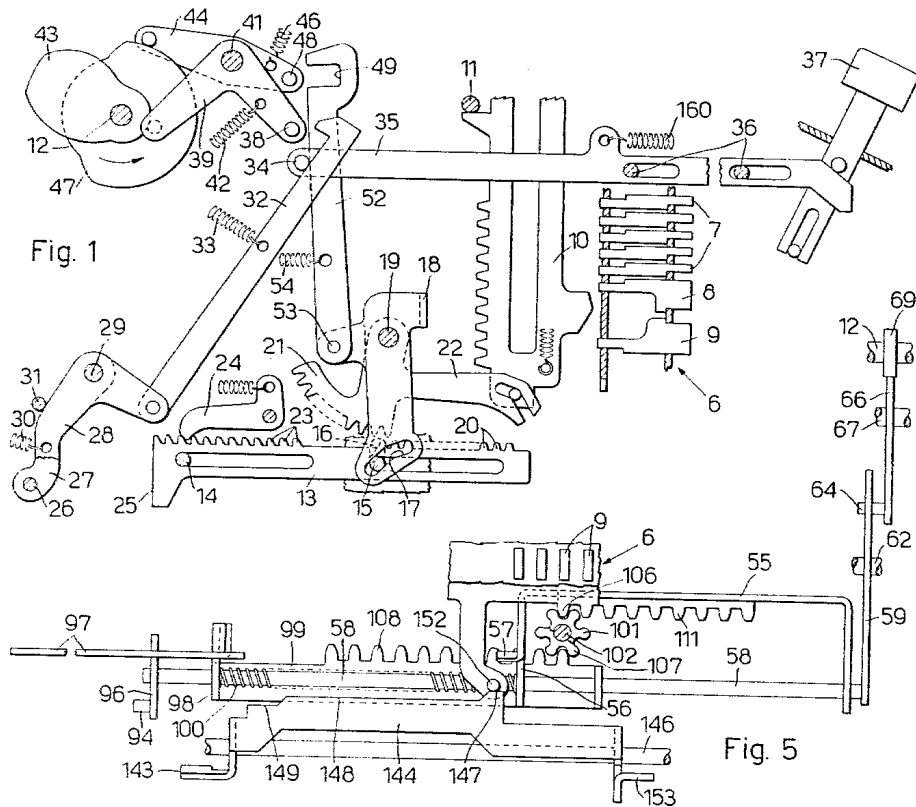
Dec. 14, 1965

T. GASSINO
AUTOMATIC MULTIPLICATION DEVICE FOR A TEN
KEY CALCULATING MACHINE

3,223,318

Filed April 5, 1965

2 Sheets-Sheet 1



INVENTOR.
TERESIO GASSINO
BY *John Trappenberg*
AGENT

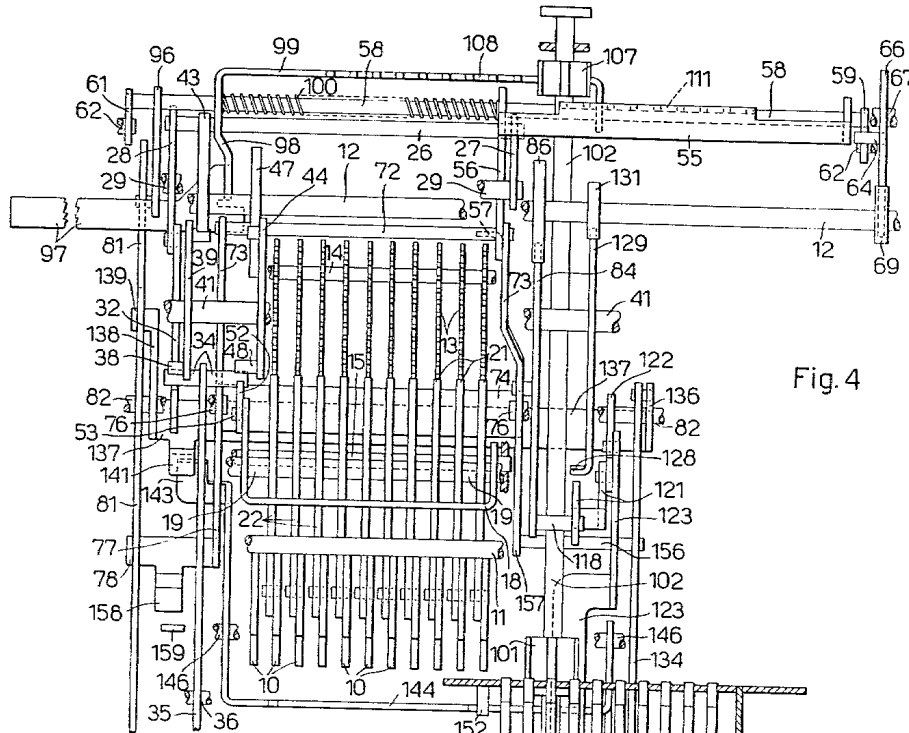
Dec. 14, 1965

T. GASSINO
AUTOMATIC MULTIPLICATION DEVICE FOR A TEN
KEY CALCULATING MACHINE

3,223,318

Filed April 5, 1965

2 Sheets-Sheet 2



1

2

3,223,318

AUTOMATIC MULTIPLICATION DEVICE FOR A TEN KEY CALCULATING MACHINE

Teresio Gassino, Ivrea, Italy, assignor to Ing. C. Olivetti & C., S.p.A., Ivrea, Italy, a corporation of Italy

Filed Apr. 5, 1965, Ser. No. 445,454

Claims priority, application Italy, Apr. 7, 1964, 7,517/64

9 Claims. (Cl. 235—60)

This invention relates to an automatic multiplication device for a ten key calculating machine having a set of actuators, a transversely traveling set up carriage adapted to store a multiplicand, a multiplier storing device adapted to store a multiplier, a cycle counting member transversely movable for sequentially co-operating with the various orders of said storing device, and a locking member transversely movable according to the number of orders of said multiplicand and adapted to sense said storing device to prevent the machine from effecting a multiplication when the sum of the number of orders of said multiplicand and of said multiplier is higher than the number of said actuators.

There are known various multiplication devices of the above kind. In said known devices generally the counting member and the locking member are transversely moved by independent means, whereby the multiplication device is relatively intricate and expensive to manufacture.

This disadvantage is obviated by the automatic multiplication device according to the invention which is characterized by moving means connected to said carriage for concomitant movement and normally effective for moving said locking member, multiplication control means being provided for causing said moving means to move said counting member instead of said locking member.

