Sept. 4, 1928. 1,682,901

C. M. F. FRIDEN

REVERSING MECHANISM

Filed April 13, 1926 2 Sheets-Sheet 1

FIG. 1.

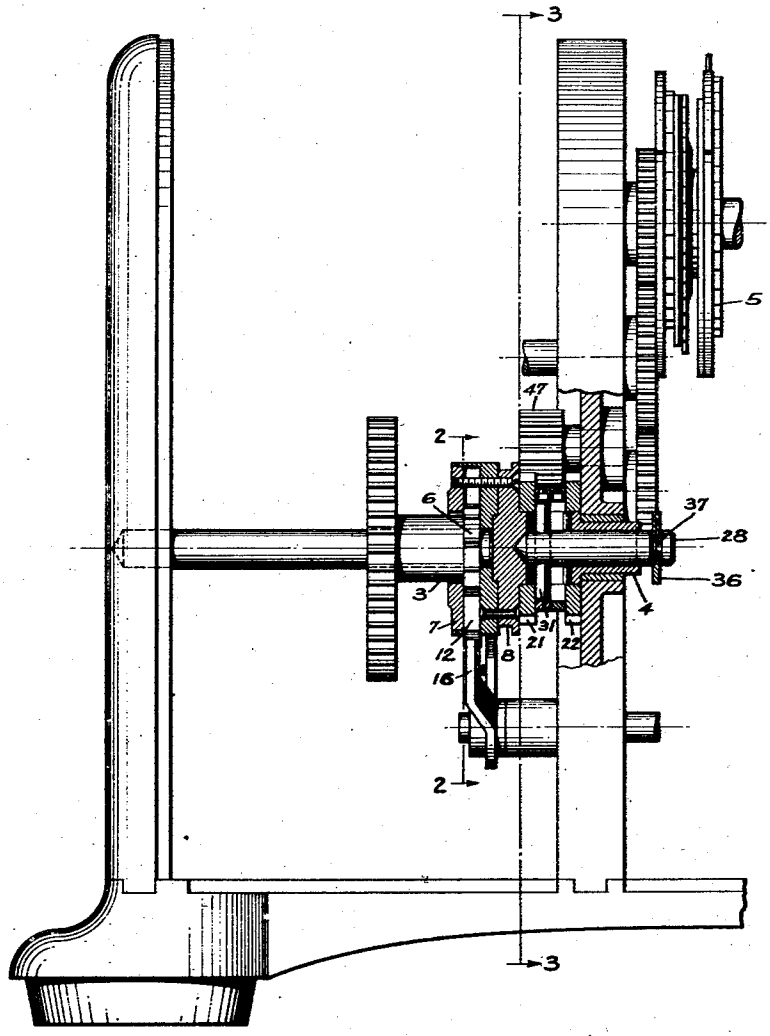

FIG. 2.

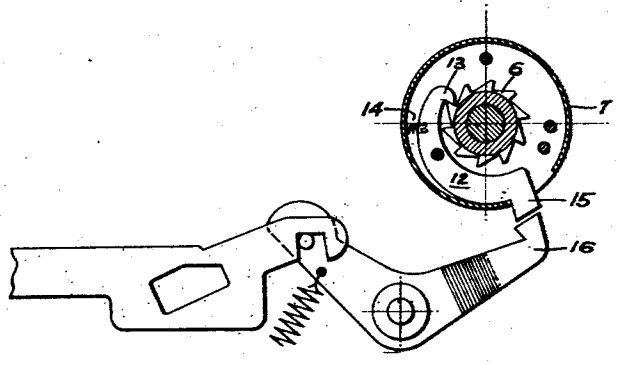

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FIG. 3.

