May 2, 1950 R. E. BOYDEN 2,506,337

COVER SECTION FOR OSCILLATING TYPE WHEELS

Original Filed March 13, 1945 8 Sheets-Sheet 1

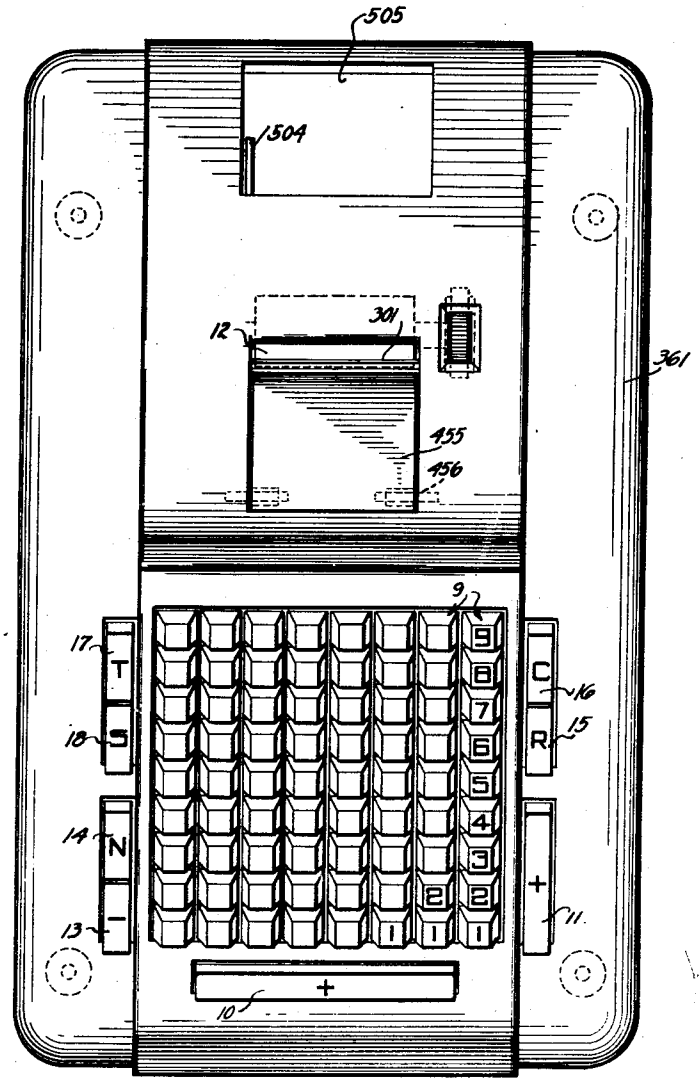


FIG. 1.

INVENTOR.
ROBERT E. BOYDEN
BY
Fred M. Schwend
ATTORNEY

May 2, 1950 R. E. BOYDEN 2,506,337

COVER SECTION FOR OSCILLATING TYPE WHEELS

Original Filed March 13, 1945 8 Sheets-Sheet 2

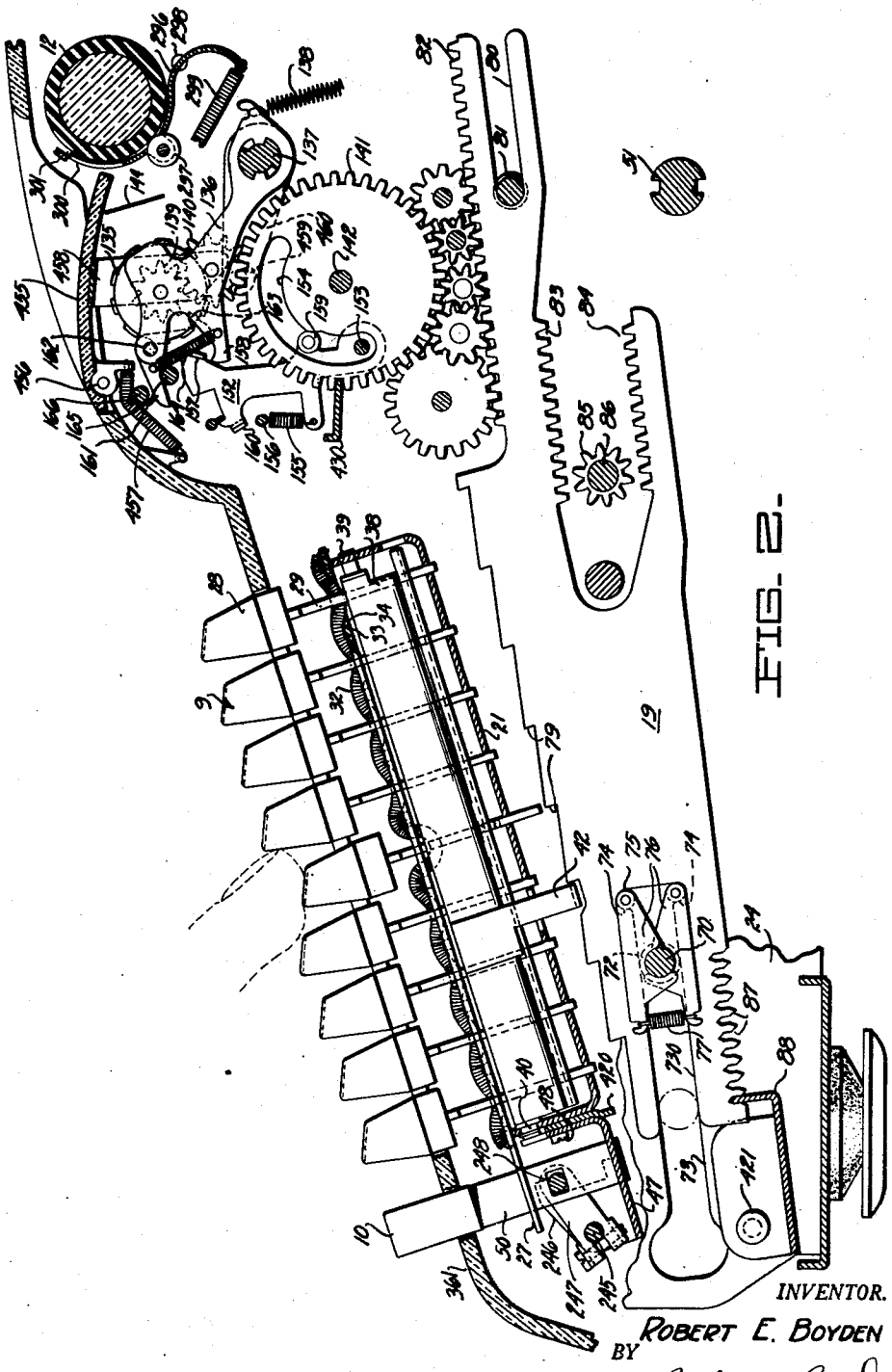


FIG. 2.

