Sept. 9, 1941. B. CARLSTRÖM 2,255,102

ADDING AND CALCULATING MACHINE

Filed July 12, 1938 2 Sheets-Sheet 1

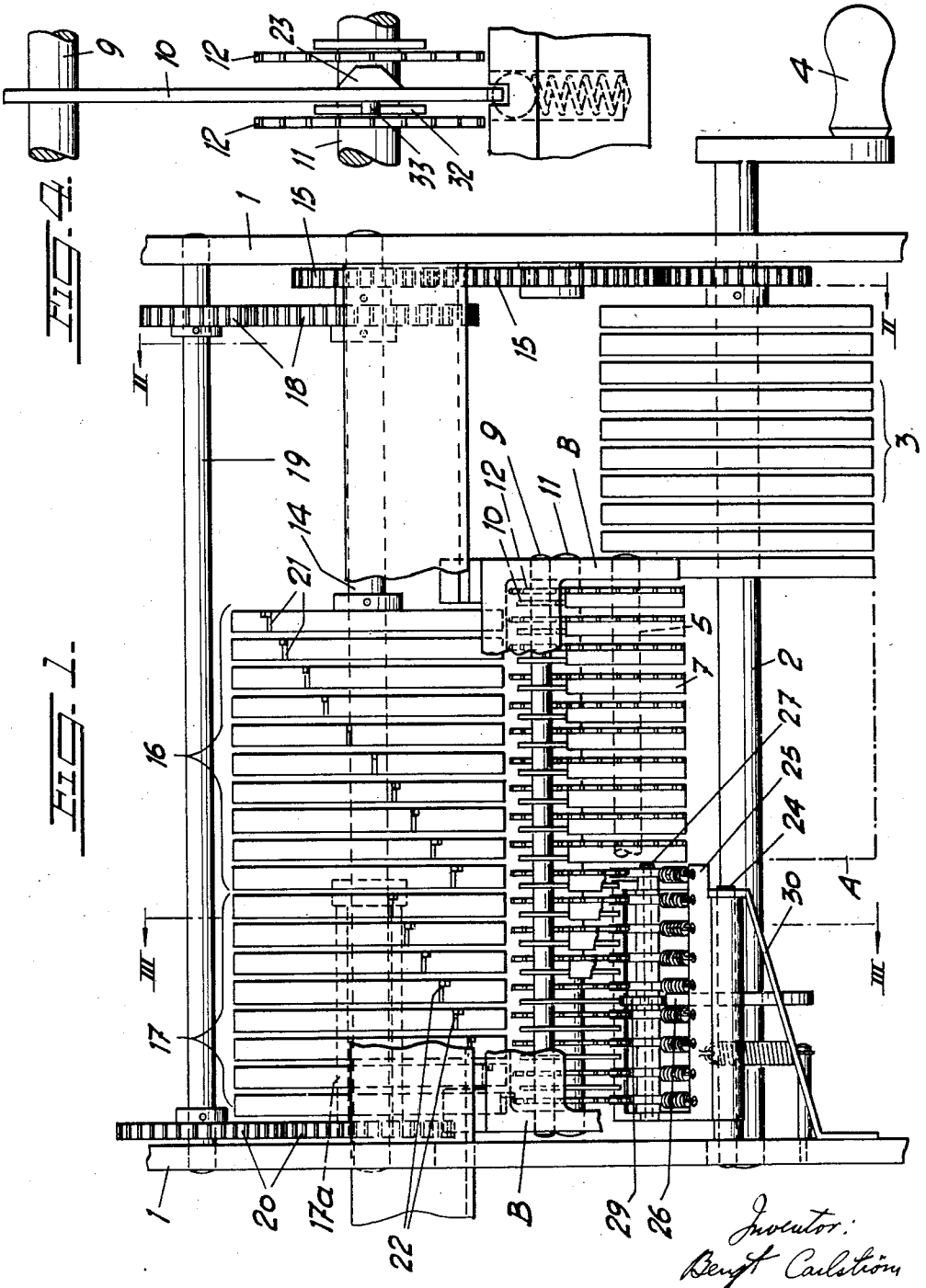


FIG. 4.

FIG. 1.

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FIG. 2.

