Sept. 4, 1951 C. HERZSTARK 2,566,835

LOCKING DEVICE

Filed April 27, 1950 2 Sheets-Sheet 1

Fig. 1

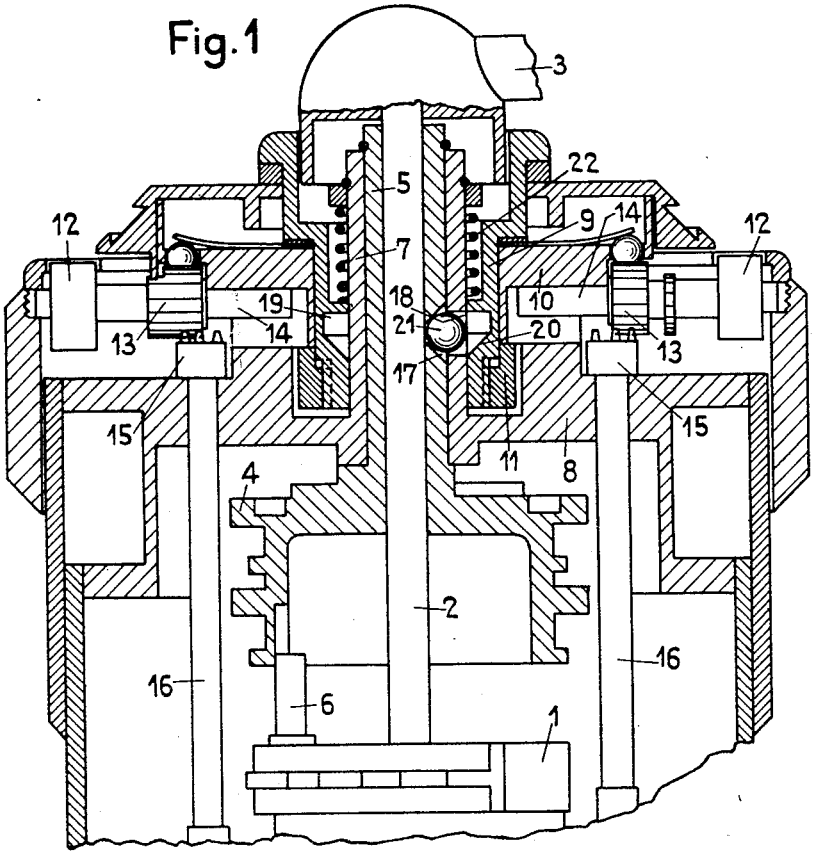

Fig. 2

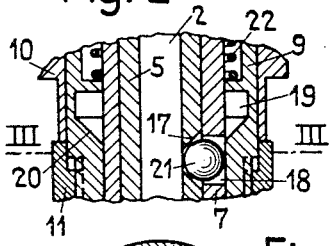

Fig. 3

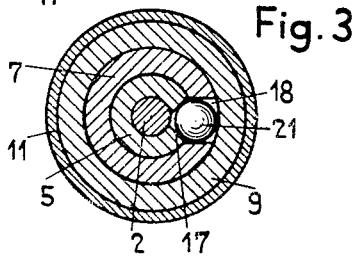

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Fig.6

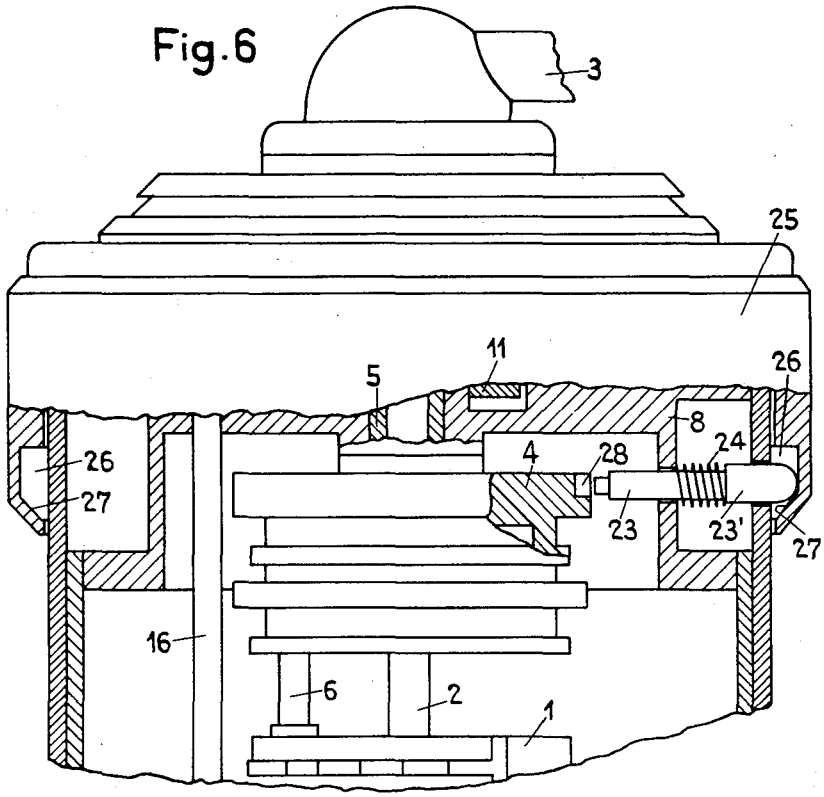


Fig.4

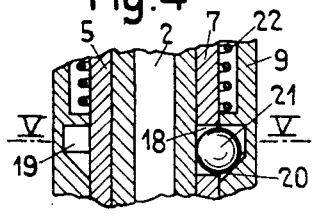
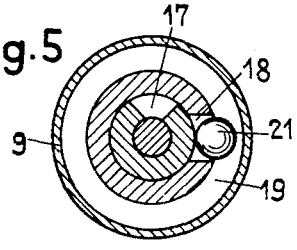


Fig.5



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UNITED STATES PATENT OFFICE

2,566,835

LOCKING DEVICE

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7 Claims. (Cl. 235—144)

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The present invention relates to locking devices, and more particularly to a locking device for selectively preventing rotation of a first member and longitudinal movement of a second member.

It is well known in the art to provide detents of various types for preventing the rotation of a shaft or for selectively preventing the rotation of one or another of two shafts. The present invention differs from previously known devices in that a detent is slidably positioned on a stationary member and is movable by rotation of a first member into engagement with a second member to prevent longitudinal movement of the latter and movable by longitudinal movement of the second member to engage the first member and prevent rotation thereof. One proposed use of the present invention is particularly described hereinafter wherein the device is embodied in a pocket-sized calculating machine having a centrally mounted rotatable drive element and transmission members arranged in a circle around said drive element adapted to actuate a counting mechanism, the counting mechanism being adapted to be disengaged from the actuating means by axial displacement of the counting mechanism carrier.

The invention consists of a selectively and automatically operable locking device actuated either by the drive element or by the carrier of the counting mechanism to lock the counting mechanism or the drive element respectively against movement with respect to the stationary body of the machine. The locking device comprises a locking element mounted within the machine body engageable alternately with the drive element or the carrier of the counting mechanism in such manner that either the drive element locks the counting mechanism against lifting when the counting mechanism is disconnected or locks the counting mechanism against axial displacement when the drive element has been rotated out of a predetermined position.

The objects and advantages of the invention will be evident upon consideration of the following description, reference being made therein to the accompanying drawings, in which:

Figure 1 is a partial longitudinal section on an enlarged scale of a calculating machine having the locking device of the present invention embodied therein.

Figure 2, a longitudinal section of the locking device,

Figure 3, a cross sectional view on the line III—III of Figure 2.

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Figure 4, a longitudinal section of the locking device, in which the various elements of the device are shown in positions different from those of Figure 2.

Figure 5, a cross sectional view on the line V—V of Figure 4, and,

Figure 6, a partial sectional view on an enlarged scale of a second embodiment of the invention.

