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B. CARLSTRÖM

2,312,797

LOCKING MECHANISM FOR THE SETTING MEMBERS OF CALCULATING MACHINES

Filed March 5, 1940

2 Sheets-Sheet 1

FIG. 1.

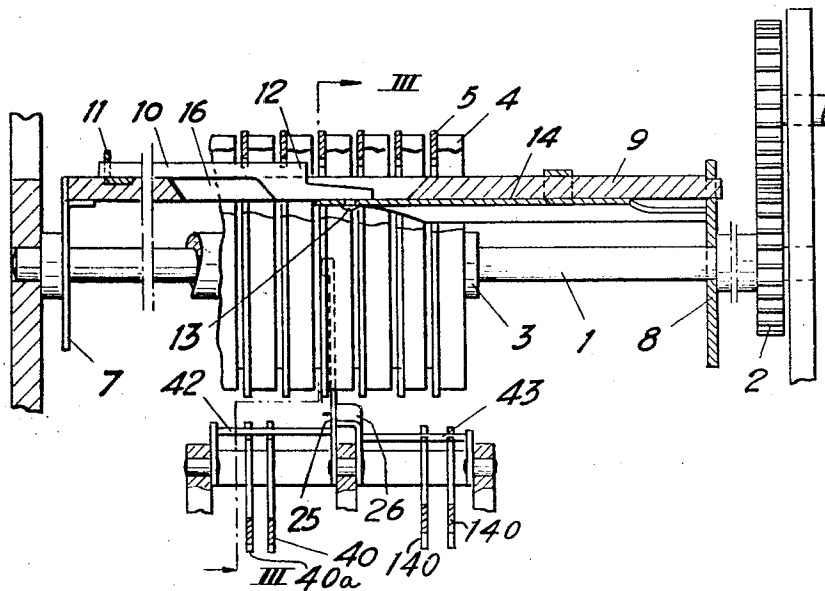
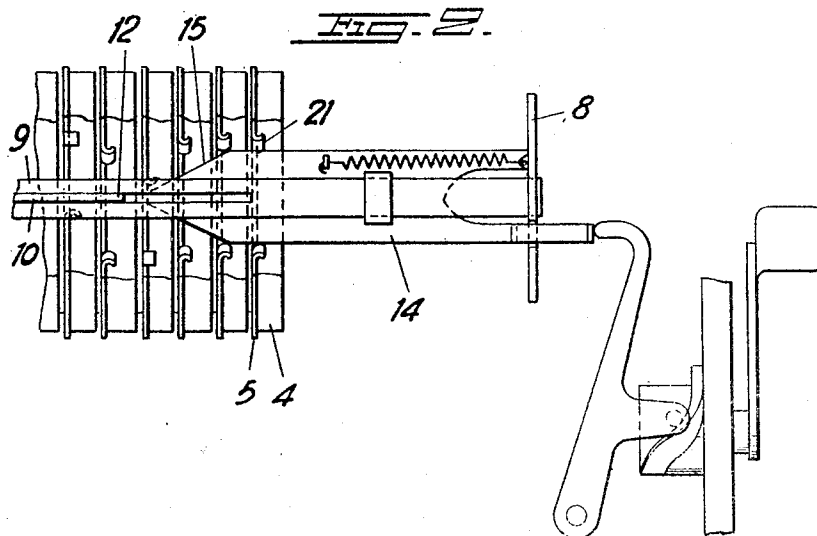


FIG. 2.