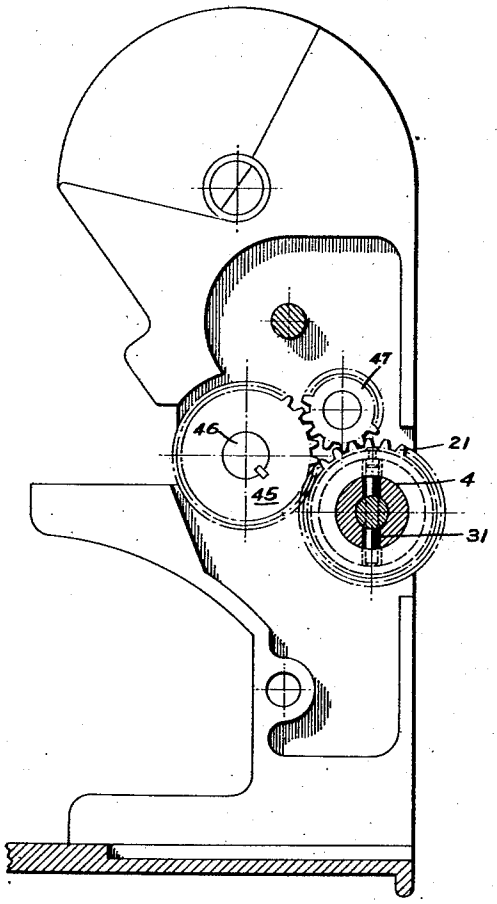


FIG. 4.

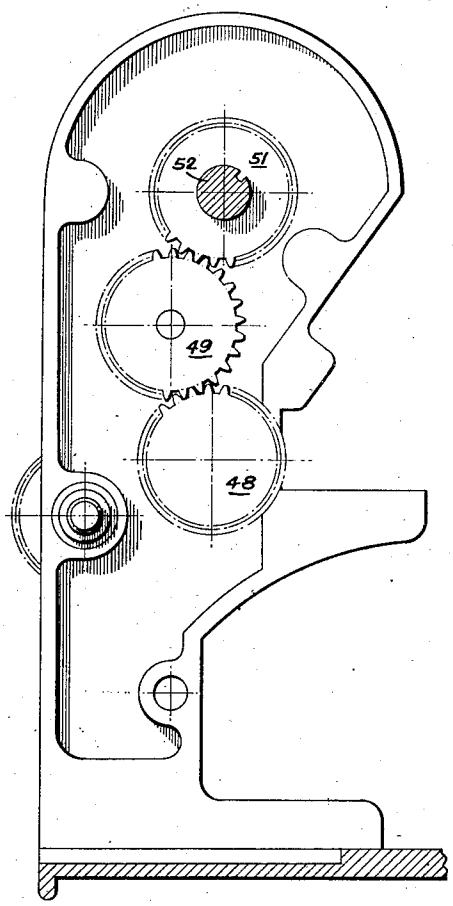


FIG. 5.

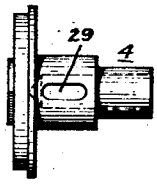


FIG. 6.

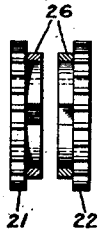
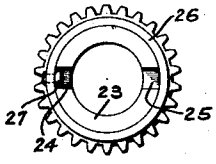


FIG. 7.



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Patented Sept. 4, 1928. 1,682,901

UNITED STATES PATENT OFFICE.

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REVERSING MECHANISM.

Application filed April 13, 1926. Serial No. 101,613.

The invention relates to a reversing mechanism for reversing the direction of rotation of a rotatable element.

An object of the invention is to provide a reversing mechanism that cannot be operated to disturb the timing of the reversible element.

Another object of the invention is to provide a reversing mechanism of simple construction and compact arrangement.

The invention possesses other advantageous features, some of which with the foregoing will be set forth at length in the following description, where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one form of the reversing mechanism of my invention incorporated in a calculating machine of the rotary type, but it is to be understood that the reversing mechanism may be used in other environments and that the invention, as set forth in the claims, may be embodied in a plurality of forms.

Referring to said drawings:

Figure 1 is an elevation of a portion of a calculating machine employing the reversing mechanism of my invention, the reversing mechanism being shown in section.

Figure 2 is a vertical section of the clutch with which the reversing mechanism is associated, taken on the line 2—2, Figure 1.

Figure 3 is a section of the calculating machine taken on the line 3—3, Figure 1.

