

Aug. 8, 1961

H. GANG ET AL
CONSTANT FACTOR MECHANISM

2,995,299

Filed Feb. 11, 1957

4 Sheets-Sheet 1

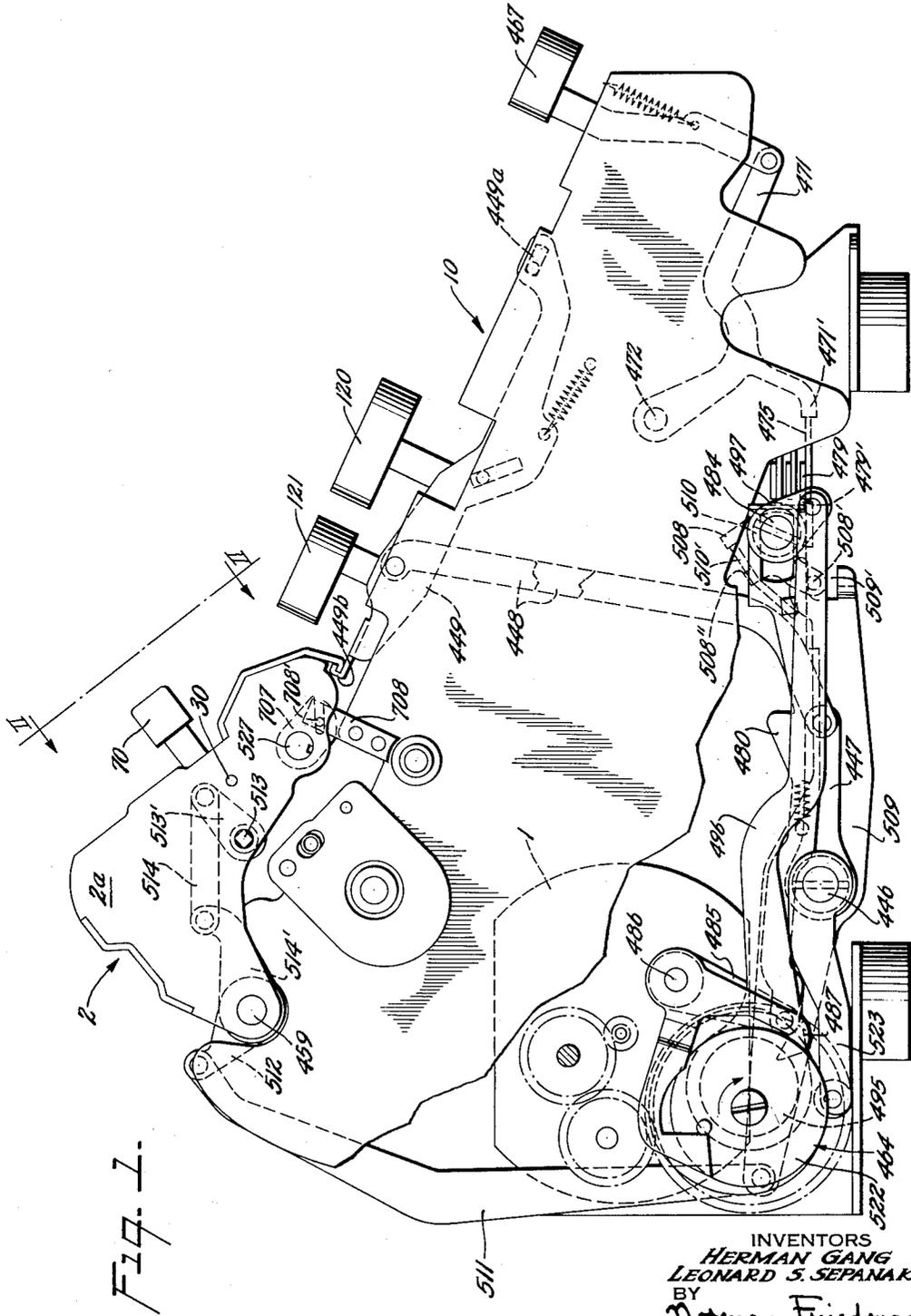


Fig. 1.

INVENTORS
HERMAN GANG
LEONARD S. SEPANAK
BY
Norman Friedman
ATTORNEY

Aug. 8, 1961

H. GANG ET AL

2,995,299

CONSTANT FACTOR MECHANISM

Filed Feb. 11, 1957

4 Sheets-Sheet 2

Fig. 2.

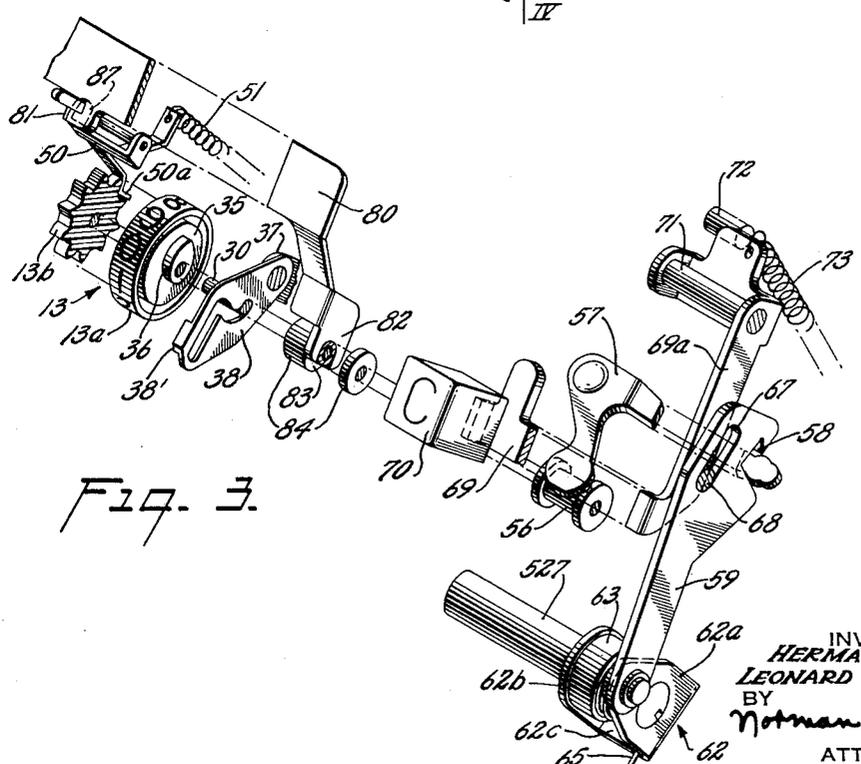
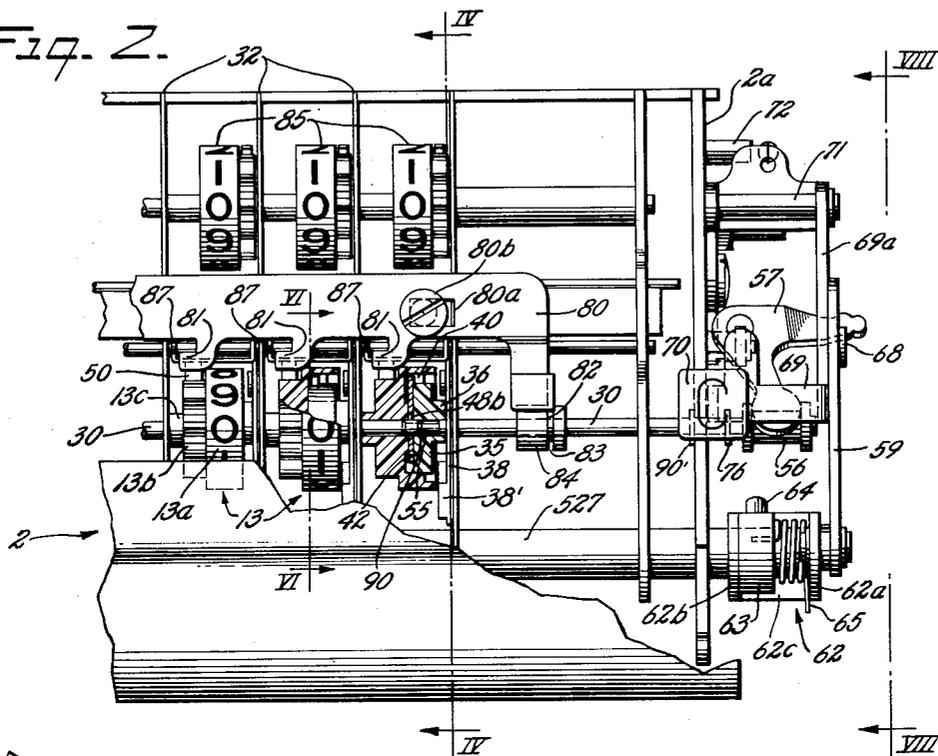