This and other characteristics of the invention will become apparent from the following description of a preferred embodiment thereof, and from the accompanying drawings, wherein:

FIG. 1 is a left hand longitudinal partial sectional view of a ten key calculating machine embodying an automatic multiplication device according to the invention;

FIG. 2 is another left hand partial sectional view of the machine;

FIG. 3 is a third sectional view of the machine;

FIG. 4 is a partial plan view of the machine;

FIG. 5 is a front view of a detail of FIG. 4.

With reference to FIG. 1, the numeral 6 generically indicates a conventional transversely traveling set up carriage of a ten key calculating machine. The carriage 6 comprises in each denominational order a plurality of stop pins 7 for the figures from one to nine, a stop pin 8 for the zero figure, and a stop pin 9 for controlling the transverse step by step travel of the carriage 6 upon setting up each order. The set stop pins 7 and 8 of the carriage 6 are adapted to cooperate with a set of actuators 10 differentially movable upwards under the control of a universal bar 11 operable in a known manner by a conventional main shaft 12 adapted to be cyclically rotated one revolution.

The calculating machine comprises also a multiplier storing device adapted to store a multiplier, the multiplicand being stored in the set up carriage 6. More particularly, said storing device comprises in each order an element or rack 13 differentially settable rearwards (leftwards in FIG. 1) from the zero position shown in the drawings. The racks 13 are slidably mounted on a stationary shaft 14 and on a shaft 15 vertically slidable on a pair of vertical slots 16 of the machine frame, one slot 16 only being shown in FIG. 1. The bar 15 engages also a pair of cam slots 17 provided on a pair of arms of

a bail 18 fulcrumed on a stationary shaft 19. Each rack 13 is provided with a toothed edge 20 adapted to engage a corresponding toothed sector 21 fulcrumed on the shaft 19 and having an arm 22 pin and slot connected with a corresponding actuator 10. A second toothed edge 23 of each rack 13 normally engages a corresponding spring urged locking lever 24.

