Aug. 11, 1953 K. JORDAN ET AL 2,648,498

CALCULATING MACHINE

Filed Sept. 14, 1949

Fig. 1

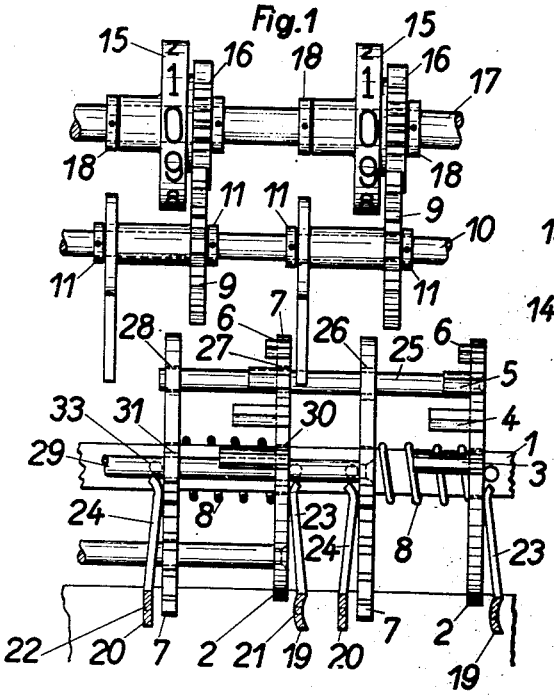


Fig. 2

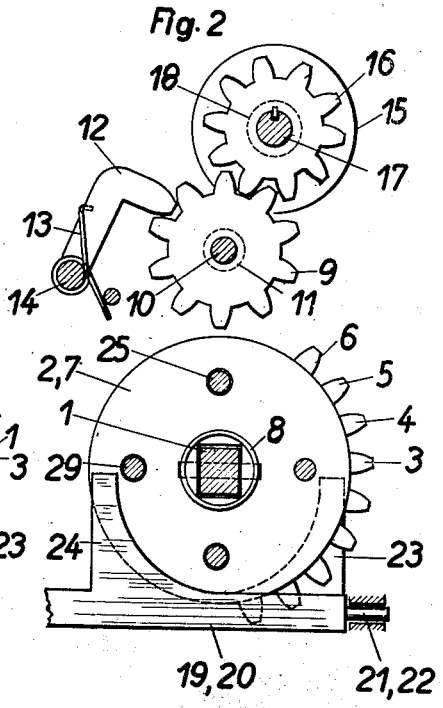


Fig. 3

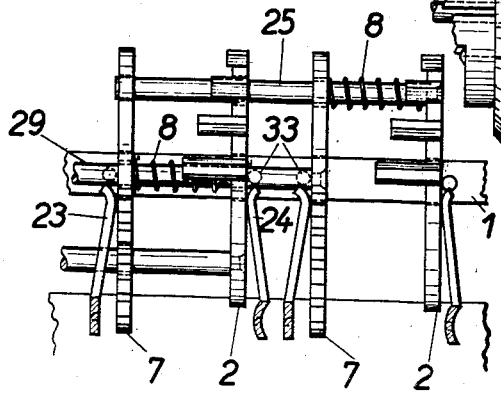
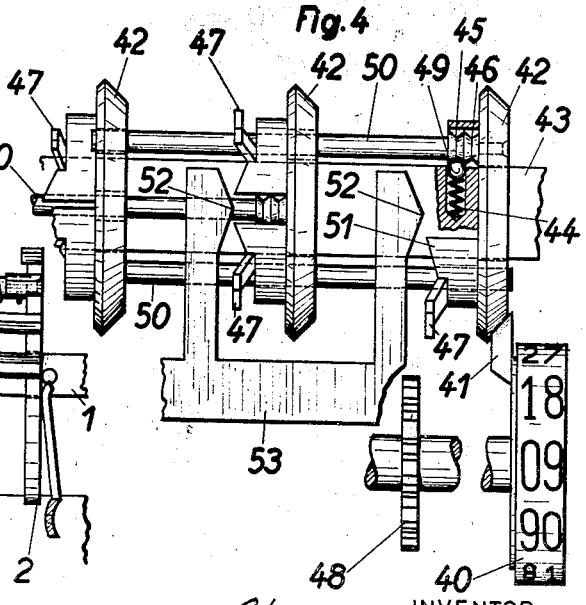


Fig. 4



INVENTOR

Hans Neumann-Legrün

BY Kurt Jordan

ATTORNEY

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CALCULATING MACHINE

Kurt Jordan and Hans Neumann-Lezius, Brunswick, Germany, assignors to Brunsviga Maschinenwerke Aktiengesellschaft, Brunswick, Germany

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4 Claims. (Cl. 235—79)

1

The present invention concerns improvements in or relating to calculating machines.

