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MINIATURE-TYPE CALCULATING MACHINES

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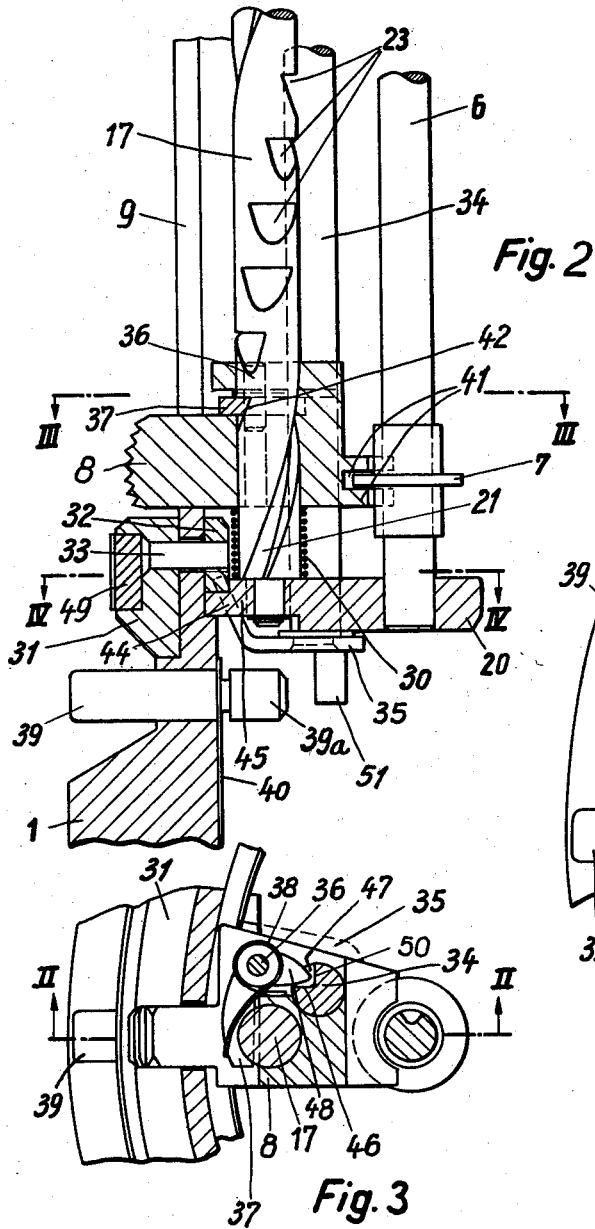


Fig. 4

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## MINIATURE-TYPE CALCULATING MACHINES

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The present invention relates to a clearing device for miniature type calculating machines of the type having a centrally mounted rotatable drive member for actuation of the counting mechanism.

These miniature-type calculating machines are characterized by a plurality of parallel setting shafts the number of which corresponds to the number of orders of the setting mechanism, said parallel shafts being mounted in a casing spaced along a circle concentric with a drive member.

To return the setting shafts in these calculating machines to their initial or zero position—this operation can be described more briefly by the term "individend clearing," which means the set setting shafts which are turned out of the zero position must be individually returned by hand to their inoperative zero position. This is complicated and time-consuming so that it is an object of the present invention to provide means which cause the simultaneous return of all setting shafts to the zero position, which operation may be briefly described by the term complete clearing.

Because it is known to lock all setting shafts in the set position, the invention involves the further object so to design the handle for operating said locking device that it causes the clearing in the other end position. It was previously required to operate various handles for individual clearing so that misoperation was possible. Beside, a person desiring to become familiar with the operation of the calculating machine had to acquire the skill required to operate several handles. Each handle must obviously be connected by separate means to the elements to be controlled thereby. This resulted in a complicated design of the machine. Because the machines are extremely small, suitably only of such a size that they can be embraced by one hand, it is a further object of the invention to combine operating elements as far as possible so as to ensure that the design of the machine can be simple to permit of an economical manufacture. Finally, it is an object of the present invention to provide a circular calculating machine which meets all requirements mentioned hereinbefore.

