

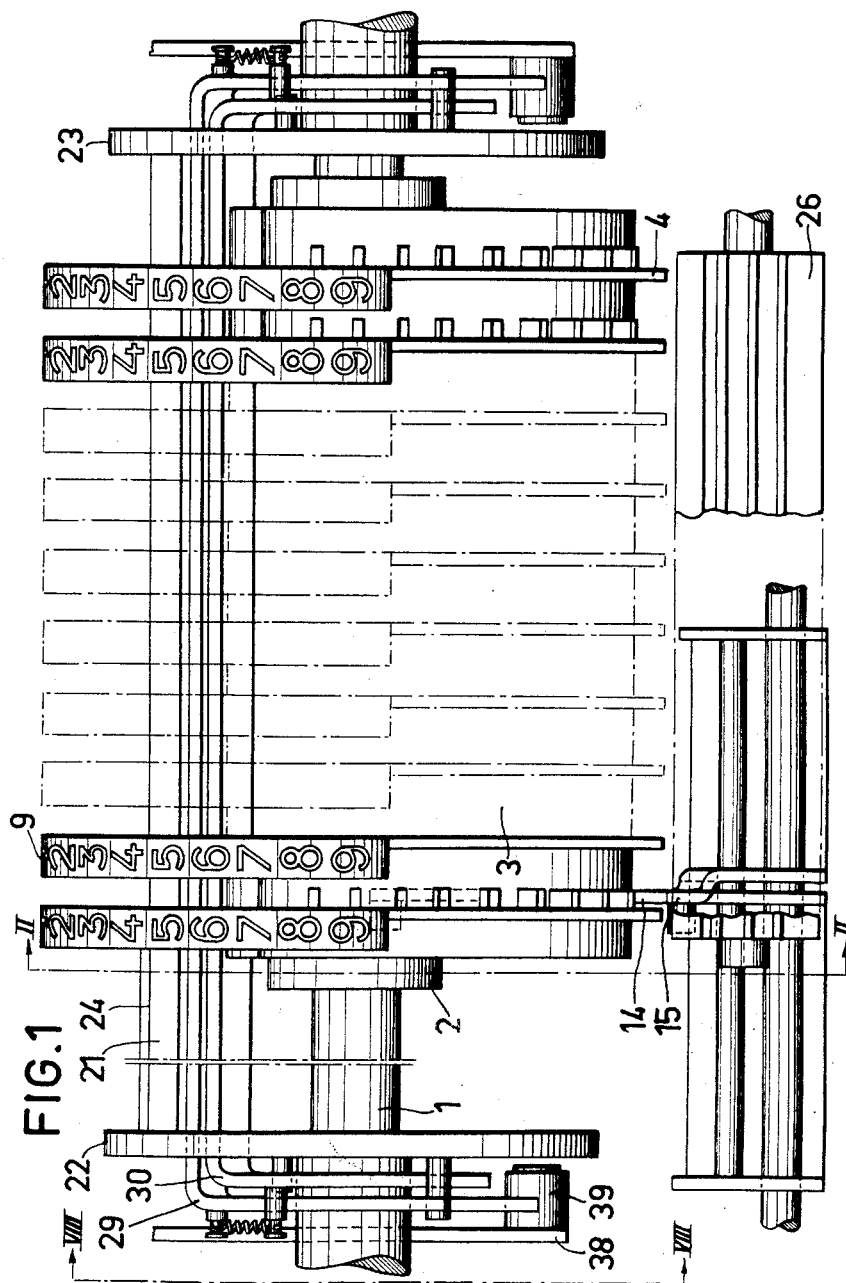
Oct. 6, 1959

E. K. GRIP
ZEROIZING MECHANISM FOR CALCULATING
MACHINES OF THE PINWHEEL TYPE

2,907,518

Filed Dec. 12, 1956

7 Sheets-Sheet 1



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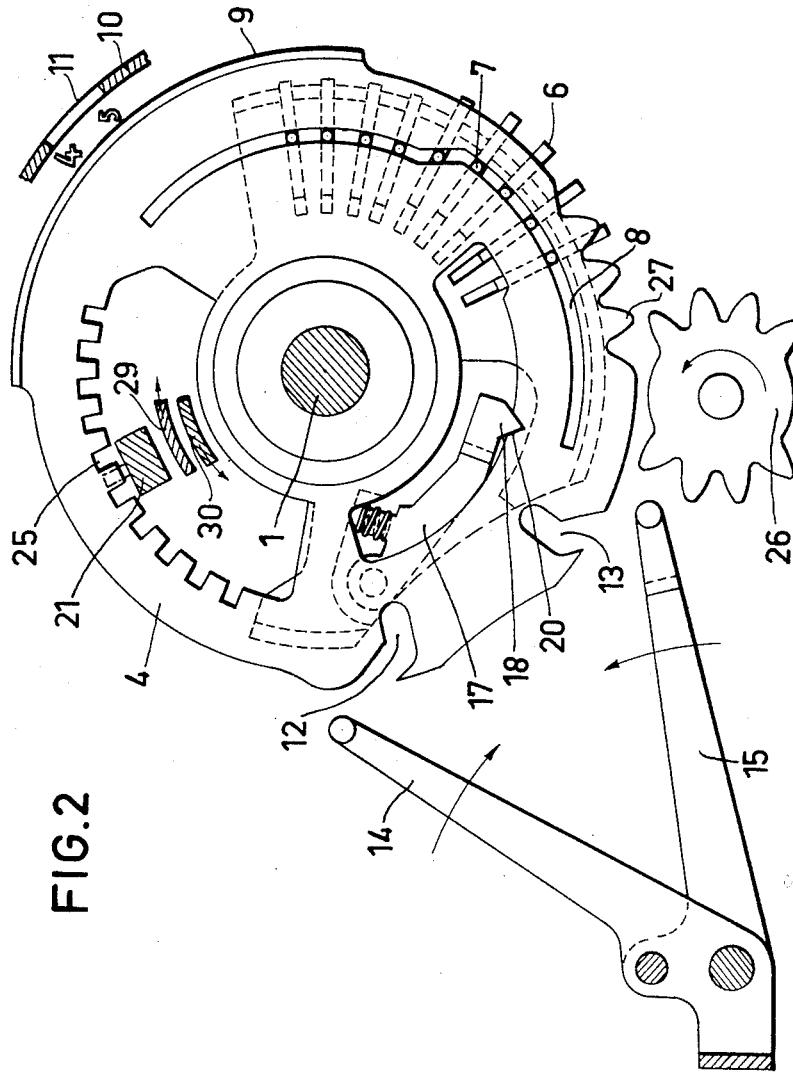