INVENTOR.
ROBERT E. BOYDEN
BY Fred M. Schwend
ATTORNEY

May 2, 1950 R. E. BOYDEN 2,506,337

COVER SECTION FOR OSCILLATING TYPE WHEELS

Original Filed March 13, 1945 8 Sheets-Sheet 3

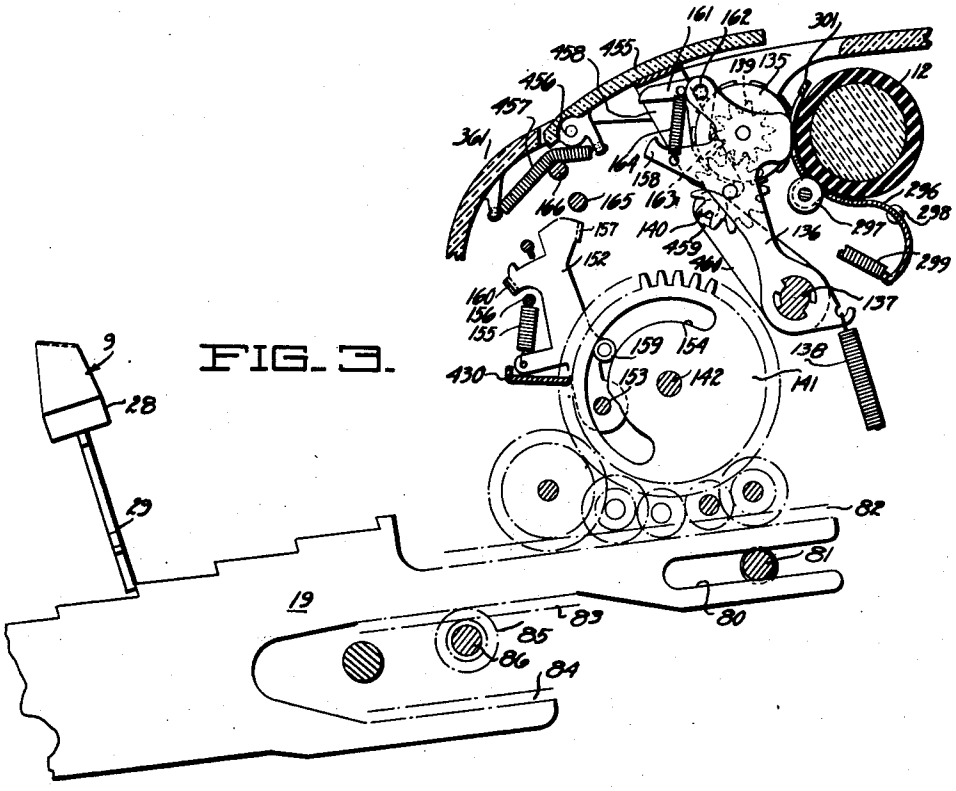


FIG. 3.

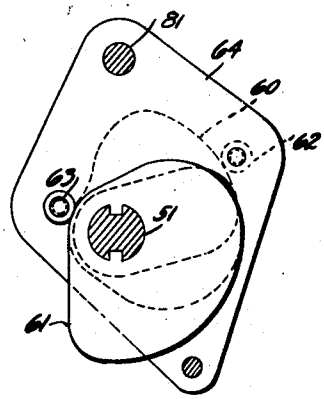


FIG. 4.

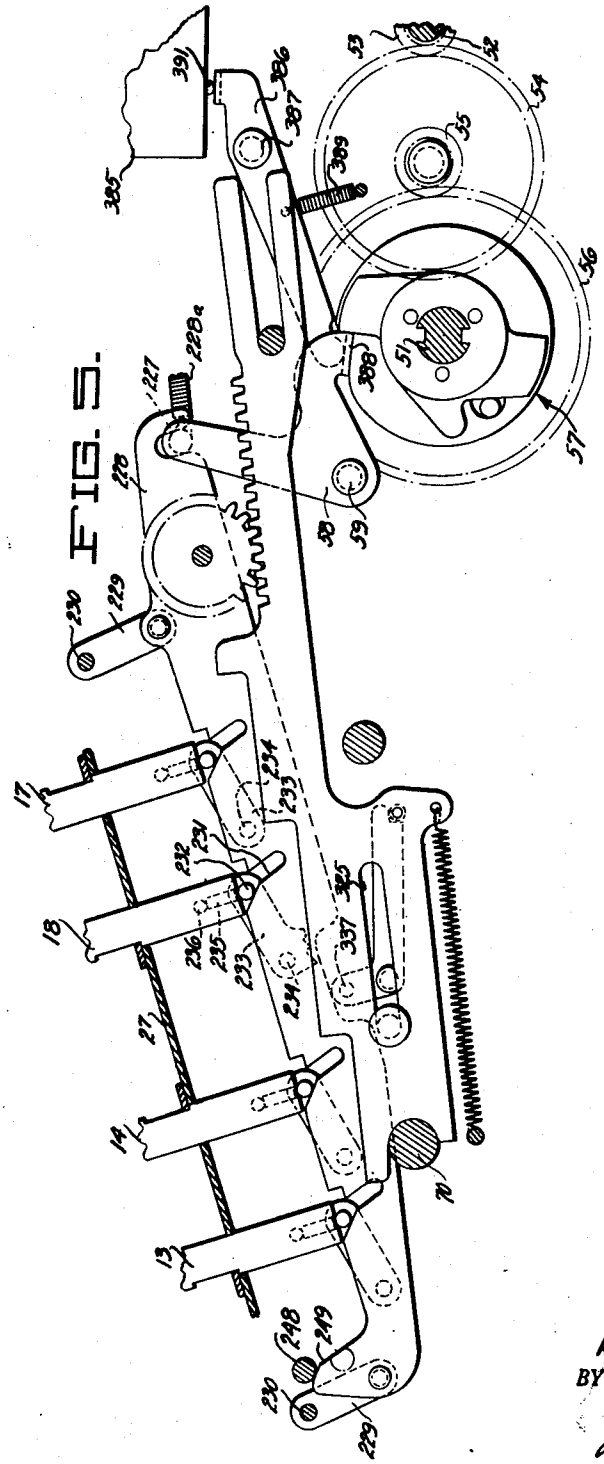
INVENTOR.
ROBERT E. BOYDEN
BY
Fred N. Schwarz
ATTORNEY

May 2, 1950 R. E. BOYDEN 2,506,337

COVER SECTION FOR OSCILLATING TYPE WHEELS

Original Filed March 13, 1945 8 Sheets-Sheet 4

FIG. 5.



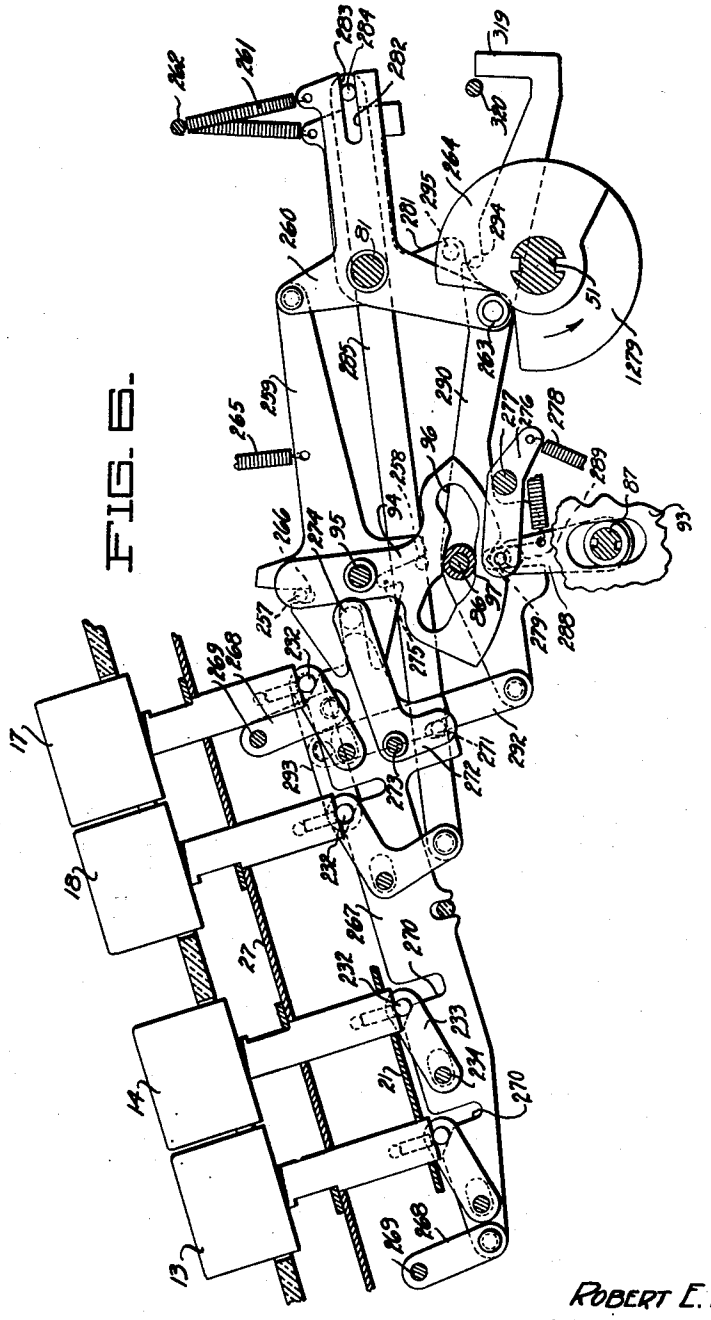
INVENTOR.
ROBERT E. BOYDEN
BY
Fred N. Schwed
ATTORNEY

May 2, 1950 R. E. BOYDEN 2,506,337

COVER SECTION FOR OSCILLATING TYPE WHEELS

Original Filed March 13, 1945 8 Sheets-Sheet 5

FIG. 6.



