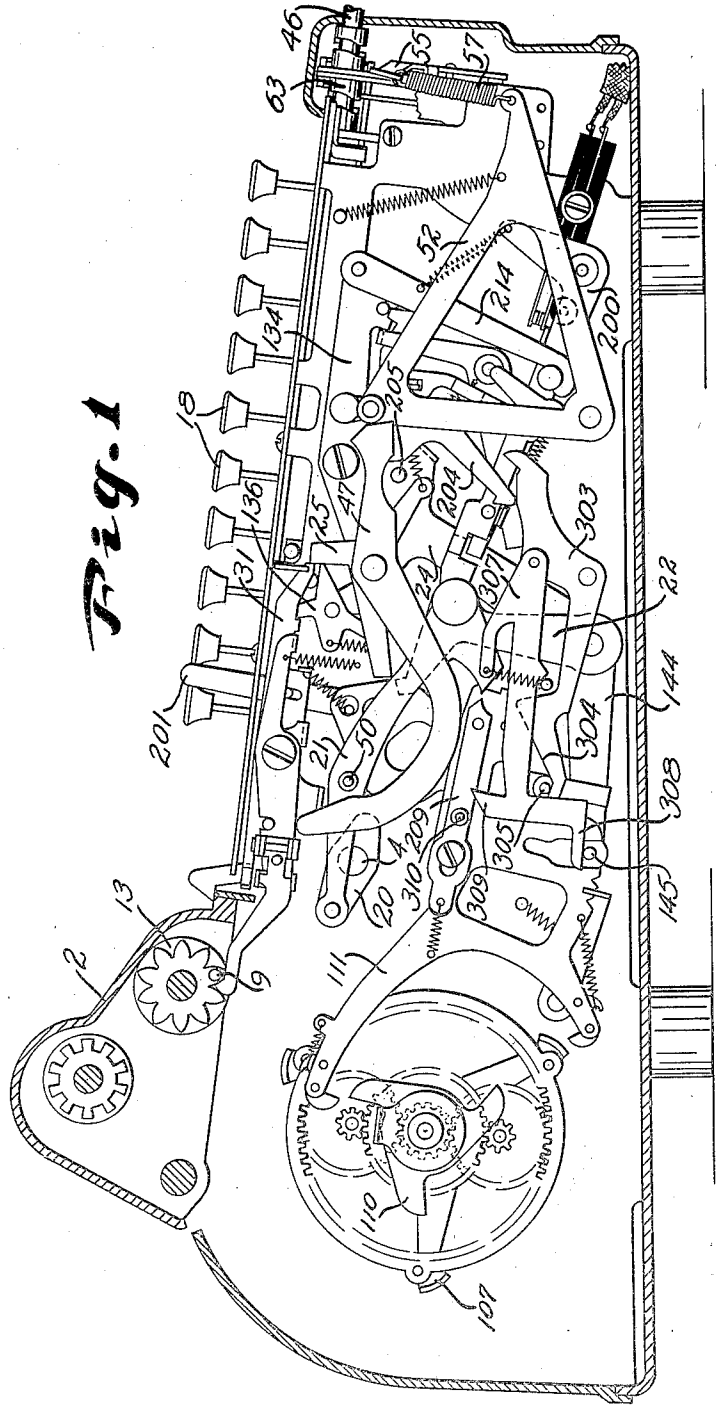
July 7, 1936. S. HILDER 2,046,820

CALCULATING MACHINE

Filed Aug. 27, 1935 3 Sheets-Sheet 1



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CALCULATING MACHINE