The driving member of the miniature calculating machine of the present invention consists of an echelon drum 1 which is fixedly mounted upon a drive shaft 2, to one end of which is secured an operating crank 3. A decade counter drum 4, having an elongated hub 5, is rotatably mounted on the shaft 2 and is connected by a pin 6 with the echelon drum 1 so as to rotate with the latter. The shaft 2 is mounted, with the hub 5 of the decade counter drum 4, in the sleeve 7 which forms a part of the body member or machine body 8. A counter mechanism sleeve 9 is rotatably mounted upon the sleeve 7, and is capable of relative axial movement with respect thereto. The sleeve 9 is connected with a counter mechanism body 10 by means of a nut 11 which confines a portion of the body 10 between a shoulder on the sleeve 9 and the nut. The counter mechanism body consists of a radial flange and an annular ring which forms a skirt or the like overlying the external surface of the cylindrical body 8. Within the counter mechanism body 10, a plurality of numbering rollers 12 are arranged in a circle about the axis of the body. The rollers 12 are mounted upon shafts 14, upon which are also mounted the transmission gears 13 for actuating the rollers 12. The transmission gears 13 are arranged to normally engage with crown gears 15 which are mounted on shafts 16, the shafts 16 being actuated, through means not illustrated, by the echelon drum 1.

In the embodiment of the invention illustrated in Figures 1 to 5, the body sleeve 7 is provided with a radial bore 18 within which a locking element or ball 21 is positioned. The ball 21 and bore 18 are of such relative size that the ball protrudes from the bore on both sides of the sleeve 7 when positioned centrally within the bore and can be moved only along the axis of the bore. The hub 5 is provided with a conical bore 17 which coincides with the bore 18 when the hub 5 is in a predetermined position of rotation. Opposite the outer end of the hole 18 and coincident therewith the counter mechanism sleeve 9 is provided with an annular groove

19 having an inclined lower wall 20. The ball 21 is of such size as to be received within either of the chambers formed by the bore 18 and conical bore 17, or the bore 18 and annular groove 19.

The bores 17 and 18 are so positioned in the relative members as to be directly opposite each other when the counter mechanism is in operative position and when the crank 3 is in its normal position. In this position the crank 3 may be rotated or the counter mechanism 10 may be moved axially with respect to the body 8. Upward movement of the counter mechanism 10 is manually effected against the action of spring 22, to move the transmission gears 13 out of engagement with the crown gears 15. During this axial displacement of the counting mechanism the annular groove 19 is moved from the position shown in Figure 1 into the position shown in Figure 2, the result being that the locking ball 21 is moved by the action of the inclined wall 20 into the bore 17, whereafter the outer end of the bore 18 is blocked by the inner wall of the counter mechanism sleeve 9. In this position the ball 21 is confined between the conical surface of the bore 17 and the inner wall of the sleeve 9, and, having engagement in the bore 17 and in the bore 18, locks the hub 5 with respect to the sleeve 7 so that the counter drum 4, echelon drum 1, shaft 2 and crank 3 are held against rotation.

When the counter mechanism 10 is returned to its normal position by the spring 22 the hub 5 may be rotated by means of the crank 3. Rotation of the hub 5 causes movement of the ball 21 into the annular groove 19, by virtue of the inclined conical walls of the bore 17. The inner end of the bore 18 will be blocked by the outer wall of the hub 5. In this position, as shown in Figure 4, the ball 21 engages in the bore 18 and groove 19, thus preventing axial movement of the counter mechanism 10 while allowing rotation thereof.

The locking device according to the second embodiment of the present invention consists of an axially slidable locking pin 23 mounted within a bore in the machine body 8. This locking pin 23 is urged outwardly into engagement with the covering 25 by a spring 24. The inner circumferential wall of the covering 25 of the body of the counter mechanism is provided with an annular groove 26, having an inclined lower wall 27. The head 23' of the locking pin 23 engages the wall 27 in the cover 25. A locking recess 28 is provided opposite the locking pin 23 in the decade counter drum 4, or in another member which is coupled with the drive element 1. If the counting mechanism is raised, when the operating crank 3 is in its normal position, the reduced inner end of the locking pin 23 will be moved by means of the inclined wall 27 into engagement with the locking recess 28 to lock the drive element against rotation with respect to the body 8. The movement of the cover 25 is limited to such an extent that it can never be moved above and beyond the head 23' of the locking pin 23.