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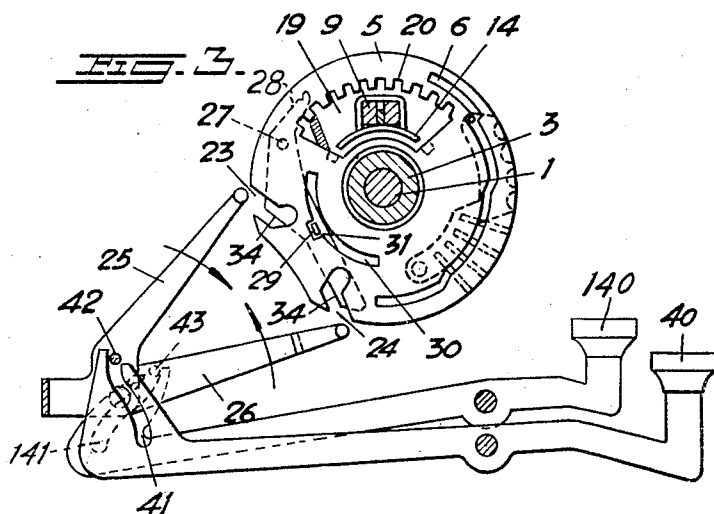
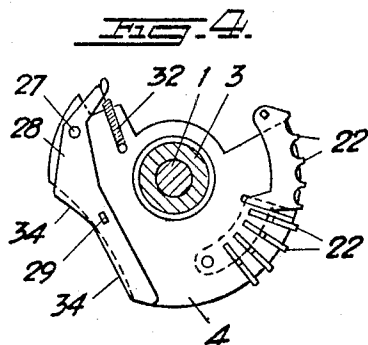
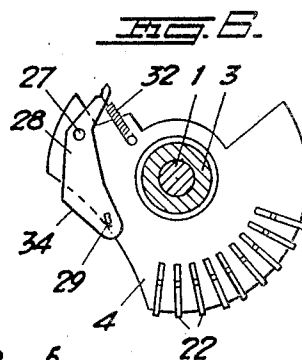
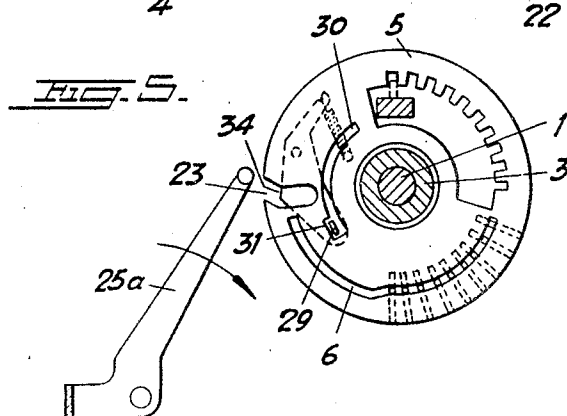
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LOCKING MECHANISM FOR THE SETTING MEMBERS OF CALCULATING MACHINES

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6 Claims. (Cl. 235—130)

In calculating machines the setting members (which may consist of pin-wheels, Thomas wheels or the like) are generally locked in set position during the calculating operations. When the setting members have been returned to their zero or reset position, however, some or all of them are not locked but may be unintentionally moved out of their zeroized or reset position in such denominations in which no digit has been set (entered) and in which the setting members should remain in their zero position. Such unintentional displacements of the setting members may cause errors of calculation and may also result in jamming, when the machine is operated. It is to be noted that as soon as a resetting or zeroizing operation has been completed, the setting members should be ready for a new setting operation. Thus, in accordance with the ideas heretofore prevailing, the setting members should not be locked subsequent to a zeroizing operation in order not to prevent a following setting operation.

An unintentional displacement of those setting members which have not been set, may easily take place, when in moving the machine from one place to another, it is not handled with a sufficient care, for instance, by putting it down on a table with a shock.

As an example, reference may be made to the machine illustrated in the British Patent No. 351,276 (or the U. S. Patent 2,108,596) as well as in the U. S. Patent 1,927,771. In said machine, the setting members, that is to say, the pin wheels, are positively locked immediately after they have been set, but the pin wheel just to be set by means of the numeral keys as well as the adjacent pin-wheels have not yet set (which are in engagement with the slanting part of the zeroizing wedge) are not locked and may, therefore, be unintentionally displaced or rocked out of their zero position. In other machines, analogous conditions prevail.

The present invention relates to calculating machines of the type having numeral keys; in such machines pawls actuated by strong springs cannot be used to keep the setting members in their zero position, as in such case a strong spring pressure would have to be overcome in effecting the setting operations and, consequently, the necessary finger pressure on the numeral keys would be too high.

The object of this invention is to overcome such drawbacks and to provide means for positively locking all of the setting members, thereby preventing any unintentional displacement thereof. To this end the setting devices of the machine are normally locked and are unlocked only during the actual setting operation, that is to say, while the respective numeral key is depressed. It is to be noted that the locking opera-

tion is quite independent of the position of the manually operated crank (or motor) of the machine as well as of the position of the setting mechanism. Another object of the invention is to effect the locking of the setting device without substantially increasing the finger pressure necessary for depressing a numeral key. It is to be pointed out that in all calculating machines a light finger pressure for manipulating the numeral keys is essential.