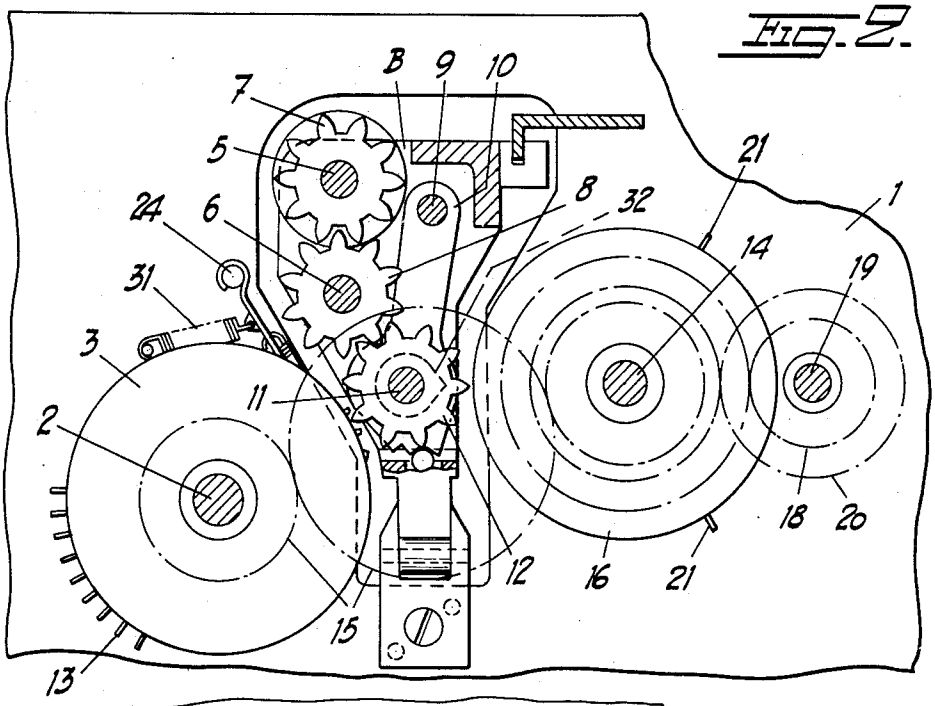
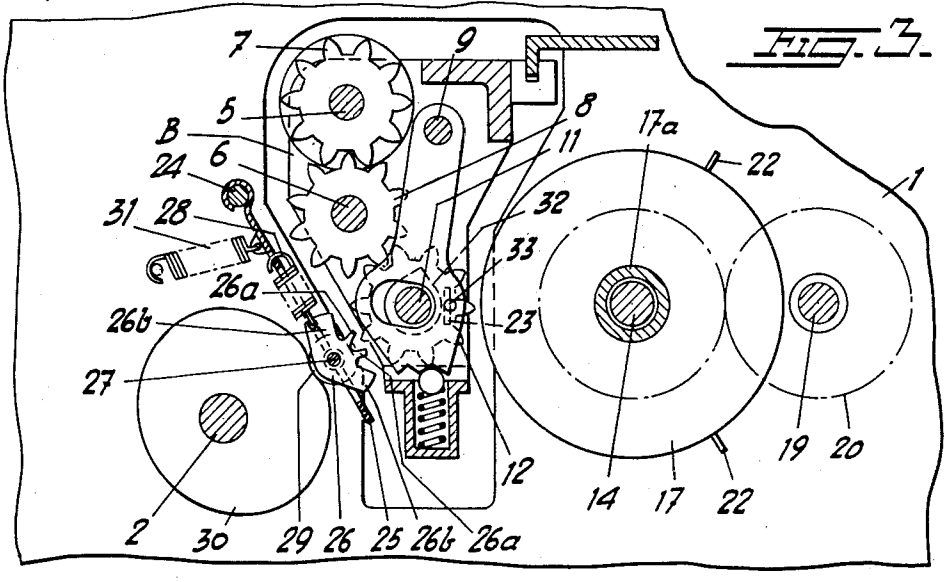


FIG. 3.



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Patented Sept. 9, 1941 2,255,102

UNITED STATES PATENT OFFICE

2,255,102

ADDING AND CALCULATING MACHINE

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Application July 12, 1938, Serial No. 218,788
In Germany August 8, 1937

3 Claims. (Cl. 235—138)

In adding and other calculating machines having a tens transfer mechanism for all wheels or pinions of one or more totalizers or registers, such as a result register, a quotient register etc., often a special tens transfer rotor is used which carries the tens transfer teeth. When the registers have a great capacity, that is, have many denominational wheels, such rotors will get excessively big dimensions, which makes the calculating machine clumsy and difficult to handle. Due to the heavy rotary masses, such machines work slowly and run heavily. For this reason, only a partial tens transfer was often used in big registers, there being no tens transfer for the highest denominations.

It was also proposed to divide the tens transfer rotor for a register into two parts and to couple said two parts together temporarily. In that embodiment the additional tens transfer rotor for the higher denominations outside of the operation range of the actuator begins its motion later than the principal tens transfer rotor and consequently remains stationary during the first portion of the motion of the principal rotor and is then suddenly rapidly accelerated, when it is coupled to the principal rotor, which is directly driven from a main shaft. Thus, the machine does not run uniformly but instead very jerkily, which is unfavorable, especially at high speeds, and may result in errors in the calculation.

