Jan. 3, 1939. G. B. PETTER 2,142,286

CALCULATING OR ADDING MACHINE

Filed Sept. 30, 1933 2 Sheets-Sheet 1

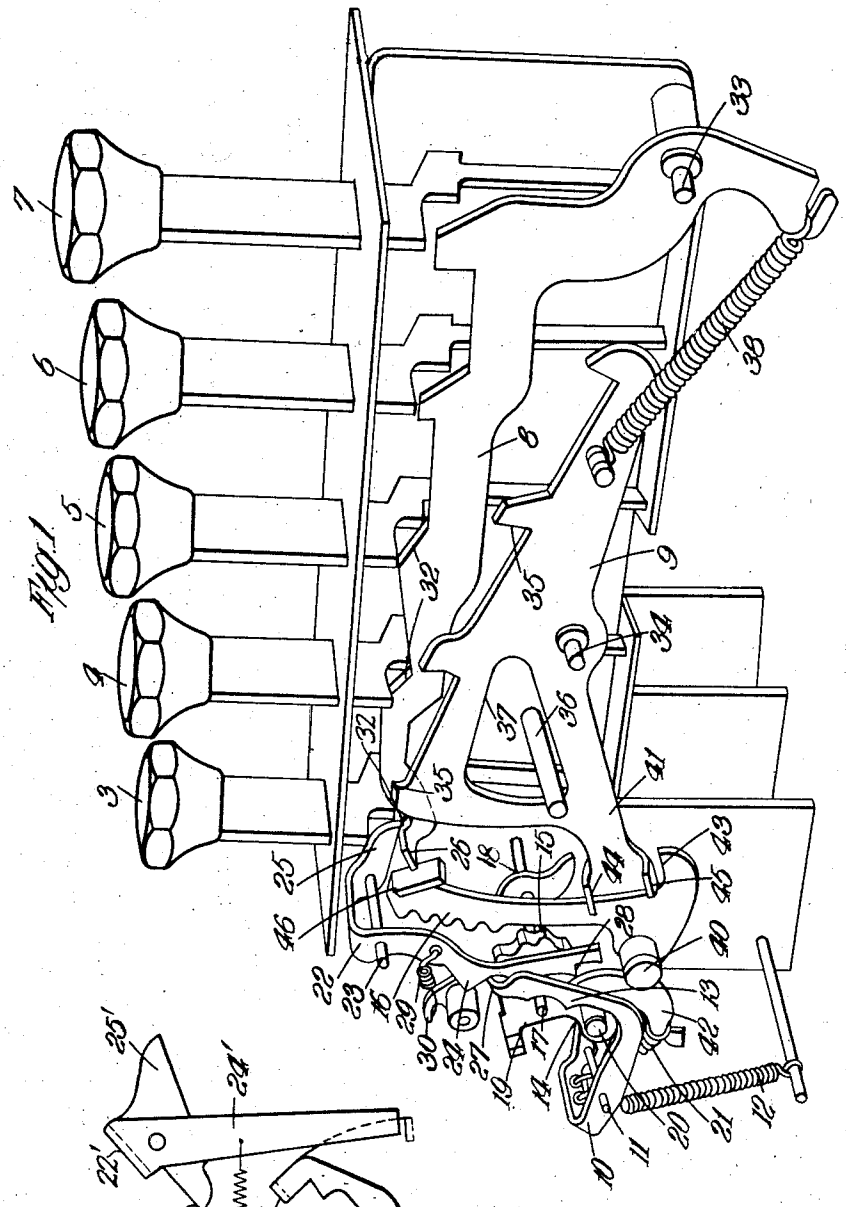


Fig. 1.

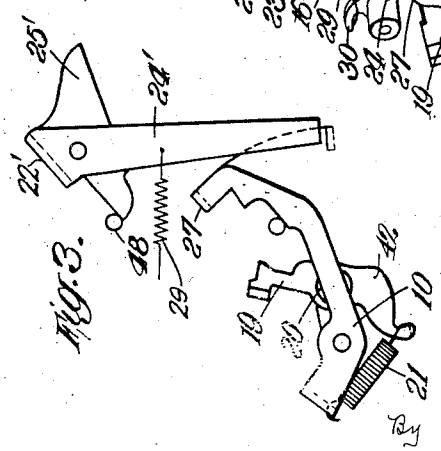


Fig. 3.