With these and other objects in view, the invention consists, essentially, in the provision of individual means (as detents) for positively locking the various setting members in their zero position, each of said locking means being independently movable to unlocking position exclusively under the control of the numeral keys when depressed to effect a setting operation, preferably before the setting motion proper of the setting member starts, so that at every moment only the locking means associated with the setting member operated may be released by means of the numeral keys.

Two embodiments of the invention are shown in the accompanying drawings.

Fig. 1 is a front view (partly in section) of an Odhner or pin-wheel rotor having a locking device constructed in accordance with this invention.

Fig. 2 shows part of the mechanism of Fig. 1 as seen from above, the upper portions of the pin wheels being removed.

Fig. 3 is a section on the line III—III of Fig. 1.

Fig. 4 is an end view of a pin wheel, after the cam disc thereof has been removed.

Fig. 5 is a section of a modified embodiment.

Fig. 6 is an end view of the pin wheel of Fig. 5, after the cam disc has been removed.

The machine shown in Figs. 1-4 is of the Odhner or pin-wheel type in which the pin wheels are set in two directions from a zero position (cfr. for instance, the British Patent No. 351,276 or, for a more full description, the U. S. Patent No. 2,108,596). Figs. 5 and 6 illustrate the invention as applied to a machine, in which the pin wheels are set by means of a unidirectional rotation.

With reference to Figs. 1-4 of the drawings, 1 indicates a main shaft journaled in the machine frame which may be rotated by a toothed wheel gearing 2 from a manually operated crank or a motor (not shown). Slidably but not rotatably mounted on the shaft 1 is a carriage 3. Said carriage supports an Odhner or pin wheel rotor comprising a set of pin wheels 4 and a set of cam discs 5, one for each pin wheel. The wheels 4 with their pins 22 are rigidly connected to the carriage 3, while the cam discs 5 are movable with relation to the respective pin-wheels 4 in order to effect the setting of the

pins 22. In the example shown, said setting operation is effected in both directions by means of the cam slot 6 (Fig. 3), the pin wheels 4, 5 being successively set, beginning with the extreme left hand wheel in Figs. 1 and 2. The setting operation is effected by means of numeral keys, in well-known way, each depression of a key causing the carriage 3 to move one step to the left so that, as soon as the setting of a pin wheel 4, 5 has been completed, the next pin wheel will be moved to the setting position in front of the numeral key system. Such a setting mechanism is wholly described in the patents above referred to so that a detailed description thereof seems not to be necessary in this connection. It is sufficient to say that each cam disc 5 has two notches 23, 24, into which levers 25, 26, respectively, enter in order to rotate the cam disc clockwise or counterclockwise to an angle corresponding to the numeral key depressed. The numeral keys are divided into two groups which act directly upon the levers 25 and 26, respectively. In Fig. 1 two keys of each group are shown, the keys of one group being designated by reference characters 40 and 40a, and those of the other group by 140 and 140a. In Fig. 3 only one key of each group is shown. For its cooperation with the lever 25 in Fig. 3, the key 40 is formed with a cam slot 41 engaged by a pin or rod 42 rigidly connected to the lever 25, see also Fig. 1, which is adapted to be engaged by any of the keys forming the group which includes key 40. The lever 26 is provided with a similar pin or rod 43 to be engaged by the keys of the other group which includes key 140 formed with a cam slot 141.

Secured to the shaft 1 are two discs 7, 8 and between them a rod 9 extends which is parallel to the shaft 1 and rigidly connected to said discs, so that the parts 1, 7, 8, 9 constitute a rigid aggregate. A locking bar or rail 10 is in slidable engagement with a stirrup 11 mounted on the bar 9 in such a manner that the locking bar 10 can only be displaced axially. The bar 10 comprises an elevated portion and a depressed portion, a shoulder 12 being formed therebetween. Said depressed portion is connected, as by rivet 13, to a zeroizing or resetting member 14. Said member 14 consists of a plate having parallel straight edges and ending at one end in a wedge-shaped point 15 (Fig. 2) bounded by two oblique edges. As shown in Fig. 3, the zeroizing member 14 may be curved, as seen in end view, so as to form part of a cylinder concentric with the shaft 1 and the pin wheels 4, 5. The zeroizing member 14 may be displaced together with the locking bar 10 a fixed distance in the axial direction. During this motion the member 14 slides on the lower surface of the rod 9.