Figure 4 is an elevation of a portion of the calculating machine showing the opposite side of the standard shown in Figure 3.

Figure 5 is an elevation of the driving shaft on which the reversing gears are journalled.

Figure 6 is an end elevation of the pair of reversing gears, the rings surrounding the shoulders on the gears being shown in section.

Figure 7 is a side elevation of one of the gears.

The reversing mechanism of my invention is particularly adapted for use in calculating machines of the rotary type, having a reversible rotary actuator which has a single full cycle or stop position. In calculating machines of this type, it is essential that the actuator always be brought to a stop in full cycle position and therefore it is essential that a reversing mechanism be employed which will prevent the reversal of the actuator at any time other than that which will result in the actuator being brought to stop at full cycle position. Ordinarily the reversing mechanism is actuated to reverse the direction of rotation of the actuator, only when the actuator is stopped in full cycle position, but through improper operation of the calculating machine, an attempt may be made to shift the reversing mechanism during the time that the actuator is in rotation and the present invention provides a reversing mechanism of such construction that if an attempt is made to shift the reversing mechanism during the time that the actuator is in rotation, and such attempt results in the shifting of the reversing mechanism, the timing of the actuator with respect to the driving shaft, will not be disturbed, so that when the mechanism is brought to rest, the actuator will stop in full cycle position.

Calculating machines of this type comprise a driving motor, which is connected through suitable gearing with an operating shaft 3, which is rotated continuously with the motor. Interposed between the operating shaft 3 and the driving shaft 4 is a clutch and stop mechanism, having a single full cycle position. Interposed between the driving shaft 4 and the rotatable actuator 5, rotation of which serves to introduce values entered into the actuator, into the counting mechanism, is a reversing gear whereby the direction of rotation of the actuator may be reversed. The actuator has a single full cycle position, corresponding to the single full cycle position of the clutch and the reversing mechanism is so constructed that the timing relation of the clutch and the actuator is not disturbed by the operation of the reversing mechanism.

Secured to the operating shaft 3 is a clutch ratchet 6 which is disposed within the clutch housing 7 which is secured to the flange 8 on the end of the hollow driving shaft 4. Pivoted in the end of the housing 7 is a clutch dog 12 having a tooth 13 on one end adapted to engage the ratchet 6. The dog 12 is urged in a direction to cause engagement of the tooth with the ratchet by the spring 14. The clutch dog 12 is provided on its other end with a projection 15 which when the tooth is in engagement with the ratchet, extends outward through an aperture in the

clutch housing 7. Means, such as the lever 16, is provided for engaging the projection 15 and depressing it into the housing, thereby disconnecting the lever 12 from the ratchet 6. The end of the lever 16 extends into the aperture in the wall of the housing, thereby bringing the housing to rest in full cycle position. In the operation of the calculating machine, the lever 16 is normally in engagement with the housing and operation of the lever 16 to remove it from engagement with the housing, causes engagement of the clutch and the operation of the calculating machine until the lever 16 subsequently disengages the clutch.

Journaled on the hollow shaft 4 are two contiguous gears 21 and 22, each gear being provided on one side with an annular shoulder 23, the shoulders of the two gears being arranged contiguously. Each shoulder 23 is provided with two diametrically opposed slots or seats 24 and 25, the two seats being of different lengths radially, for reasons which will hereinafter appear. For purposes of production, it is advantageous to cut the two seats at one operation and to make them both of the same length radially, and one of the seats 24 is subsequently shortened to make it of different length radially than the seat 25. The shortening of the seat 24 is preferably accomplished by the use of a ring 26, engaging the annular shoulder 23 and being provided with a projection 27 which extends into the seat 24. The extension 27 may comprise a stud or screw seated in the ring 26. It is understood that there are two rings 26, one for each of the gears 21 and 22, so that each gear is provided with two seats of different lengths radially.