An illustrative embodiment of a calculating machine according to the invention is shown in the drawing.

FIG. 1 is a general view of the machine,

FIG. 2 is an enlarged view showing a detail of this machine.

FIG. 3 is a horizontal cross-sectional view taken on line III—III of FIG. 2.

FIG. 4 is a horizontal cross-sectional view of the machine taken on line IV—IV of FIG. 2.

The miniature-type calculating machine comprises a cylindrical casing 1, in which the drive member 2, formed by several toothed segments, is centrally mounted by means of the shaft 3. The toothed segments of the driver member combine to form a stepped roller, which has arranged in a circle around it in the cylindrical casing the setting mechanism. The cylindrical casing 1 has mounted at its top the counter carriage 4, which is circular and centrally surrounds the shaft 3 passing through it. The shaft 3 has at its upper end the drive crank 5, by means of which the stepped roller, constituting the drive member 2, is turned. The setting mechanism comprises a number of

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shafts 6, which are arranged in a circle around the stepped roller 2 and parallel to the shaft 3, and which are rotatably mounted in the casing 1 at two points and carry a setting wheel 7 each. The drawing shows only one shaft 6 with one setting wheel 7. The setting handles 8 for the setting wheels 7 and the casing slots 9 for axially displacing the setting wheels are visible in FIG. 1 of the drawing. Each shaft 6 has mounted at its top end a crown wheel 14 in mesh with a pinion 10 of the counter mounted in the counter carriage 4. The pinion 10 is firmly connected to a numeral drum 11 and together with the same is mounted for free rotation on a shaft 10a, which is fixed in a radial recess 12 of the counter body 13. The counter body 13 is arranged within the counter carriage 4. At their free outer ends the shafts 10a are fixed to the enclosing ring 15 of the counter carriage 4, which is rotatable about the central shaft 3. During the uncoupling and turning movement of the counter carriage the enclosing ring 15 forms a handle therefor. Shafts 6 and 17 are mounted externally in the flange 18 of the body 19 of the machine and in the bottom plate 20 of the machine casing 1.

The setting shafts 17 have grooves in the form of coarse screw threads in mesh with a portion, not shown, of the setting handles 8. The lead of the helix formed by the grooves 21 is ten times the distance by which a setting handle 8 is moved during an axial displacement by one unit. As a result, each displacement of the setting handles by one unit will cause the digit wheel 22 at the top end of the setting shaft 17 to rotate by one tenth of its periphery provided with numerals 0 to 9 so that the set numeral is visible in the slot 9 in the casing. To enable the setting handles to be locked in their correct position, the setting shafts 17 have recesses 23, which are engaged by resiliently mounted detents provided on the setting handles 8. The recesses 23 are disposed on helices evenly spaced from the grooves 21.

The machine comprises ten-transfer members 24, ten-stepping wheels 25 with ratchet wheels, a zero buffer disc 26, a zero buffer wheel 27, a zero buffer bearing 28 and a ten-stepping spring 29. As far as described hereinbefore, miniature-type calculating machines and their functions are known from the U.S. Patents 2,661,155, 2,544,426 and Re. 23,553. For example the U.S. Patent 2,661,155 describes the operation of the machine in columns 3 and 4. The present invention is not concerned with this operation, but only with the clearing of the calculator.

The following new features are shown in detail in FIGS. 2 to 4 of the drawing.

FIG. 2 shows again the bottom flange 20 of the machine member 19, in which flange the setting shafts 17 are mounted. A helically wound compression spring 30 is so disposed below each setting handle 8 that released setting handles tend to yield upwardly. The casing 1 serves for rotatably mounting the single clearing means including a driver ring 32 concentric with the manually operated ring 31, 49. Pins 33 interconnect the rings 31 and 32 to cause the driver ring 32 to perform the same movements as the operating ring 31. Grooved clearing shafts 34 extend through the setting handles 8 as best seen in FIG. 3, and like the setting shafts 17 are mounted at the lower end in the bottom flange 20 of the machine body and at the top end in the top flange 18 thereof. Each of the grooved clearing shafts 34 has grooves 47 and is connected to a camwheel or cam member 35 disposed under the bottom flange 20 in such a manner that the camwheels 35 turn with the grooved shafts 34. The recesses 23 in the setting shafts 17 have a special shape, like a saw tooth or notch. Those portions of the setting handles 8 which are adjacent to the notches 23 serve to receive pins 36, on which rotary pawls 37, 48 are rotatably