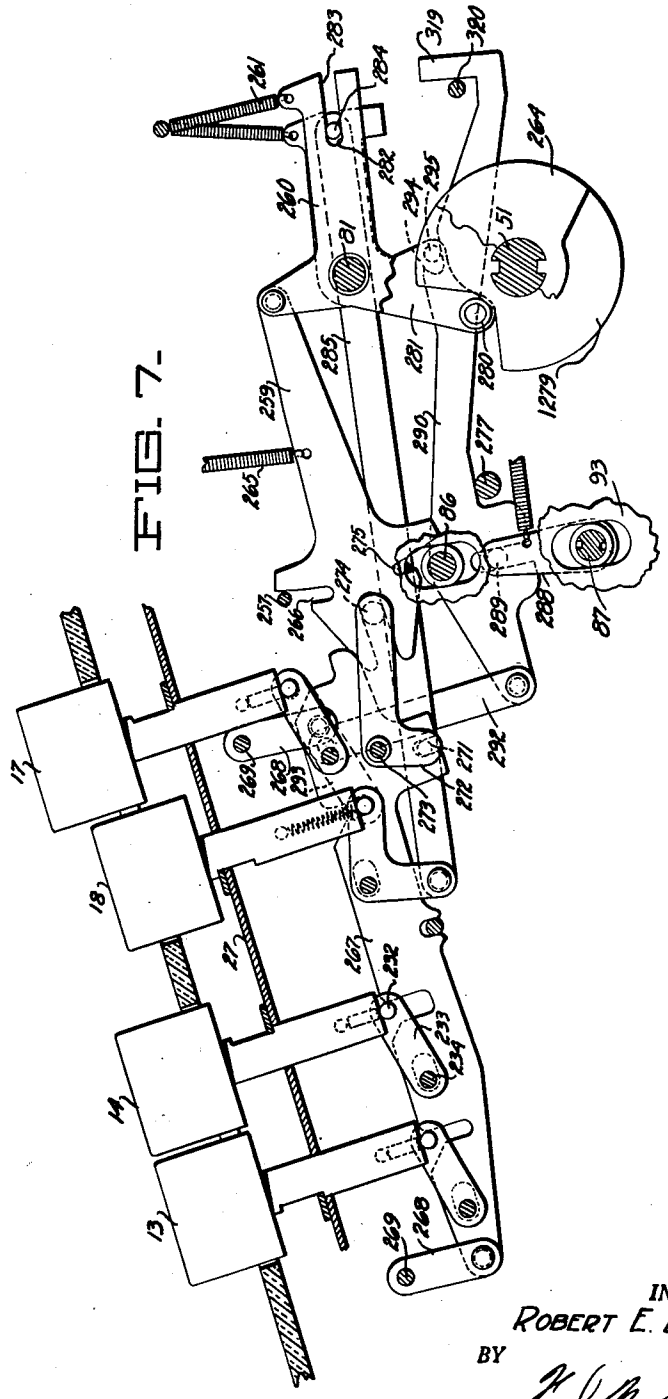
INVENTOR.
ROBERT E. BOYDEN
BY
Fred M. Schwend
ATTORNEY

May 2, 1950 R. E. BOYDEN 2,506,337

COVER SECTION FOR OSCILLATING TYPE WHEELS

Original Filed March 13, 1945 8 Sheets-Sheet 6

FIG. 7.



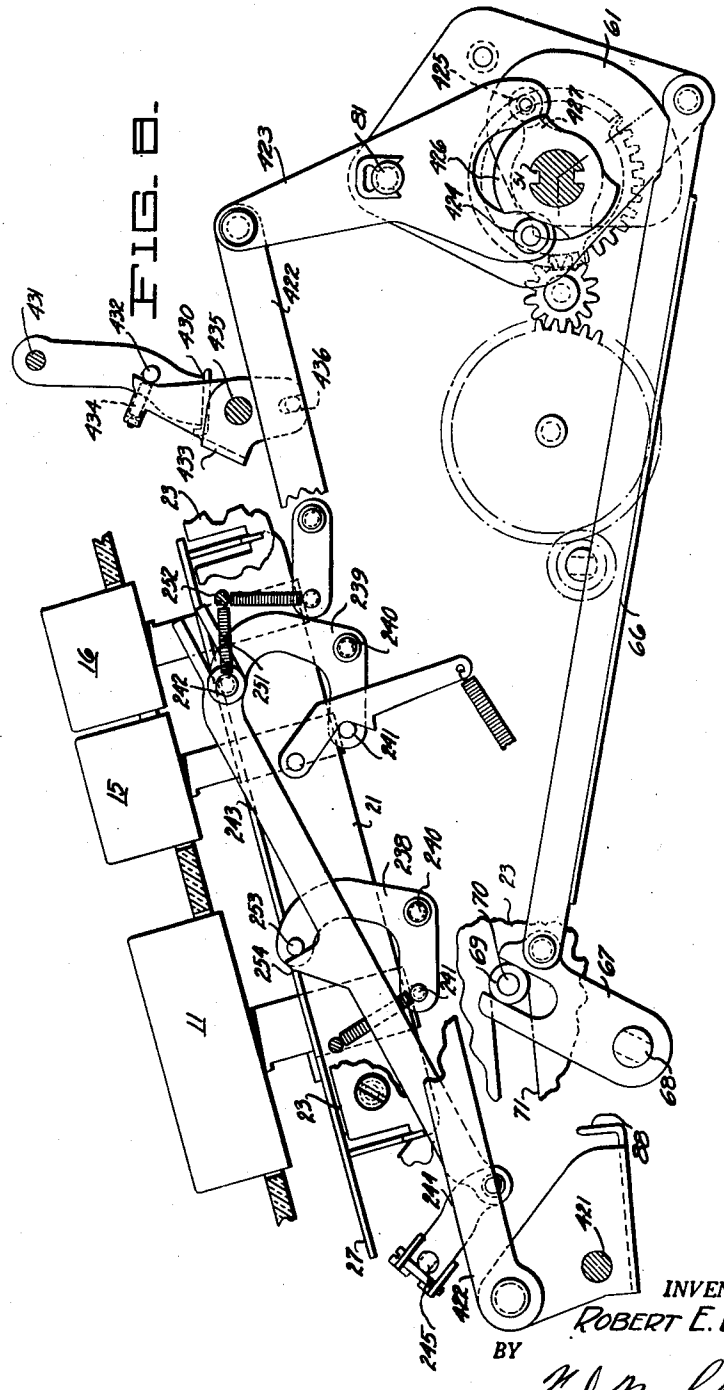
INVENTOR.
ROBERT E. BOYDEN
BY
Fred M. Schwarz
ATTORNEY

May 2, 1950 R. E. BOYDEN 2,506,337

COVER SECTION FOR OSCILLATING TYPE WHEELS

Original Filed March 13, 1945 8 Sheets-Sheet 7

FIG. 8.



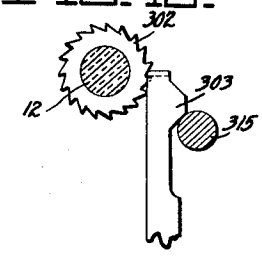
INVENTOR.
ROBERT E. BOYDEN
BY
Fred N. Schwend
ATTORNEY

May 2, 1950 R. E. BOYDEN 2,506,337

COVER SECTION FOR OSCILLATING TYPE WHEELS

Original Filed March 13, 1945 8 Sheets-Sheet 8

FIG. 10.