FIG. 2

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FIG. 3

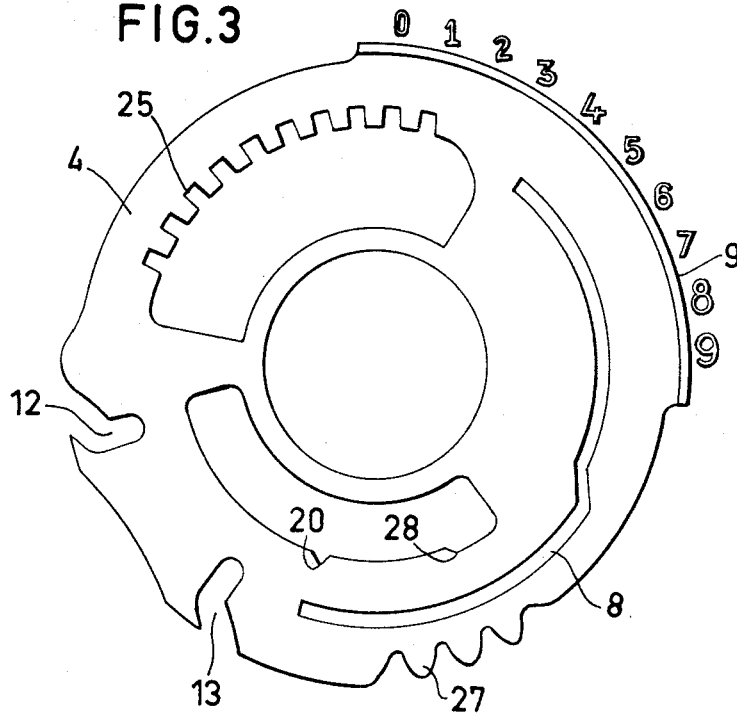
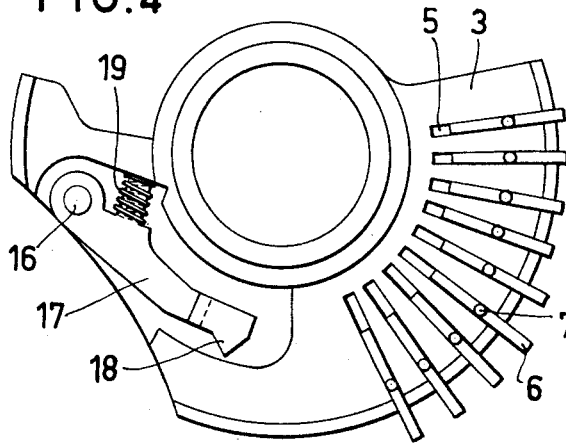


FIG. 4