In Patent No. 2,042,986, June 2, 1936, to Haase, there is disclosed a machine in which the differential actuating mechanism includes a shaft and a pair of vari-toothed discs that rotate with the shaft and are axially adjustable thereon. It is an object of the present invention to provide means for maintaining such discs accurately in planes parallel to each other by simple means that can be made at small cost and without difficulty, and which do not involve increase in the size of the machine.

In the patent above referred to the discs in question are guided along the shaft by wedge-shaped key ways that are expensive to make and relatively inefficient as guiding means because of the short portion that engages a disc, due to the close spacing of the discs. They are, therefore, liable to get out of order, especially as they become worn with use, and it is another object to do away with loose play of the discs.

The invention consists in that on each operating disc a pin is provided which passes freely parallel to the associated shaft through clearance holes in the adjacent disc or discs and finds a support in another more remote disc or in another part of the calculating machine which shares the rotary motion of the operating disc in question.

In order that the invention may be properly understood two embodiments are shown in the accompanying drawing in which the same reference numerals are used for all corresponding parts. In these drawings:

Fig. 1 is a front view of a part of the machine showing two denominational orders of the register and differential actuating mechanism therefor,

Fig. 2 is a side view of the arrangement shown in Fig. 1,

Fig. 3 is a portion of Fig. 1 showing a different arrangement of the springs 8,

Fig. 4 is a front view of a part of the transfer mechanism.

In the embodiment of the machine shown in Figs. 1 and 2, reference character 1 indicates a shaft which is driven by means of a crank or an electric motor through the agency of intermediate gearing. The shaft 1 carries actuator discs 2 which are each provided with four teeth 3, 4, 5, 6 of different lengths and also actuator discs 7 which each carry five teeth all of similar construction (the tens transfer mechanism is not shown). For each denominational order of the

2

calculating machine two actuator discs 2 and 7 are provided. Between each pair of these actuator discs 2 and 7 are located coil springs 8 mounted on the shaft 1. These coil springs are compressed when the actuator discs 2, 7 are pressed together and they cause the actuator discs to be separated again when the pressure is released. When the shaft is turned the actuator discs 2 and 7 of each pair act successively on an intermediate wheel 9 which is rotatable but not axially movable on a shaft 10 said wheel forming part of an accumulator. This shaft 10 is built into a shiftable carriage in the machine. The intermediate wheels 9 are retained in their position on the shaft 10 by means of collars 11 which are secured to the shaft. A pawl 12 pressed by a spring 13 operates on the teeth of each intermediate wheel 9 and all the pawls 12 are pivoted on a rod 14. By means of these pawls the step-by-step rotation of the intermediate wheels 9 and the number discs 15 which are driven by the wheels 9 is ensured. Each wheel 9 meshes with a gear 16 which is rigidly secured to a number disc 15. The number discs 15 are rotatable but not axially movable on shaft 17 which is secured to the side walls of the shiftable carriage. The wheels 15 are secured in their exact position by collars 18.

On opposite sides of the actuator discs 2 and 7 of each denominational order, bars 19 and 20 are mounted so as to rock about pivots 21, 22 which are mounted in the walls of the machine casing. The rear ends of these bars 19, 20, are provided with upwardly projecting arms 23, 24 which co-operate with the exterior faces of the operating discs 2 and 7. The inner faces of the bars 19 and 20 carry at their front ends wedge-shaped noses which co-operate with the teeth of the setting discs. These teeth can be bent out of the material of the setting discs or can be fastened thereto as described and shown in United States Patent No. 2,042,986.

On disc 2 of the units denominational order a pin 25 is riveted and extends parallel to the shaft 1 through clearance holes 26, 27 in the two neighboring discs 7 of the units order and 2 of the tens order and engages in a hole 28 in the third successive disc 7 (tens denominational order) in which it is loosely guided. To the disc 7 of the units denominational order but displaced 90° with respect to the pin 25, Fig. 2, there is riveted a pin 29 which similarly extends parallel to the shaft 1 through clearance holes 30, 31 of the neighboring discs 2 (tens denominational order) and 7 (tens denominational order) and

engages in the third successive digit disc, viz., the disc 2 (hundreds denominational order, not shown) in a hole in which it is guided. In corresponding manner all the further discs 2, 7 are provided with similar guides as may be seen from Fig. 3.

It is also possible for the guide pins 25, 29 to carry the springs 8 which serve to force apart the actuator discs 2, 7, of each denominational order after they have been moved together in accordance with the setting of a particular value by the operation of the bars 19 and 20 (see Fig. 3). Moreover, the extreme position of the discs 2, 7 can be limited by stop pins 33 which project from transverse holes in the shaft 1.