Furthermore each rack 13 is provided with a shoulder 25 adapted to be engaged by a universal bar 26 secured to a pair of arms 27 and 28 fulcrumed on a stationary shaft 29. The arm 28 is normally urged by a spring 30 to contact a stationary stop member 31 and is linked with a pawl 32 normally urged by a spring 33 to contact a pin 34 of a slide 35. This latter is slidably mounted on a pair of stationary pins 36 and is urged forwards by a spring 160. The slide 35 is adapted to be displaced rearwards at the depression of a multiplier storing key 37. The pawl 32 is adapted to cooperate with a pin 38 of a lever 39 fulcrumed on a stationary shaft 41 and normally urged by a spring 42 to contact a cam 43 of the main shaft 12. Another lever 44 fulcrumed on the shaft 41 is urged by a spring 46 to contact a second cam 47 of the main shaft 12. The lever 44 is provided with a pin 48 adapted to be engaged by a notch 49 of a lever 52 linked at 53 with the bail 18 and normally urged by a spring 54 to contact the pin 34.

The calculating machine embodies a multiplication device comprising a cycle counting member formed of a bail 55 (FIGS. 2 and 4) having an arm 56 provided with a bent lug 57 adapted to sequentially cooperate with the toothed edge 23 of the various racks 13. The bail 55 is rotatably and slidably mounted on a guiding means or bar 58 secured to a pair of arms 59 and 61 fulcrumed on a pair of corresponding stationary pivots 62. The arm 59 is normally urged by a spring 63 (FIG. 2) to contact a pin 64 of a lever 66 fulcrumed on a stationary pivot 67. The lever 66 is urged by a spring 68 to contact a cam 69 of the main shaft 12.

The arm 56 is provided with a slot 71 cooperating with a bar 72 (FIG. 4) transversely guiding the bail 55 together with the bar 58. The bar 72 is secured to a pair of arms 73 of a bail 74 fulcrumed on a pair of stationary pivots 76 and operable by yieldable means formed of a spring 79 (FIG. 2). More particularly, the bail 74 is provided with a third arm 77 having a lug 78 normally urged by the spring 79 to contact a projection 80 of a slide 81 longitudinally slidable on a stationary shaft 82. Another arm 83 of the bail 74 is pin and slot connected with a lever 84 fulcrumed on the shaft 41 and adapted to cooperate with a cam 86 of the main shaft 12.

The multiplication device is also provided with multiplication control means comprising a multiplication key 92, the stem of which is pin and slot connected with a bail 87 fulcrumed at 88 and urged by a spring 89 to contact a stationary stop member 91. The bail 87 is also connected with the forward end of the slide 81, whereas the rear end thereof is provided with a cam slot 93 engaging a pin 94 of a lever 96 fulcrumed on the bar 58. The lever 96 is provided with a notch 95 engaging a transversely movable locking member formed of a lug 97 (FIG. 4) of an arm 98 of a bail 99. The bail 99 is also slidably and rotatably mounted on the guiding means or bar 58, whereas a common compression spring 100 (FIGS. 4 and 5) is provided between the arm 98 of the bail 99 and the arm 56 of the bail 55.

Furthermore, the multiplication device is provided with moving means connected to the carriage 6 for concomitant movement and comprising a pinion 107 (FIG. 2) secured to a longitudinal shaft 102 rotatably and slidably mounted on a pair of portions 103 and 104 of the machine frame. Secured to the shaft 102 is a gear 101 constantly engaging a toothed edge 106 (FIG. 5) pro-

vided on the carriage 6. A compression spring 109 (FIG. 2) located between the portion 104 and a hub 110 secured to the shaft 102 normally urges this latter rearwards to cause the pinion 107 to engage at its lower side a first rack 108 (FIG. 5) provided on the bail 99 of the locking member 97. The pinion 107 is further adapted to engage at its upper side a second rack 111 provided on the counting member or bar 55. In this order the hub 110 (FIG. 2) is provided with an annular groove 112 engaging a lug 113 of a slide 114 slidably mounted on a stationary pin 116 and pin and slot connected with the bail 87.

