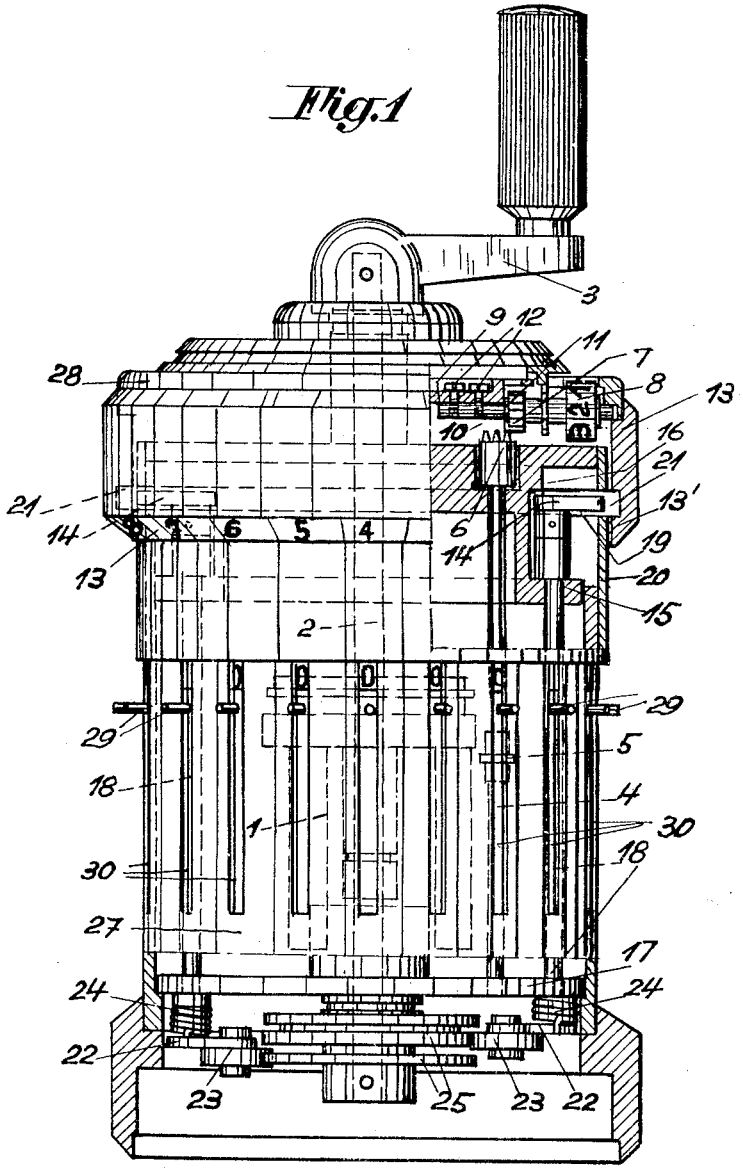
Dec. 1, 1953 F. MARK 2,661,155

ACCUMULATOR-CARRIAGE AND DRIVE-SHAFT INTERLOCK FOR MINIATURE-TYPE CALCULATING MACHINES

Filed March 22, 1952 2 Sheets-Sheet 1

Fig. 1



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Filed March 22, 1952 2 Sheets-Sheet 2