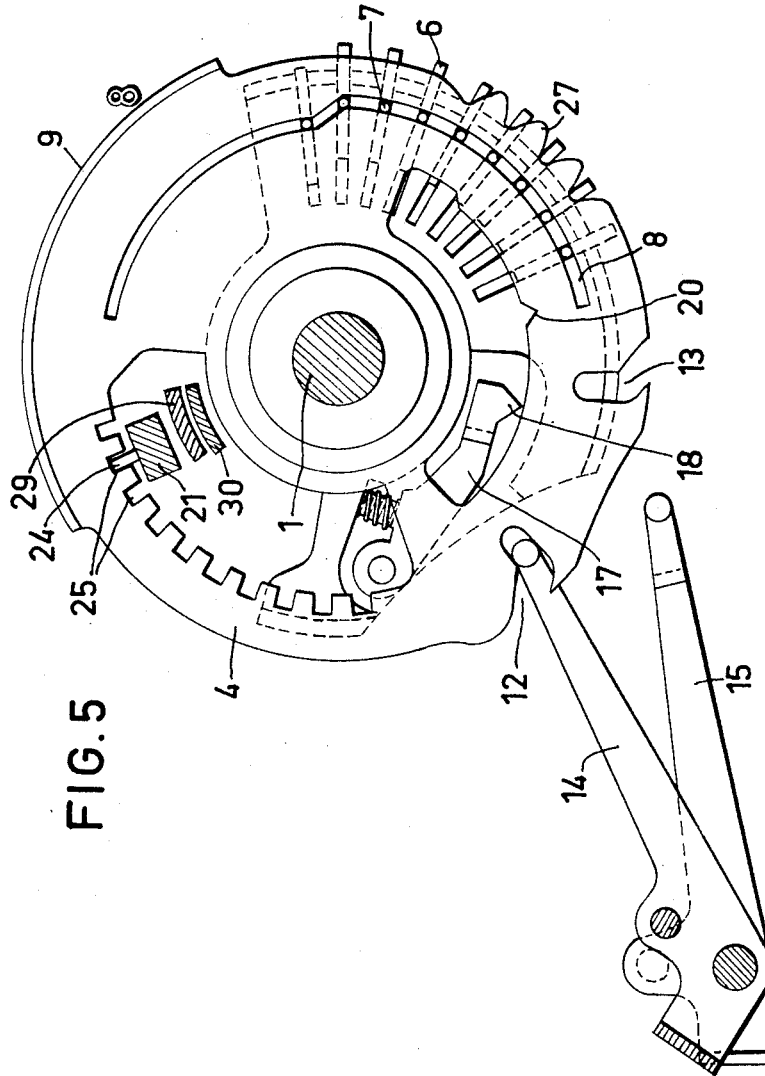
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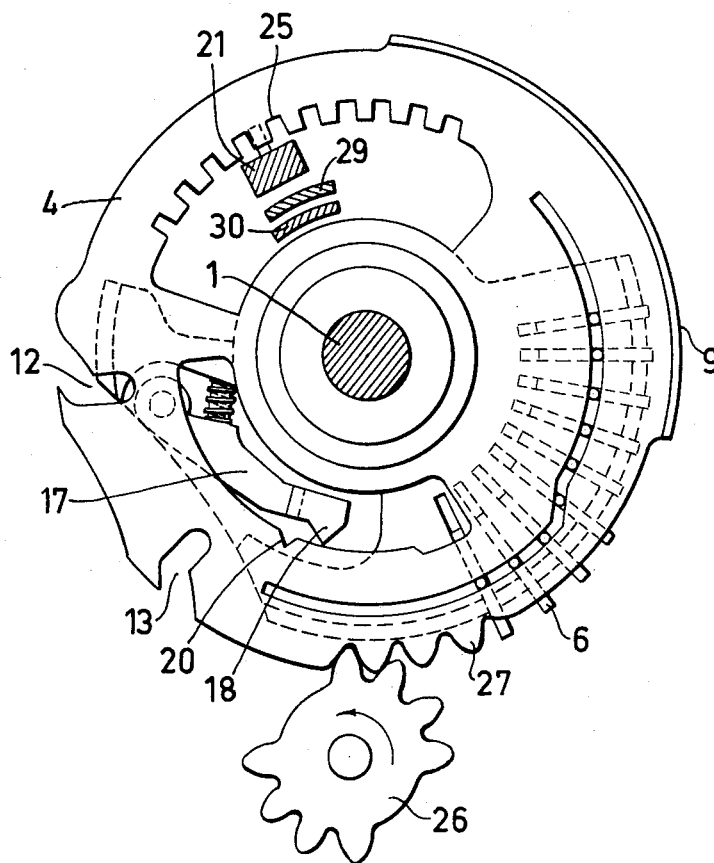
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FIG. 6