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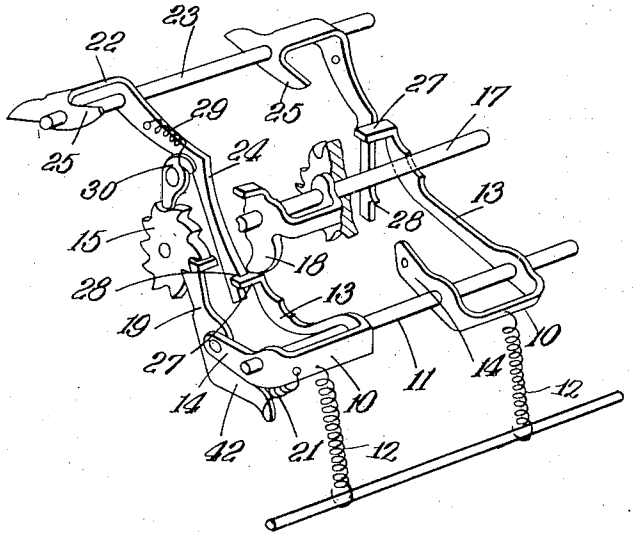
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Fig. 2.



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CALCULATING OR ADDING MACHINE

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Application September 30, 1933, Serial No. 691,669
In Great Britain October 12, 1932

3 Claims. (Cl. 235—1)

This invention relates to calculating or adding machines of the multiple bank type having a series of ordinal keys in each bank and in which depression of one of the keys causes through the medium of interengaging means the rotation of a numeral wheel. The invention has particular although not exclusive reference to machines known as partial keyboard machines in which for example only five keys are provided in each bank or column and in which for the purpose of adding the numerals "6", "7", "8", or "9" it is necessary to depress certain of the keys twice. In the specifications of my prior patents Nos. 360,375 and 360,376 actuating and transfer mechanisms applicable to partial keyboard machines are disclosed.

It is the object of the present invention to effect certain improvements in the mechanisms disclosed in these two prior English patent specifications. As referred to in the two prior patent specifications above mentioned, an actuating lever is provided in each bank or column which is turned about is pivot upon depression of one or other of the keys of the associated bank. Movement of the actuating lever is communicated to a gear segment pivotally mounted on a segment lever so as to rotate a pinion in the associated column. When the pinion passes beyond the "9" position a transfer is effected and the pinion in the adjacent column of higher order is moved forward one tooth. This movement is effected through the medium of a transfer lever which is actuated by a cam in one column and has a transfer pawl that projects into engagement with the pinion in an adjacent column of higher order. At the appropriate time the cam permits the transfer lever to move so as to effect the transfer operation.

According to the present invention means are provided for preventing movement of the transfer lever in any column to effect the transfer operation when actuation is taking place in the next higher column until after a movable part or lever in the said higher column returns to its initial position. By these means it is possible to actuate any number of columns simultaneously without causing interference between the actuating and transfer movements. For the purpose of preventing operation of the transfer lever as aforesaid, another lever may be provided (hereinafter referred to as the "duplex" lever) having two arms, one of which extends into a column to be engaged by the transfer lever to prevent operation of the latter lever at the appropriate time, whilst the other arm extends into a position in which it can be engaged, for example, by the corresponding actuating lever, the gear segment or segment lever, to move it to a position to release the transfer lever. Thus for example during duplex operations, namely, when keys in adjacent columns are depressed simultaneously, the transfer operation from the column of lower order to the adjacent column of higher order is prevented until the levers in the column of higher order are returned to their initial positions.

In order that the said invention may be clearly understood and readily carried into effect the same will now be more fully described with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of a section of a partial keyboard calculating or adding machine embodying the invention, certain parts having been omitted for the sake of clarity;

Figure 2 is a front perspective, partially exploded view of the duplex lever and associated parts of Figure 1 with certain elements omitted for the sake of clarity; and

Figure 3 is a side elevation of a modified construction of duplex lever.