Fig.2

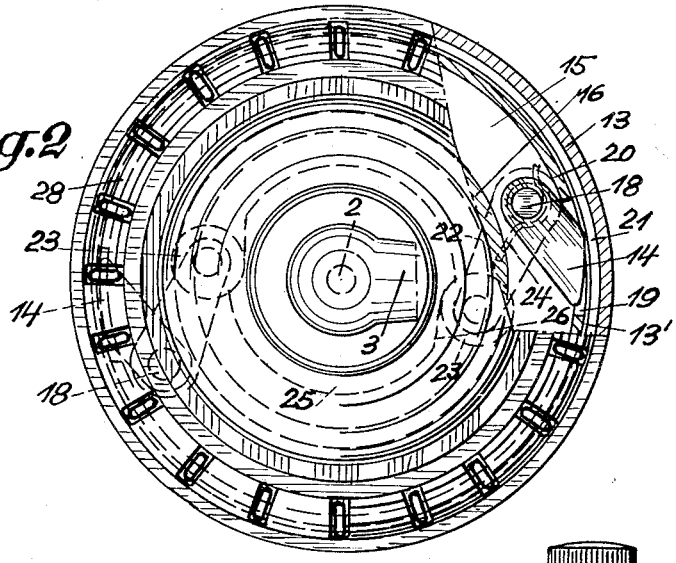


Fig.3

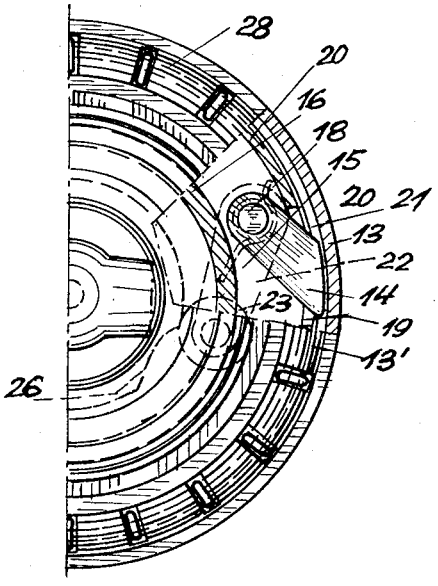
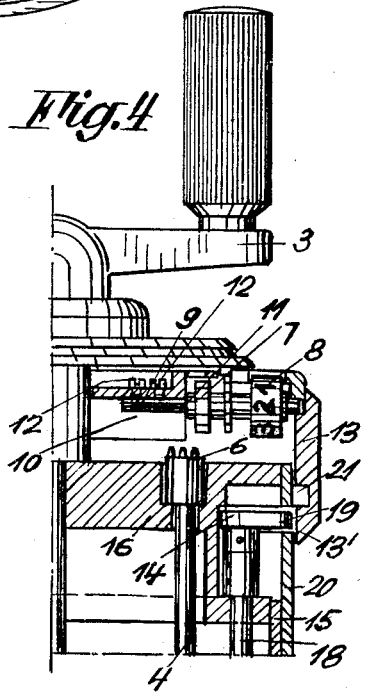


Fig.4



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ACCUMULATOR-CARRIAGE AND DRIVE-SHAFT INTERLOCK FOR MINIATURE-TYPE CALCULATING MACHINES

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5 Claims. (Cl. 235—63)

1

The present invention relates to miniature type calculating machines of the type having a centrally mounted rotatable drive member for actuation of the counting mechanism. In computing machines of this type the accumulator is located in a rotatable counter carriage which is axially movable between a coupled position in which the accumulator in the counter carriage registers values when the drive member is rotated, and an uncoupled position permitting free rotation of the counter carriage for shifting of the same through decades.

The essential feature of the invention resides in that for mutually interlocking the drive member and the counter carriage the machine has incorporated in it a locking device operated by the drive element and locking the counter carriage when the counter or accumulator is coupled. This locking device on the one hand prevents the rotation of the drive member when the counter is uncoupled, and on the other hand prevents the uncoupling of the counter when the drive member has been turned out of its zero position.

The interlock mechanism according to the present invention mainly comprises a pivoted arm which is turned upon rotation of the drive member into a locking position in which the arm engages the counter carriage at an outwardly located ring portion thereof whereby axial movement of the counter carriage to a position in which the accumulator is uncoupled from the setting mechanism is prevented. On the other hand the rim of the counter carriage prevents return of the pivoted arm to its locking position while the counter carriage is in its uncoupled position.

In the drawing an embodiment of a miniature-type calculating machine constructed according to the invention is shown by way of example with its parts most essential for an understanding of the invention,

Fig. 1 showing the miniature-type calculating machine on a greatly enlarged scale partly in section and partly in elevation to expose the components of the locking device, the drive crank being shown in normal position.

Fig. 2 illustrates the calculating machine in a top plan view, partly in cross section, along the plane of the locking bolt of the locking device.