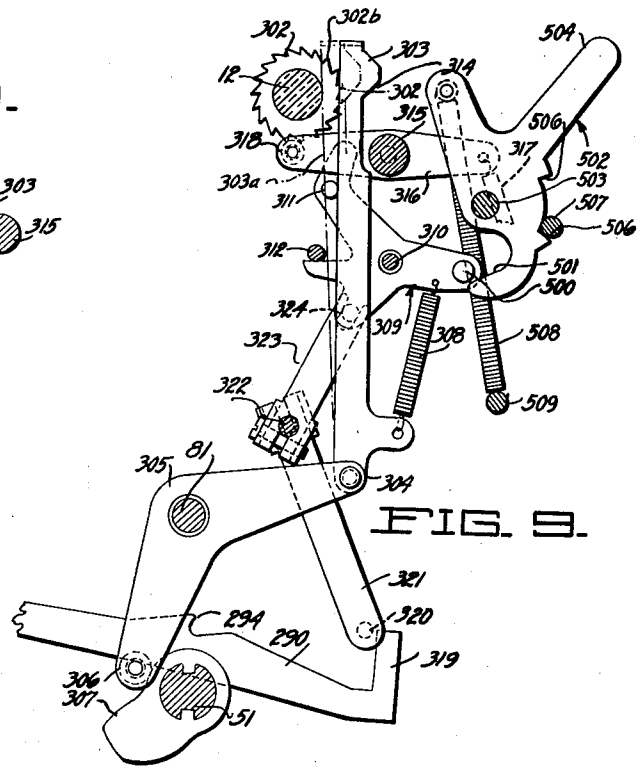


FIG. 9.

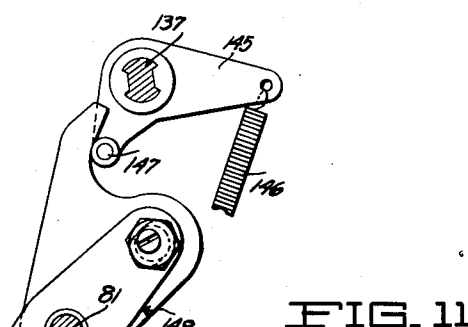


FIG. 11.

INVENTOR.
ROBERT E. BOYDEN
BY
Fred M. Schwarz
ATTORNEY

Patented May 2, 1950

2,506,337

UNITED STATES PATENT OFFICE

2,506,337

COVER SECTION FOR OSCILLATING TYPE WHEELS

Robert E. Boyden, Los Angeles, Calif., assignor to Clary Multiplier Corporation, Los Angeles, Calif., a corporation of California

Application November 26, 1946, Serial No. 712,384

7 Claims. (Cl. 101—94)

1

This invention relates to calculating machines or the like and has particular reference to machines commonly known as adding machines. However, it is to be understood that at least certain phases of the invention may be applicable to other types of machines which incorporate mechanism for impressing on a paper tape a record of values set up in the machine.

One object of the present invention is to provide a cover which effectively encloses the operating parts of a machine of the above type, particularly a printing mechanism.

Another object is to predominately display the last value printed by a machine of the above type.

The manner in which the above and other objects of the invention are accomplished will be readily understood on reference to the following specification when read in conjunction with the accompanying drawings, wherein:

Fig. 1 is a plan view of a machine embodying a preferred form of the invention.

Fig. 2 is a longitudinal sectional view with parts broken away, of the machine.

Fig. 3 is a sectional view similar to that of Fig. 2 but illustrating the machine in a phase partly through its operation.

Fig. 4 is a side view of the rack drive cams and cam follower.

Fig. 5 is a side elevational view illustrating the clutch and switch controls.

Fig. 6 is a side view of the controls for the accumulator and part of the controls for the platen feed mechanism.

Fig. 7 is a view similar to Fig. 6 but illustrating the mechanism conditioned for a sub-total operation.

Fig. 8 is a side view illustrating the rack lock, rack drive and right side motor controls.

Fig. 9 is a side view of the platen feeding mechanism.

Fig. 10 is a fragmentary side view illustrating the platen ratchet feed pawl at the end of its stroke.

Fig. 11 is a side view illustrating the printer control shaft operating device.

The present invention is disclosed in connection with a motor operated, key controlled, adding machine of the type disclosed and claimed in the copending application of Robert E. Boyden, Serial Number 582,553, filed March 13, 1945, and entitled "Calculating machine." The present application is a continuation in part of said copending application and reference is hereby made thereto for an understanding of details of the machine not specifically disclosed herein.

2

Referring in general to Fig. 1, an amount to be added or subtracted is entered in the machine by depressing appropriate "amount" keys 9. In order to add this amount, one or the other of two add bars 10 and 11 is depressed. This amount is then added into an accumulator and is also printed on a paper strip (not shown) fed over a platen 12. If the amount set on the keys 9 is to be subtracted from an amount stored in the accumulator a "minus" bar 13 is depressed.

If it is desired to print an amount set up on the keys 9, but not to add the same in the accumulator, a "non-add" bar 14 would be depressed. If it is desired to add the same amount in the accumulator two or more times, as is generally done in multiplying, a "repeat" bar 15 is depressed and held down until the requisite number of additions are made by the machine.

If a wrong amount is set up on the keys 9, the keyboard may be cleared by depressing a "correction" bar 16 which releases the keyboard without starting the motor.

When it is desired to obtain the total of a number of additions or the net total value of additions and subtractions entered into the accumulator, a "total" bar 17 is depressed. This will print the total and will clear the accumulator to zero so that it will be in condition to total a subsequent series of additions and/or subtractions. In the event it is desired to obtain a sub-total, a "sub-total" bar 18 is depressed.

Keyboard

The keyboard is of the flexible type, and each amount key 9 (Figs. 1 and 2), when depressed, serves as a stop to limit the movement of an aligned drive rack 19 which both drives the accumulator to enter therein a value corresponding to the value of the depressed key and also sets the printing mechanism to print the said value.

Each of the keys 9 comprises a key top 28 of plastic or similar material and a key stem 29 guided in aligned slots formed in a top plate 27 and a bottom frame plate 21. The keys in each bank are yieldably pressed upward by a tension spring 32 extending the length of the keyboard and suitably attached at opposite ends to the plate 27. Said spring rests upon cross ribs 33 formed across slots 34 in the plate 27 and extends in openings in each of the key stems. Upon depression of a key, the adjacent portions of the spring are stretched and extend downwardly through the slots 34.

Means are provided for locking the keys 9 in their depressed positions and for releasing any

depressed key. Each key stem has a cam lobe (not shown) formed thereon which, when the key is depressed, rocks a locking bail 38 pivoted at either end thereof to the front and rear walls of the key frame 21 by trunnion bearings 39 and 40. At the end of its stroke, the cam lobe on the key passes below the bail, enabling the latter to retract partially under the action of a spring (not shown) to a position where it latches the key depressed.

A zero stop 42 is attached to each locking bail 38, and when no key 9 in any one order is depressed, the bail 38 of that order will be spring held in an extreme inwardly rocked position in which the zero stop lies directly in front of one of the steps of the associated rack 19, thereby preventing any substantial forward movement of the rack during subsequent phases of operation of the machine. However, when any amount key is depressed and latched down, the locking bail will be held outward sufficiently to retain the associated zero stop out of the path of the aligned rack.

Referring to Figs. 6 and 8, the stems of the various control bars 11 and 13 to 18, inclusive, are also slidably mounted within the key frame 21 and plate 27. Two control bar stems of the bar 10 (one of which is shown at 50 in Fig. 2) slide vertically within aligned slots formed in the plate 27 and brackets 47, the latter being secured by screws 48 to the frame 21.

Drive

Referring to Fig. 5, the drive shaft 52 of the motor (not shown) is entrained with a main drive shaft 51 through a gear train comprising a pinion 53 on the motor shaft, which pinion meshes with an idler 54 having a pinion 55 secured thereto and meshing with a gear 56 rotatable on shaft 51 and suitably connected to the driving side of a cyclic clutch generally indicated at 57, the driven side of which is secured to the shaft 51.