When the operating crank 3 is rotated away from its normal position so that the recess 28 does not coincide with the pin 23, the counting mechanism cannot be lifted for the reason that the locking pin 23 is engaged in the annular groove 26 in the circumference of the counting mechanism.

It is clear from the foregoing description that I have provided a novel locking device which is selectively operative to prevent rotation of a first member and longitudinal movement of a second member, provision being made to allow rotation of said longitudinally movable member whether said member is locked against longitudinal movement or not. The locking device has a particular use in the calculating machine described hereinbefore, but it is clear that such device can be used wherever the features it provides are desired.

Having described only one preferred embodiment of my invention, it being clear that various modifications and departures from the particular embodiment can be made without departing from the spirit or scope of my invention, I do not desire to define my invention by the preceding description but rather by the appended claims.

What I claim is:

1. A locking device for the operating crank of a miniature calculating machine having a centrally arranged rotatable drive element and circularly arranged transmission members which are adapted to be disconnected from the drive element by axial displacement, comprising a body member, and a locking element movably mounted in said body member, said locking element being selectively influenced by said drive element and said transmission members, said locking element being influenced upon disconnection of said transmission members to lock said drive element against rotation with respect to said body member and being influenced by said drive element to prevent disconnection of said transmission members when said drive element has been moved away from a predetermined position.

2. A locking device according to claim 1, including a sleeve, said transmission members being mounted on said sleeve, a bearing sleeve on said body member, said transmission member sleeve being mounted on said bearing sleeve and being axially movable with respect thereto, said drive element being rotatably mounted in said bearing sleeve, said bearing sleeve having a radial bore through the wall thereof, said drive element having a radial bore coinciding with said bore in said bearing sleeve in one position of rotation of said drive element, said transmission member sleeve having an annular groove in the inner wall thereof coinciding with said bore in said bearing sleeve in one position of axial movement of said transmission member sleeve, said locking element being positioned in said bore in said bearing sleeve and being movable selectively into said bore in said drive element and into said groove in said transmission member sleeve.

3. A locking device according to claim 2, in which said bore in said drive element and said groove in said transmission member sleeve are provided with inclined walls, said inclined walls serving as cam surfaces for moving said locking element.

4. In a calculating machine having a body member, a drive element rotatably mounted in said body member, and a counting mechanism telescopically mounted on said body member for axial movement with respect to said body member and said shaft; a locking device, comprising a locking element slidably mounted on said body member and arranged to selectively engage said drive element and said counting mechanism while maintaining engagement with said body member, said locking device being influenced by rotation of said drive element to engage said counting mechanism and prevent axial movement thereof and being influenced by axial movement of said mounting mechanism to engage said drive element and prevent rotation thereof.

5. In a calculating machine, a locking device

according to claim 4, in which said body member is provided with a bore, said drive element is provided with a recess coinciding with said bore when said drive element is in a predetermined position with respect to said body member, and said counting mechanism is provided with a groove coinciding with said bore when said counting mechanism is in a predetermined position with respect to said body member, said locking element being positioned within said bore, said locking element being moved into said groove when said drive element is rotated away from its said predetermined position to prevent axial movement of said counting mechanism, said locking element being moved by said counting mechanism into said recess when said drive element is in its predetermined position by axial movement of said counting mechanism away from its predetermined position to prevent rotation of said drive element.

6. In a calculating machine, a locking device according to claim 5, in which said locking element is a ball loosely positioned within said bore so as to be engaged by said drive element and said counting mechanism.

7. In a calculating machine, a locking device according to claim 5, in which said locking element is an elongated pin, including a spring associated with said pin and urging same into engagement with said counting mechanism.

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