The non-slidable rod 9 is provided with a long axial recess 16 (Figs. 1 and 3), in which the lower portion of the locking bar 10 slides.

The axially extending parts 9, 10, 14 pass through recesses formed in the wheels 4 and the cam discs 5. Because said parts 9, 10, 14 cannot rotate with relation to the shaft 1, the recesses of the wheels 4 may have a shape corresponding to the cross section of said parts 9, 10, 14. As shown in Fig. 4 the recess in the wheel 4 may (for other reasons) be larger. The cam discs 5, on the contrary, must be rotatable a certain angle in relation to the shaft 1, in order to be able to effect the setting of the pins 22, and for this reason the recesses 19 of the cam discs 5 have the shape shown in Fig. 3. At its outer

circular edge the recess 19 of each cam disc has ten notches 20 for the ten setting positions (corresponding to the numeral values 0, 1, 2 ... 9) of the cam disc 5. The recess 19 is, substantially, of the shape of a sector of a circular ring, the centre angle of which is approximately equal to the centre angle of the zeroizing member 14. Right opposite the edges of the member 14 flaps 21 are bent out from the cam discs 5 (Fig. 2).

Each wheel 4 carries a pin 27, on which a locking lever or detent 28 is journaled. Said detent 28 has a lateral projection 29, which is always in engagement with a circular slot 30 of the cam disc 5 which is concentric with the shaft 1. In its centre said slot has a radial notch or recess 31, into which the projection 29 enters under the action of the tensional spring 32 when the cam disc 5 is in its central position and, consequently, the respective pin wheel 4 is held zeroized or reset. In this position, parts (that is, the oblique surfaces 34) of the detent 28 bridge the recesses 23, 24, as shown in Fig. 3.

Evidently, each cam disc 5 is positively locked in its zero position by the action of the locking members 29, 31, 32 and cannot be turned in relation to its pin wheel 4, until the projection 29 is moved out of the notch 31. It is thus seen, that any unintentional movement of the cam disc is positively prevented.

The device described operates as follows:

After the resetting operation has been completed, all of the cam discs 5 are in their zero position and positively locked against motion in relation to their pin wheels, by the action of the locking members 29, 31, 32. Assuming a numeral key be depressed, the corresponding setting lever 25 or 26 will be rocked into engagement with the extreme left-hand cam disc, that is to say, the cam disc of the highest denomination. In this operation, the setting lever first strikes one of the oblique surfaces 34 of the detent 28 and rocks the latter so that the projection 29 is moved out of the notch 31 and the cam disc 5, consequently, is released. In its continued rocking motion, the lever 25 or 26 rocks the cam disc, until such a number of pins 22 has been set into operative position as corresponds to the numeral value of the key depressed. During this motion the projection 29 may slide freely in the slot 30. When, afterwards, the numeral key is released, the lever 25 or 26 returns to its position of rest shown in Fig. 3, under the action of a spring, the carriage 3 being simultaneously, in well-known manner, displaced axially one step to the left in Figs. 1 and 2. During this displacement the shoulder 12 enters the corresponding notch 20 of the cam disc 5 just set, thereby positively locking said cam disc in its set position. The same procedure is repeated in connection with the successive setting of the remaining pin wheels.

The pin wheels set are positively locked by the locking bar 10 and the pin wheels not set, that is to say, those which are in their zero position, are locked by the projection 29 in the notch 31. This locking of the pin wheels set as well as of those not set also takes place during the performance of the calculating operations, because in both cases the locking is independent both of the rotation of the pin wheels and of the axial displacement (shifting) of the carriage 3 during the calculating operations. It is thus seen, that the locking operation is quite independent of the manually operated crank or the motor.

After the calculating operations are finished, the pin wheels may be zeroized without difficulty, namely, in the example shown, by displacing the zeroizing member 14 to the left in Figs. 1 and 2 in well-known way. By this displacement the notches 20 of the cam disc are successively disengaged from the locking bar 10, and the cam discs thus released are zeroized by the member 14. During this operation the projections 29 of the detents 28 automatically enter the notches 31 under the influence of springs 32 to lock the cam discs. After the zeroizing operation has been completed, all cam discs and pin wheels are locked in their zero position and can be moved therefrom only as a result of a new setting operation. Consequently, an unintentional motion is impossible.