Since cyclic clutches suitable for the present purpose are well-known in the art it is not deemed necessary to describe the same in detail.

The clutch is controlled by a dog 58 fulcrumed at 59 and arranged to effect engagement of the clutch upon counter-clockwise rocking movement thereof away from the clutch. Disengagement of the clutch is effected by rocking the dog 58 clockwise into the position illustrated in Fig. 5.

Means are provided for yieldably transmitting a drive from the shaft 51 to the various drive racks 19, Fig. 2, located in the different orders of the machine. Referring to Figs. 4 and 8 in particular, a pair of juxtaposed complementary rack drive cams 60 and 61 are keyed to the shaft 51 adjacent the right-hand end thereof. These cams are engaged by rollers 62 and 63, respectively, mounted on a cam follower plate 64 straddling the shaft 51 and pivoted on a cross shaft 81. A link 66 is pivotally connected between the lower end of the cam follower plate 64 and an arm 67 secured to a rock shaft 68 which is journalled in bearings (not shown) formed in the machine frame plates. The arm 67 is bifurcated to embrace a roller 69 journalled on one end of a rack drive shaft 70. The roller 69 also is guided for transverse movement within a longitudinally extending slot 71 in the machine frame plate 23.

A roller 72 (Fig. 2) on the opposite end of the shaft 70 is guided along an elongated slot 73 (similar to slot 71) in the left-hand machine frame plate 24 and a second arm (not shown) similar to arm 67 is fixed to the shaft 68 to guide the left-hand end of shaft 70 and thereby insure parallel movement of the latter during its transverse shifting movement.

Referring to Fig. 2, each of the drive racks 19 has an elongated slot 730 therein embracing the shaft 70 whereby to support the forward end of the rack. The slot 730 terminates in opposed lateral depressions 74 at its closed end. Each of these depressions 74 is normally engaged by a roller 75 carried by a pawl or drive element 76 which is rockably fitted within a groove in the shaft 70. The adjacent drive elements 76 associated with any one rack 19 are spring urged in opposite directions about shaft 70 by a tension spring 77 connected between the tails of the two elements, thus forming a yieldable connection between the shaft 70 and the respective drive rack 19.

When, during the forward movement of the shaft 70, a particular rack 19 is stopped due to striking a depressed key stem 29, or the associated zero stop 42 or a stationary "nine" stop 420, the rollers 75 will ride out of the depressions 74 against the action of spring 77, thus breaking the connection between the shaft and rack.

Referring to Figs. 2 and 3, each rack 19 is provided with equally spaced shoulders 79, the spacings of which are slightly larger than the spacings of the keys 9 so that the rack, when advanced toward the front of the machine, will strike the lower end of a depressed key after it has been moved a number of increments equal to the value of the depressed key. In the event a "nine" amount key has been depressed the rack will not be stopped thereby but will continue until the second shoulder 79 from the front thereof strikes the "nine" stop 420 attached to the forward wall of the key frame 21.

Each rack, in addition to being guided by the shaft 70, is provided with a slot 80 adjacent the rear end thereof which is guided over the stationary cross rod 81 extending between the machine frame plates.

A rack gear section 82 is formed on the upper edge of the racks for the purpose of meshing with one of a series of gears operatively connected with the printer mechanism as is disclosed in detail in said parent application. Also formed on each rack 19 is a pair of opposed rack gear sections 83 and 84 disposed on opposite sides of an associated accumulator gear or element 85 rotatably mounted on an accumulator shaft 86 forming part of the accumulator unit.

A series of notches 87 are formed on the under forward edge of each rack 19 and are spaced apart distances equal to the different increments of movement of the rack. These notches are adapted to be engaged by a locking bail 88 before and after both the forward and the return movements of the rack. For this purpose, the locking bail is pivoted at opposite ends on frame pins 421 and is connected by means of a link 422 (Fig. 8) to a cam follower 423 pivoted on a shaft 81 and carrying rollers 424 and 425 which ride on complementary cams 426 and 427, respectively, keyed on shaft 51.

Accumulator

Since the accumulator unit does not in itself relate to the present invention the details thereof are omitted herein. However, reference may be had to said parent application or to Patent No. 2,472,696 issued to Edward P. Drake on June 7,

1949, for the details of an accumulator applicable to the machine.

The accumulator unit is arranged to be raised or lowered for the purpose of engaging the various accumulator gears 85 (forming the accumulator elements) with either of the rack gear sections 83 or 84 (Fig. 2) of the racks 19. During an additive operation the accumulator is lowered to mesh the gears 85 with the lower rack gear sections 84 whereby the gears will be rotated in a clockwise direction during the subsequent forward rack movement, while, during a subtractive operation, the accumulator is raised to mesh the gears 85 with the upper rack gear section 83 so that the subsequent forward rack movement will drive the gears in a counter-clockwise direction.

The shafts 86 and 87 (Figs. 6 and 7), forming part of the accumulator unit, are guided at opposite ends thereof in vertical slots 91 and 92, respectively (Fig. 7), formed in plates 93 suitably attached in a manner not shown to the machine frame side plates.

For the purpose of raising and lowering the accumulator unit in accordance with the type of problem being performed, a box cam 94 (Fig. 6) is pivoted on a frame stud 95 and has a cam groove 96 therein embracing a roller 97 rotatably mounted on the shaft 86 at the left-hand end thereof. Clockwise rocking movement of the cam 94 in a manner to be described hereinafter will lower the accumulator to its additive position, while counterclockwise rocking thereof from its illustrated position will raise the accumulator to its subtractive position.

Printer

The printer (Figs. 2 and 3) comprises a series of numeral printing dials or elements 135, one for each of the drive racks 19. Each numeral dial has thereon a series of type ranging from zero to nine and these dials are so connected to the associated racks that they will print a digit corresponding to the value of the key depressed in the associated key bank or to the numerical position to which the rack is moved in its forward stroke.

Each dial 135 is rotatably mounted on a separate lever 136 which is loosely keyed on a printer control shaft 137 and spring-urged clockwise by a tension spring 138 extended between the lever 136 and a suitable portion of the frame. Each dial 135 has secured thereto a gear 139 permanently meshed with a gear 140 also rotatably mounted on the associated lever 136. When a lever 136 is held in its normal position illustrated in Fig. 2 by the shaft 137, the gear 140 is meshed with an aligned one of a series of large idler gears 141 rotatably mounted on a cross shaft 142. The latter idlers are continuously entrained with respective ones of the drive racks 19 through a series of pinion assemblies, the details of which are not deemed necessary to disclose herein.

At approximately the mid-point in a machine cycle, and after the racks have digitized the accumulator and printer, the printer control shaft 137 is rocked clockwise permitting the springs 138 to rock the printer arms 136 and thus carry the printing dials 135 forward into contact with a printing ribbon 144 and the paper strip (not shown) which is carried on the platen 12, whereby to print the number registered on the dials onto the paper at the printing station. The printing ribbon extends parallel to the platen 12, and is adapted to be contacted by any of the printer dials 135.

Referring to Fig. 11, the shaft 137 is fastened to a lever 145 urged clockwise by a strong tension spring 146 and provided with a roller 147 held against a camming lever assembly 148. The latter is pivoted on the cross rod 81 and has a roller 150 on the lower end thereof which rides on the periphery of a cam 151 keyed to the drive shaft 51. The latter is so arranged that as the machine passes through approximately 180° of its cycle, the spring 146 is permitted to rock the shaft 137 clockwise to effect the printing.