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mounted. Each rotary pawl 37, 48 has associated with it a torsion spring 38 in such a manner that the rotary pawls 37, 48 tend to rotate in the counterclockwise sense in FIG. 3. Each setting handle 8 has a clearing member 39 associated with it, which is urged outwardly by a leaf spring 40. Each of the shafts 6 carries one of the abovementioned axially displaceable setting wheels 7, which is guided in a forked portion 41 of the setting handle 8 to follow the axial movements thereof.

The mode of operation of the device thus described is as follows.

Under the action of the springs 30, all setting handles 8 are in their top or zero position. To set a digit by depressing a setting handle 8, the opposing spring force of the compression spring 30 disposed below the setting handle to be operated must be overcome. Since shaft 17 is turned by the projection in handle 8 engaging helical groove 21, the notches 28 successively turn to a position opposite catch portion 37 of pawl 37, 48. The bevelled end wall 42 of the rotary pawl 37, 48 slides over the bevelled portions of the notches 23 so that the rotary pawl 37, 48 is rotated in the counterclockwise sense against the spring action of the torsion spring 38 whenever catch portion 37 passes out of a notch 23. When the number to be set has been reached, the setting handle 8 is released by the hand which has operated it. As a result, the spring 30 becomes effective, but only until the top face of the rotary locking pawl 37, 48 engages the horizontal top face of the sawtooth-shaped notch 23 which is adjacent to the position to which the handle 8 has been moved. As a result, the setting handle 8 is held in a height which corresponds to the set position of the desired numeral.

To lock the setting handles and with them the setting wheels 7 against movement in the axial direction for the subsequent calculating operation, it is sufficient to effect a small rotation of the manually operated ring 31, 49 (FIG. 4) in the clockwise sense. This causes the lower edge of the recess 43 in the driver ring 32 to engage the upper nose 44 of the camwheel 35 so that the latter as well as the grooved shaft 34 are rotated in the clockwise sense. The upper driver nose 44 extends through a recess 45 of the bottom flange 20. The side face 46 of the groove 47 in the grooved shaft 34 is caused to engage the nose 48 of the rotary pawl 37, 48 so as to prevent a clockwise movement of the latter. This means that the setting handle 8 has been locked against movement in the axial direction. These parts shown for one setting handle 8 are associated with each of these setting handles.

To improve the grip, the operating ring 31 has a knurled rubber ring 49. Means, not shown, are provided to cause the operating ring to snap tangibly into a locked position.

For complete clearing it is sufficient to rotate the single operating clearing ring means consisting of the operating ring 31 in the other sense of rotation, in this case in the counterclockwise sense. This rotation is followed by the driver ring 32 and causes the top edge of the recess 43 (FIG. 4) to engage the top nose 44 of the cam wheel 35 so that the latter as well as the grooved shaft 34 associated with it are rotated in the counterclockwise sense. This causes the side face 50 of the groove 47 to engage the nose 48 of the rotary pawl so that the rotary pawl 37, 48 is rotated in the clockwise direction (FIG. 3) and disengages the notch 23 in the setting shaft 17. The pressure of the spring 30 causes the setting handle 8 to spring upwardly to its zero position. Erasing is effected simultaneously for all setting handles because all these parts are under the action of the common manually operated ring 31, 49, on the one hand, and under the influence of the springs 30, on the other hand. The erasing of a single handle is effected by pressing the erasing key 39 disposed below that particular handle. This pressing of the key causes the same to engage the

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lower nose 51 of the camwheel 35 so that the same as well as the grooved shaft 34 rotate in the counterclockwise sense so that pawl 37, 48 moves out of the respective notch 23 so that the respective shaft 17 is released. A stop 39a provided on the clearing member 39 prevents a movement of the driver ring 32 by the upper nose 44 of the camwheel 35. For this reason the recess 43 is wider in the peripheral direction than the nose 44. Upon release of an erasing key 39, it is returned to its original position by a leaf spring 40.