Filed Aug. 27, 1935 3 Sheets-Sheet 2

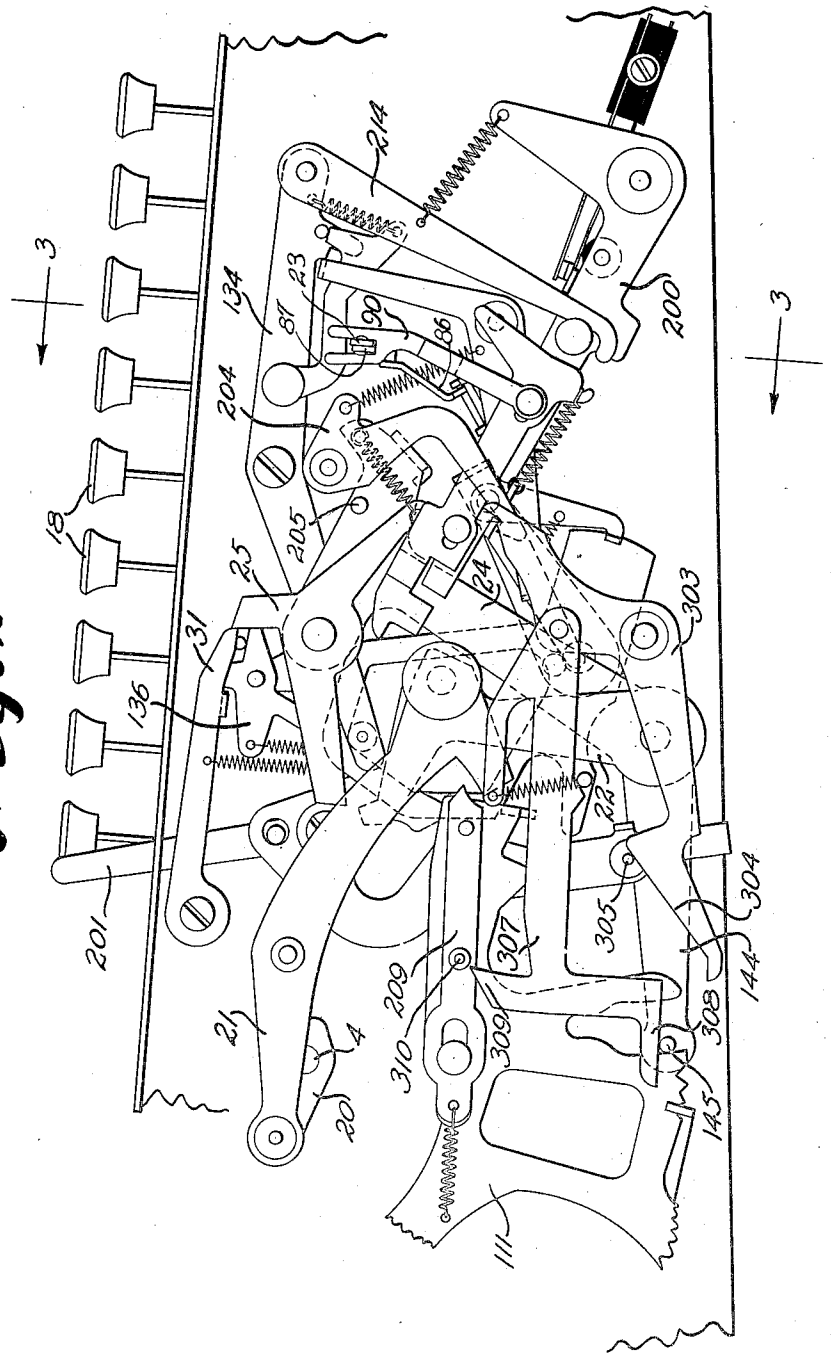

Fig. 2

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Filed Aug. 27, 1935 3 Sheets-Sheet 3