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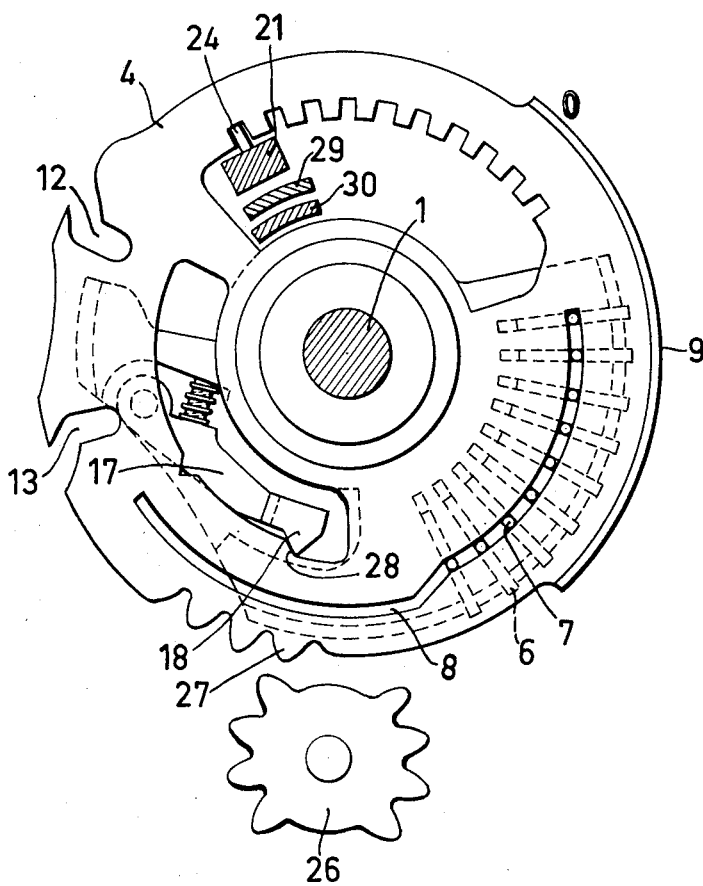
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FIG.7