The chief object of this invention is to remove such drawbacks and to create a smoothly and safely working tens transfer mechanism for registers and totalizers of high capacity.

Another object of this invention is to create a simple and non-expensive tens transfer mechanism, which is very reliable in operation and resistive to rough handling and may be operated also at high speeds.

Another object of this invention is to render it possible to reduce the diameters of tens transfer rotors, while the machine retains its safety of operation and runs uniformly.

Another object of this invention is to prevent detrimental oscillations in the machine, thus rendering the machine very reliable and giving it a long life.

Another object of this invention is to couple the two tens transfer rotors of a register permanently with each other by means of a gearing.

Other objects of this invention will be evident from the following specification and claims.

One embodiment of this invention is shown in the annexed drawings.

Fig. 1 shows a plan view of a calculating machine having a transfer mechanism in accordance with this invention.

Figs. 2 and 3 show vertical sections on the lines II—II and III—III, respectively, in Fig. 1.

Fig. 4 is a front view of a portion of the device shown in the preceding figures.

For the sake of clearness only the essential parts of the machine are shown.

The calculating machine as shown is constructed substantially in accordance with United States Patent No. 2,108,596 and has an actuator in the shape of a pin wheel rotor which is set, preferably by means of keys. In contrast to the machine shown in the said patent, the machine shown in the annexed drawings has its registers (result register and quotient register) in a displaceable carriage, as well-known in the art.

Referring now to the drawings, 1 indicates the stationary machine frame, in which the main driving shaft 2 is rotatably journalled. Said shaft carries the actuator or pin wheel rotor 3 and may be rotated in well-known manner, for instance, by means of a manually operated crank 4. Of course, a motor may be provided instead of the crank. The rotor 3 may be tabulated to different positions along the shaft 2, for instance, in dependence on the number of numerals of the item set in said actuator. Such tabulations may be effected as described in United States Patents Nos. 2,108,596 and 2,105,520, or in United States patent application Serial No. 756,823, filed on December 10, 1934, for "Improvements in calculating machines."

The extreme right position of the actuator 3 is shown in full lines in Fig. 1 and its extreme left position is indicated by the dash-and-dot line A. In a carriage B movable in parallel with the shaft 2 shafts 5, 6 are secured, which in the conventional manner carry register wheels or pinions 7 and intermediate pinions 8. In this carriage B also a shaft 9 is secured carrying tens transfer levers 10 (which may be constructed in accordance with Swedish Patent No. 90,932). Through holes in the tens transfer levers 10 a shaft 11 passes, which is secured in the carriage B and carries intermediate or transmission wheels 12 which are actuated by the settable teeth or pins 13 of the rotor 3 at the calculating operations.

In Fig. 1 the carriage B and the register 7 are shown in their extreme left position.

In the machine frame 1 a shaft 14 is rotatably journalled which is driven by the shaft 2 via spur gears 15. The shaft 14 carries a principal tens transfer rotor 16 which is secured to the shaft

14 and rotates together with the same. The spur wheel gears are so chosen that the shafts 2, 14 and the rotors 3, 16 effect the same number of revolutions and always have the same rotary speed. On a sleeve 17a an additional or auxiliary tens transfer rotor 17 is arranged and the sleeve 17a together with the rotor 17 is loosely journalled on the shaft 14 and may rotate in relation to said shaft. Via a spur gear 18 the shaft 14 drives an intermediate shaft 19 which in its turn drives the rotor 17 via a spur wheel gear 20. In the embodiment shown the additional rotor 17 is driven twice as many revolutions as those of the main rotor 16, but the ratio of transmission between said two rotors may be chosen arbitrarily, in dependence on the fact, in how many positions tens transfer is desired. But said ratio of transmission must always be so chosen that the additional rotor effects an integral number of revolutions, but at least two revolutions, for each revolution of the principal rotor 16.

The two rotors or cylinders 16, 17 are provided with rockable tens transfer teeth 21, 22 in the conventional manner. Those teeth are arranged along helical lines on the rotors. The extreme left transfer pin 21 (that is the tens transfer pin of the highest denomination) of the rotor 16 and the extreme right transfer pin 22 (that is the tens transfer pin of the lowermost denomination) of the rotor 17 are arranged in such angular positions, with regard to the different rotary velocities of the rotors that when said highest denominational transfer pin 21 passes by the oblique cam or projection 23 of the corresponding tens transfer lever 10 the lowermost denominational transfer lever 22 is in correct position for carrying the tens transfer further to the higher denominations of the register. In other words: in that moment in which the highest transfer pin 21 passes by the corresponding cam 23, the pins 21 and 22 form a continuous helical line for that direction of rotation. Consequently, the two rotors act as one single rotor having a continuous helical line of transfer pins for the direction of rotation concerned, a tens transfer being thus effected throughout the whole register.