Fig. 3

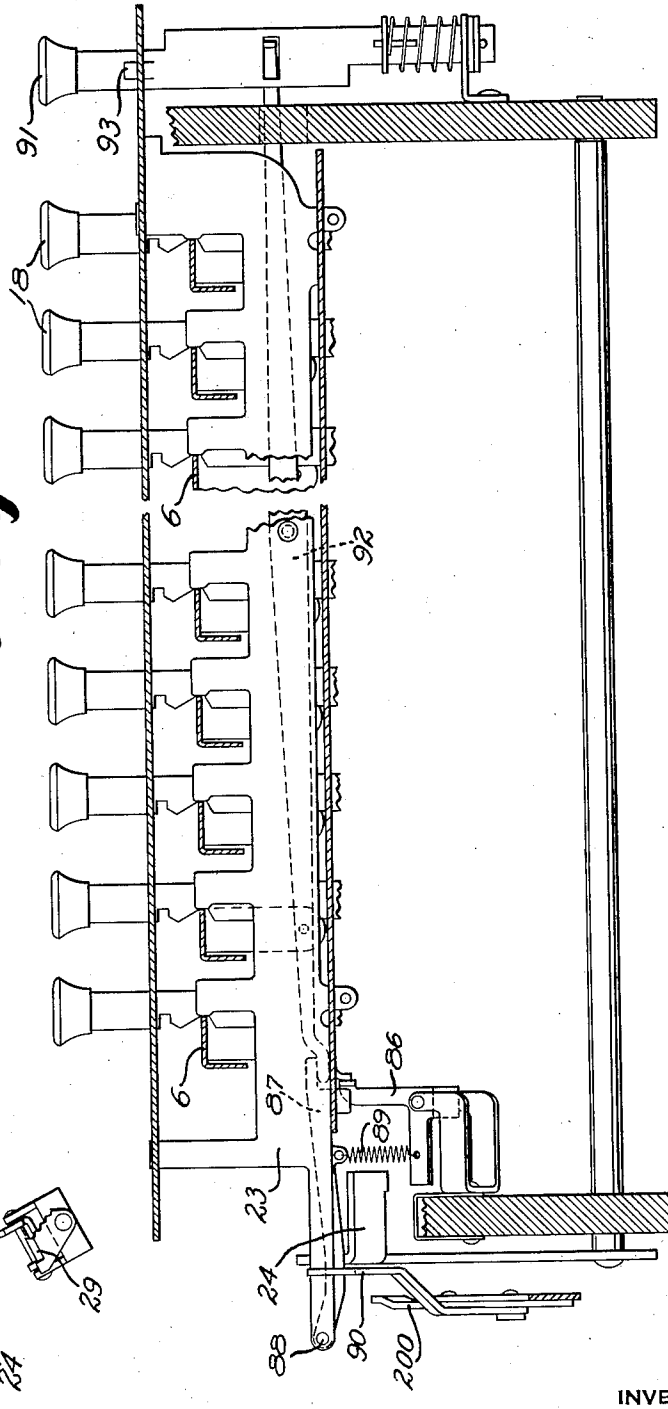
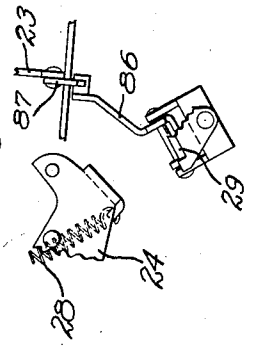


Fig. 4



INVENTOR

Stuart Hilder

Patented July 7, 1936

2,046,820

UNITED STATES PATENT OFFICE

2,046,820

CALCULATING MACHINE

Stuart Hilder, Glencarlyn, Va., assignor to Monroe Calculating Machine Company, Orange, N. J., a corporation of Delaware

Application August 27, 1935, Serial No. 38,043

3 Claims. (Cl. 235—79)

The invention has relation to calculating machines, and more particularly to means for releasing the depressed digit keys of a key set calculating machine at the end of an operation. United States Patent No. 2,010,068 issued on August 6, 1935 to Harvie J. Duke, discloses means for releasing the depressed digit keys of an adding machine at the end of an operation comprising one or more cycles of continuous registration. The present invention is applied to a calculating machine capable of performing plural order registrations, wherein multiplication and division, involving registration in several ordinally shifted positions of the register carriage, and the shifting of said carriage from one position to another, is performed at a single operation. This involves a termination of the registration in each ordinal position, and the present invention is designed to release the keys during such an operation only at the end of the complete computation, irrespective of intermediate interruptions of the register actuating device.

The invention consists in the novel construction and combination of parts, as set forth in the appended claims.

The invention is shown as applied to a calculating machine of the Monroe type, illustrated in United States Patent No. 1,566,650, issued to George C. Chase, on December 22, 1925; in application Serial No. 213,637, filed by George C. Chase on August 17, 1927, and in Patent No. 1,964,211, issued to Austin A. Overbury, on June 26, 1934.

In the accompanying drawings, illustrating the invention:

Fig. 1 is a left side view of a calculating machine embodying the invention, with the casing broken away and parts shown in their position of rest.

Fig. 2 is an enlarged left side elevation of certain mechanism illustrated in Fig. 1, the parts being shown in the position assumed upon movement of the division lever to operative position.

Fig. 3 is a section, taken on line 3—3 of Fig. 2.

Fig. 4 is a detail view of the key release lever and associated parts.

Operation control

As fully described in the above named patents, the differential numeral wheel actuators of the machine are driven by an electric motor, through a planetary gear clutching and transmission mechanism, controlled by a clutch lever 111, movable from an intermediate, inactive position into engagement with addition members 107, or oppositely into engagement with subtraction members 110 of the planetary train. Upon engagement of clutch lever 111 with member 107, the numeral wheels 13 of the machine, mounted in an ordinally shiftable carriage 2, will be rotated forwardly, to register additively amounts set by the keys 18 into the differential actuators. Engagement of clutch lever 111 with the member 110 will effect a reverse rotation of the parts, to register subtractively on the wheels 13.

