

Sept. 8, 1931.

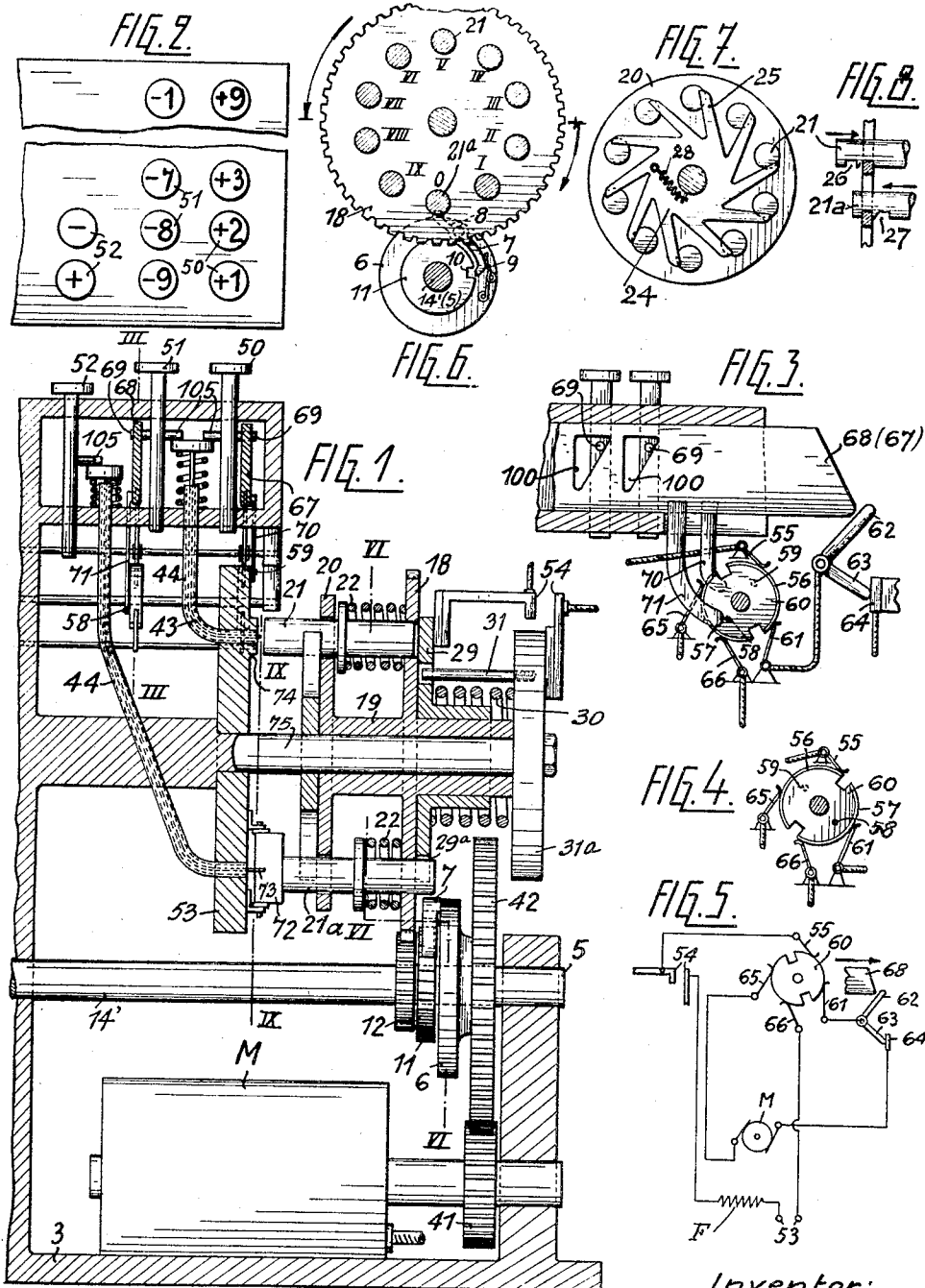
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1,822,031