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FIG. 8

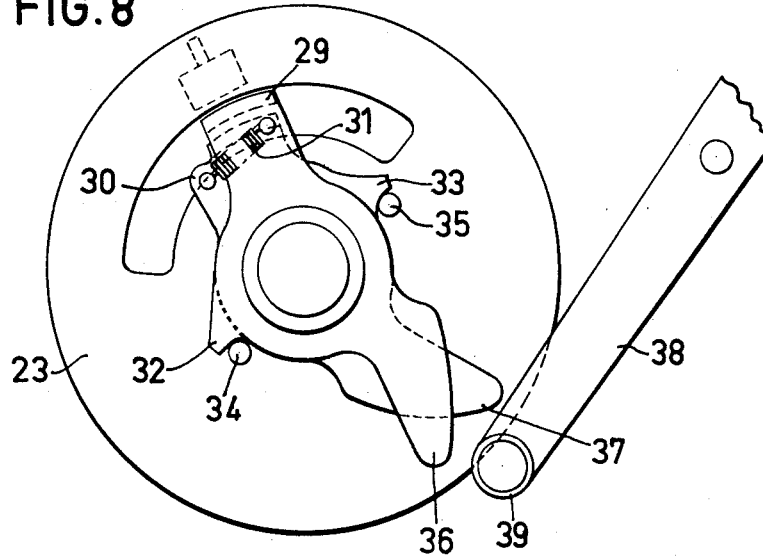
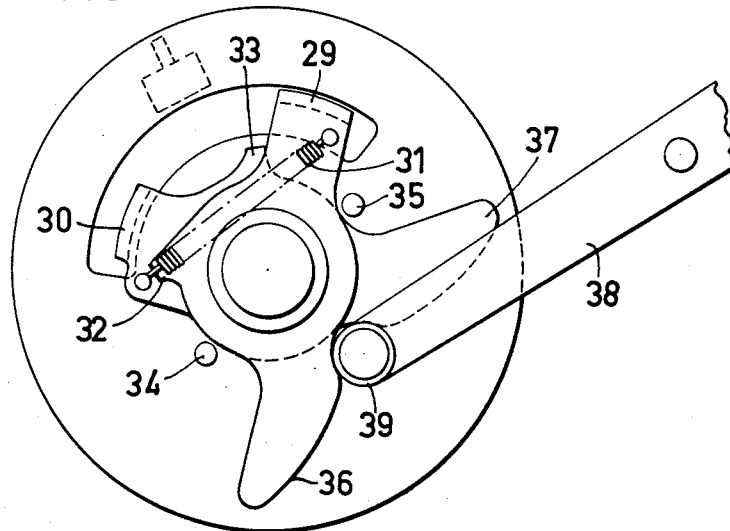


FIG. 9



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ZEROIZING MECHANISM FOR CALCULATING MACHINES OF THE PINWHEEL TYPE

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Application December 12, 1956, Serial No. 627,783

Claims priority, application Sweden December 13, 1955

4 Claims. (Cl. 235—81)

The present invention relates to calculating machines of the "Odhner" type in which the setting-up mechanism comprises pin wheels with adjustable pins, which are actuated by means of rotatable cam discs. During setting-up the said cam discs are rotated through an angle corresponding to the particular digit set, that is, the angular displacement thereof depends upon the value of the digit set.

The mechanical effort required for setting up the digits varies within wide limits depending upon whether, for instance, a nine is set up, and therefore the use of keys to effect setting-up is rendered much more difficult.

Different constructions have been proposed to eliminate these difficulties, for example the device according to Swedish patent specification No. 74,358 in which the cam discs are rotatable in both directions from the initial position and actuate certain of the pins when rotating in one direction and the remaining pins when rotating in the opposite direction.