Fig. 3.

INVENTORS
HERMAN GANG
LEONARD S. SEPANAK
BY
Notman Friedman
ATTORNEY

Aug. 8, 1961

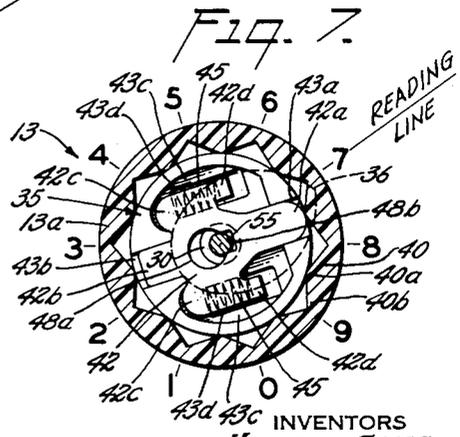
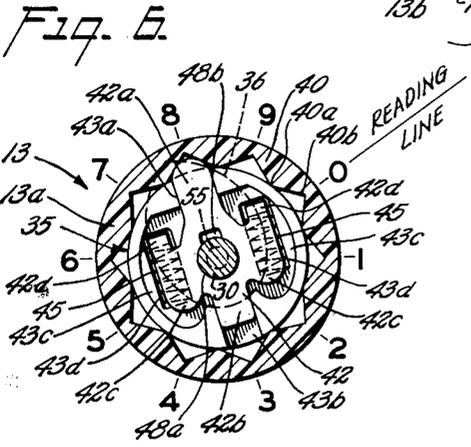
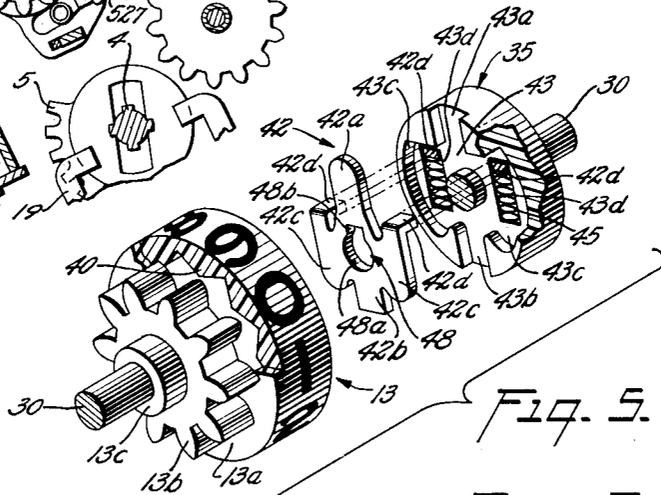
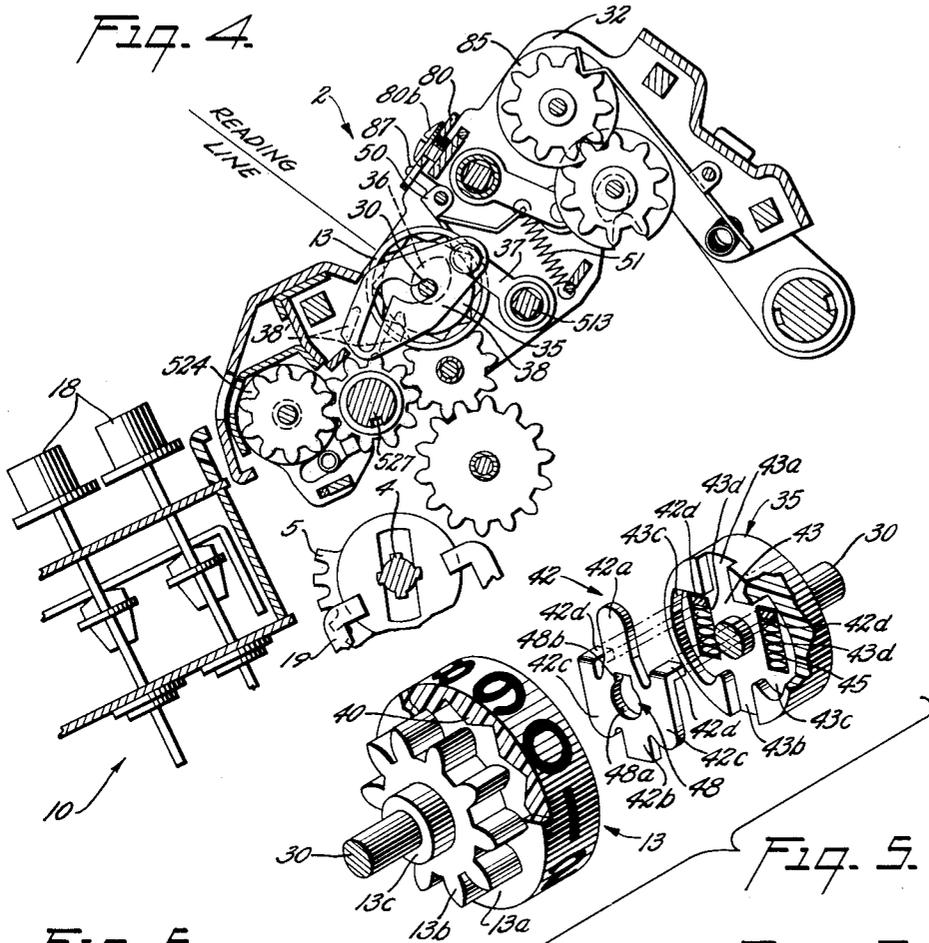
H. GANG ET AL

2,995,299

CONSTANT FACTOR MECHANISM

Filed Feb. 11, 1957

4 Sheets-Sheet 3



INVENTORS
 HERMAN GANG
 LEONARD S. SEPANAK
 BY
 Norman Friedman
 ATTORNEY

Aug. 8, 1961

H. GANG ET AL

2,995,299

CONSTANT FACTOR MECHANISM

Filed Feb. 11, 1957

4 Sheets-Sheet 4

Fig. 8.