Means are provided to prevent printing of zeros to the left of the highest significant digit being printed while enabling all zeros to the right thereof to be printed. For this purpose a latch 152 (Figs. 2, 3 and 6) is provided adjacent each lever 136 and is journalled on a cross rod 153 extending through cam slots 154 in the various idler gears 141. The levers 152 are urged clockwise by tension springs 155 extending between the levers and a cross rod 156, and are provided with ears 157, each adapted to normally overlie a foot 158 extending forwardly from an aligned lever 136. A roller 159 rides in the cam slot 154 and when the associated idler 141 and printing dial 135 are retained at zero position the contour of the cam slot enables the spring 155 to rock the lever 152 to its fullest extent as illustrated in Fig. 2 wherein it overlies the foot 158 of lever 136 and thus prevents the latter from being rocked during the printing operation. However, when any idler gear 141 is rotated to its "one" or any other position its cam slot will rock the associated lever 152 outwardly to the position illustrated in Fig. 3, thereby enabling the associated lever 136 to be subsequently rocked into printing position. Each of the latch levers 152 is provided with an ear 160 overlying the corresponding ear on the lever to the left. Therefore, when any latch lever 152 is rocked outwardly by its gear 141, all of the levers 152 to the right thereof will likewise be rocked outwardly by virtue of the overlapping ears 160.

In order to hold the various gears in registered positions during the time that the associated gears 140 are demeshed therefrom, a locking bail 430 is provided, extending across the various gears 141 and normally engaged between two of the teeth of each thereof. The bail is pivoted on frame studs 431 (Fig. 8) and is provided with a pin 432 connected to a second bail by a spring 434 which normally holds the pin 432 thereagainst. Bail 433 is pivoted on a frame stud 435 and is pivotally connected by a pin and slot arrangement 436 to the hereinbefore mentioned link 422.

Means are provided for retaining each printer dial 135 in its registered position after the gear 140 entrained therewith is demeshed from its idler 141. For this purpose a centralizer pawl 161 (Fig. 2) is pivoted at 162 on the associated lever 136 and has a tooth 163 adapted to engage between two adjacent teeth of the dial gear 139. A tension spring 164 extending between the pawl and the lever urges the pawl toward engagement with the gear. However, when the printing levers are in their normal positions illustrated in Fig. 2, a tail on each of the pawls engages a stationary cross bar 165, thus holding the pawls out of engagement with the gears 139. During the printing operation, and when the levers 136 are rocking clockwise, the pawls 161 recede from the rod 165, thus enabling the springs 164 to rock the latter into engagement with their respective gears 139. In order to insure engagement thereof with

the gears 139, a second stationary rod 166 is located above the tails of these pawls so that as the levers 136 carry the latter upwardly and rearwardly, the tails strike the rod 166 and are positively forced in a counter-clockwise direction toward pawling positions in case the springs 164 are insufficient to do so soon enough.

Clutch controls

Operation of the machine and engagement of the clutch 57 (Fig. 5) is effected by depressing any of the various control bars except the correction bar 16 (Fig. 1).

Referring to Fig. 5 in particular, the clutch control dog 58 is connected by a pin and slot arrangement 227 to a clutch control bar 228 supported for longitudinal movement by a pair of parallel links 229 pivotally supported on frame pins 230. The bar 228 has four cam slots 231 formed therein, each of which underlies a pin 232 carried on a lever 233 pivoted on a frame pin 234 and urged upwardly by a tension spring 235 extending between the pin 232 and a frame stud 236. The pins 232 underlie the minus, non-add, sub-total and total bar stems 13, 14, 18 and 17, respectively. Therefore, depression of any of these bars will cause the associated pin 232 to cam the clutch control bar 228 forwardly to effect engagement of the clutch 57.

Provision is also made to effect engagement of the clutch upon depression of either of the add bars 10 and 11 and the repeat bar 15. Referring to Fig. 8, bellcranks 238 and 239 are pivoted on frame pins 240 adjacent the add bar 11 and repeat bar 15, respectively. Pins 241 mounted on the bellcranks 238 and 239 underlie the stems of the associated bars. A pin 242 carried at the upper end of bellcrank 239 fits within a slot formed in a control link 243 pivoted to an arm 244 which is attached to a shaft 245 pivotally mounted in flanges 246 (Fig. 2), extending upward from the brackets 47.

Arms 247 attached to the shaft 245 carry a rod 248 which extends over a camming contour 249 (Fig. 5) formed on the control bar 228. Upon depression of the repeat bar 15, its bellcrank 239 will be rocked counter-clockwise against the action of a spring 251 tensioned between the pin 242 and a frame pin 252 thereby forcing the link 243 forward to lower the rod 248 and thereby cam the clutch control bar 228 forward.

The bellcrank 238 (Fig. 8) also has a pin 253 thereon overlying a shoulder 254 on the link 243, so that depression of the add bar 11 will rock the bellcrank 238 against the action of a spring and likewise force the link 243 forwardly.

Operation of the clutch dog 58 also causes closing of a normally open motor switch generally indicated at 385 (Fig. 5). A switch operating lever 386 is pivoted on a frame pin 387 and overlies an ear 388 on the clutch dog 58 so that counter-clockwise rocking of the latter to engage the clutch will rock the lever 386 against the action of a spring 389 to permit a switch plunger 391 to be spring operated downwardly in a manner not shown to close the motor switch.

Accumulator control

As also stated under the heading Accumulator, the accumulator is raised or lowered to mesh the accumulator gears 85 (Fig. 2) with either the upper rack gear sections 83 or the lower gear sections 84 of the drive racks depending upon the type of operation to be performed. For this purpose, mechanism is provided which is under control of the different control bars for determining and effecting the positioning of the accumulator.

The hereinbefore described box cam 94 (Fig. 6) carries a pair of pins 257 and 258 arranged on opposite sides of the frame pin 95. These pins are adapted to be selectively engaged by a hook member 259 connected to a three-armed cam follower 260 pivoted on the shaft 81. The cam follower is urged counter-clockwise by a spring 261 tensioned between one arm of the cam follower and a frame pin 262 to press a roller 263 on another arm thereof against a cam 264 keyed on the drive shaft 51. Cam 264 has a high portion extending over substantially half of its periphery whereby to rock the cam follower 260 and thereby position the hook member 259 rearward during approximately the first half of a machine cycle. Normally, during additive operations or when the machine is at rest, the hook member 259 is raised by a tension spring 265, whereby a slot 266 therein embraces the upper pin 257, so that as the hook is moved rearward it will rock the cam 94 clockwise to lower the accumulator into its additive position.

For the purpose of locating the hook member 259 in a lowermost or an intermediate position, a control bar 267 is provided, being supported for longitudinal movement by a pair of parallel links 268 pivotally supported by frame pins 269. The bar 267 has four camming surfaces 270 formed thereon and underlying the various aforementioned pins 232 operable by the different control bars on the left-hand side of the machine. The bar 267 is connected by a pin and slot arrangement 271 to a bellcrank 272 pivoted on a frame stud 273 and having a pin 274 on the opposite end thereof which is embraced by a slot formed in the hook member 259.

The camming surfaces 270 of bar 267 are so arranged that upon depression of the minus bar 13, the total bar 18 or the sub-total bar 17, the control bar 267 will be moved forwardly its fullest extent which, through the bellcrank 272, will lower the hook member 259 until a slot 275 therein embraces the pin 94 so that subsequent rearward movement of the hook member will place the accumulator into its upper subtractive position. The contour of the camming surface 270 underlying the non-add bar 14 is such that depression of this bar will move the control bar 267 only half way through its stroke so that the hook member 259 will be located in an intermediate position in which neither slot 266 or 275 will embrace its associated pin on the cam 94 and consequently will not effect rocking of the cam 94 during operation of the machine.

During an additive or subtractive operation, and after the high portion of cam 264 has passed by the roller 263, the spring 261 will become effective to return hook 259 and cam 94 to their positions illustrated in Fig. 6.

In order to maintain the box cam 94 in its neutral position illustrated in Fig. 6 when it is so positioned, a centralizer lever 276 is provided, being pivoted on a frame stud 277 and urged in a clockwise direction by a tension spring 278 to force a roller carried thereby into a detent 279 formed in the under-surface of the box cam 94.