Transfer of numbers from the results register or the revolutions counter to the setting-up mechanism, however, is hardly possible by means of the setting up mechanism disclosed in Swedish patent specification No. 74,358, since the angular displacement of the cam discs is not proportional to the value of the digit set.

The object of the present invention is to make such a transfer possible while at the same time the setting up by means of keys is highly facilitated.

The device according to the invention is substantially characterized in that the initial position of the cam discs is not the zero position, the initial position instead being substantially mid-between the highest and the lowest number that can be set up, that is, for the decimal system approximately at $4\frac{1}{2}$ (about midway between zero and nine).

When numbers between zero and four are set by means of keys, the cam discs are turned in one direction, and when numbers between five and nine are set, the cam discs are turned in the opposite direction. Thus the greatest angular displacement of the cam discs is reduced to about one half of the angular displacement otherwise required, which in turn results in a lessened differential in setting-up effort among the setting-up keys 1-9.

An embodiment of the invention will now be described, reference being had to the accompanying drawings in which,

Fig. 1 shows a front elevation of the parts essential to the invention.

Fig. 2 is a section on the line II—II of Fig. 1.

Fig. 3 illustrates a cam disc.

Fig. 4 is a fragmentary view of a pin wheel, the cam disc being omitted.

Fig. 5 illustrates the position of the parts when the digit eight has been set up.

Figs. 6 and 7 are side elevational views of one embodiment of a zeroizing device for the cam discs, the zeroiz-

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ing having been started in Fig. 6 and having been completed in Fig. 7, and

Figs. 8 and 9 are side elevational views of a device for restoring all cam discs to their initial position. In Fig. 8 the said device is not actuated, in Fig. 9 it is actuated.

Referring now to the drawings, reference numeral 1 designates a main shaft mounted in the framework of the calculating machine, which main shaft is rotated in a well-known manner (therefore not shown in the drawing) by means of the hand crank or a motor. A carriage 2 is mounted on shaft 1 and is displaceable lengthwise on the shaft but non-rotatable with respect thereto. The carriage supports an Odhner or other pin-wheel type rotor which in a well-known manner comprises a number of pin wheels 3 rigidly secured to the carriage and an equal number of cam discs 4. Each pin wheel 3 (Fig. 4) has nine pins 6, corresponding to numbers 1-9 in the decimal system mounted thereon, each pin being radially displaceable in a corresponding groove 5, each pin 6 is in a well-known manner, provided with a laterally projecting stud 7 which engages a cam slot 8 in the corresponding cam disc 4, said pins 6 consequently being displaced radially of the pin wheel on rotation of the corresponding cam disc. A circumferential portion 9 of the cam discs 4 is provided with numbers 0-9, and of those numbers the one which has been set up is visible through a window 11 provided in the casing 10 of the machine. The cam discs 4 are further shaped with two recesses 12 and 13 at their periphery which are engaged by setting up arms 14 and 15 actuated by the keys for turning the cam discs 4 clockwise (Fig. 2) for setting up the digits 4-0 and counterclockwise (Fig. 2) for setting the digits 5-9.

The setting up arms 14 and 15 are actuated by the setting keys of the calculating machine in a manner disclosed in Swedish patent specification No. 74,358.

In its initial position the pin wheel rotor 2 is located at the far right of the machine (Fig. 1). The extreme left cam disc 4 corresponding to the highest decade then is located in setting up position opposite the setting up arms 14 and 15. When a digit has been set up in the said highest decade the pin wheel rotor is moved a step to the left, in a manner known per se, for example as described in Swedish patent specification No. 74,358, and the cam disc 4 of the next highest decade will assume its setting-up position at the same time as the digit first set up on the pin wheel becomes visible at the right of the window 11 in the casing 10 of the machine.

If more digits than one are set up, the pin wheel rotor is thus moved as many steps to the left as the number of digits set up.