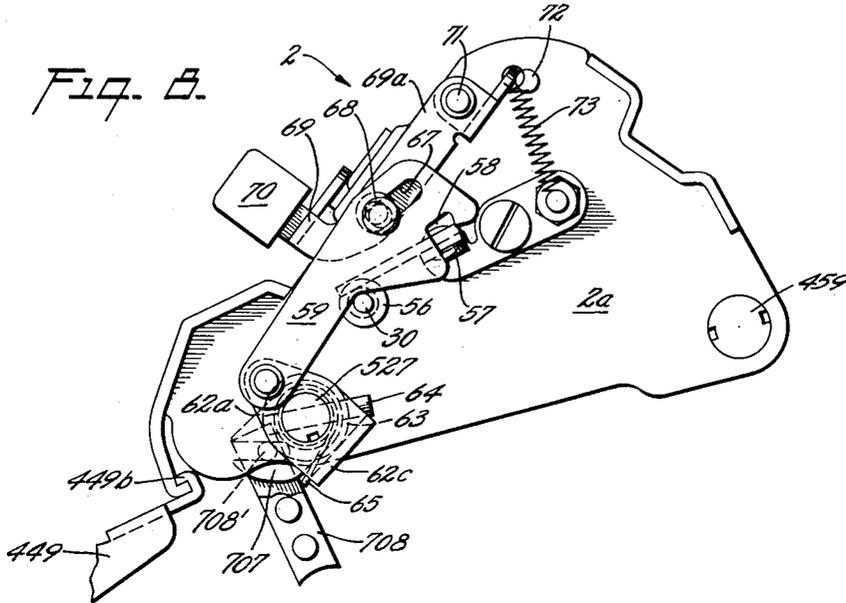
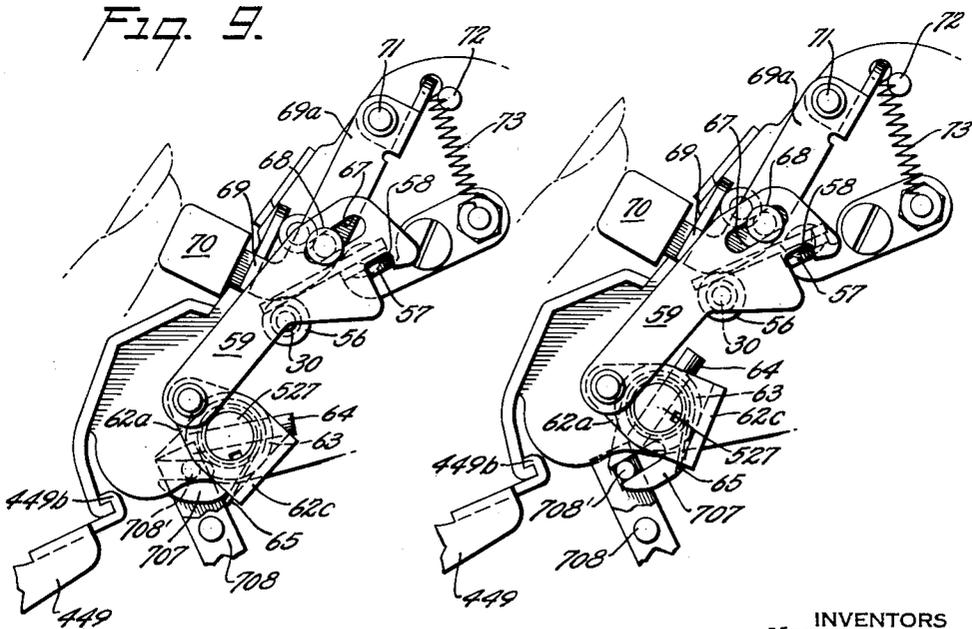


Fig. 10.

Fig. 9.



INVENTORS
HERMAN GANG
LEONARD S. SEPANAK
BY
Norman Friedman
ATTORNEY

1

2,995,299

CONSTANT FACTOR MECHANISM

Herman Gang, Morris Plains, and Leonard S. Sepanak,
Clifton, N.J., assignors to Monroe Calculating Machine
Company, Orange, N.J., a corporation of Delaware
Filed Feb. 11, 1957, Ser. No. 639,358
21 Claims. (Cl. 235-144)

The present invention relates to improvements in calculating machines.

More specifically, the invention pertains to a new and improved mechanism whereby a constant factor can be entered in a register of a calculating machine.

Generally, when an arithmetic program is carried out on a calculating machine, the appropriate register is first reset by being cleared to zero to erase any digital values appearing in the register. For many operations, however, it is desirable that the register be reset at some constant value other than zero at the beginning of each program. Various mechanisms have been devised in the past for achieving this result, as disclosed in the following patents: No. 1,995,434 granted March 26, 1935 to A. A. Overbury; No. 2,360,704 granted October 17, 1944 to J. L. Moody; and No. 2,660,377 granted November 24, 1953 to H. J. Chall.

The mechanisms of these patents all embody substantially the same approach to the problem of entering a constant factor into a register. They provide a resetting device adjustably coupled to each numeral wheel. In normal operation, positioning of the resetting device to a predetermined position places the wheel in zero registering position. To enter the constant factor, the resetting device and numeral wheel must first be cleared to zero. The resetting device is then locked in position and the constant factor value entered into the wheels through the keyboard and differential actuating mechanism. The resetting device is thereafter unlocked and the wheel recoupled thereto. In all subsequent resetting operations, the resetting device will be brought to its given predetermined position, but because of the angular digital adjustment of the wheel relative to the resetting device, the wheel will be set at the constant factor value in the cleared condition of the register.

From the foregoing it will readily be seen that to enter a constant factor value using the prior art mechanisms, it is always necessary to pre-clear the register and then enter the value through the keyboard. If the constant factor to be entered is a value which has been obtained by a previous machine computation and already appears on the dials of the register, the operator must read the dials, transcribe the value from the dials to the keyboard, and operate an appropriate motor key to enter the value into the register thereby affording an opportunity for human error in the reading of the dials or the operation of the keyboard.

The present invention, on the other hand, has as its object an arrangement such that a value appearing on a register may be directly inserted into the register as a constant factor without the necessity of erasing the value from the register and reentering said value into the register as a constant factor.

It is a further object of the invention to provide a constant factor mechanism in which the power drive of the machine is utilized to operate the mechanism for entering the constant factor, it merely being necessary for the operator to manually adjust the mechanism from normally inactive condition to active condition.

It is a further object to provide a new and improved coupling means between a numeral wheel and its associated resetting device.

In the drawings:

FIG. 1 is a left side elevation of a calculating machine

2

in which the constant factor mechanism of the present mechanism is incorporated.

FIG. 2 is a fragmentary view of the right side of the machine carriage taken on line II—II of FIG. 1, with parts broken away and in section.

FIG. 3 is an exploded perspective view showing the numeral wheel and related resetting mechanism of one order, and the constant factor mechanism.

FIG. 4 is a section taken on line IV—IV of FIG. 2.