Arranged in the hollow shaft 4 and extending therefrom is a stub-shaft 28 which is adapted to be moved longitudinally within the hollow shaft 4. The hollow shaft 4 is provided at that part on which the gears 21 and 22 bear, with a transverse slot 29, and seated in the inner end of the stub-shaft 28 is a transverse pin 31 which is disposed in the slot 29. The ends of the pin 31 extend beyond the periphery of the hollow shaft 4 and into one of the pairs of seats 24—25 formed in the annular shoulders 23 of the gears 21 and 22. The two ends of the pin 31 are of different length, one end seating in the short seats 24 and the other and longer end seating in the long seats 25. The pin is of such diameter that it will seat in the seats in one gear and be out of engagement with the seats in the contiguous gear. The stub shaft 28 is movable longitudinally to move the pin 31 from engagement with the seats in one gear into engagement with the seats in the other gear. The gears 21 and 22 are rotated in opposite directions, as will hereinafter appear, and due to the difference in the length of the seats 24 and 2 and the length of the two ends of the pi 31, the pin may be shifted only after th gears 21 and 22 have made a half or a whol revolution, or a multiple of a half or whole revolution. In other words, it is im possible to shift the pin 31 at any poin other than the half cycle or full cycle posi tion of the gears 21—22. When the gear 21—22 are in full cycle position, as indi cated in Figure 1, the clutch housing is i full cycle position and the actuator is in ful cycle position. Normally the pin is shiftabl only when the actuator is in full cycle posi tion, but, in the event that it is shifted whe the actuator is in half cycle position, th clutch housing will simultaneously be in hal cycle position, so that the relationship of th actuator to the clutch housing is not dis turbed. The clutch housing can be stoppe only in full cycle position, and consequentl with this reversing gear, regardless of th time of reversal, the actuator will always sto in full cycle position.

In Figures 3 and 4, only a few of the teet on each of the gears are shown, but it is t be understood that the gears are complet gears, being provided on their peripherie with regularly spaced teeth. Meshing wit the reversing gear 22 is a gear 45 of equa pitch diameter, which is secured to the sha 46, suitably journaled in the machine. Mesh ing with the gear 45 and with the other re versing gear 21 is an idler gear 47. Secure to the shaft 46 is a gear 48 of the same pitc diameter which meshes with a similar gea 49, which in turn meshes with a similar gea 51, secured to the shaft 52 of the actuator By longitudinally shifting the pin 31, th direction of rotation of the gears 21 and 2 is reversed and consequently the directio of rotation of the gear 45 and consequentl the direction of rotation of the gear 51, reversed, thereby causing reversal of th direction of rotation of the actuator 5. Th gears 21 and 22 are rotated at a fairly hig speed, so that the accidental shifting of th pin 31 while the gears are in rotation is sub stantially precluded but, should such ac cidental shifting occur, the timing of th actuator with respect to the stop mechanism will not be disturbed, so that the actuato will always be brought to rest in full cycl position. The devices for actuating th clutch lever 16 to cause engagement an disengagement of the clutch are shown in m co-pending application Serial Number 693 546 filed February 18, 1924 which ha matured into Patent No. 1,643,710, Septem ber 27, 1927 to which reference is hereb made for a more complete disclosure of th calculating machine in which the device o the present invention is embodied.

I claim:

1. A reversing mechanism comprising

driving shaft having a diametric slot therein, a pair of contiguous gears rotatably mounted on said shaft, said gears being provided on their contiguous sides with diametrically disposed seats of different lengths on the opposite sides of the axis of the gears, a transverse pin disposed in said slot and extending beyond the surface of the shaft for different lengths on opposite sides thereof, and means for moving the pin longitudinally of the shaft into engagement with the seats of either gear.

2. A reversing mechanism comprising a driving shaft, having a diametric slot therein, a pair of contiguous gears rotatably mounted on said shaft, said gears being provided on their contiguous faces with circular shoulders having diametrically disposed slots therein, a ring seated on each shoulder, a stud on each ring extending into one of the slots, whereby diametrically disposed seats of different length are provided on opposite sides of the axis of the gear, a transverse pin disposed in said slot and extending beyond the surface of the shaft for different lengths on opposite sides thereof, and means for moving the pin longitudinally of the shaft into engagement with the seats of either gear.

In testimony whereof, I have hereunto set my hand.

CARL M. F. FRIDEN.