It is to be noted that the release of the detent 28 by means of the setting lever 25 or 26 may be effected with a very low consumption of energy, because the lever slides along the corresponding oblique surface 34 of the detent. In addition, the pivot 27 of the detent is situated at a substantial distance from the point where the lever 25 or 26 strikes the detent, and the spring 32 can obviously be weak without causing any trouble. Consequently the finger pressure to be exerted on the numeral keys may be low.

The embodiment shown in Figs. 5 and 6 relates to an Odhner-machine, in which the pin wheels are set by a rotation in one direction only. For effecting the setting operation a single setting lever 25a is used. In other respects this embodiment is similar to that shown in Figs. 1 and 4 and corresponding parts are indicated by like reference numerals.

It is also to be noted that the invention may be applied both to calculating machines having stationary registers and to calculating machines having the registers mounted in a shiftable carriage. The invention is of special advantage in connection with ten-key machines, but may also be applied to machines having a full key-board. The invention may be applied to machines the pins of which are adapted to be set in the axial direction as well as to machines, the pins or teeth of which are radially set. Thus, the invention is not limited to machines having cam discs for effecting the setting operation, but may also be applied to calculating machines having a setting mechanism of other construction. The detent 28 may be mounted to slide instead of rock and may be adapted to cooperate with projections instead of the notch 31.

What I claim is:

1. In a calculating machine, a series of depressible numeral keys, a setting mechanism including a series of pin wheels and a rotatable cam disc associated with each pin wheel for effecting the setting of the pins of the respective wheels, a detent for each pin wheel and its associated cam disc to positively lock the pin wheel and cam disc to each other in the zero position of the pin wheel, and a lever operable by the depression of any of said series of numeral keys for effecting release of said detent and rotation of the cam disc in a timed relation to each other.

2. In a calculating machine, a series of depressible numeral keys, a setting mechanism including a series of pin wheels and a rotatable cam disc associated with each pin wheel for effecting the setting of the pins of the respective wheels, a lever

operable by the depression of any of said series of keys to effect rotation of the cam disc, a detent for each pin wheel and its associated cam disc to lock the pin wheel and cam disc to each other in the zero position of the pin wheel, said detent lying in the path of movement of said lever so as to be released by the latter when acted on by a numeral key for effecting rotation of the cam disc.

3. In a calculating machine, a series of depressible numeral keys, a setting mechanism including a series of pin wheels and a rotatable cam disc associated with each pin wheel for effecting the setting of the pins of said wheels, a lever operable by the depression of any of said series of keys to effect rotation of the cam disc, a detent for each pin wheel and its associated cam disc to lock the pin wheel and cam disc to each other in the zero position of the pin wheel, said cam disc having a recess in its circumference to receive the free end of said lever, said detent lying within the circumference of the cam disc in register with said recess so as to be operated by the lever when moved for effecting a rotation of the cam disc.

4. In a calculating machine, a series of depressible numeral keys, a setting mechanism including a series of pin wheels and a rotatable cam disc associated with each pin wheel for effecting the setting of the pins of said wheels, a detent pivotally mounted on each pin wheel and engaging the associated cam disc so as to lock the pin wheel and cam disc to each other in the zero position of the pin wheel, and a lever operable by the depression of any of the series of numeral keys for effecting release of said detent and subsequent rotation of the cam disc.

5. In a calculating machine, two groups of depressible numeral keys, a setting mechanism including a series of pin wheels and a rotatable cam disc associated with each pin wheel for effecting the setting of the pins of the pin wheels, two levers each operable by an individual group of numeral keys to effect rotation of the cam discs in opposite directions, a detent for each pin wheel and its associated cam disc to lock the pin wheel and the cam disc to each other in the zero position of the pin wheel, said detent lying in the paths of movement of said levers so as to be released by either of the levers when acted on by a numeral key for effecting rotation of the cam disc in the respective direction.

6. In a calculating machine, two groups of depressible numeral keys, a setting mechanism including a series of pin wheels, and a rotatable cam disc associated with each pin wheel for effecting the setting of the pins of the pin wheels, two levers each operable by an individual group of numeral keys to effect rotation of the cam discs in opposite directions, and a detent pivotally mounted on each pin wheel and engaging the associated cam disc so as to lock the pin wheel and cam disc to each other in the zero position of the pin wheel, each cam disc being formed with two recesses each adapted to receive an individual one of said levers when moved for effecting the rotation of the cam disc in the respective direction, said detent lying in register with both of said recesses so as to be operated by either of the levers when moved for effecting rotation of the cam disc.

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