FIG. 5 is an exploded perspective view showing a numeral wheel, the associated resetting hub, and the plate therebetween for coupling the wheel with the hub.

FIG. 6 is a section taken on line VI—VI of FIG. 2.

FIG. 7 is a view similar to FIG. 6 showing the position of the coupling plate ratcheting past the internal teeth of the numeral wheel as the resetting hub is rotatively restored to zero position relative to the wheel.

FIG. 8 is a right side elevation of the carriage taken on line VIII—VIII of FIG. 2, showing the mechanism for controlling entry of the constant factor in normal, inactive position.

FIG. 9 is a view similar to FIG. 8 showing the position of the mechanism as adjusted to active position by depression of the constant factor control key, but prior to operation of said mechanism.

FIG. 10 is a view similar to FIG. 9 showing the mechanism in operated position.

INTRODUCTION

The constant factor mechanism of the present invention is shown and will be described as embodied in a calculating machine of the general type of that disclosed in Patent No. 2,531,206 issued November 21, 1950 to Herman Gang, to which reference is made for a detailed description of such machine.

The machine includes a conventional accumulator of product-dividend register comprising an ordinal series of numeral wheels or dials. Associated with each wheel is a resetting device in the form of a hub provided with a resetting cam. A resetting arm provided for each resetting device is cooperable with said cam to restore said devices to a given predetermined normal position whereby resetting of the numeral wheels is effected. The wheels are normally in such an angular position relative to the resetting hubs that when said hubs are restored to normal position, the wheels will then be in zero registering position.

To enter into the register as a constant factor a value which appears on the register, the coupling between the wheels and hubs is rendered ineffective, the numeral wheels locked against rotation and the hubs rotatively reset to their normal or what may be termed their "zero" position. Thereafter, the coupling between the wheels and hubs is rendered effective and the wheels unlocked. From the foregoing, it will be seen that the wheels have been angularly or rotatively adjusted relative to the clearing hubs so that the wheels register the constant factor value when the hubs are reset to normal (zero) position. In all subsequent resetting operations, the wheels when reset will register the constant factor value rather than zero.

GENERAL DESCRIPTION OF MACHINE

Referring to the drawings, the machine includes a main body 10 (FIGS. 1, 4) and a transversely shiftable carriage 2 mounted thereon. Mounted in the carriage 2 are an accumulator or product-dividend register comprising an ordinal series of numeral wheels 13 (FIG. 4), a multiplier storage register comprising storage wheels 524, and a counter register comprising wheels 85. Body portion 10 is provided with the usual keyboard including digital value keys 18 and a clear key 467 (FIG. 1) manually

depressible to initiate a cycle of operation of the clearing or resetting mechanism for wheels 13.

Amounts set up on actuating gears 5 (FIG. 4) by means of keys 18 and setting bails 19 are registered either additively or subtractively in accumulator wheels 13 according to the direction of rotation of the actuator shaft 4. A plus key 120 (FIG. 1) and minus key 121 respectively control additive and subtractive operation of the registering mechanism.

Registration is effected in the counter dials 85 by counting fingers (not shown) which operate substantially as set forth in Patent No. 2,273,237 to Walters.

The power for operating the machine is provided by an electric motor 1.

RESETTING MECHANISM

The ordinarily arranged series of numeral wheels 13 (FIGS. 2-5) comprising the accumulator register are loosely journaled for rotation on a shaft 30 which extends across the carriage 2 and is supported in left and right-hand side plates 2a (FIGS. 1, 2) of the carriage. Each wheel 13 comprises an annular cup-shaped portion 13a on the outer periphery of which are consecutively disposed the various digits 0 through 9 inclusive. Integral with the base of portion 13a there is formed a numeral pinion gear 13b adapted to cooperate with an intermediate gear of the digital actuating mechanism. An integral spacer collar 13c extends to the left of pinion 13b and abuts an auxiliary framing plate 32 of the carriage to prevent leftward movement of wheel 13.

Adjustably coupled to each numeral wheel 13 is a resetting or clearing device in the form of a hub 35 journaled for rotation on shaft 30. As hereinafter described, the nature of the coupling between the wheel 13 and its associated hub 35 is such that the wheel and hub can be rotatably adjusted relative to one another for entry of a constant factor.

Normally, however, the wheel and hub are coupled together in such an angular relation that when said hub is returned to a predetermined normal "zero" angular position, the wheel will be in zero registering position.

Since each wheel 13 and its hub are normally coupled together for concomitant rotation as a unit, the registration of a digital value other than zero in the wheel will cause it and the hub to assume an angular position corresponding to that digital value. To reset the wheels to zero position, each hub is reset to its predetermined zero position whereby the wheels will likewise be restored to zero position as described below.

The resetting mechanism is constructed substantially as disclosed in Patent No. 2,617,594 issued November 11, 1952 to Herman Gang, noting particularly FIG. 5 of said patent. Such mechanism includes a heart-shaped resetting cam 36 (FIGS. 2, 3, 4) integral with the right side of each resetting hub 35. For operation in conjunction with cams 36, a like number of arms 37 are fixed on a rock shaft 513 rotatably mounted in the carriage framing. Each arm is provided with a pivoted member 38 having a pair of oppositely disposed flanges 38'. The arrangement is such that upon rocking of shaft 513 clockwise (FIG. 4, counterclockwise FIG. 1), one or the other of flanges 38' will engage the cam 36 of the related hub 35 and thereby reset the hub (and the wheel 13 coupled to the hub) in the direction of lesser travel.

Shaft 513 is rocked to effect resetting of hubs 35 in response to depression of clear key 467 by mechanism which will now be described. For a fuller description of said mechanism, reference is made to the aforementioned Patent No. 2,531,206.

Referring to FIG. 1, the stem of clear key 467 is attached at its lower end to the forward end of a lever 471 pivotally mounted on a fixed stud 472. Lever 471 terminates at its rear in a horizontally extending finger 471' adapted for contact with an arm of a bell crank 475

pivotally mounted for rotation about a vertical axis. The other arm of bell crank 475 is connected to a horizontal slide 479 which extends across the machine. Depression of clear key 467 will rock lever 471 clockwise causing the finger 471' thereof to engage bell crank 475 to move slide 479 toward the left side of the machine (i.e., toward the viewer in FIG. 1). The movement of slide 479 unlatches a slide 480 for forward movement allowing a one-cycle clutch 464 to be engaged. Clutch 464 is driven by a suitable gear train from the electric motor 1 and is of well-known construction in which a spring pawl mounted on the driven member of the clutch is held out of engagement with the driving member by a detent 487. Slide 480 is pivoted at its rear end to an arm 485 fixed on a shaft 486. Forward movement of slide 480 in response to depression of key 467 will cause arm 485 to rock shaft 486 counterclockwise thus removing detent 487, which is fast on the shaft, from engagement with the spring-biased pawl of one-cycle clutch 464, and thereby permitting the pawl to engage the driving member of the clutch to effect one cycle of rotation of the clutch.

Clutch 464 during its cycle of operation provides the power to operate the mechanism adjusted to active position by slide 479. To this end, the driven member of the clutch is provided with an eccentric cam 495. The eccentric cam is adapted to impart a reciprocatory movement to a link 496 which is attached at its forward end to a crank arm 497 fixed on a rotatable shaft 484 which extends across the machine. Thus when clutch 464 is operated, shaft 484 is rocked clockwise during the first half of the cycle and rocked back to normal position during the second half of the cycle.