The cam discs 4 are prevented from unintentional turning by latches 17 pivoted on studs 16 on the pin wheels 3 (Fig. 4), the said latches being formed with projections 18 which, by means of springs 19 acting upon the latches, are urged into locking engagement with notches 20 in the cam discs 4 (Fig. 2).

On a bar 21 extending axially through the rotor 2 and secured on two disc members 22 and 23 fixed to the main shaft 1 of the machine a rule-shaped locking member 24 is mounted (Figs. 1 and 5). In order to cooperate with the locking member 24 the cam discs 4 are formed with notches 25 at angular positions which correspond to the respective set-up positions of the numbers 0-9.

The locking member 24 extends from the left side of the machine to that cam disc 4 that is located in setting-up position opposite the setting-arms 14 and 15 (Fig. 1) only, so that the said cam disc and those located to the right thereof are not locked by the member 24 but are only retained by the latches 17. Thus when digits are

set up in the pin wheel rotor the cam discs are locked consecutively as the carriage is moved stepwise to the left and during the calculating operation all the cam discs belonging to pin wheels in which digits have been set up, are prevented from rotating relative to the rotor.

During certain calculating operations, for example division, it will be necessary that the rotor may be tabulated to a position farthest to the left in the machine. All the pin wheels, in which digits have not been set up, must then be in their zero position.

In order to enable those cam discs 4 that are located to the right of cam discs in which digits have been set up, to be zeroized the machine is provided with a toothed roller 26 rotatably mounted in the machine framework (Figs. 1 and 2) in a manner not illustrated. The toothed roller 26 extends from the setting up position to the right across all cam discs located to the right of said setting-up position, and when a special tabulating key or the like, known per se, is depressed, the toothed roller 26 is coupled, in a manner not illustrated, to a member, for example a toothed wheel or the like which imparts a rotation of half a revolution to the roller 26 (in the direction of the arrow in Figs. 2 and 6), making the roller engage teeth 27 formed on the circumference of the cam discs 4 (Fig. 6) and turns the said discs back to the zero position, thus, in Fig. 7 about $4\frac{1}{2}$ pitches.

After this rotation of the cam discs has occurred, the tabulating operation of the rotor can take place in the usual manner. In order to prevent rotation of the cam discs during the movement of tabulation, before they are locked by the locking member 24, the projections 18 of the latches 17 engage a notch 28 formed in the cam discs 4 (Fig. 7).

In order to restore the cam discs 4 to their initial position the pin wheel rotor 2 must first be tabulated back to its initial position farthest to the right in the machine, so that all cam discs 4 will cease to engage the locking member 24. Two bail-shaped members 29 and 30 (Figs. 1 and 2) which are rotatably mounted on the main shaft 1 and extend axially through the whole rotor 2, thereafter restore the cam discs 4 to their initial position by being rotated through a predetermined angle (in the direction of the arrows in Fig. 2).

The bail-shaped members 29 and 30 are normally held by a tension spring 31 interconnecting the same, in such a position (Fig. 8) that stops 32 and 33 provided thereon engage studs 34 and 35, respectively, fixed to the disc 23. The shank portions of the bail-shaped members 29 and 30 are further provided with cam portions 36 and 37, respectively. An arm 38 provided with a roller 39, is urged towards the said cam portions 36 and 37, respectively, and thus causes the rotation of the bail-shaped members 29 and 30 (Fig. 9). It should be kept in mind, however, that the initial position of the cam discs 4 is not the same as the zero position thereof.

Thus, the cam discs are moved by the bail-shaped members 29 and 30 back to their initial position about midway between 0 and 9 (Fig. 2), and from this position digits are set up by turning the cam discs 4 in either direction. When the cam discs 4 are in their initial position, the corresponding pin wheel must be in setting-up position or to the right thereof (opposite the setting-up arms 14 and 15); none of the digits provided on the circumferential portions 9 of the cam discs being visible in the window 11 in the casing 10 (Fig. 2) as the said window extends to the left from a position corresponding to one step to the left of the setting-up position (Fig. 1). The cam discs 4 can be rotated to zero position (Fig. 7) either by the setting-up arm 15, when the setting-up key 0 (not shown) is depressed or by turning the toothed roller 26 half a revolution when the rotor is tabulated.