The invention is not restricted to the embodiment shown, which may be modified in various respects without departing from the invention.

What is claimed is:

1. In a calculator, in combination; a plurality of setting shafts; a plurality of handles mounted on said setting shafts, respectively, for movement along the same, and including means for turning said setting shafts, respectively, between a plurality of digital positions including a cleared zero position; means biasing said handles to move to an end position at the end of the respective setting shaft for turning said setting shafts to said zero positions; a plurality of locking means for locking each handle to the respective setting shaft for locking the latter in each digital position thereof, said locking means being respectively mounted on said handles for movement with the same along said setting shafts, and also for movement transversely to the respective setting shaft between a locking position engaging the respective setting shaft, and a releasing position; and a manually operated clearing means operatively connected to all said locking means and being movable from a normal inoperative position to a clearing position for moving all said locking means to said releasing positions of the same whereby said handles are released and are moved by said biasing means to said end position whereby said setting shafts are turned to said zero positions.
2. In a calculator, in combination, a plurality of setting shafts; a plurality of handles mounted on said setting shaft for movement along the same, and including means for turning said setting shafts, respectively, between a plurality of digital positions including a cleared zero position; means biasing said handles to move to an end position at the end of the respective setting shaft for turning said setting shafts to said zero positions; a plurality of locking means for locking each handle to the respective setting shaft for locking the latter in each digital position thereof, said locking means being respectively mounted on said handles for movement with the same along said setting shafts, and also for movement transversely to the respective setting shaft between a locking position engaging the respective setting shaft, and a releasing position; a manually operated clearing ring means surrounding said setting shafts and operatively connected to all said locking means and being movable from a normal inoperative position to a clearing position for moving all said locking means to said releasing positions of the same whereby said handles are released and are moved by said biasing means to said end position whereby said setting shafts are turned to said zero positions.
3. In a calculator, in combination, a plurality of setting shafts, each setting shaft having a plurality of notches; a plurality of handles mounted on said setting shaft for movement along the same, and including means for turning said setting shafts, respectively, between a plurality of digital positions including a cleared zero position;

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means biasing said handles to move to an end position at the end of the respective setting shaft for turning said setting shafts to said zero positions;

a plurality of locking pawls respectively mounted on said handles for turning movement and being movable with the respective handles along said setting shaft for locking each handle to the respective setting shaft for locking the same in each digital position thereof, each locking pawl having a locking position engaging one of said notches and a releasing position and being spring biased to move to said locking position;

and a manually operated clearing means operatively connected to all said locking pawls and being movable from a normal inoperative position to a clearing position for moving all said locking pawls to said releasing positions of the same whereby said handles are released and are moved by said biasing means to said end position whereby said setting shafts are turned to said zero positions.

4. In a calculator, in combination,

a plurality of setting shafts arranged in a circle, each setting shaft having a plurality of notches arranged along a helix;

a plurality of handles mounted for movement along said setting shafts, respectively, and being operatively connected to the same for turning the same between a plurality of digital positions including a cleared zero position when moving in one direction along said setting shafts to an end position, said setting shafts being in said zero position when said handles are in said end position;

spring means abutting each of said handles for moving the same to said end positions so as to urge said setting shafts to said zero positions;

a plurality of locking pawls respectively mounted on said handles for movement with the same along said setting shafts, and for turning movement on the same between a locking position for engaging one of said notches of the respective setting shafts, and a releasing position;

a plurality of clearing shafts extending parallel to said setting shafts and having grooves engaged by said locking pawls so that turning of said clearing shafts effects movement of said locking pawls to said releasing positions;

a turnable cam member secured to each clearing shaft for turning with the same;

and a manually turnable clearing ring means surrounding said setting shafts and engaged by said cam members, said clearing ring means being movable from a locking position in which said cam members, said clearing shafts, and said locking pawls are locked to lock said handles, and a clearing position for turning said cam members, said clearing shafts, and said locking pawls simultaneously until said locking pawls are in said releasing position whereby said setting shafts are released by said locking pawls so that said biasing means move all said handles to said end positions whereby said setting shafts are all turned to said zero position.