Fig. 3 is also a top plan view showing half of the machine, partly in cross section showing the locking bolt in locking position. Finally,

Fig. 4 is a partial longitudinal section through the machine with the locking device blocked and the counter uncoupled.

2

The miniature-type calculating machine comprises a cylindrical casing 27, in which the drive member 1, formed by several toothed segments, is centrally mounted by means of the shaft 2. The toothed segments of the drive member combine to form a stepped roller, which has arranged in a circle around it in the cylindric casing the setting mechanism. The cylindric casing 27 has mounted at its top the counter carriage 28, which is circular and centrically surrounds the shaft 2 passing through it. The shaft 2 has at its upper end the drive crank 3, by means of which the stepped roller, constituting the drive member 1, is turned. The setting mechanism comprises a number of shafts 4, which are arranged in a circle around the stepped roller and parallel to the shaft 2, and which are rotatably mounted in the casing 27 at two points and carry a setting wheel 5 each. The drawing shows only one shaft 4 with one setting wheel 5. The setting handles 29 for the setting wheels 5 and the casing slots 30 for axially displacing the setting wheels 5 are visible in Fig. 1 of the drawing. Each shaft 4 has mounted at its top end a crown wheel 6 in mesh with a pinion 7 of the counter mounted in the counter carriage 28. The pinion 7 is firmly connected to a numeral drum 8 and together with the same is mounted for free rotation on a shaft, which is fixed in a radial recess 10 of the counter body 11 by means of screws 12. The counter body 11 is arranged within the counter carriage 28. At their free outer ends the shafts 9 diverging in the form of a star have fixed to them the enclosing ring 13 of the counter carriage 28, which is rotatable about the central shaft 2. During the uncoupling and turning of the counter carriage the enclosing ring 13 forms a handle therefor and is controlled by a locking device, which is operated by the drive member 1. This locking device has a one-armed locking bolt 14, which is mounted at the upper end of a shaft 18 mounted externally in the flange 15 of the body 16 of the machine and in the bottom plate 17 of the machine casing 27. With its free locking end the bolt 14 extends through a slot 19 of the cylindrical casing wall 20 with small play. The locking recess associated with the locking bolt 14 is formed by an annular groove 21, which is provided on the inside of the enclosing ring 13 of the counter carriage, and in the coupled position of the counter is in register with the slot 19 of the casing wall 20. The shaft 18 for the locking bolt 14 protrudes with its lower end below the bottom plate 17 and carries at this end a rocker arm 22, to the free end of which

a roller 23 is rotatably fixed. The rocker arm 22 is loaded by a spring 24 mounted on the shaft 18 and urging the arm 22 continuously against the periphery of a circular cam 25 fixed to the lower end of the drive shaft 2 of the drive member 1. This cam 25 has at one point of its periphery a shallow recess 26, which receives the roller 23 of the arm 22 when the crank 3 is in normal, i. e., zero position. After each full turn of the drive crank 3 the roller 23 of the rocker arm 22 engages the recess of the cam 25 whereas in any other position of the cam the rocker arm 22 is kept out of its engaged position. Thus the rocker arm 22 and the recess 26 of the cam 25 cooperate to form a so-called zero buffer, which eliminates the need for providing a special device for this function.

When the drive crank 3 is in normal position and the counter carriage 18 in coupled position the locking bolt 14 is in register but not in engagement with the annular groove 21 of the enclosing ring 13, the roller 23 of the rocker lever 22 being engaged in the recess 26 of the cam 25. Thus the counter provided in the counter carriage 28 may be uncoupled freely by an axial displacement of the counter carriage out of mesh from the crown wheels 6 of the setting mechanism, the pinions 7 and the crown wheels 6 coming out of mesh (Fig. 4). In this position of the counter the same may be advanced by decades by turning the counter carriage. However, when the crank 3 is turned out of its zero position, the roller 23 rolling on the peripheral surface of the cam 25 will pivotally move the rocker arm 22 and the locking bolt 14 connected therewith by the shaft 18, the end of the locking bolt 14 entering into the annular groove 21 of the enclosing ring 13 of the counter carriage. When the locking bolt is in its engaged position in the groove the counter carriage is secured against axial displacement and the counter is thus locked against being uncoupled from the crown wheel 6 of the setting mechanism. When in this locking position somebody inattentively tries to uncouple the counter carriage, the force applied in the axial direction on the enclosing ring 13 will be transmitted directly to the locking bolt 14, which is supported in turn in the slot 19 of the wall 20 of the casing 27, the moment of force being transmitted directly to the casing 20, 27 to relieve the ring. As a result, an elastic bending of the shafts 9 carrying the enclosing ring 13 of the counter carriage will be prevented even if the enclosing ring is seized roughly.