In totaling operations, the accumulator is returned to zero during the first part of the operating cycle and is then placed in a neutral position in the same manner as normal addition and subtraction operations, while in sub-totaling operations, the accumulator is returned to zero during the first part of the cycle and is then

again reset at its former accumulated value during the latter part of the cycle. Therefore, it is necessary in the latter operation to maintain the accumulator in mesh with the drive racks 19 until the latter have returned from their forward strokes. To this end, a second cam 1279 is mounted on the shaft 51 adjacent the cam 264 and is provided with a high portion around the greater part of the periphery thereof. This cam engages the roller 280 (Fig. 7) of a second bellcrank 281 also pivoted on the shaft 81 adjacent the cam follower 260. A slot 282 is formed in the rearwardly extending arm of bellcrank 281 which is co-extensive with a slot 283 formed in the cam follower 260. However, it will be noted that the rearward extension of the bellcrank 281 is somewhat shorter than the similar extension of the cam follower 260. A pin 284 carried by a link 285 rides within one or both of the slots 282 and 283 depending on its position longitudinally of the machine. The link 285 is connected to the lower arm of the lever 233 which is associated with the sub-total bar 18 and is so arranged that when the bar 18 is in a raised position, as indicated in Fig. 6, the pin 284 will be located solely in the slot 283 of cam follower 260. However, upon depression of the bar 18 as indicated in Fig. 7, the pin 284 will be moved forwardly to locate within both the slot 283 and the slot 282. In this condition, i. e. during a sub-totaling operation, the two members 260 and 281 will move as a unit and the cam 1279 will therefore, through the hook member 259, hold the accumulator engaged with the drive racks throughout the major portion of the cycle.

During totaling and sub-totaling operations, the keyboard is not utilized to control the extent of movement of the racks 19 but instead the racks are controlled by the various accumulator gears in returning from their accumulated increments of rotation to their zero positions. For this purpose, zero stop elements (not shown) are mounted on the lower shaft 87 associated with the accumulator. During totaling and sub-totaling operations the shaft is rocked counter-clockwise carrying the zero stop elements into blocking relation with zero stop teeth (not shown) mounted on the gears 85.

The shaft 87 and zero stop elements are rocked by power under control of the bars 17 and 18, and in order to accomplish this an arm 288 (Figs. 6 and 7) is keyed to the shaft 87 and is connected through a pin and slot connection 289 to a floating lever 290 which rides on the stationary frame pin 277. The forward end of lever 290 is pivoted to the lower end of a link 292, the upper end of which is pivotally connected to a cross link 293 intermediate its ends. The link 293 is pivotally connected to the pins 232 underlying the stems of the bars 17 and 18. Upon depression of either of the bars, the link 292 will be lowered sufficiently to rock the lever 290 counter-clockwise about the pin 277 to position a hook 294 thereon in the path of a pin 295 carried by the cam follower 281 so that as the latter is rocked at the beginning of a total or sub-total operation the pin 295 will drive the lever 290 forwardly, rocking the shaft 87 against the action of a spring to likewise rock the zero stop levers into blocking position. Thus, as the machine continues its cycle the racks will be driven forward, rotating the accumulator gears 85 in a subtractive direction until they are stopped in their zero positions. The racks will therefore stand in positions mechanically representing the value previously registered by the accumulator and will consequently cause the printer dials to register this value.

Platen feed

The record medium, in the form of a paper strip or tape on which the factors and results of computations are printed, is fed at certain increments past the printing station or point by the platen 12 (Figs. 1, 2, 3, 9 and 10).

In order to insure intimate driving contact between the paper and the platen, a guide member 296 (Figs. 2 and 3) is provided having the upper surface thereof conforming substantially to the contour of the platen. The member 296 is pivotally supported at 298 in a suitable manner (not shown) to machine frame plates and it is urged clockwise toward the platen by a spring 299 tensioned between the member and a suitable portion of the frame, so as to impress a roller 297 carried by the member 296 against the paper strip. A pair of fingers 300 extend upwardly from the member 296 on either side of the group of printing dials 135 to aid in guiding the strip upwardly.

The paper is carried in a roll (not shown) located in the rear of the machine and is arranged to guide the paper onto the underside of the platen 12.

A stationary paper tear-off bar 301 extends across the upper tips of the fingers 300. The bar forms a severing device for the purpose of severing the paper strip which is passed thereunder whenever the strip is pulled outwardly thereagainst.

The platen 12 is normally rotated one increment after each printing operation but when taking totals or sub-totals it is rotated three increments so as to locate such values above the tear-off bar 301. For this purpose, a ratchet 302 (Figs. 9 and 10) is attached to the platen 12 and is fed by the upper ear of a pawl 303 pivotally connected at 304 to a cam follower 305 pivoted on the shaft 81. The lower end of the cam follower carries a roller 306 engaging a cam 307 keyed on the shaft 51. The upper end of pawl 303 is urged to the left by tension spring 308 extending between the pawl and a control lever 309 which is pivoted on a frame stud 310. A pin 311, also mounted on the control lever 309, presses against the side of the pawl 303. The leverage ratios involved between the spring 308, the pawl 303, and the lever 309 are so arranged that the pin 311 will normally press the pawl rearward into the full-line position illustrated in Fig. 9, this outward movement being limited by a frame stud 312 against which the lever 309 normally rests. During operations other than totaling and sub-totaling the pawl 303 will be moved downwardly by the cam 307 against the action of spring 308 while riding against the pin 311 until the upper ear on the pawl strikes a ratchet tooth in the position indicated at 302*a*. Further downward movement will rotate the ratchet one tooth before the pawl reaches the end of its stroke. At this time, a diagonal shoulder 314 will strike a frame pin 315 thereby wedging the ear of the pawl against the ratchet 302 as illustrated in Fig. 9 to prevent overthrow of the ratchet and platen.

A centralizer arm 316 is pivoted on the frame pine 315 and is urged clockwise by a spring 317 to press a roller 318 on the opposite end thereof against the teeth of the ratchet and thus centralize the platen in its adjusted position.

In the event that the total or sub-total key is depressed the floating lever 290 will be rocked

counter-clockwise as described hereinbefore to position a hook 319 thereon behind a pin 320 on an arm 321 fastened to a rock shaft 322. During the subsequent machine operation the lever 290 will be moved forwardly and the hook 319 will rock arm 321 and shaft 322 in a clockwise direction. A second arm 323 also attached to shaft 322 is connected by a pin and slot connection 324 to the control lever 309 and, therefore, the latter will be rocked counter-clockwise, moving the pin 311 forwardly whereby the spring 308 will become effective to position the pawl 303 forwardly in the location indicated by the dot and dash lines 303*a*. Consequently, during the subsequent stroke of the pawl 303 it will engage a ratchet tooth indicated at 302*b* resulting in a three tooth advance of the platen. In the latter case, the shoulder 314 will also be effective to prevent overthrow of the platen at the end of the stroke.

The cut-off bar 301 is so located that after an additive or subtractive value has been printed, the paper strip will normally be advanced by the platen to a position wherein the printed numerals lie directly below the cut-off bar. However, after a total or sub-total operation the paper will be advanced to such an extent that the printed numerals of such total or sub-total values will lie directly above the cut-off bar, said bar being of a width substantially equal to one increment of spacing of the paper.

Manually selective means are provided to selectively control the control lever 309 so as to cause the pawl 303 to normally space the platen three increments or teeth as an incident to all types of machine operations including additions, etc., as well as totaling and sub-totaling. This provision affords sufficient spacing between the printed values to enable identifying marks, etc., to be written in between such values.

Referring to Fig. 9, a stud 500 on the control lever 309 overlies a camming shoulder 501 on a lever 502 which is pivoted on a frame pin 503 and is provided with a handle portion 504 extending through an opening 505 (Fig. 1) in the rear of the upper machine casing 361. By means of the handle portion, the camming lever 502 may be manually set clockwise from its illustrated position and, in this latter movement, the camming shoulder 501 will cam the control lever 309 into the same position it assumes under control of the link 290 during totaling and sub-totaling operations. Thus, the platen will be advanced three increments regardless of the type of machine operation.

The lever 502 is limited in its movement by shoulders 506 which limit against a stationary frame stud 507. A toggle spring 508 is tensioned between an upper extremity of the lever 502 and a frame pin 509 located below the pivot pin 503 to maintain the lever in either of its adjusted positions.