CALCULATING MACHINE

Filed Dec. 13, 1928

2 Sheets-Sheet 1



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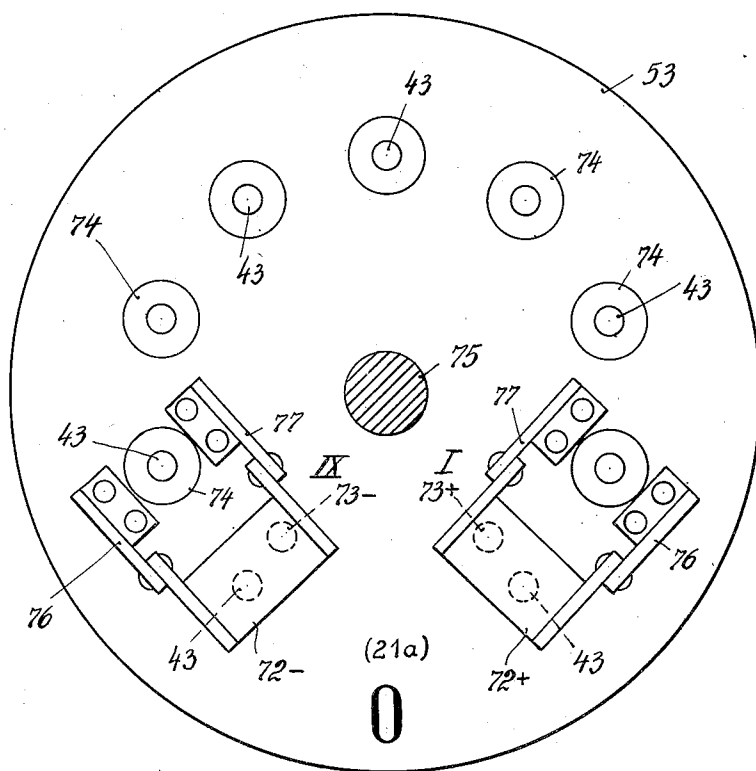
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2 Sheets-Sheet 2

FIG. 9.



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UNITED STATES PATENT OFFICE

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CALCULATING MACHINE

Application filed December 13, 1926, Serial No. 325,872, and in Germany March 29, 1928.

My invention relates to power driven calculating machines and more particularly to the driving mechanism for a machine of this kind provided with numeral wheels actuated by a reversible rotary motor.

My invention will be better understood in connection with the drawings affixed to this specification and forming part thereof, in which mechanism embodying my invention is illustrated diagrammatically by way of example. In the drawings:

Fig. 1 is a longitudinal sectional view of the driving mechanism which is connected at the left hand side to a calculating machine (not shown).

Fig. 2 is a plan view of the keys.

Fig. 3 is a section taken on the line III—III in Fig. 1 showing the actuating device for the commutator which is in a positive position.

Fig. 4 shows the commutator in a negative position.

Fig. 5 is a diagram of the electric connections.

Fig. 6 is a section taken on the line VI—VI in Fig. 1 showing the pawl coupling and

Figs. 7 and 8 are views of the locking mechanism for the pins 21,

Fig. 9 is a section on the line IX—IX in Fig. 1 drawn to a larger scale.

Referring to the drawings, M is the motor driving the machine, the shaft of which is provided with a gear 41 meshing with the gear 42 rotatably mounted on the fixed shaft 5. Shaft 5 and motor M are suitably supported on the base plate 3 of the calculating machine or on a part fixed thereon. Gear 42 is connected to a coupling disk 6 which may be coupled to the disk 11 by means of the pawl 7, to drive the gear 12 on the shaft 14' of the calculating machine. This is effected by spring 9 which presses the pawl 7 into a notch 10 formed in the disk 11. As soon as this pawl 7 catches the notch 10 the movement is transferred from the motor M to the disk 11.

Gear 12 meshes with gear 18 which is mounted to rotate on a fixed shaft 75 with its hub 19, the ratio of gearing being 10: 1.

Hub 19 connects gear 18 firmly with the pin disk 20 carrying ten actuating pins 21 which together with the pawl 7 engage and disengage the coupling between the parts 6 and 11. This is effected as follows:

All pins with the exception of 21a, the one which has reached the lower-most position, extend to the left as shown by the uppermost pin 21 in Fig. 1. The lowermost pin 21a is in a position in which the pawl 7 is lifted out of the notch 10 so that the machine is brought to a standstill.

By pressing a pin 21 to the right a locking mechanism to be described further below causes the pin 21a in the lowest position to return to the left. The pawl is raised hereby and engages the notch 10 under the action of the spring 9, keeping the machine coupled with the driving mechanism until the pin 21 that was just pressed has reached the position 0 (Fig. 6).

If for instance the shifted pin is in position IX, the connection between the time pawl 7 and disc 11 is disconnected only when the large gear 18 has completed 9 revolutions in the direction marked + in Fig. 6, so that the small gear 12 has completed 9 rotations in the same time. Then the pin which was shifted at IX engages the pawl 7 and lifts it out of the notch.

The well known locking mechanism mentioned above is shown in Figs. 7 and 8 to consist of a locking disk 24 with ten arms 25. The actuating pins are formed with a square shaped notch 26 and a bevelled notch 27, both adapted to receive the locking disk which is pressed into one of the two notches by the spring 28 according to the position of the actuating pin. By pressing an actuating pin 21 extending to the left the locking disk is slightly turned against the action of a spring 28 (Fig. 7) and the lowermost actuating pin 21a is disengaged thereby and is shifted to the left by spring 22.