The lever 84 (FIG. 3) is provided with an arm 117 having a pin 118 engaging a cam slot 119 of a pawl 121. This latter is linked with a lever 122 pivoted on the shaft 82 and in turn linked with a horizontal slide 123. This latter is slidably mounted on a stationary pin 124 and is urged forwards by a spring 125. Furthermore the slide 123 is provided with a lug 126 (FIGS. 3 and 4) adapted to set a zero stop pin 8 and a stop pin 9 controlling the step by step travel of the carriage 6. The pawl 121 (FIG. 3) is adapted to cooperate with a lug 128 of a lever 129 fulcrumed on the shaft 41 and normally urged by a spring 130 to contact a cam 131 of the main shaft 12.

The slide 123 is also provided with a bent lug 132 adapted to cooperate with a shoulder 133 of a link 134 normally urged by a spring 135 to contact a stationary stop member 145. The link 134 is linked with an arm 136 of a bail 137 pivoted on the shaft 82. A second arm 138 of the bail 137 is provided with a bent lug 139 adapted to cooperate with a shoulder 140 of the slide 81.

The bail 137 is also provided with a lug 141 normally urged by a spring 142 to contact a lug 143 of a bail 144 pivoted on a shaft 146. The transverse part of the bail 144 (FIG. 5) is provided with a cam shaped upper edge comprising three different portions 147, 148 and 149. The bail 144 is urged by a spring 151 (FIG. 3) to contact a pin 152 secured to the carriage 6. Normally when the carriage 6 is in the right or rest position, as shown in FIG. 5, the pin 152 is contacted by the portion 147 of the upper edge of the bail 144. This latter is further provided with a lug 153 adapted to cooperate with a projection 154 (FIG. 3) of the link 134.

The bail 74 (FIG. 2) is also provided with an arm 157 having a pin 156 adapted to cooperate with the lower edge of the link 134 (FIGS. 3 and 4). The lug 78 (FIG. 2) of the bail 74 is provided with a projection 158 adapted to cooperate with a control member 159 adapted to control the engagement of the conventional totalizer not shown with the actuators 10 (FIG. 1) in a manner known per se. Particularly, the control member 159 is adapted to be yieldably displaced rearwards at the beginning of each machine cycle and, if it is arrested after a predetermined stroke, it controls the engagement of the totalizer for an accumulating cycle. On the contrary, if the member 159 is moved through a longer stroke, it prevents the engagement of the totalizer, whereby a non add cycle will be effected.

The multiplication mechanism operates as follows:

At first the multiplier is set through the ten key keyboard into the carriage 6. Then upon depressing the multiplier key 37 (FIG. 1) the main shaft 12 is caused to effect a non add cycle, while the key 37 displaces the slide 35 rearwards. On one hand the pin 34 of the slide 35 releases the pawl 32, whereby the spring 33 locates the pawl 32 on the path of the pin 38 of the lever 39. On the other hand the pin 34 releases the lever 52, whereby the spring 54 causes the notch 49 to engage the pin 48 of the lever 44.

At the beginning of the cycle of the main shaft 12, the cam 43 rocks the lever 39 counterclockwise and through the pin 38 displaces the pawl 32 upwards. Then the pawl 32 rocks the two arms 27 and 28 counterclockwise, whereby the universal bar 26 engages the shoulder 25 of the racks 13, thus returning all the racks 13 to their zero position, in the case they have been previously set rear-

wards. Simultaneously, the universal bar 11 releases the actuators 10 which are differentially moved upwards until arrested by the set up pins 7 and 8 of the carriage 6. The actuators 10 thus rock differentially the corresponding sectors 21 counterclockwise. Now the multiplier is printed on the paper in a known manner.

Thereafter the cam 47 causes the lever 44 to be rocked clockwise by the spring 46. Now the pin 48 of the lever 44 displaces upwards the lever 52, thus rocking the bail 18 clockwise. The cam slots 17 of the bail 18 displace the shaft 15 upwards along the vertical slots 16, thus engaging the racks 13 with the sectors 21. The universal bar 11 is now returned downwards and restores the actuators 10 together with the sectors 21. Now these latter set the racks 13 rearwards according to the multiplier set up in the carriage 6.