Cover

The machine is encased in a cover 361 of plastic or similar material supported in a suitable manner (not shown) by the machine frame plates 23 and 24.

In order to obtain maximum visibility of the values recorded on the paper strip and also to effectively cover the printing mechanism, a movable cover section 455 (Figs. 1, 2 and 3) is provided, being pivoted on trunnions 456 to the upper cover and extending over the printer mechanism to a point adjacent the platen 12. The section 455 is urged downward into the position shown in Fig. 2 partly by its own weight and partly by a spring 457 extending between projections on the section and on the upper cover 361. An arm 458 attached to the section 455 extends downward and has a cam surface on the lower edge thereof contacting a roller 459 carried by an arm 460 secured to the printer control shaft 137.

Normally, except during a printing operation, the section 455 lies in the position illustrated in Fig. 2, the rearmost edge of the section being positioned directly below the location of the printed numerals on the paper tape after such numerals have been recorded as the result of any operation but a total or sub-total operation, and after the tape has been advanced as an incident to such operation (assuming the lever 502 to be in its normal single spacing control position illustrated in Fig. 9). Therefore, it will be seen that the cover section aids in leading the operator's eyes directly to such last printed item. Also, the cover section and the tear-off bar 301 frame said printed item so that the last recorded value may be quickly found by the operator. This is of considerable importance in checking the entry of items in the machine when such items are successively entered at a relatively high speed.

During a printing operation, the shaft 137, when rocked to allow the printer arms 136 to rock rearward, will cause arm 460 to force arm 458 and cover section 455 upward sufficiently to allow printer dials 135 and other elements carried by the arms 136 to pass thereunder as illustrated in Fig. 3. Since this movement of the cover section is accomplished at a high rate of speed it is practically invisible to the operator and thus does not offer any material distraction.

It will be noted that the cover section 455 also covers the ribbon 144 and thus prevents dirt and dust from falling thereon. Furthermore, the cover section hides the ribbon from view thus improving the appearance of the machine.

Although I have described my invention in detail and have therefore used certain terms and languages herein, it is to be understood that the present disclosure is illustrative rather than restrictive, and changes and modifications may be made without departing from the spirit or scope of the invention as set forth in the claims appended hereto.

Having thus described the invention, what I desire to secure by United States Letters Patent is:

1. In a calculating machine, means for guiding a record medium past a recording station, recording mechanism comprising recording elements movable to and from said recording station to record a value on said record medium, a severing bar for said record medium located above said station, means operable as an incident to operation of said recording mechanism for advancing said record medium to position a recorded value thereon above said recording station and below said severing bar, a cover section for said recording mechanism, said cover section being normally located in a first position with one end thereof adjacent the path of said recording medium and below said severing bar whereby to cooperate with said bar to frame one of said recorded values only at any one time, said cover section being also normally located in the path of movement of said recording ele-

ments, means responsive to operation of said recording mechanism for raising said cover section above the path of movement of said recording elements and into a second position obstructing the last recorded value from view, and means for thereafter returning said cover section to said first position.

2. In a calculating machine, means for guiding a record medium past a recording station, recording mechanism comprising recording elements movable to and from said recording station to record a value on said record medium, a severing bar for said record medium located above said station, means operable as an incident to operation of said recording mechanism for advancing said record medium to position the last recorded value thereon above said recording station and below said severing bar, a cover section for said recording mechanism, said cover section being normally located in a first position with one end thereof adjacent the path of said record medium and sufficiently below said severing bar to cooperate with said bar to frame said last recorded value only, said cover section being also normally located in the path of movement of said recording elements, means responsive to operation of said recording mechanism for raising said cover section above the path of movement of said recording elements and into a second position obstructing the last recorded value from view, and means for thereafter returning said cover section to said first position.

3. In a calculating machine, means for guiding a record medium past a recording station, recording mechanism comprising recording elements movable to and from said recording station to record a value on said record medium, a severing bar for said record medium located above said station, means operable as an incident to operation of said recording mechanism for advancing said record medium to position the last recorded value thereon above said recording station and below said severing bar, a cover section for said recording mechanism, said cover section being normally located in a first position with the rear end thereof adjacent the path of said recording medium and sufficiently below said severing bar to cooperate with said bar to frame said last recorded value only, said cover section being also normally located in the path of movement of said recording elements, means pivotally supporting said cover section adjacent the forward end thereof for movement about a horizontal axis, means operable as an incident to operation of said recording mechanism for moving said cover section about said pivotal means and above the path of movement of said recording elements into a second position obstructing the last recorded value from view, and means for returning said cover section to said first mentioned position upon completion of operation of said recording mechanism.

4. In a calculating machine, means for guiding a record medium past a recording station, recording mechanism comprising recording elements movable to and from said recording station to record a value on said record medium, a severing bar for said record medium located above said station, means for actuating said recording elements including an actuating member, a cover section for said recording mechanism, said cover section being normally located in a first position with the rear end thereof adjacent the path of said recording medium and sufficiently below said severing bar to cooperate with said bar to frame said last recorded value only, said cover section being also normally located in the path of movement of said recording elements, means pivotally supporting said cover section adjacent the forward end thereof for movement about a horizontal axis, means controlled by said actuating member upon movement of said recording elements to said station for moving said cover section about said pivotal means to a second position above the path of movement of said recording elements and wherein said cover section obstructs the last recorded value from view and for returning said cover section to said first position upon movement of said recording elements from said recording station.

5. In a caluculating machine, a platen for guiding paper past a printing station, a cover for said machine having an opening therein adjacent said platen, printing mechanism including printing elements movable in said opening to and from said printing station to print values on said paper, a severing bar for said paper located above said station, means operable as an incident to operation of said printing mechanism for advancing said paper to position the last printed value above said printing station and below said severing bar, a cover section, said cover section being normally located within said opening in a first position with one end thereof adjacent the path of said paper and below said severing bar whereby to cooperate with said bar to print the last value thereon only, said cover section being also normally located in the path of movement of said printing elements, and means operable as an incident to operation of said printing mechanism for raising said cover section in said opening above the path of movement of said printing elements and to a second position obstructing the last printed value, said last mentioned means being operable thereafter to return said cover section to said first mentioned position.

6. In a calculating machine, a platen for guiding a paper past a printing station, printing mechanism for printing values on said paper at said printing station, a severing bar for said paper located above said station, means operable as an incident to operation of said printing mechanism for advancing said paper to position the last printed value thereon above said printing station and below said severing bar, a cover section for said printing mechanism, said cover section being normally located in a first position with the rear end thereof adjacent the path of said paper and sufficiently below said severing bar to cooperate with said bar to frame the last printed value only at any one time, and means operable as an incident to operation of said printing mechanism for raising said cover section to a second position wherein the latter obstructs the last printed value from view and for thereafter returning said cover section to said first mentioned position.

7. In a calculating machine, a platen for guiding a paper past a printing station, printing mechanism for printing values on said paper at said printing station, a severing bar for said paper located above said station, means operable as an incident to operation of said printing mechanism for advancing said paper to position the last printed value above said printing station and below said severing bar, a cover section for said printing mechanism, said cover section being

normally located in a first position with the rear end thereof adjacent the path of said paper and sufficiently below said severing bar to cooperate with said bar to frame the last printed value only at any one time, means pivotally supporting said cover section adjacent the opposite end thereof for movement about a horizontal axis, and means operable as an incident to operation of said recording mechanism for raising said cover section about said pivot means to a second position wherein the said cover section obstructs the last printed value from view and for thereafter returning said cover section to said first mentioned position.

ROBERT E. BOYDEN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,371,138	Bair	Mar. 8, 1921
1,399,450	Trinks	Dec. 6, 1921
1,568,338	Kurowski	Jan. 5, 1926
1,705,272	Sunstrand	Mar. 12, 1929
1,732,920	Waldheim	Oct. 22, 1929
2,239,060	Sloan	Apr. 22, 1941
2,245,142	Crosman	June 10, 1941
2,258,695	Anderson	Oct. 14, 1941
2,281,577	Haynes	May 5, 1942