5. In a calculator, in combination,

a plurality of setting shafts arranged in a circle, each setting shaft having a plurality of notches arranged along a helix;

a plurality of handles mounted for movement along said setting shafts, respectively, and being operatively connected to the same for turning the same between a plurality of digital positions including a cleared zero position when moving in one direction along said setting shafts to an end position, said setting shafts being in said zero position when said handles are in said end position;

spring means abutting each of said handles for moving the same to said end positions so as to urge said setting shafts to said zero positions;

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a plurality of locking pawls respectively mounted on said handles for movement with the same along said setting shafts, and for turning movement on the same between a locking position for engaging one of said notches of the respective setting shaft, and a releasing position;

a plurality of clearing shafts extending parallel to said setting shafts and having grooves engaged by said locking pawls so that turning of said clearing shafts effects movement of said locking pawls, to said releasing positions;

a turnable cam member secured to each clearing shaft for turning with the same;

a manually turnable clearing ring means surrounding said setting shafts and engaged by said cam members, said clearing ring means being movable from a locking position in which said cam members, said clearing shafts, and said locking pawls are locked to lock said handles, and a clearing position for turning said cam members, said clearing shafts, and said locking pawls simultaneously until said locking pawls are in said releasing position whereby said setting shafts are released by said locking pawls so that said biasing means move all said handles to said end positions whereby said setting shafts are all turned to said zero position;

and a plurality of clearing members respectively correlated with said setting and clearing shafts, each clearing member being movable independently of the other clearing members to a clearing position engaging the respective cam member for turning the respective clearing shaft so that the respective locking pawl is moved to said releasing position.

6. A calculator as set forth in claim 5 wherein said clearing ring means has a plurality of circumferentially spaced recesses, each of said cam members having a first projection located in one of said recesses, and a second projection located opposite one of said clearing members so that each cam member is individually turned when one of said clearing members engages said second projection, and so that all cam members are simultaneously turned when the walls of said recesses simultaneously engage said first projections when said clearing ring means is turned.

7. A calculator as set forth in claim 6 wherein said clearing shafts respectively pass through bores in said handles, and wherein said locking pawls are double-armed pawls engaged at one end by a groove in a clearing shaft, and engaged at the other end by a notch in a setting shaft, and a spring mounted on each handle for urging the respective pawl to said locking positions, said notches having each an abutment face on which said locking pawl abuts when said handle is urged by said spring means to move to said end position, and a bevelled face for moving said locking pawl out of said notch when said handle is moved in the opposite direction by the operator when the respective setting shaft is being set, said circumferentially spaced recesses in said clearing ring means having such length as to permit limited turning movement of said cam members and clearing shafts in said inoperative position of said clearing means.

8. In a calculator, in combination, a plurality of setting shafts; a plurality of handles mounted on said setting shafts, respectively, for movement along the same, and including means for turning said setting shafts respectively, between a plurality of digital positions including a cleared zero position; means biasing said setting shafts to move to said zero positions, respectively; a plurality of locking means respectively mounted on said handles for movement with the same along said setting shafts and also for movement transversely to the respective setting shaft between a locking position engaging the respective setting shaft, and a releasing position so that each setting shaft can be locked in each digital position thereof; and a manually operated clearing means including a plurality of clearing

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shafts respectively located in the region of said setting shafts, each clearing shaft being engaged by the respective locking means during movement of the same with said handle along the respective setting shaft, and each clearing shaft being turnable for shifting the respective locking means between said releasing and locking positions, and a manually operated member operatively connected to said clearing shafts for simultaneously turning the same whereby all locking means are moved to said re-

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leasing positions so that said biasing means turn said setting shafts to said zero position.

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