At the end of an operation, the clutch is disengaged and the differential actuators brought to rest as follows:

Shaft 4, on which the differential actuators are mounted, is connected by crank arm 20 and link 21 with a rock lever 22, said rock lever being reciprocated during the rotation of the actuators. A stop arm 24 is mounted co-axially with lever 22, and is provided with a spring pawl 25, normally held out of the path of lever 22 by the action of spring 28 (Fig. 4) and trigger 31. Trigger 31 being released at the end of the operation, pawl 25 will be moved by its spring into the path of movement of rock lever 22, whereby arm 24 will be carried forwardly with lever 22, so that rearward extension 144 of arm 24 will rise, a pin 145 in said extension camming clutch lever 111 into neutral position. Movement of arm 24, and therefore of the differential actuators, is resisted by spring 28, and limited by engagement of the arm with a fixed stop 29 (Fig. 4). After engagement with stop 29 the parts will be restored by spring 28 into full cycle position of the differential actuators. A lever 200 serves to locate the actuators accurately and to lock them in full cycle position, this lever being raised, against the tension of its spring by a lever 134 and link 214, which lever is rocked in counterclockwise direction, as seen in Figs. 1 and 2, upon depression of a motor key, and is allowed clockwise movement upon manual release of such key. Lever 200 is secured in raised position by a latch 204, this latch being released at the end of the operation by a pin 205 on stop arm 24. The forward end of lever 134 is provided with a pawl 136, operable to engage and trip the trigger 31 upon release of the motor key.

Setting of the division lever 201 effects the engagement of a clutch 63 in the train of mechanism whereby register carriage 2 is shifted, and also, through a pin 305 on said lever, engaging a cam surface 304, rocks a lever 303, which lever will engage and lift lever 200 out of locking position. Lever 201 is also provided with means for throwing clutch lever 111 into subtract position,

and for projecting a tooth 209, mounted on said lever, into position to cooperate with a reversing tooth of link 21.

Subtractive registration having thus been started, a divisor set up on the keys 18 will be repeatedly subtracted from a dividened registered on wheels 13, until the registration upon said wheels becomes negative, whereupon a pin 9 on a wheel 13 located to the left of the keyboard, will trip trigger 31 and effect movement of the stop arm 24. This will cause disengagement of the clutch and a rebound of the differential actuators from their over-run beyond full cycle position, this rebound movement carrying the reversing tooth of link 21 against the end of tooth 209 (which has been centralized with the clutch lever), causing movement of clutch lever 111 into its additive position.

A single cycle of additive rotation of the actuators will bring the numeral wheels 13 again into positive registration, and the pin 9 will again trip trigger 31, centralizing the clutch lever 111, whereupon the tooth of link 21, moving in opposite direction, will, through tooth 209, throw clutch lever 111 into subtracting position. During this movement of arm 24, to reverse the drive from additive to subtractive rotation, the register carriage 2 will be shifted one ordinal place towards the left, by means of a push rod 47 pivoted to arm 24, lever 52, link 57, lever 55, etc., acting through the clutch 63 to give the carriage shifting shaft 46 a half rotation and thereby, through the well known crank pin arrangement, to shift the carriage. Push rod 47 cooperates with a pin 50 on link 21 in effecting the shift, pin 50 being in a different position upon reversal from subtraction to addition, and therefore not holding push rod 47 against the cooperating stud of lever 52.

During the above described movements of the parts lever 303 acts to hold lock lever 200 in raised or inactive position but, upon completion of the quotient figure registration following the retraction of division lever 201, lock lever 200 will be allowed to fall, and the machine will be brought to rest as follows:

The retraction of division lever 21 brings mechanism into position to retract the tooth 209 as soon as said tooth (with clutch lever 111) is thrown into additive position, whereupon a pin 310, secured in tooth 209, will be moved from position shown in Fig. 2 to the position shown in Fig. 1, said pin now lying in the path of movement of a cam tooth 309 of arm 307, pivoted upon the lever 303. Arm 307 is provided with a foot 308 overlying the pin 145, so that each forward movement of stop arm 24 will act to lift arm 307 toward the pin 310. So long as pin 310 remains in position shown in Fig. 2, tooth 309 will move idly past the pin, but when pin 310 is in position shown in Fig. 1, upward movement of arm 307 will bring tooth 309 against said pin, resulting in a forward camming movement of arm 307 and in clockwise rotation of lever 303, as seen in Figs. 1 and 2. This will disengage lever 303 from lock lever 200, which lever will fall, under the influence of its spring, lying on top of link 21 until the actuators have returned to full cycle position, whereupon lever 200 will drop in front of link 21, locking the machine against rotation. There will be no attempt to throw the clutch lever 111 into subtractive position at this time, because of the retraction of tooth 209 out of the path of movement of link 21. Therefore the above described parts, which have effected a reversal during the division computation, have now acted in their normal manner, similar to the action following the release of a motor key, to bring the machine to rest.