Near the end of the machine cycle the cam 47 restores the lever 44, which through the lever 52, the bail 18 and the shaft 15 disengages the racks 13 from the sectors 21, while the carriage 6 is restored rightwards. At the end of this cycle the key 37 is restored in a known manner and the slide 35 is returned forwards by the spring 160, which prevails over the springs 33 and 54, whereby the pin 34 of the slide 35 disengages the pawl 32 from the pin 38 and the lever 52 from the pin 48.

Now the multiplicand is set up through the ten key keyboard into the carriage 6. This latter is thus displaced leftwards (FIGS. 4 and 5) and, through the gear 101, the shaft 102 and the pinion 107, moves from left to right the bail 99 a number of steps equal to the multiplicand orders. The lug 97 is thus brought over a corresponding number of racks 13. It is to be noted that the bail 99 is moved rightwards whenever the carriage 6 is displaced leftwards, but till the multiplication key 92 (FIG. 2) is depressed said displacement has no effect.

Now the multiplication key 92 is depressed and rocks the bail 87 counterclockwise, thus displacing the slide 81 forwards. The cam slot 93 of the slide 81 rocks clockwise the lever 96 together with the bail 99, thus causing the lug 97 to sense the racks 13 of the multiplier storing device. If the sum of number of orders of the multiplicand and of the multiplier is higher than the number of actuators 10, the lug 97 has reached at least one rack 13 set out of the zero position. The clockwise rotation of the bail 99 is thus arrested by said set rack 13 through the lug 97, whereby the lever 96 prevents the slide 81 from being fully displaced forwards. In this case the key 92 cannot be fully depressed and the machine is prevented from effecting the multiplication. The carriage 6 may be restored by depressing the conventional set up clearing key not shown.

On the contrary, if the sum of the number of orders of the multiplicand and of the multiplier is less than, or equal to the number of the actuators 10, the lug 97 does not reach the set rack 13 of the highest multiplier order. Therefore, the lug 97 is not arrested by the set racks 13, whereby the slide 81 may be fully displaced forwards and the key 92 may be fully depressed. Now the key 92 through the bail 87 displaces the slide 114 forwards, and the lug 113 through the hub 110 displaces forwards the shaft 102 together with the gear 101 and the pinion 107. However, the gear 101 due to its longitudinal size remains engaged with the toothed edge 106 of the carriage 6, while the pinion 107 at first engages the rack 111 of the bail 55 and then disengages the rack 108 of the bail 99. This latter is now restored leftwards (FIG. 5) by the compression spring 100. Furthermore the key 92 (FIG. 2) at the end of its downward stroke causes the main shaft 12 to be cycled.

The slide 81 when displaced forwards removes its projection 80 from the lug 78 of the bail 74. The spring 79 rocks thus the bail 74 counterclockwise and the lever 84 clockwise, whereby the lever 84 is now controlled by the cam 86 of the shaft 12. Furthermore, the slide 81 locates its shoulder 140 (FIG. 3) forwards with respect

5

to the lug 139 of the bail 137. In the case at least a multiplicand order has been set up, the carriage 6 when displaced leftwards has brought its pin 152 (FIG. 5) over the portion 148 of the bail 144. This latter has been thus rocked counterclockwise by the spring 151 (FIG. 3) and released the lug 141 of the bail 137, whereby the lug 139 thereof contacted the lower edge of the slide 81. Therefore, at the depression of the key 92 (FIG. 2) when the slide 81 is displaced forwards, the lug 139 latches the shoulder 140 of the slide 81 thus locking the key 92 in the depressed position through all the required multiplication cycles.

At the beginning of each machine cycle the cam 86 through the lever 84, the bail 74 and the bar 72 causes the lug 57 to sense the rack 13 of the lowest multiplier order under the action of the spring 79. If the sensed rack 13 is already in the zero position the lug 57 is not arrested by the rack 13 and the bail 74 is rocked counterclockwise. The projection 158 of the lug 78 is thus located above the rearward path of the totalizer engaging control member 159. This latter is thus displaced rearwards to condition the machine for a non add cycle.

On the contrary, if the sensed rack 13 is out of its zero position the lug 57 engages the toothed edge 23 of the rack 13 and is arrested thereby. The bail 74 remains now with the projection 158 on the rearward path of the control member 159 which is arrested in the position controlling an accumulating machine cycle. During the sensing action of the lug 57 the cam 69 rocks the lever 66 clockwise, thus causing the spring 63 to rock counterclockwise the arm 59 together with the bar 58 and the arm 61. The bar 58 moves now the bail 55 forwards and causes the lug 57 to return the engaged rack 13 one step forwards, thus counting the accumulating cycle of the main shaft 12.