However, if the counter is to be disconnected from the setting mechanism, the crank 3 and with it the drive member 1 must be secured against rotation during such disconnection. To this end the inner wall surface 13' of the enclosing ring 13 forms a stop, which when the counter members, i. e. the counter pinions 7, are uncoupled, is in register with the locking bolt 14 and prevents the same from moving out of the casing slot 19. Held in its unlocked position by the wall surface 13', the locking bolt 14 holds also the rocker arm 22 and its roller 23 in the recess 26 of the cam 25 so that the latter, and with it the drive member 1, shaft 2, and crank 3 are locked against rotation.

To prevent the locking device from acting unilaterally on the counter carriage 28, it is suitable to provide in accordance with Fig. 2 another locking device, which is arranged at an angle in respect of the first one and also consists of

a shaft 18, a rocker arm 22 with a roller 23, a locking bolt 14, a spring 24, and a cam 25.

The locking devices being arranged outside the calculating mechanism, they are readily accessible and may be mounted or removed easily.

Without departing from the scope of the invention the cams 25 and rocker arms 22 might be arranged in the machine at a place other than that shown in the drawing. The cams 25 might be arranged inside the machine, e. g., between the flange 15 and the bottom plate 17. Such arrangement, however, would have the disadvantage that the shafts 4 of the setting wheels 5 must be prolonged and would bend more easily. Moreover, the length of the entire machine would be increased, which is undesirable.

I claim:

1. In a miniature-type calculating machine, a casing, a drive member shaft extending through the casing and having an end portion protruding out of the casing, a drive member mounted on said shaft for free rotation in the casing and centrally arranged in the latter, teeth on said drive member, a crank fixed to said shaft end portion, a counter carriage supported on the casing with freedom of rotation about said drive member shaft and of axial movement between a coupled and an uncoupled position and having an annular groove, a counter for a number of digits provided in said counter carriage, radial shafts provided in said counter carriage, a plurality of transmission gears the number of which corresponds to the number of digits of the counter, said gears being rotatably mounted on said radial shafts and spaced from each other in a circle concentric with the drive member shaft, a setting mechanism for a plurality of digits arranged in the casing, a plurality of parallel shafts the number of which corresponds to the number of digits of the setting mechanism, said parallel shafts being mounted in the casing parallel to the drive member shaft and spaced like said transmission gears in a circle concentric with the drive member shaft, setting pinions mounted on said parallel shafts and rotatable therewith, with freedom of axial movement to throw said pinions selectively and individually in mesh with the drive member teeth, crown wheels rigidly fixed on the parallel shafts near the upper end thereof and in mesh with said transmission gears in the coupled position of the counter carriage, a control member firmly mounted on the drive member shaft, a one-armed locking bolt arranged adjacent to said annular groove when the counter carriage is in its coupled position, means pivotally mounting said locking bolt in the casing free to move into said groove to prevent axial movement of the counter carriage out of said coupled position, a follower in engagement with said control member and operatively connected to the locking bolt to hold the latter in the groove during the whole rotation of the drive member excepting a zero position, said control member having a recess adapted to receive said follower in said zero position, and a stop on said counter carriage lying in the path of said locking bolt when the counter carriage is in said uncoupled position and adapted to engage with said locking bolt to hold said follower in said recess and prevent rotation of the drive member out of said zero position.