Keys 50, 51 and 52 are provided for operating the pins 21 through the medium of Bowden trains or other flexible elements 73 and 43 which are guided in tubes 44. The lower ends of the tubes are secured in a plate 53 opposite the pin disk 20.

The keys are arranged in three sets: Keys 50 marked "+" for rotating the motor M in a given or "plus" direction, keys 51 marked "-" for rotating the motor in the opposite or "minus" direction, and a pair of so-called permanent keys 52 which are required for altering figures already set in the machine and for performing divisions, by repeated operation of the machine, while one of the permanent keys is held depressed. One of the keys 52 is allotted to the + set 50 and the other to the - set 51.

The keys in the sets 50 and 51 are arranged in pairs +1, -9, +2, -8, etc. and the two keys of each pair cooperate with one of the Bowden trains 43 by means of pins 105 so that the trains are operated by depressing the corresponding "+" key, and also by depressing the corresponding "-" key. Springs may be provided for returning the keys to their initial positions. The operative positions of the several pins 21 are marked 0 and I-IX in Figs. 6-9. With the exception of position 0 a train 43 is provided for each position. Bosses 74 are formed on the plate 53 for each train except for the trains at I and IX, where the plate 53 is flat. At these positions Bowden trains 73⁺ and 73⁻ are provided in addition to the trains 43. The Bowden train 73⁺ is connected with the permanent key 52⁺ and the Bowden train 73⁻ is connected with the permanent key 52⁻, as partly shown in Fig. 1. 72⁺ and 72⁻ are flaps which are mounted to rock in bearings 76 and 77 on the plate 53 and are adapted to cooperate with the trains 73⁺ and 73⁻, respectively. The bosses 74 project from the plate 53 for the thickness of the flaps 72⁺ and 72⁻. Springs, not shown, normally hold the flaps 72⁺ and 72⁻ down on the plate 53. The keys 50 and 51 close the circuit of the motor M for the + direction of rotation (key 50) and for the - direction (key 51), as will be described in the following. If for instance key 50 marked +1 is pressed down, the motor M rotates in the + direction. If on the contrary the key marked -9, actuating the same Bowden train 43, is pressed down, the motor revolves in the opposite or - direction, rotating member 11 9 times, as the same actuating pin that cuts out the motor in the + direction after 1 rotation brings the machine to a standstill at the end of 9 rotations in the - direction. In the same manner the Bowden-train actuated by the +2 key is also operated by the -8 key etc. By this arrangement of the + keys 1-9 and the - keys 9-1 the machine may be operated in one or the other direction by pressing one of these keys without having to change over the mechanical driving mechanism.

The Bowden train 43 of the keys +1 and -9 strikes the pin 21 which is at I, Fig. 6, through the medium of flap +72; likewise,

the train 43 of the -1 and +9 keys strikes a pin 21 in position IX (Fig. 6) through the medium of flap -72. The train 43 of the keys +2 and -8 strikes the pin 21 which is at II, etc. The train 73⁺ of the permanent key +52 strikes the pin 21 which is at I, through its flap 72⁺, and the train 73⁻ of the permanent key -52 strikes the pin 21 which is at IX, through its flap 72⁻.

Figs. 3, 4 and 5 show the electrical connections. A source of current (not shown) is inserted at the points 53 (Fig. 5). In a position of the commutator 60, according to Fig. 3, the current passes through the field-winding F of the motor M to the contact 54. The contact 54 is adapted to be operated through the medium of a disc 29 which is fitted to slide on an extension of the hub 19 and is provided with a spring 30 which tends to move it to the left toward the gear 18. 31 is a pin which is secured in a disc 31a, this disc being held against rotation with respect to the hub 19 so that the disc 29 is free to slide on the hub 19 but is held against rotation thereon. The depression of any of the keys 50 or 51 will move pins 21 to the right (as seen in Fig. 1) which in turn will move disc 29 to the right, against spring 30, thereby closing switch 24 and initiating rotation of gears 12, and 18, hub 19, and disc 20. Upon further rotation of the disc 20, the pin finally arrives in the lowermost position 21a which is the zero position in Fig. 6. At this point the disc 29 is recessed at 29a so that the disc 29 is free to return into its initial position under the action of its spring 30 and the contact 54 is opened.

When the contact 54 is closed, current flows to the wiping contact 55 (Figs. 3 and 5) along the conducting segment 56 of the commutator 60 to the wiping contact 61, passing the contacts 63, 64 which will be described further below, and the rotor of the motor. From there a current passes the wiping contact 65, flows along conducting segment 57 to wiping contact 66 and finally reaches clamp 53.

In a position of the commutator 60 according to Fig. 4 the current flows from the wiping contact 55 along the conducting segment 56 to the wiping contact 65 and then passes the rotor, so that the motor rotates in a reversed direction with respect to the connection shown in Fig. 3.