Thereafter, the cam 86 temporarily restores the lever 84 and the bail 74 against the urge of the spring 79, while the multiplicand is printed on the paper. Of course in the subsequent machine cycles the machine is prevented from repeatedly printing the multiplicand, in a manner known per se. After the engagement of the totalizer with the actuators 10 (FIG. 1), the cam 86 through the lever 84 and the bail 74 causes the bar 72 (FIG. 2) to sense all the racks 13. If the rack 13 already returned one step has not yet returned to its zero position, the lug 57 is again arrested by the toothed edge 23 of said rack 13 without effect.

On the contrary, if said rack 13 is already located in its zero position, the lug 57 is not arrested by its toothed edge 23. Now, in the case at least another rack 13 is out of its zero position, this rack 13 arrests the bar 72 in such a position as to cause the lever 84 through the pin 118 (FIG. 3) and the cam slot 119 to locate the pawl 121 on the path of the lug 128 of the lever 129. Near the end of the machine cycle the cam 131 rocks the lever 129 counterclockwise and the lug 128 through the pawl 121 and the lever 122 displaces the slide 123 rearwards. Then the lug 126 engages the stop pins 8 and 9 of the highest unset order of the carriage 6, which will be thus moved one step leftwards. Now the carriage 6, through the gear 101 (FIG. 4), the shaft 102, the pinion 107 and the rack 111, moves the bail 55 one step leftwards, whereby the lug 57 is brought in correspondence with the rack 13 of the next higher order.

It is thus clear that the moving means 107 are connected to the carriage 6 for concomitant movement and are normally effective for moving the locking member 97 from left to right, the multiplication control means 92, 87, being provided for causing the moving means 107 to move the counting member 55 from right to left, instead of the locking member 97.

Finally, in the case the lug 57 has already reached the rack 13 of the highest multiplier order and this rack 13 has been returned to its zero position, when the cam 86

6

causes the bar 72 to sense all the racks 13, neither the lug 57, nor the bar 72 are arrested by these racks. Then the lever 84 is urged by the spring 79 to follow fully the cam 86, whereby the bail 74 is rocked counterclockwise through an angle wider than in the preceding case. The pin 156 of its arm 157 (FIG. 3) engages now the lower edge of the link 134 causing its shoulder 133 to be located on the path of the lug 132 of the slide 123. Simultaneously the lever 84 locates the pawl 121 on the path of lug 128 as in the preceding case. Now, when the cam 131 causes the slide 123 to be displaced rearwards, the lug 132 engages the shoulder 133 thus displacing the link 134 rearwards. The link 134 rocks the bail 137 counterclockwise, thus releasing the slide 81 from the lug 139. The spring 89 (FIG. 2) through the bail 87 restores now the slide 81 and the key 92, whereby at the end of this cycle the calculating machine will be stopped. The product may now be printed by taking the total from the totalizer, in a manner known per se.

In the case the key 92 is erroneously depressed without having set up any multiplicand order in the carriage 6, the pin 152 (FIG. 5) of the carriage 6 engages still the portion 147 of the bail 144. This latter remains thus in the position of FIG. 3, and through its lug 143 prevents the bail 137 from being rocked clockwise. The slide 81 is thus not latched by the lug 139, and the machine will be stopped at the end of the first cycle, independently of the multiplier stored in the racks 13.

If the carriage 6 has been accidentally fully displaced leftwards, while a rack 13 at right of the lug 57 (FIG. 5) has not been returned to its zero position, the pin 152 reaches the portion 149 of the bail 144. This latter is then rocked counterclockwise by the spring 151 prevailing over the spring 135, whereby the lug 153 engages the projection 154 of the link 134, which locates its shoulder 133 on the path of the lug 132. The machine will be thus arrested in the manner above described.

It is intended that many modifications, improvements and additions of parts may be made to the described multiplication device, without departing from the scope of the invention.