In the drawings the invention is illustrated as applied by way of example to a partial keyboard machine.

In Figures 1 and 2 of the drawings one section or bank of a partial keyboard calculating or adding machine is illustrated, it being appreciated that several sections or banks are employed and arranged side by side in the actual machine. The present embodiment illustrates a machine for operating on the decimal system of notation and in the example shown five keys, 3, 4, 5, 6 and 7 are employed in each section or bank. The keys co-operate with a pivoted actuating lever 8 which imparts motion to a pivoted segment lever 9 in the manner hereinafter to be described. The reference numeral 10 indicates a transfer lever similar to the construction shown in the specification of my prior patents above referred to, the transfer lever 10 being pivotally mounted on a spindle 11 and normally urged into the position shown by means of a spring 12. The arm 13 of the transfer lever is spaced from the arm 14 thereof. The reference numeral 15 indicates a ten toothed pinion which is adapted to be rotated in a clockwise direction when any one of the keys in the associated column is depressed through the medium of a gear segment 16 carried by the segment lever 9, the pinion rotating a numeral wheel not shown but described in the prior specifications above mentioned. The pin-

ion 15 is rotatably mounted on a transverse spindle 17 and associated with each pinion is a snail cam 18 which co-operates with a lug 27 on the arm 13 of each transfer lever in each bank and moves the arm 13 in a clockwise direction as viewed in Figure 1 until the peak of the cam is reached when the said arm is moved in an anti-clockwise direction as viewed in Figure 1 under the action of the spring 12 to effect the transfer operation. The snail cam for actuating the arm 13 of the transfer lever shown is not illustrated in the drawings but the snail cam in the adjacent column of higher order is indicated by the reference numeral 18. The arm 14 of the transfer lever 10 carries a transfer pawl 19 which is pivotally mounted on the arm 14 at 20 and is connected to a spring 21, the pawl 19 being adapted to be moved into engagement with the pinion 15 to move it forward one tooth when the arm 13 of the transfer lever 10 is permitted to move in an anti-clockwise direction during the transfer operation.

In accordance with the main feature of the present invention means are provided for preventing movement of the transfer lever 10 to effect the transfer operation until the movable parts or levers in the adjacent column of higher order, which column includes the pinion which is to be moved forward one tooth, are returned to their initial position. The means according to the invention includes a duplex lever 22 pivoted on a spindle 23 towards the upper part of the machine, the duplex lever having a downwardly extending arm 24 disposed to engage the arm 13 of the transfer lever 10 and having another arm 25 extending into a position in which it can be engaged by a movable part of the lever system such as the segment lever 9, gear segment 16 or actuating lever 8. In the example shown the arm 25 is adapted to be engaged by a lug 26 on the end of the actuating lever 8. The arm 24 of the duplex lever is provided with a curved portion as shown which is adapted, when the actuating lever of said higher order is depressed to be engaged by the lug 27 on the arm 13 of the transfer lever 10 for a considerable length of travel of the said lever 10 when it is moved by its associated transfer or snail cam. The end of the arm 24 of the duplex lever 22 is adapted to move into the path of the lug 27 when the transfer lever is passing the position corresponding to the zero position of the associated numeral wheel and is about to be returned under the influence of the spring 12 to its initial position to effect the transfer operation. In the preferred construction shown in Figure 1 the arm 24 of the duplex lever is provided with a notch 28 for engagement with the lug 27 on the transfer lever and for limiting the duplex lever when moving into engagement with the lug 27. Normally the arm 24 of the duplex lever is held out of engagement with the lug 27 due to the engagement of the arm 25 of the duplex lever with the lug 26 on the actuating lever 8. When, however, the actuating lever 8 is moved as a result of key actuation, the arm 24 of the duplex lever is caused to move by a spring 29 into the path of the lug 27 on the transfer lever 10, the spring 29 in the example shown being connected to a pawl 30 which prevents anti-clockwise rotation of the pinion 15. If at this time key actuation is occurring in the adjacent column of lower order so as to cause the transfer cam to move the transfer lever 10 into position to effect the transfer operation, the lug 27 on the transfer lever is caught on the end of the arm 24 of the duplex lever and passes into engagement with the notch 28; the transfer operation is thus delayed until the aforesaid actuating lever 8 in the adjacent column of higher order is returned to its initial position when the lug 26 thereon engages the arm 25 of the duplex lever and causes the latter to be moved out of engagement with the lug 27 on the transfer lever, permitting the latter to be rotated in an anti-clockwise direction as viewed in Figure 1 to its initial position to enable the pawl 19 on the transfer lever to engage the associated pinion and move it forward one tooth to effect the transfer operation.