What I claim is:

1. In a calculating machine having a laterally shiftable multi-order rotatable actuator of the pinwheel type, the

pins being adjustable by means of rotatable cams coaxial with said pinwheels and in which the cams normally occupy positions corresponding to digital values other than zero and are set sequentially from an initial lateral position to selected values by rotation in opposite directions through angular amounts corresponding to the digit set under control of digit keys, the improvement which comprises external teeth on the rotatable cams, a toothed roller engageable with said cam teeth and extending axially parallel to the axis of the cams from the lowest denominational order to the next to the highest denominational order of the actuator when the actuator is in initial position and means to rotate said roller to set all cams unset by the digit keys to zero positions.

2. In a calculating machine having a laterally shiftable actuator of the pinwheel type, the pins being adjustable by means of rotatable cams and in which the cams normally occupy positions corresponding to digital values other than zero and are set to selected values by rotation in opposite directions through angular amounts corresponding to the digit set under control of digit keys, the improvement which comprises means for positioning the rotatable cams to positions corresponding to a digital value of 4.5, said means comprising a pair of bars extending axially through axially aligned circumferentially extending slots in the rotatable cams and means for rotating said bars in opposite directions about the aligned axis of said slots, said bars engaging the periphery of said slots during said rotation to effect said positioning prior to each setting of the cams by the digit keys.

3. In a calculating machine having a laterally shiftable multi-order rotatable actuator of the pinwheel type, the pins being adjustable by means of rotatable cams coaxial with said pinwheels and in which the cams normally occupy positions corresponding to digital values other than zero and are set sequentially from an initial lateral position to selected values by rotation in opposite directions about the aligned axis of said slots, said bars engaging the periphery of said slots during said rotation through angular amounts corresponding to the digit set under control of digit keys, the improvement which comprises external teeth on the rotatable cams, a toothed roller engageable with said cam teeth and extending axially parallel to the axis of the cams from the lowest denominational order to the next to the highest denominational order of the actuator when the actuator is in initial position, means to rotate said roller to set all cams unset by the digit keys to zero positions, means for positioning the rotatable cams to positions corresponding to a digital value of 4.5, said means comprising a pair of bars extending axially through axially aligned circumferentially extending slots in the rotatable cams and means for rotating said bars in opposite directions to effect said positioning prior to each setting of the cams by the digit keys.

4. In a calculating machine having a laterally shiftable multi-order rotatable actuator of the pinwheel type, the pins being adjustable by means of rotatable cams coaxial with said pinwheels and in which the cams normally occupy positions corresponding to digital values other than zero and are set sequentially from an initial lateral position to selected values by rotation in opposite directions through angular amounts corresponding to the digit set under control of digit keys, the improvement which comprises external teeth on the rotatable cams, a toothed roller engageable with said teeth and extending axially parallel to the axis of the cams from the lowest denominational order to the next to the highest denominational order of the actuator when the actuator is in initial position and means to rotate said roller to set all cams unset by the digit keys to zero positions, means for positioning the rotatable cams to positions corresponding to a digital value of 4.5, said means comprising a pair of bars extending axially through axially aligned circumferentially extending slots in the rotatable cams,

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means for rotating said bars in opposite directions about the aligned axis of said slots, said bars engaging the periphery of said slots during said rotation to effect said positioning prior to each setting of the cams by the digit keys, and means for locking the cams, said means comprising a rule like member extending through aligned internal teeth formed in circumferential slots in the cams, said member having an axial length equal to the length of said multi-order actuator to engage the teeth of cams of denominational orders equal in number to the number of denominational orders of the actuator and extending from the lower denominational orders of the actuator towards the higher orders from a position

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located one order higher than the highest denominational order of the actuator when said actuator is in its initial position.

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