It will be recalled that shaft 513 is rocked counterclockwise (FIG. 1) to restore resetting cams 36 and hubs 35 to normal position. The clockwise rocking movement of shaft 484 under the control of eccentric cam 495 is utilized to rock shaft 513 as follows.

A crank arm 513' fast with shaft 513 has link connection 514 with an arm 514' fixed on the carriage shaft 459 on which carriage 2 is rotatably mounted. Shaft 459 is journaled for rotation in and ordinal sliding movement relative to the fixed framing of the machine body portion 10. An arm 512 splined to shaft 459 is pivoted to the upper end of a link 511 which is pivoted at its lower end to the rearward end of a lever 509. Lever 509 is loosely supported for rotation intermediate its ends on a shaft 446, and is formed at its forward end with a forwardly opening slot 509'. An arm 508 provided with a leftwardly extending pin 508' is slidably mounted on shaft 484 and is coupled to the shaft for rocking movement therewith by a collar 510 having a laterally extending lug 510' which extends into a slot 508'' of said arm 508. Normally, arm 508 is located sufficiently far to the right of lever 509 so that pin 508' lies outside of slot 509'. Slide 479 is provided with a rearwardly extending projection 479' formed with a slot the walls of which engage the forward edge of arm 508. Accordingly, when slit 479 is shifted to the left in response to depression of clear key 467 as described earlier, arm 508 will also be moved to the left to position pin 508' within slot 509' in driving relation with lever 509. The subsequent clockwise rocking movement of shaft 484 and arm 508 will rock lever 509 counterclockwise and cause the linkage train 511, 512, 514', 514, and 513' to rock shaft 513 counterclockwise and thereby effect resetting of hubs 35 and wheels 13 coupled thereto.

As it is necessary that the intermediate gears in the carriage 2 be out of mesh with the intermediate gears in the machine body when wheels 13 are reset, a clearout cycle of clutch 464 operates to raise the forward end of the carriage. A cam 522 rotated with the driven member of clutch 464 serves to depress an arm 523 at the beginning of a resetting cycle. Arm 523 is fast on shaft 446, as are arms 447 pivoted to the lower ends of links 448. Carriage lifters 449 are provided with slots

449a at their forward ends by which they are pivotally mounted on pins on the inner sides of the right and left side frames respectively of the machine. The rearward end portions of lifters 449 are provided with hooked end portions 449b adapted to fit under and over an inwardly turned shelf located at the front and extending along the length of the carriage 2. The upper ends of links 448 are pivoted to the rear portions of lifters 449.

Counterclockwise rocking of shaft 446 in response to depression of arm 523 by cam 522 will, therefore, raise the forward end of carriage 2 through arms 447, links 448, and lifters 449. As clutch 464 approaches its full cycle position at the end of a resetting cycle, arm 523 is allowed to move upwardly as a suitable spring (not shown) pulls the carriage downwardly to its normal position.

A shaft 527 (FIGS. 1, 2, 3, 8, 9, 10), which is rotatably mounted in the carriage framing and is adapted to be rocked clockwise (FIG. 1) and returned as an incident to a resetting operation, is utilized as the power drive means for operating the constant factor set-up mechanism as described subsequently. A crank 707 (FIG. 1) is splined on shaft 527 and extends forwardly between two spaced plates 708 which are mounted on and extend upwardly from the left-hand side frame of the machine body. Plates 708 are provided with a pin 708' extending therebetween and through an open end slot in the end of crank 707. Crank 707 is therefore held against lateral movement when carriage 2 is shifted. However when carriage 2 is raised in the resetting operation, the pin 708' in engagement with the slot of crank 707 will hold the forward end of the crank from upward movement. Therefore as shaft 527 is raised with carriage 2, crank 707 will be rocked clockwise and due to the splined connection with shaft 527 will rock the shaft in like direction. When the carriage is lowered to normal position at the end of a resetting cycle, shaft 527 will of course be restored counterclockwise.

CONSTANT FACTOR MECHANISM

(Coupling between wheels and hubs)

As stated earlier, numeral wheels 13 are normally coupled to resetting hubs 35 for rotation therewith in such a relative angular disposition of these parts that when the hubs are reset to their predetermined zero or normal position, the wheels will be in zero registering position, as shown in FIG. 6. In accordance with the present invention, a constant factor is entered by: (1) causing the numeral wheels 13 to register the constant factor value; (2) locking the wheels against rotation and rendering the coupling between the wheels and resetting hubs 35 ineffective so that the hubs can be reset to their normal zero position without causing rotation of the numeral wheels; (3) resetting the hubs to their normal zero position; and (4) thereafter unlocking the wheels and rendering the coupling between the wheels and hubs effective for rotation of the wheels with the hubs. With regard to step (1), it should be noted that if the wheels 13 register the value to be entered as a constant factor as a result of a previous computation performed by the machine, one may proceed immediately with steps (2) et seq., for entry of the constant factor. This is in contrast to the operation of prior art constant factor mechanisms wherein the entry of a constant factor always requires that the register be cleared to zero and the constant factor value inserted through the keyboard. Of course, in the use of the mechanism of the present invention, the constant factor value can also be entered through the keyboard if desired or necessary.

The adjustable coupling between resetting hubs 35 and numeral wheels 13 will now be described. With reference to FIGS. 2, 4-7, the annular wheel 13a of each numeral wheel 13 is internally toothed to provide an annular series of ten equiangularly spaced teeth 40 providing high points 40a and low points 40b. Each low point corresponds to a different digital registering position

of wheel 13. The associated resetting hub 35, which is rotatably journaled on shaft 30, is disposed within annulus 13a and is of a diameter slightly less than the locus of high points 40a for rotation therewithin. The driving coupling between each hub 35 and wheel 13 is provided by a coupling plate 42 comprising medial oppositely directed arms 42a, 42b, and symmetrically arranged side arms 42c which are laterally bent to form lugs 42d disposed to the opposite sides of arm 42a. The inner face of hub 35 is formed with a recess 43 contoured to receive plate 42. Recess 43 comprises opposite radial portions 43a, 43b which receive arms 42a and 42b respectively and are of a width to closely fit the width of said arms, whereby plate 42 is constrained to rotate with hub 35. The recess 43 also includes enlarged arcuate side portions 43c adapted to receive side arms 42c. The bases of recess portions 43c are provided with inwardly formed slots 43d which receive lugs 42d and also house compression springs 45 which urge the lugs toward the ends of said slots. The central portion of plate 42 is formed with a keyhole-shaped aperture 48, said aperture comprising a circular portion 48a and a narrow portion 48b which extends radially in the direction of arm 42a. Circular portion 48a of aperture 48 serves to rotatably mount plate 42 on shaft 30 with a close running fit between the plate and shaft.

Noting FIG. 2, the inner end face of resetting hub 35 abuts the end wall of annulus 13a, while coupling plate 42 is securely held between a rightwardly extending boss of said wall and the base of recess 43. Heart-shaped resetting cam 36 integral with hub 35 abuts resetting member 38, thereby restraining the hub against movement to the right.