On a stationary shaft 24 a bridge 25 is rockable, which carries locking pawls 26, one for each denomination of the register to the left of the extreme left hand position A of the actuator 3. These pawls are rotatable on the shaft 27, which is secured in the bridge 25. The pawls are separately loaded by springs 28 and each pawl 26 has two narrower teeth 26a and two broader outer teeth or projections 26b. The bridge 25 carries a roller 29, which is rotatable on the shaft 27 and engages a cam disc 30 on the shaft 2. A spring 31 presses the roller 30 to engage the cam disc permanently. The tens transfer tooth of the wheel 12 is indicated by 32 and engages the pin 33 of the lever 10 at the tens transfer operation.

The device described operates as follows:

When at a tens transfer to one denomination of the register the tens transfer tooth 32 of the wheel 12 of the next lower denomination engages the pin 33 of the lever 10 said lever is rocked counter-clockwise from its position of rest shown in Figs. 2 and 3. The wedge-shaped projection 23 of the lever 10 then enters the path of the corresponding transfer pin 21 (or 22) of the tens transfer rotors 16 (or 17) and rocks said pin laterally, that is, in the axial direction, so much that the latter engages the intermediate wheel 12 of the next higher denomination and rotates the latter together with the wheels 8 and 7 of this next higher denomination one step, thus completing the tens transfer. At the beginning of the rotation of the shaft 2 the bridge 25 is rocked inwards towards the wheels 12 by the cam disc 30, causing the pawls 26 to engage those of said wheels, which are to the left of the position A of the actuator 3. It is to be observed that the pawls 26 are normally held by the springs 28 in the middle position shown in Fig. 3 and are out of engagement with the wheels 12, but as soon as the shaft 2 is rotated for a calculating operation, the pawls 26 are brought into engagement with the wheels 12 by means of the cam disc 30, which rocks the bridge 25. If now a tens transfer is effected in a denominational position whose wheels are engaged by the pawls 26, the wheel 12 is rocked one step as described above and rocks the pawl 26 in the corresponding direction so that one of the narrow teeth 26a enters the space between the teeth. Further rotation of the pawl 26 and the wheel 12 is then positively prevented by the fact that the corresponding outer tooth 26b is so broad that it cannot enter a space between the teeth of the wheel 12 but instead locks the wheel 12 and prevents an overthrow. At the continued rotation of the shaft 2 the roller 29 follows the periphery of the cam disc 30 and consequently holds the pawls 26 against the wheels 12 during the whole period in which the tens transfer is effected, because that part of the cam disc is cylindric (non-eccentric). Thus an efficient locking of the wheels 12 is effected and errors of calculation are prevented. When the tens transfer has been completed, the roller 29 again slides down upon the lower part of the cam disc 30, causing the pawls 26 to be drawn out of engagement with the wheels 12 and to be restored by their springs 28 to their positions of rest as shown in Fig. 3.

Stress is laid upon the fact that the operation of the mechanism is the same for both directions of rotation, that is, both for addition and subtraction.

Obviously, the device may also be used for non-decimal calculating machines, such as calculating machines for English coinage (duodecimal and vigesimal system). Because the actuator has no influence upon the tens transfer mechanism, the device in accordance with this invention may obviously be applied to calculating machines of other types than that shown in the drawing. Certain subject matter disclosed in the present application, but not claimed herein, is claimed in my divisional application Serial No. 254,011.

What I claim is:

1. In a calculating machine, in combination, a register, two cooperating tens transfer rotors for said register, and a gearing between said two rotors for coupling them permanently together, said gearing having such a ratio of transmission that the rotor for the higher denominations is rotated at a higher speed than the other rotor and performs an integral number of revolutions for each revolution of said other rotor.

2. In a calculating machine, in combination, a register, a shaft, two cooperating tens transfer rotors on said shaft, and toothed wheel gearings between said rotors for coupling them permanently together, said gearings having such a ratio of transmission that the rotor for the higher denominations is rotated at a higher speed than the other rotor and performs an integral number of revolutions for each revolution of said other rotor.

3. In a calculating machine, in combination, an

axially shiftable register having several toothed wheels, an actuator for said register, two co-operating tens transfer rotors for said register, one of said rotors acting exclusively on those of said wheels which are beyond the range of direct actuation of said actuator, and a gearing between said two rotors for coupling them permanently together, said gearing having such a ratio of transmission that the rotor for the higher denominations is rotated at a higher speed than the other rotor and performs an integral number of revolutions for each revolution of said other rotor.

BENGT CARLSTRÖM.