What I claim is:

1. An automatic multiplication device for a ten key calculating machine having a set of actuators, a transversely traveling set up carriage adapted to store a multiplicand, and a multiplier storing device adapted to store a multiplier, comprising in combination:

- a cycle counting member for sequentially cooperating with the various orders of said storing device,
- a locking member transversely movable according to the number of orders of said multiplicand,
- means for causing said locking member to sense said storing device to prevent the machine from effecting a multiplication when the sum of the number of orders of said multiplicand and said multiplier is higher than the number of said actuators,
- moving means connected to said carriage for concomitant movement,
- and multiplication control means for causing said moving means to alternately move said locking member and said counting member.

2. An automatic multiplication device for a ten key calculating machine having a set of actuators, a transversely traveling set up carriage adapted to store a multiplicand, and a multiplier storing device adapted to store a multiplier, comprising in combination:

- a cycle counting member for sequentially cooperating with the various orders of said storing device,
- a locking member transversely movable according to the number of orders of said multiplicand,
- means for causing said locking member to sense said storing device to prevent the machine from effecting a multiplication when the sum of the number of orders of said multiplicand and said multiplier is higher than the number of said actuators,

- (d) moving means connected to said carriage for concomitant movement and normally effective for moving said locking member,
- (e) and multiplication control means operable at the beginning of a multiplication for causing said moving means to move said counting member instead of said locking member. 5
3. An automatic multiplication device for a ten key calculating machine having a set of actuators, a transversely traveling set up carriage adapted to store a multiplicand, and a multiorder storing device adapted to store a multiplier, comprising in combination: 10
- (a) a cycle counting member for sequentially cooperating with the various orders of said storing device,
- (b) a transversely movable locking member, 15
- (c) moving means connected to said carriage for concomitant movement and normally engaging said locking member to move same from left to right according to the number of orders of said multiplicand,
- (d) means for causing said locking member to sense said storing device and to prevent the machine from effecting a multiplication when at least one significant order of said storing device is sensed, 20
- (e) and multiplication control means operable at the beginning of a multiplication for causing said moving means to disengage said locking member and to engage said counting member to move same from right to left. 25
4. An automatic multiplication device for a ten key calculating machine having a set of actuators, a transversely traveling set up carriage adapted to store a multiplicand, and a multiorder storing device adapted to store a multiplier, comprising in combination: 30
- (a) a cycle counting member for sequentially cooperating with the various orders of said storing device, 35
- (b) a transversely movable locking member,
- (c) a pinion connected to said carriage for being rotated concomitantly with the transverse travel thereof,
- (d) a first rack connected to said locking member and normally engaging said pinion at a predetermined side thereof for being moved from left to right according to the number of orders of said multiplicand, 40
- (e) means for causing said locking member to sense said storing device and to prevent the machine from effecting the multiplication when at least one significant order of said storing device is sensed, 45
- (f) a second rack connected to said counting member and adapted to engage said pinion at a side opposite to said predetermined side for being moved from right to left, 50
- (g) and multiplication control means operable at the beginning of a multiplication for shifting said pinion to disengage said first rack and to engage said second rack.
5. An automatic multiplication device for a ten key calculating machine having a set of actuators, a transversely traveling set up carriage adapted to store a multiplicand, and a multiorder storing device adapted to store a multiplier, comprising in combination: 55
- (a) a cycle counting member for sequentially cooperating with the various orders of said storing device, 60
- (b) a transversely movable locking member,
- (c) a pinion connected to said carriage for being rotated concomitantly with the transverse travel thereof, 65
- (d) a first rack connected to said locking member and normally engaging said pinion at a predetermined side thereof for being moved from left to right according to the number of orders of said multiplicand,
- (e) means for causing said locking member to sense said storing device and to prevent the machine from effecting the multiplication when at least one significant order of said storing device is sensed, 70
- (f) a second rack connected to said counting member and adapted to engage said pinion at a side opposite 75