Patent No. 1,566,650 shows means whereby the motor keys controlling lever 134 (designated in the art as plus and minus bars) may throw clutch lever 111 into additive or subtractive position, and Patent No. 1,964,211 shows means whereby the division key mechanism may be utilized to effect automatic multiplication.

Automatic key release

The keys 18 are provided with notches (Fig. 3) engageable by spring locking bails 6, these bails extending each along the stems of the keys of a single column of the machine. Upon depression of a key, the related bail 6 will be cammed outwardly and then allowed to drop into the notch of the key stem, serving to hold the key in depressed position against the tension of the key spring. A key release slide 23 extends at right angles to the bails 6, and is provided with lugs engaging said bails. Movement of slide 23 to the left, as seen in Fig. 3, will therefore effect release of all depressed keys 18.

A releasing lever 86, fulcrumed upon the frame of the machine, is provided with an arm lying in the path of movement of the stop arm 24, the opposite arm of said lever being adapted to engage a lug of bar 87, pivoted at 88 upon the slide 23. Bar 87 is held in the path of movement of lever 86 by a spring 89, and as shown this spring is attached at its other end to an arm of the lever 86, and said lever engages a lug of slide 23, so that spring 89 serves to return lever 86 to normal position after operation, the lug acting as a stop for said lever.

Bar 87 is engaged by a link 90 (Figs. 2 and 3) secured upon the lock lever 200, so that upon lifting of said lock lever to the inactive position shown in Fig. 2, bar 87 will be lifted out of the path of movement of lever 86.

It will be noted that at the end of any operation, whether addition, subtraction, multiplication or division, lock lever 200 will be allowed to drop on top of link 21, and this action is immediately followed by the contact of stop arm 24 with the fixed stop 29. Therefore, at the end of every operation, bar 87 will be dropped into active position, and thereafter, and immediately before engagement of arm 24 with stop 29 (Fig. 4), said arm will engage and operate lever 86 to clear the keyboard. It is also to be noted that during the operation of stop arm 24 to reverse the character of the registration during a division computation, lever 86 will be operated, but, bar 87 being held out of its path of movement, the keys will remain in set position.

In order that the machine may be operated and brought to rest without clearing the keyboard, if desired, a key 91 is provided, having engagement with a lever 92, fulcrumed upon the slide 23 and having its free end underlying a lug of the bar 87. When key 91 is depressed and latched in depressed position by engagement of lug 93 with the bottom of the keyboard plate, bar 87 will be held free of lever 86. Key 91 is normally held in raised position by its spring means.

I claim:

1. In a calculating machine, the combination with an ordinally shiftable carriage, numeral wheels thereon, a keyboard, means for registering upon said numeral wheels amounts set up on said keyboard, and means for controlling a plural

order registration including power driven devices for terminating the registration in successive ordinal positions of said carriage and a device normally restrained during operation of said power driven devices and alternatively operable therewith to bring the machine to rest; of keyboard clearing means including a power transmission element held inoperative by said restrained device and movable in the alternative operation of said device into position to connect the power driven devices with the clearing means.

2. In a calculating machine, the combination with an ordinally shiftable carriage, numeral wheels thereon, a keyboard, means for registering upon said numeral wheels amounts set up on said keyboard, and means for controlling a plural order registration including power driven devices for terminating the registration in successive ordinal positions of said carriage and a device normally restrained during operation of said power driven devices and alternatively operable therewith to bring the machine to rest; of keyboard clearing means including a power transmission element held inoperative by said restrained device and movable in the alternative operation of said device into position to connect the power driven devices with the clearing means, and means manually adjustable to hold said power transmission element inoperable.

3. In a calculating machine, the combination with an ordinally shiftable carriage, numeral wheels thereon, a keyboard, means for registering upon said numeral wheels amounts set up on said keyboard, and means for controlling a plural order registration including power driven devices for terminating the registration in successive ordinal positions of said carriage and a device normally restrained during operation of said power driven devices and alternatively operable therewith to bring the machine to rest; of keyboard clearing means including a key release slide, a bar pivotally connected to said slide, and a lever fulcrumed upon the frame of the machine, adapted for operation by said power driven devices and for operative engagement with said bar, said bar being held out of the path of movement of the lever by said restrained device and movable in the alternative operation of said device into said path.

STUART HILDER.