The actuating lever 8 in the example shown and as described in the aforesaid prior patent specifications is provided with inclined surfaces or serrations 32 so that the proper extent of movement can be imparted to the said lever 8 on depression of one of the keys. In the present construction a single actuating lever is provided as shown in each column for the five keys and is pivoted at the rear of the machine on a spindle 33, the spindle being located beyond the fifth key and in a position below the pivot 34 of the segment lever 9. The segment lever 9 is pivotally mounted on the pivot 34 more or less midway of the length of the key bank, the segment lever being provided with stops 35 for limiting the movement imparted to the segment lever but instead of having five stops as described in the above mentioned prior patent specification, only four stops are provided. It will be appreciated that when the actuating lever is moved downwardly by the keys the lug 26 engages the lug 46 hereinafter more fully referred to, which causes the segment lever 9 to move about its pivot 34 in an anti-clockwise direction so that one of the stops 35 engages whichever of the keys 3, 4, 5 or 6 is depressed. The stop for the fifth key is afforded by the engagement of the segment lever 9 with a spindle or bar 36. As shown the spindle or bar 36 passes through a slot 37 in the segment lever 9, the slot being so shaped and dimensioned that the spindle or bar 36 serves to limit not only the movement of the segment lever 9 on depression of one of the keys but also the return movement of the said lever. It will be understood that if the key 7 is depressed the segment lever 9 is turned about its pivot until the upper edge of the slot 37 is engaged by the bar 36. The actuating lever 8 and segment lever 9 are resiliently connected together by a spring 38 so that the two levers are held normally at the top or uppermost position as shown. The gear segment in each column as referred to in the above mentioned prior patent specifications when applied to a calculating machine for operating on the decimal system of notation is provided with ten teeth for co-operation with a pinion also provided with ten teeth. In the present construction whilst providing the pinion with ten teeth the gear segments 16 in the partial keyboard machine shown are provided with gear teeth corresponding in number to the number of keys in each bank. In the embodiment shown in the drawings five teeth are provided on the gear segment 16 since there are only five keys in each column. The gear segment 16 is pivotally mounted at 40 on an arm 41 of the segment lever 9 the said arm extending into proximity to a downwardly extending arm 42 on the transfer pawl 19, the arrangement being such that on the return movement of the transfer lever to effect the transfer operation and when the transfer oper-