Springs 45 acting on lugs 42d of plate 42 urge arm 42a thereof in a radially outward direction along recess portion 43a of hub 35. Arm 42a (FIG. 6) is thereby centered intermediate two adjacent teeth 40 of numeral wheel annulus 13a in contact with the adjacent side walls of said teeth. Since shaft 30 is of substantially the same diameter as the circular portion 48a of plate aperture 48, said shaft holds the plate arm 42a blocked in radially outward position in meshed driving relation with teeth 40, and thus wheel 13 and hub 35 are coupled together for conjoint rotation. Rotary movement of either the hub or wheel member (as in resetting or registering operations respectively) will cause a corresponding simultaneous rotation of the other member, since the torque of the driving member will be transmitted to the driven member through abutment of the edges of plate arms 42a and 42b with the sides of the respective mating recesses 43a and 43b.

There is also provided for each numeral wheel 13 the usual pivoted check pawl 50 (FIGS. 3, 4) formed with a forwardly extending detent portion 50a biased clockwise by a spring 51 into engagement with the teeth of numeral pinion 13b. Pawl 50 serves to accurately locate wheel 13 in the various rotary digital positions of the latter, and also to prevent overtravel of the wheel in registering operations. As wheel 13 rotates, the teeth of its pinion 13b will rock pawl 50 counterclockwise against the urge of spring 51 whereby said teeth ratchet past detent 50a of the pawl.

CONSTANT FACTOR MECHANISM

(Constant factor set-up)

Let us assume that the mechanism has been in a normal condition of adjustment wherein operation of the resetting mechanism causes the numeral wheels to be restored to positions of zero registration, and it is now desired to set up for constant factor operation wherein operation of the resetting mechanism will return the numeral wheels not to zero, but to the constant factor registration. The numeral wheels must first be caused to register the constant factor value, either as the result of a previous machine computation or by insertion through the

keyboard and digital actuating mechanism. Mechanism is provided whereby thereafter, in response to manual depression of a suitable constant factor control key and initiation of a resetting operation, the wheels are locked against rotation, the coupling between the wheels and hubs rendered ineffective, the hubs reset to their zero position while the wheels are held at the constant factor setting, and finally the wheels unlocked and the coupling between the wheels rendered effective again. As herein-after described, the wheels are locked against rotation and the coupling between the wheels and hubs rendered ineffective by: (1) blocking pawls 50 against rearward counterclockwise movement thus preventing the teeth of numeral pinions 13b from ratcheting past the pawl; and (2) longitudinally shifting shaft 30 to the left to radially align reduced diameter portions thereof with the central apertures 48 of coupling plates 42. When resetting of hubs 35 is effected with the parts adjusted as indicated above, the substantial radial clearance now provided between the walls of apertures 48 and shaft 30 will permit arms 42d of said plates to be cammed inwardly by teeth 40 of stationary wheels 13 against the urge of springs 45. Accordingly, as hubs 35 are rotatively reset to their zero position, arms 42a can ratchet past teeth 40. FIG. 7 shows, by way of example, the position of the parts as a constant factor value of 7 is being set up. The coupled numeral wheel 13 and resetting hub 35 have first been jointly rotated from their zero position of FIG. 5 to cause the wheel to register the 7 value at the reading line. FIG. 7 shows the inwardly cammed position of coupling plate ratcheting past teeth 40 of the locked wheel 13 as the resetting hub 35 is reset to its predetermined zero angular position of FIG. 6.

The mechanism whereby the above operations are performed will now be described. Shaft 30 (FIGS. 2, 3, 8, 9, 10) is slidably mounted for longitudinal movement in the carriage framing plates 2a and is formed with a plurality of reduced diameter portions 55 (FIGS. 2, 6, 7) each located to the right of a coupling plate 42. The diameter of shaft portions 55 is slightly less than the width of the radial aperture portions 48b of coupling plates 42 so as to free plates 42 for inward movement when said reduced portions 55 are aligned with the plates. A collar 56 fixed to the right end of shaft 30 is provided with enlarged end walls between which is received the forward end of one arm of a pivoted bell crank 57. The other arm of the bell crank extends to the right beneath a downwardly opening slot 58 formed at the rear end of a link 59 which is pivoted at its forward end to one arm 62a of a U-member 62 which comprises two arms 62a, 62b and an interconnecting base 62c. Member 62 is loosely pivotally mounted on rock shaft 527 journaled for rotation in the carriage framing. A collar 63 is fixed to shaft 527 by a pin 64 which extends outwardly to the rear of the collar and shaft. A coil spring 65 is mounted on shaft 527 between collar 63 and arm 62a. One end of the spring is fastened to the collar while the free forward end of the spring abuts base portion 62c of U-member 62 and urges it counterclockwise into engagement with the rear end of pin 64.

A longitudinal slot 67 formed in the rear portion of link 59 serves to adjustably support the link on a pin 68 fixed to the rear leg 69a of the right-angled stem 69 of a manually operable constant factor control key 70. Stem 69 is pivotally supported on a stud 71 and is normally maintained in clockwise position abutting a stop 72 by a spring 73, in which position pin 68 holds link 59 elevated with slot 58 above the right end of bell crank 57 as shown in FIG. 8.

Shaft 527, which is utilized as the power drive means for effecting operation of the constant factor mechanism, is adapted to be rocked clockwise and returned as an incident to a resetting operation as described earlier. U-member 62, being coupled to shaft 527 by spring 65, will itself be rocked in like direction thus causing link 59 to

move forwardly and return. Since, however, the link is normally held in disabled elevated position by pin 68 with slot 58 above the right end of bell crank 57, the link will merely operate idly back and forth above the bell crank.

To effect leftward shifting movement of shaft 30 and thereby render the coupling between wheels 13 and hubs 35 ineffective during a resetting operation, key 70 is manually held depressed while a resetting operation is initiated and carried out in response to depression of clear key 467. As seen in FIG. 9, depression of key 70 will enable link 59 by rocking key stem 69 counterclockwise, thereby lowering the rear end of the link by virtue of the pin and slot connection 67, 68 between the stem and link. Link 59 is now in enabled driving relation with bell crank 57, the right end of the bell crank being disposed within slot 58 of the link. When link 59 is subsequently moved forwardly in response to counterclockwise rocking of shaft 527, as shown in FIG. 10, it will rock bell crank 57 clockwise and displace shaft 30 to the left to align the reduced portions 55 with the central apertures 48 of coupling plates 42, as shown in FIG. 6 and in broken lines in FIG. 2. Leftward movement of shaft 30 is halted by abutment of a stop collar 76 fixed thereon (FIG. 2) with the right side plate 2a of the carriage before shaft 527 has completed its counterclockwise stroke. However, the yieldable coupling provided by spring 65 between the shaft and U-member 62 will permit the shaft to complete its stroke even though the linkage 57, 59, 62 is restrained against further movement by collar 76 and side plate 2a.