The commutator 60 is adjusted by the slides 67 and 68 which are moved by pins 69 secured to the keys 50 and 51 (Figs. 1 and 3). If key 50 for the multipliers +1 to +9 is pressed down, the pin 69 moves along the cam slot 100 in the slide 67 and shifts the slide to the right. The arm 70 which is fixedly connected to the slide 67 engages the plug 59 on the commutator 60 and puts it in the position (shown in Fig. 3) required for the + direction of rotation, provided

it is not already in this position. If the key 51 for the multipliers -1 to -9 is pressed down, the position of the commutator is reversed (as shown in Fig. 4) by means of the slide 68 disposed in front of slide 67 in Fig. 3 which is likewise moved to the right whereby the larger arm 71 which is firmly connected to it, engages the plug 58 on the other side of the commutator.

A special current switch 62, 63 and 64 is provided to prevent electric connection, before the commutator has been adjusted and damages resulting therefrom. As above described, one of the slides 67 or 68 is shifted to the right if one of the keys 50 and 51, is pressed down. Thereby both slides contact with an insulated lever 62 and separate the conducting lever 63 from the contact 64. It is obvious therefore that the flow of the current is interrupted when the key is pressed down and the motor does not start till the key has reached its normal position again and all other settings have been completed.

When one of the permanent keys 52 is depressed, the corresponding flap 72 is lifted and the neutral actuating pins 21 passing with the pin disk 20 glide on to the lifted flap 12 one by one and are shifted to the right successively into a position similar to that of the pin 21a, whereby the foregoing pin is released every time by the locking disk 24, 25, as has been described above. The machine is thus coupled until the permanent key is released and the actuating pin which was the last to be pressed, disengages the machine. The permanent keys 52 operate the commutator in the same way as keys 50 and 51, but do not interrupt the flow of current at the switch 63, 64. Flaps 72+ and 72- are so arranged that if the corresponding permanent key is released, only the rotation of disc 11 is completed, which had already started.

It is obvious that the -9 and +1 keys and the -1 and +9 keys, have the same effect upon flaps +72 and -72, respectively, as key 52, except for the fact that when one of the keys 52 swings a flap the machine starts immediately, while when one of the first-mentioned keys is depressed and swings a flap the machine does not start until the key is released.

I wish it be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

I claim:—

1. In combination with a calculating machine, an electric motor, a commutator for reversing said motor, a circuit connecting said commutator and said motor, two sets of keys, means operatively connected with the keys in each of said sets for reversing

said commutator, means also operatively connected with said keys for making and breaking said circuit, and a second circuit breaker also operatively connected with said keys and adapted to make said circuit after a key which had been depressed has returned to its normal position.

2. In combination with a calculating machine, an electric motor, a commutator for reversing said motor, a circuit connecting said commutator and said motor, two sets of keys, slides operatively connected with the keys in each set, a circuit breaker in said circuit adapted to be operated by either one of said slides and to make said circuit after a key which had been depressed has returned to its initial position, means operatively connected with the keys in each of said sets for reversing said commutator, and means also operatively connected with said keys for making and breaking said circuit independently of said first circuit breaker.

3. In combination with a calculating machine, a motor, gearing connecting said motor with said calculating machine, a set of pins adapted to be displaced in a rotary cage operatively connected with said gearing, a clutch in said gearing adapted to be controlled by said pins, means for reversing said motor, two sets of keys, and means operatively connected with the keys in each of said sets for controlling said reversing means in opposite directions of rotation, and means also operatively connected with said keys for displacing said pins in said cage.

4. In combination with a calculating machine, a motor, gearing connecting said motor with said calculating machine, a set of pins adapted to be displaced in a rotary cage operatively connected with said gearing, a clutch in said gearing adapted to be controlled by said pins, means for reversing said motor, two sets of keys, and means operatively connected with the keys in each of said sets for controlling said reversing means in opposite directions of rotation, means also operatively connected with said keys for displacing said pins in said cage, an independent key, and means operatively connecting said key with said pins and adapted to hold said pins in such position as to maintain said clutch thrown in while said independent key is depressed.

5. In combination with a calculating machine, a motor, gearing connecting said motor with said calculating machine, a set of pins adapted to be displaced in a rotary cage operatively connected with said gearing, a clutch in said gearing adapted to be controlled by said pins, means for reversing said motor, two sets of keys, and means operatively connected with the keys in each of said sets for controlling said reversing means in opposite directions of rotation,

means also operatively connected with said
keys for displacing said pins in said cage,
an independent key for either direction of
rotation, and means operatively connecting
5 said independent keys with said pins and
adapted to hold said pins in such position
as to maintain said clutch thrown in while
one of said independent keys is depressed.

10 In testimony whereof I affix my signature,
HERMANN HOFFMEISTER.

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