ation is completed, the downwardly extending arm 42 on the transfer pawl 19 comes into engagement with the pivot or boss 40 of the gear segment so that the transfer pawl is held in mesh with its associated pinion in order that the pinion cannot be thrown by its momentum beyond the one tooth movement necessary to effect the transfer operation. When, however, the cam associated with the transfer lever 10 is rotated to move the transfer lever against the tension of the spring 12, the downwardly extending arm 42 on the transfer pawl is moved away from the pivot or boss 40 to release the pinion held by the transfer pawl. Similarly the said pinion is released upon key actuation in the same column as the transfer pawl, as the pivot or boss 40 is moved away from the downwardly extending arm 42 of the transfer pawl upon movement of the segment lever 9. The gear segment 16 in the present embodiment is constituted by two arms one of which is provided with the said teeth and projects upwardly from the aforesaid pivot or boss 40 whilst the other arm projects in the opposite direction, this latter arm constituting an abutment 43 for the purpose hereinafter described. The arm 41 of the segment lever 9 is provided with a pair of lugs 44 and 45 projecting into the path of the gear segment, one of the lugs 44 being on one side of the pivot or boss 40, whilst the other lug is located on the opposite side to co-operate with the abutment 43. The upper end of the gear segment 16 is provided with a lug 46 which co-operates with the lug 26 on the actuating lever 8 on the downward stroke of one of the keys of the associated bank. When the actuating lever 8 is turned about its pivot 33 the lug 26 thereon engages the lug 46 with a sliding action and moves the gear segment into engagement with the teeth of the pinion 15, the movement of the gear segment into mesh with the pinion being limited due to engagement of abutment 43 with the lug 45. As aforesaid, the pivot of the actuating lever 33 lies behind that of the segment lever 9 and is so situated that the path of the lug 26 on the actuating lever nearly coincides with the path of that portion of the gear segment with which it engages, whereby there is a minimum amount of sliding movement between the two. Upon the return stroke of the actuating and segment levers the lug 26 on the actuating lever moves away from the lug 46 on the gear segment and due to the pinion 15 being prevented from anti-clockwise rotation by means of its pawl 30 the gear segment 16 moves out of gear with the pinion 15 until finally in its normal position it leaves the gear altogether. The out of gear movement of the gear segment is limited due to the engagement of the lug 44 with the gear segment. Other means may if desired be provided for limiting the movement of the gear segment.

The curvature of the arm 24 of the duplex lever is not an essential feature. In Figure 3 of the drawings a modified construction is shown in which the arm 24' is straight and instead of providing the notch 28 on the arm 24 as shown in Figure 1 the lug 27 on the transfer lever 10 engages beneath the end of the arm 24' as shown in Figure 3 the clockwise movement of the arm 24' being limited by a fixed stop 48. The dotted line position shown in Figure 3 indicates the relative positions of the transfer lever 10 and the arm 24' of the duplex lever when the latter is in position to prevent the transfer operation.

Due to the provision of the duplex lever in each column as aforesaid it is possible to actuate any number of columns simultaneously without causing interference between the actuating and transfer operations. It has been found possible to make the pinion and its associated parts so light that the transfer operations take place with extreme rapidity so that even under high speed actuation the operations are always completed without risk of interference by subsequent actuations.

Although in the above description the invention has been described in conjunction with a partial keyboard calculating or adding machine, it is to be understood that the invention is not to be limited thereto since certain features, notably the duplex lever, can be applied to full keyboard machines. It will be appreciated that in a full keyboard machine operating on the decimal system of notation the gear segment will be provided with ten teeth and if desired more than one actuating lever or more than one segment lever can be used as described in the specifications of my prior patents above referred to.

Although in the above description the decimal system of notation has been referred to it will be appreciated that other systems of notation may be employed for example the English monetary system.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a calculating machine, a plurality of accumulator wheels, actuators therefor, movable members for moving said actuators, a cam fixedly arranged relative to a wheel of lower decimal order, a spring controlled transfer lever, movable in one direction by said cam and in the opposite direction by said spring, a spring controlled locking lever having an arm movable into the path of said transfer lever to prevent movement thereof by the spring, means on a movable member of higher order for normally holding said locking lever out of the path of said transfer lever, said locking lever being movable by its spring into the path of said transfer lever when said movable member is moved.

2. A calculating machine as in claim 1, wherein the locking lever has a second arm disposed in the path of and engageable by said means on the movable member of higher order.

3. In a calculating machine a plurality of accumulator wheels, actuators therefor, movable members for moving said actuators, a cam fixedly arranged relative to a wheel of lower decimal order, a spring controlled transfer lever movable in one direction by said cam and in the opposite direction by said spring, a spring controlled locking element having two arms one of which is movable into the path of the transfer lever to prevent movement thereof by its spring, means on a movable member of higher order adapted normally to engage the second arm of said locking element and thus to hold the first arm out of the path of said transfer lever, said locking element being moved by its spring into a position wherein the first arm will lie in the path of said transfer lever when said movable member is moved and being returned positively to its normal position on return of said movable member by virtue of the engagement of the said means on the movable member with said second arm.

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