Movement of shaft 30 to the left is also employed to lock the numeral wheels 13 against rotation as follows. An elongated slide 80 (FIGS. 2, 3), mounted at the top of and extending across the carriage 2, is provided at its end portions with a longitudinal slot 80a into which extends a guide pin 80b fixed to the carriage. Slide 80 is formed with an ordinal series of blocking lugs 81 each disposed slightly forwardly of and adapted for cooperation with the upper end of a corresponding numeral wheel check pawl 50. Slide 80 is connected with shaft 30 to move longitudinally therewith by means of a fork 82 integral with the right end of the slide. The opposed arms of said fork extend into an annular groove 83 of a collar 84 fast on shaft 30. In the normal right-hand position of shaft 30 and slide 80, lugs 81 are inactively located to the right of upstanding noses 87 of pawls 50. Upon a leftward shift of the shaft and slide, lugs 81 will be brought to active position wherein they lie in the path of movement of pawl noses 87, thereby blocking pawls 50 against counterclockwise movement. Numeral wheels 13 are thus effectively rendered incapable of rotation and thereby locked against resetting, inasmuch as the teeth of numeral pinions 13b can rotatively ratchet past detents 50a of pawls 50 only if the latter are free for counterclockwise pivotal movement.

It should be noted that in a resetting cycle of operation, shaft 527 rocks counterclockwise (and thereby operates to move shaft 30 to the left) before resetting members 38 are caused to cooperate with heart-shaped cams 36 to reset hubs 35. Since the shaft reduced diameter portions 55 are now aligned with the radial aperture portions 48b of plates 42, arms 42a of said plates are no longer held blocked by shaft 30 in meshed driving relation with the teeth 40 of wheel 13. As hubs 35 (and plates 42) are rotatively reset to zero position while the wheels are locked against rotation, arm 42a will be cammed inwardly by teeth 40 against the urge of springs 45 (note FIG. 7) whereby the arm ratchets past said teeth. Coupling plate arm 42a is free for such inward camming movement since shaft portion 55 is of a smaller diameter than the width of the radial aperture portion 48b of plate 42 thereby providing substantial radial clearance between the plate and reduced shaft portion 55.

Shaft 30 is maintained to the left by shaft 527 until after hubs 35 have been reset, whereupon shaft 527 rocks back to clockwise position upon lowering of the carriage 2, thus returning shaft 30 to normal, right-hand position through linkage 62, 59, 57, in which position the shaft 30 again maintains coupling arm 42a blocked in driving relation with teeth 40. A second stop collar 90' (FIG. 2), similar to collar 76, fixed on shaft 30 is adapted to limit rightward movement of the shaft by abutment with the carriage framing plate 2a.

It should be noted that when shaft 30 is to be restored from its leftward position, arms 42a of coupling plates 42 will usually be urged to radially outward position by springs 45, as shown in FIG. 6. If for any reason, however, arms 42a are not so held in outward position, shaft 30 might be jammed against rightward restoring movement by contact with the side edges of the plate apertures 48. To avoid the possibility of such jamming, the left edge of each reduced diameter portion 55 of shaft 30 is bevelled outwardly at 90 (FIG. 2) to provide a camming surface which, if engaged by the side edges of apertures 48 in rightward movement of the shaft, will cam plate 42 to its usual radial position of FIG. 6 and permit shaft movement.

While there has been shown a specific form of the invention applied to a calculating machine of the type disclosed in Patent No. 2,531,206, it is intended that the present disclosure be illustrative only and not limitative of the claims, since the invention can readily be applied in other embodiments and to other types of machines. Thus, while the disclosed embodiment contemplates the provision of the constant factor mechanism in all the ordinal dials of an accumulator register, a lesser number or even only one dial may include the constant factor mechanism; and the constant factor mechanism can, if desired, be incorporated into a counter register.

With reference to possible modifications of the coupling between the wheels 13 and hubs 35 within the scope of the invention, it is not necessary that the coupling device be a plate mounted on shaft 30. The coupling elements could comprise one or more balls radially movable in guide recesses formed in the resetting hub into driving relation with internal teeth 40 of the numeral wheel. Still further, whether the coupling elements be plates or balls, springs 45—which urge the coupling elements to driving relation—could be omitted and shaft 30 provided with a bevel similar to but longer and less steep than that presently provided at 90 (whereby camming pressure is reduced), said bevel to always operate in a constant factor set-up operation to cam the coupling device radially outward to driving relation with the numeral wheel.

It will therefore be understood that various omissions and substitutions and changes in the form and details of the mechanism illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is our intention, therefore, to be limited only as indicated by the scope of the following claims.

We claim:

1. In a register, a numeral wheel digitally adjustable to register various digital values, a resetting device for said wheel, means effective to couple said numeral wheel to said resetting device for resetting therewith, selectively operable means for locking said numeral wheel against resetting and for rendering said coupling means ineffective, and resetting means for effecting operation of said resetting device while said numeral wheel is uncoupled from said resetting device and is locked against resetting, whereby said resetting device can be operated without causing resetting of said numeral wheel.

2. In a calculating machine, a register comprising an ordinarily arranged series of digitally adjustable numeral wheels, a resetting device for each wheel restorable to a predetermined position, means effective to couple each

numeral wheel to its resetting device for resetting therewith, selectively operable means for locking at least one of said numeral wheels against resetting and rendering ineffective the coupling means between said one numeral wheel and its resetting device, and means for restoring said resetting devices to said predetermined position while said one numeral wheel is uncoupled from its resetting device and is locked against resetting, whereby said resetting devices can be restored to said predetermined position without causing resetting of said one numeral wheel.

3. In a calculating machine, a register including an ordinarily arranged series of digitally adjustable numeral wheels, resetting mechanism for said numeral wheels, means effective to couple said numeral wheels to said resetting mechanism for resetting thereby, normally ineffective means for locking said wheels against rotation and rendering ineffective the coupling means between said numeral wheels and resetting mechanism, and means for rendering effective said last mentioned normally ineffective means.

4. In a calculating machine, a register comprising an ordinarily arranged series of digitally adjustable numeral wheels, a resetting device for each numeral wheel, said resetting devices being adapted to be restored to a predetermined position, each numeral wheel being coupled to its resetting device for resetting therewith, and selectively operable means for uncoupling said numeral wheels from said resetting devices in any digitally adjusted position thereof and also locking said wheels against resetting from said adjusted position, whereby said resetting devices can be restored to said predetermined position without causing resetting of said numeral wheels.

5. The invention according to claim 4 including selectively operable means for enabling said uncoupling and locking means, and means for operating said uncoupling and locking means.

6. In a calculating machine, a register comprising an ordinarily arranged series of digitally adjustable numeral wheels, a resetting device for each numeral wheel, means effective to couple each numeral wheel to its resetting device for resetting therewith, resetting means for restoring said resetting devices to a predetermined position, mechanism operable to lock said numeral wheels against resetting and render said coupling means ineffective, means for operating said mechanism, a normally disabled drive connection between said mechanism and operating means, and selectively operable means for enabling said drive connection.

7. In a calculating machine, a register comprising an ordinarily arranged series of digitally adjustable numeral wheels, a resetting device for each numeral wheel, means effective to couple each numeral wheel to its resetting device for resetting therewith, normally inactive resetting means operable to restore said resetting devices to a predetermined position, means for selectively initiating a resetting cycle of operation, means for operating said resetting means within said cycle, normally disabled mechanism for locking said numeral wheels against rotation and rendering ineffective the coupling between each numeral wheel and its resetting device, means for selectively enabling said mechanism, and means responsive to initiation of said resetting cycle of operation for operating said mechanism prior to operation of said resetting means.