2. In a miniature-type calculating machine, a casing, a drive member shaft extending through the casing and having an end portion protruding out of the casing, a drive member mounted on

said shaft for free rotation in the casing and centrally arranged in the latter, teeth on said drive member, a crank fixed to said shaft end portion, a counter carriage supported on the casing with freedom of rotation about said drive member shaft and of axial movement between a coupled and an uncoupled position and having an annular groove, a counter for a number of digits provided in said counter carriage, radial shafts provided in said counter carriage, a plurality of transmission gears the number of which corresponds to the number of digits of the counter, said gears being rotatably mounted on said radial shafts and spaced from each other in a circle concentric with the drive member shaft, a setting mechanism for a plurality of digits arranged in the casing, a plurality of parallel shafts the number of which corresponds to the number of digits of the setting mechanism, said parallel shafts being mounted in the casing parallel to the drive member shaft and spaced like said transmission gears in a circle concentric with the drive member shaft, setting pinions mounted on said parallel shafts and rotatable therewith, with freedom of axial movement to throw said pinions selectively and individually in mesh with the drive member teeth, crown wheels rigidly fixed on the parallel shafts near the upper end thereof and in mesh with said transmission gears in the coupled position of the counter carriage, a cam firmly mounted on the drive member shaft, a locking member forming a two-armed lever and having a shaft rotatably mounted in the casing and parallel to the drive member shaft, one arm of said lever constituting a rocker arm carrying adjacent to the periphery of said cam a roller, a spring connected to the rocker arm to urge its roller against the periphery of said cam, the other arm of said lever constituting a locking bolt arranged adjacent to said annular groove when the counter carriage is in its coupled position and movable into said groove to prevent axial movement of said counter carriage, said cam having in its periphery a recess adapted to receive said roller in a zero position of said drive member, said cam being adapted to hold said locking member with its locking bolt during the whole rotation of said drive member excepting said zero position in said annular groove when the counter carriage is in its coupled position, and a stop on said counter carriage lying in the path of said locking bolt when the counter carriage is in its uncoupled position and adapted to engage with said locking bolt to hold the locking member with its roller in said recess to prevent rotation of the drive member out of said zero position.

3. In a miniature-type calculating machine, a casing; a calculating mechanism comprising a drive member shaft extending through the casing and having an end portion protruding out of the casing, a drive member mounted on said shaft for free rotation in the casing and centrally arranged in the latter, teeth on said drive member, a crank fixed to said shaft end portion, a counter carriage supported on the casing with freedom of rotation about said drive member shaft and of axial movement between a coupled and an uncoupled position, a counter for a number of digits provided in said counter carriage, radial shafts provided in said counter carriage, a plurality of transmission gears the number of which corresponds to the number of digits of the counter, said gears being rotatably mounted on said radial shafts and spaced from each other in a circle concentric with the drive member shaft, a setting mechanism for a plurality of digits arranged in the casing, a plurality of parallel shafts the number of which corresponds to the number of digits of the setting mechanism, said parallel shafts being mounted in the casing parallel to the drive member shaft and spaced like the transmission gears in a circle concentric with the drive member shaft, setting pinions mounted on said parallel shafts and rotatable therewith, with freedom of axial movement to throw said pinions selectively and individually in mesh with the drive member teeth, and crown wheels rigidly fixed on the parallel shafts near the upper end thereof and in mesh with said transmission gears in the coupled position of the counter carriage; and locking means arranged in the casing externally of said calculating mechanism, said locking means comprising a locking member mounted in the casing with freedom of movement between a first position in which it is adapted to interlock with the counter carriage in the coupled position thereof to prevent axial movement of the counter carriage out of said position, and a second position, and control means operatively connected with the drive member and in engagement with the locking member and adapted to hold the same in said first position during the whole rotation of the drive member excepting a zero position thereof, and to mesh with said locking member when the same is in its second position and the control means is in said zero position; said counter carriage having a stop lying in the path of said locking member when the carriage is in its uncoupled position and adapted to hold the same in said second position in mesh with said control means to prevent rotation of the drive member out of said zero position.