- to said predetermined side for being moved from right to left,
- (g) multiplication control means operable at the beginning of a multiplication for shifting said pinion to disengage said first rack and to engage said second rack,
- (h) common guiding means for said racks,
- (i) and common yieldable means urging said racks in a direction opposite to the direction of their movement for restoring said racks when disengaged from said pinion.
6. An automatic multiplication device for a ten key calculating machine having a set of actuators, a transversely traveling set up carriage adapted to store a multiplicand, and a multiorder storing device adapted to store a multiplier, comprising in combination:
- (a) an element on each order of said storing device adapted to be differentially set from a zero position,
- (b) a cycle counting member operable for sequentially engaging said elements to individually return same step by step to said zero position,
- (c) means cyclically operating said counting member,
- (d) a locking member transversely movable according to the number of orders of said multiplicand,
- (e) means for causing said locking member to sense said storing device to prevent the machine from effecting a multiplication when the sum of the number of orders of said multiplicand and said multiplier is higher than the number of said actuators,
- (f) moving means connected to said carriage for concomitant movement,
- (g) multiplication control means for causing said moving means to alternately move said locking member and said counting member,
- (h) and yieldable means for causing said counting member to sense the set element of the lowest order before being operated to condition the calculating machine for an accumulating cycle when the sensed element is out of said zero position, and for a non add cycle when the sensed element is in said zero position.
7. An automatic multiplication device for a ten key calculating machine having a set of actuators, a transversely traveling set up carriage adapted to store a multiplicand, and a multiorder storing device adapted to store a multiplier, comprising in combination:
- (a) an element on each order of said storing device adapted to be differentially set from a zero position,
- (b) a cycle counting member operable for sequentially engaging said elements to individually return same step by step to said zero position,
- (c) means cyclically operating said counting member,
- (d) a locking member transversely movable according to the number of orders of said multiplicand,
- (e) means for causing said locking member to sense said storing device to prevent the machine from effecting a multiplication when the sum of the number of orders of said multiplicand and said multiplier is higher than the number of said actuators,
- (f) moving means connected to said carriage for concomitant movement,
- (g) multiplication control means for causing said moving means to alternately move said locking member and said counting member,
- (h) a transverse bar for guiding said counting member,
- (i) and yieldable means for causing said bar to simultaneously sense said elements after operation of said counting member to shift said carriage one step when said bar senses at least one element out of said zero position and to stop the calculating machine when said bar senses all said elements in said zero position.
8. An automatic multiplication device for a ten key calculating machine having a set of actuators, a transversely traveling set up carriage adapted to store a multi-

plicand, and a multiorder storing device adapted to store a multiplier, comprising in combination:

- (a) an element on each order of said storing device adapted to be differentially set from a zero position,
- (b) a cycle counting member operable for sequentially engaging said elements to individually return same step by step to said zero position,
- (c) means cyclically operating said counting member,
- (d) a locking member transversely movable according to the number of orders of said multiplicand.
- (e) means for causing said locking member to sense said storing device to prevent the machine from effecting a multiplication when the sum of the number of orders of said multiplicand and said multiplier is higher than the number of said actuators,
- (f) moving means connected to said carriage for concomitant movement,
- (g) multiplication control means for causing said moving means to alternately move said locking member and said counting member,
- (h) a transverse bar for guiding said counting member,
- (i) and yieldable means for causing said counting member to sense the set element of the lowest order before being operated to condition the calculating machine for an accumulating cycle when the sensed element is out of said zero position and for a non add cycle when the sensed element is in said zero position, said yieldable means being further adapted to cause said bar to simultaneously sense said elements after operation of said counting member to shift said carriage when said bar senses at least one element out of said zero position and to stop the calculating machine when said bar senses all said elements in said zero position.

9. An automatic multiplication device for a ten key calculating machine having a set of actuators, a transversely traveling set up carriage adapted to store a multiplicand, and a multiorder storing device adapted to store a multiplier, comprising in combination:

- (a) an element on each order of said storing device adapted to be differentially set from a zero position,
- (b) a cycle counting member operable for sequentially engaging said elements to individually return same step by step to said zero position,
- (c) means cyclically operating said counting member,
- (d) a transverse bar for guiding said counting member,
- (e) and yieldable means for causing said counting member to sense the set element of the lowest order before being operated to condition the calculating machine for an accumulating cycle when the sensed element is out of said zero position and for a non add cycle when the sensed element is in said zero position, said yieldable means being further adapted to cause said bar to simultaneously sense said elements after operation of said counting member to shift said carriage when said bar senses at least one element out of said zero position and to stop the calculating machine when said bar senses all said elements in said zero position.

References Cited by the Applicant

UNITED STATES PATENTS

3,005,585 9/1961 Capillare et al. ----- 235—60

LEO SMILOW, *Primary Examiner.*