In the calculating machine of United States Patent No. 2,042,986 tens transfer devices are provided which are numbered 12 and 119 in said patent. For these transfer discs also the same guide pin arrangement can be provided, as illustrated in Fig. 4. In this figure a shaft 43 that is angular in cross section carries a series of tens transfer discs 42, 42 that are slidable on the shaft and rotatable therewith, said transfer discs being shifted by engagement therewith of a transfer tooth 41 on an adjacent numeral wheel 40. Each transfer disc has two tens transfer teeth 47, as explained below.

Each transfer disc has an eccentrically mounted guide pin 50 fixed thereto and extending parallel to shaft 43, the free end of the pin being guided in a bearing aperture in a disc remote from the disc to which it is fixed, and passing loosely through clearance holes in one or more intermediate tens transfer discs. Spring pressed detents for the pins 50 comprise balls 49 adapted to engage in grooves at 45 and 46 in the pins for holding a pin and its transfer disc either in normal or operating position. Means for resetting the tens transfer disks individually comprises resetting projections 51 on discs 42 for engagement by cam faces 52 on a cam 53, operable as explained below.

When a numeral wheel 40 of the accumulator, Fig. 4, is to be moved from 9 to 0, the tens transfer tooth 41 engages with and moves to the left the tens transfer disc 42 which is mounted on the shaft 43 and has a bevelled edge lying in the path of the tooth so that the detent 49 which is pressed by the spring 44 moves out of the groove 45 into the neighboring groove 46 and thus brings the tens transfer tooth 47 into such a position that it engages the transfer wheel 48 of the next highest digit value in order to effect tens transfer. The transfer discs 42 each carry two tens transfer teeth 47 which are arranged to form two helices of opposite pitch in order that they shall be able to effect the tens transfer operation at the right time in both directions of rotation of the counting mechanism. To each tens transfer disc 42 an eccentrically located guide pin 50 is riveted and after passing through a clearance hole in the next tens transfer disc 42 it fits at its other end in the hole of the succeeding disc 42. These guide pins 50 which according to the digit position concerned may also engage either in the transfer discs of the lower digit positions or at the end of the train in other rotating parts of the tens transfer mechanism include grooves 45, 46 in which the above-described spring-pressed detents 44, 49 engage and serve to establish the effective and normal positions of the transfer discs 42. This has the advantage that the force necessary for overcoming the resistance of the locking devices and for moving the guide pins and connected parts can be kept as small as possible.

The considerable length of the guiding arrangements which is achieved according to the invention makes it possible for the point of application of the force for effecting the axial movement of the transfer discs to be eccentric and therefore one-sided, which also means that their restoration to the normal position can be effected by the provision of re-setting projections 51 on the transfer discs 42 which projections are adapted to be engaged by correspondingly-shaped teeth 52 of a cam 53 that may be either fixed or movable so that the restoration of the transfer discs 42 no longer needs to be effected simultaneously in all digit places by means of a cam rotating with the shaft and forming a part thereof, which is costly to manufacture. On the contrary, restoration of the oscillating transfer discs 42 can be effected successively and hence quietly and without impulsive reactions on the drive.

Having thus particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. In a calculating machine, a shaft, a series of numeral wheels on the shaft, a second shaft parallel to the first-named shaft, disks on the second shaft including a pair of actuator disks for each numeral wheel, said actuator disks being rotatable with the shaft and movable axially thereof, indexing means for adjusting the disks of each pair toward each other for engagement with the corresponding numeral wheel, means biasing the disks away from each other, a pin fixed on each disk, said pin extending parallel to the shaft through a clearance hole in an adjacent disk and being guided at its free end by a hole in another disk more remote from the disk to which the pin is fixed, and the pins of successive disks being arranged in echelon.

2. In a calculating machine, a non-circular drive shaft, a series of tens transfer disks each having an aperture fitting on said shaft and being slidable along the shaft, an eccentric pin projecting from each disk parallel to said shaft, said pin having its free end guided in a member rotating with the shaft and passing through clearance holes in one or more disks intermediate between its supporting disk and said member, number wheels, a tooth on a number wheel acting eccentrically on a transfer disk to move it into position to engage a number wheel of the next higher order of values, tens transfer teeth on the transfer disks arranged in helices of opposite pitch, resetting projections on the transfer disks, and cams individually engageable with said resetting projections for returning the transfer disks to normal position.

3. A calculating machine having an accumulator, a drive shaft angular in cross section, a series of toothed disks slidable on said shaft for operating said accumulator and means engaging the disks eccentrically for slidably adjusting them along said shaft; each disk having a central aperture fitting about the drive shaft, a bearing aperture, a plurality of clearance holes, and an eccentric pin projecting from one face parallel to the shaft; each pin having its free end guided in said aperture of a remote disk and passing through the clearance holes of intermediate disks, the pins of successive disks being arranged in echelon.

4. The structure of claim 3, including an end member rotatable with said shaft and provided

with a bearing aperture for receiving the eccentric pin of one of said disks.

KURT JORDAN.
HANS NEUMANN-LEZIUS.

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