4. In a miniature-type calculating machine, a casing having a cylindrical side wall with a slot therein, a drive member shaft extending through the casing and having an end portion protruding out of the casing, a drive member mounted on said shaft for free rotation in the casing and centrally arranged in the latter, teeth on said drive member, a crank fixed to said shaft end portion, a counter carriage supported on the casing with freedom of rotation about said drive member shaft and of axial movement between a coupled and an uncoupled position, a counter for a number of digits provided in said counter carriage, radial shafts provided in said counter carriage, a plurality of transmission gears the number of which corresponds to the number of digits of the counter, said gears being rotatably mounted on said radial shafts and spaced from each other in a circle concentric with the drive member shaft, a setting mechanism for a plurality of digits arranged in the casing, a plurality of parallel shafts the number of which corresponds to the number of digits of the setting mechanism, said parallel shafts being mounted in the casing parallel to the drive member shaft and spaced like said transmission gears in a circle concentric with the drive member shaft, setting pinions mounted on said parallel shafts and rotatable therewith, with freedom of axial movement to throw said pinions selectively and individually in mesh with the drive member teeth, crown wheels rigidly fixed on the parallel shafts near the upper end thereof and in mesh with said transmission gears in the coupled position of the counter carriage, a cam firmly mounted on the drive member shaft, a locking member forming a two-armed lever and having a shaft rotatably mounted in

the casing and parallel to the drive member shaft, one arm of said lever constituting a rocker arm carrying adjacent to the periphery of said cam a roller, a spring connected to the rocker arm to urge its roller against the periphery of said cam, said cam having in its periphery a recess adapted to receive said roller in a zero position of said drive member, the other arm of said lever constituting a locking bolt pivotally movable through said slot in a radial direction in respect of the drive member shaft, said counter carriage having an enclosing ring surrounding the top of the casing, said ring having a cylindrical inside surface forming a stop lying in the path of said locking member when the counter carriage is in its uncoupled position and adapted to engage with said locking bolt to hold the locking member with its roller in said recess in the cam to prevent rotation of the drive member out of said zero position, said ring having in said inside surface an annular groove in register with said locking bolt when the counter carriage is in its coupled position, said cam being adapted to hold said locking member with its locking bolt in said groove during the whole rotation of said drive member except said zero position, when the carriage is in its coupled position, the locking bolt being disengaged from the ring when the drive member is in its zero position and the counter carriage is in its coupled position.

5. In a miniature-type calculating machine, a casing, a drive member shaft extending through the casing and having an end portion protruding out of the casing, a drive member mounted on said shaft for free rotation in the casing and centrally arranged in the latter, teeth on said drive member, a crank fixed to said shaft end portion, a counter carriage supported on the casing with freedom of rotation about said drive member shaft and of axial movement between a coupled and an uncoupled position, a counter for a number of digits provided in said counter carriage, radial shafts provided in said counter carriage, a plurality of transmission gears the number of which corresponds to the number of digits of the counter, said gears being rotatably mounted on said radial shafts and spaced from each other in a circle concentric with the drive member shaft, a setting mechanism for a plurality of digits arranged in the casing, a plurality of parallel shafts the number of which corresponds to the number of digits of the setting mechanism, said parallel shafts mounted in the casing parallel to the drive member shaft and spaced like said transmission gears in a circle concentric with the drive member shaft, setting pinions mounted on said parallel shafts and rotatable therewith, with freedom of axial movement to throw said pinions selectively and individually in mesh with the drive member teeth, crown wheels rigidly fixed on the parallel shafts near the upper end thereof and in mesh with said transmission gears in the coupled position of the counter carriage, a plurality of spaced locking means mounted in said casing spaced from said setting mechanism and equally spaced from said drive member, said locking means being actuated by said drive member upon rotation of the same to move between a carriage locking position engaging said counter carriage when the same is in said coupled position for locking said counter carriage against axial movement out of said coupled position, and a carriage releasing position releasing said counter carriage for axial movement into said uncoupled position, said locking means being held in said carriage releasing position by said counter carriage when the same is shifted to said uncoupled position, said locking means locking said drive member against rotation when held in said carriage releasing position by said counter carriage.

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