8. In a calculating machine, a register comprising an ordinarily arranged series of digitally adjustable numeral wheels, a resetting device for each numeral wheel, means effective to couple each numeral wheel to its resetting device for resetting therewith, normally inactive resetting means operable to restore said resetting devices to a predetermined position, means including a key for selectively initiating a resetting cycle of operation, means for operating said resetting means within said cycle, normally disabled mechanism for locking said numeral wheels against rotation and rendering ineffective the coupling between

11

each wheel and its resetting device, means including a key for selectively enabling said mechanism, and power drive means responsive to initiation of said resetting cycle of operation for operating said mechanism prior to operation of said resetting means.

9. In a calculating machine, a register including an ordinal series of digitally adjustable numeral wheels, a resetting device for each numeral wheel, means effective to couple each numeral wheel to its associated resetting device for resetting therewith, normally inactive resetting means operable to restore said resetting devices to a predetermined position, means for selectively initiating a resetting cycle of operation, means responsive to initiation of said cycle for operating said resetting means within said cycle, normally ineffective means for locking said wheels against rotation, normally ineffective means for rendering ineffective the coupling means between said wheels and resetting devices, normally disabled means for rendering effective said two last mentioned normally ineffective means, means for selectively enabling said normally disabled means, and power drive means responsive to initiation of said resetting cycle of operation for operating said normally disabled means.

10. In a calculating machine, a register comprising an ordinarily arranged series of digitally adjustable numeral wheels, resetting mechanism for said numeral wheels normally effective to cause resetting of said numeral wheels, means for selectively operating said resetting mechanism, means for divorcing said numeral wheels from said resetting mechanism whereby operation of said resetting mechanism will be ineffective to cause resetting of said numeral wheels, power drive means for operating said divorcing means, a normally disabled drive connection between said power drive means and divorcing means, and means for selectively enabling said drive connection.

11. In a calculating machine, a register comprising an ordinarily arranged series of digitally adjustable numeral wheels, cyclically operable resetting mechanism for said numeral wheels normally effective to cause resetting of said numeral wheels, means for selectively initiating a resetting cycle of operation, means for operating said resetting mechanism within said cycle, normally ineffective means operable to divorce said numeral wheels from said resetting mechanism whereby operation of said resetting mechanism will be ineffective to cause resetting of said numeral wheels, means for selectively rendering said divorcing means effective, and means responsive to initiation of said resetting cycle of operation for operating said last mentioned means prior to operation of said resetting mechanism.

12. In a calculating machine, a register comprising an ordinarily arranged series of digitally adjustable numeral wheels, a resetting device for each wheel, means effective to couple each wheel to its resetting device for concomitant movement of said wheel and resetting device, resetting means operable to restore said resetting devices to a predetermined position, selectively operable means for rendering ineffective the coupling means between each wheel and its resetting device when said resetting device and wheel are in any given position, whereby said resetting device can be restored to said predetermined position while said numeral wheel is maintained at the given position, and the coupling thereafter rendered effective.

13. In a calculating machine including a register comprising an ordinarily arranged series of digitally adjustable numeral wheel members, a resetting member for each numeral wheel member, and resetting means for restoring said resetting members to a predetermined position; means effective to couple each numeral wheel member to its associated resetting member for resetting therewith, said coupling means including a coupling element constrained for movement with one of said members, said coupling element being movably adjustable to and from driving relation with the other of said members, blocking means effective to maintain said coupling element in said

12

driving relation, and means for selectively rendering said blocking means ineffective.

14. In a calculating machine including a register comprising an ordinarily arranged series of digitally adjustable numeral wheel members, a resetting member for each numeral wheel member, and resetting means for restoring said resetting members to a predetermined position; means effective to couple each numeral wheel member to its associated resetting member for resetting therewith, said coupling means including a coupling element constrained for movement with one of said members, said coupling element being adjustable to and from driving relation with the other of said members, spring means for urging said coupling element to said driving relation, blocking means effective to maintain said coupling element in said driving relation, and means for selectively rendering said blocking means ineffective.

15. In a calculating machine including a register comprising an ordinarily arranged series of digitally adjustable numeral wheel members, a resetting member for each numeral wheel member, and resetting means for restoring said resetting members to a predetermined position; means effective to couple each numeral wheel member to its associated resetting member for resetting therewith, said coupling means including a coupling element constrained for movement with one of said members, said coupling element being movably adjustable to and from driving relation with the other of said members, shaft means including a first portion of a given diameter operable to maintain said coupling element blocked in said driving relation and a second portion of a smaller diameter to permit said coupling element to move out of said driving relation, said shaft means being shiftable relative to said coupling element to bring either of said first and second shaft portions into alignment with the path of adjusting movement of said coupling element.

16. The invention according to claim 15, said numeral wheel and resetting members being mounted on said shaft means.

17. The invention according to claim 15, said shaft means being provided with an inclined cam surface intermediate said first and second shaft portions engageable with said coupling element to move said coupling element to said driving relation.

18. In a calculating machine including a register comprising an ordinarily arranged series of digitally adjustable numeral wheel members, a resetting member for each numeral wheel member, and resetting means for restoring said resetting members to a predetermined position; means effective to couple each numeral wheel member to its associated resetting member for resetting therewith, said coupling means including a coupling element constrained for movement with one of said members, said coupling element being adjustable to and from driving relation with the other of said members, spring means for urging said coupling element to said driving relation, blocking means effective to maintain said coupling element in said driving relation, and selectively operable mechanism for locking said numeral wheels against resetting and rendering ineffective said coupling means, said selectively operable mechanism including means for rendering said blocking means ineffective.

19. In a calculating machine, a numeral wheel, a resetting device therefor, means for coupling said numeral wheel to said resetting device for resetting thereby, and shaft means upon which said numeral wheel and resetting device are rotatably mounted, said shaft means being axially shiftable to selectively render said coupling means effective and ineffective.

20. The invention according to claim 19 including blocking means operable to positively maintain said coupling means in effective condition.

21. The invention according to claim 20 including means for rendering said blocking means effective in re-

2,995,299

13

sponse to axial shifting movement of said shaft in a given direction.

References Cited in the file of this patent

UNITED STATES PATENTS

1,860,490 Britten ----- May 31, 1932

2,342,352

2,568,709

2,660,377

2,808,208

5

14

Bliss ----- Feb. 22, 1944

Bliss ----- Sept. 25, 1951

Chall ----- Nov. 24, 1953

Wales ----- Oct. 1, 1957

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,995,299.

August 8, 1961

Herman Gang et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 58, for "slit" read -- slide --; column 5, line 38, for "restorted" read -- restored --; line 71, for "sheel" read -- shell --; column 8, line 35, for "prdvided" read -- provided --; column 11, line 12, for "determine" read -- determined --; column 14, line 1, for "2,342,352" read -- 2,342,325 --.

Signed and sealed this 22nd day of January 1963.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,995,299

August 8, 1961

Herman Gang et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 58, for "slit" read -- slide --; column 5, line 38, for "restorted" read -- restored --; line 71, for "sheel" read -- shell --; column 8, line 35, for "prvided" read -- provided --; column 11, line 12, for "determine" read -- determined --; column 14, line 1, for "2,342,352" read -- 2,342,325 --.

Signed and sealed this 22nd day of January 1963.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents