Oct. 13, 1953 S. LANZA 2,655,313

DEVICE FOR THE SETTING OF THE MULTIPLIER INTO MOTOR-DRIVEN CALCULATING MACHINES

Filed March 11, 1952 2 Sheets-Sheet 1

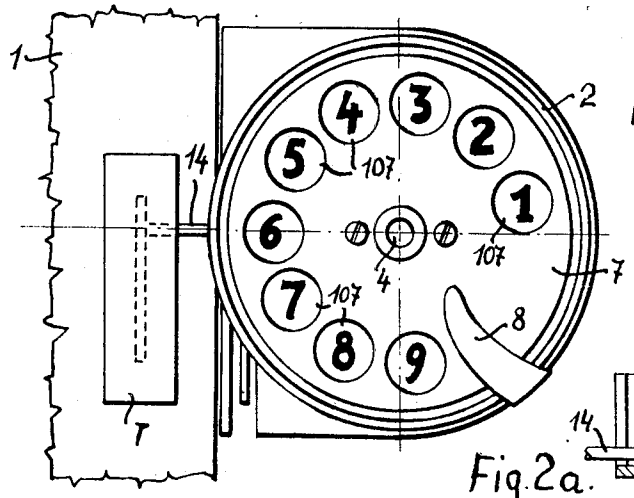

Fig. 1.

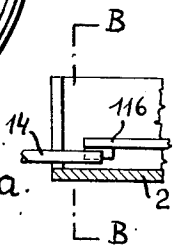

Fig. 2a.

Fig. 2b

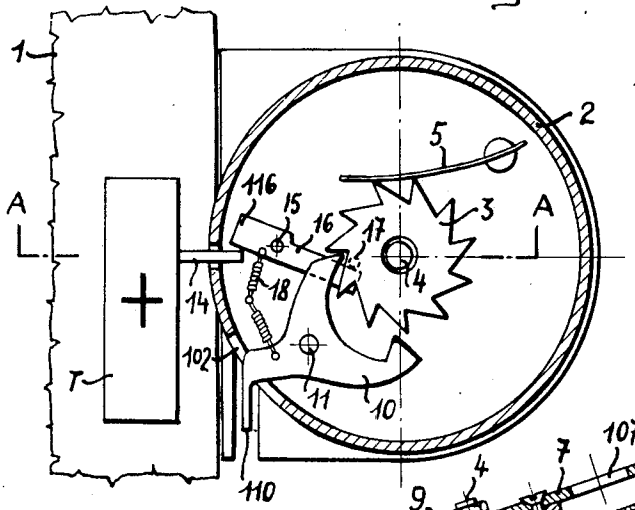

Fig. 2.

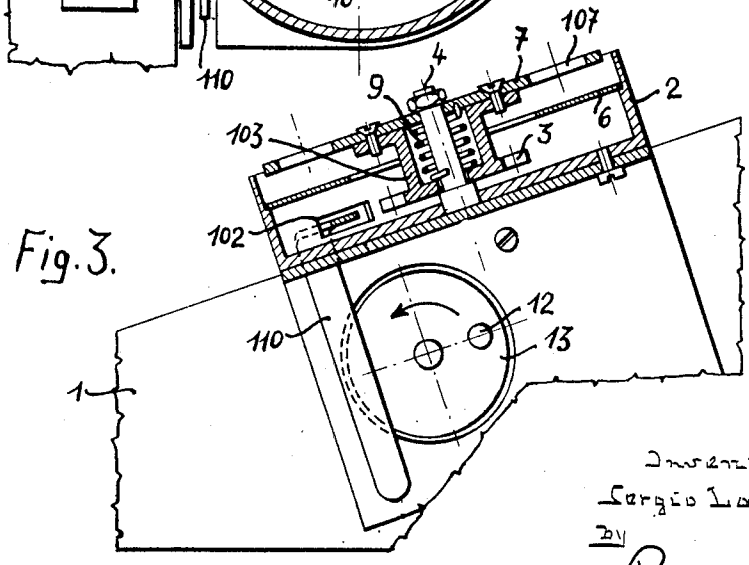

Fig. 3.

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Oct. 13, 1953 S. LANZA 2,655,313

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Filed March 11, 1952 2 Sheets-Sheet 2

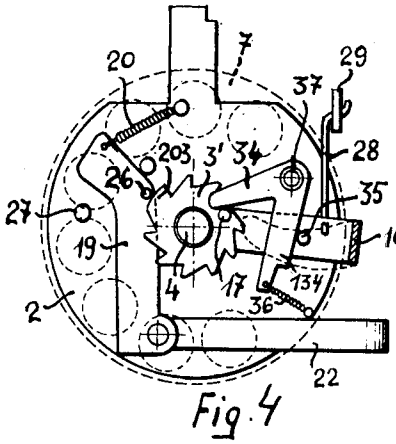


Fig. 4

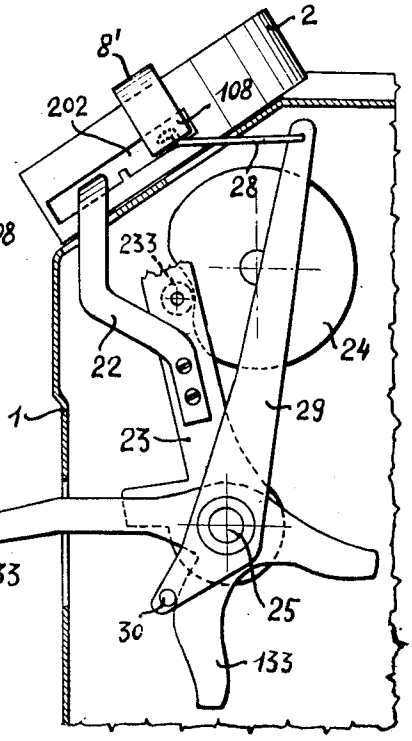
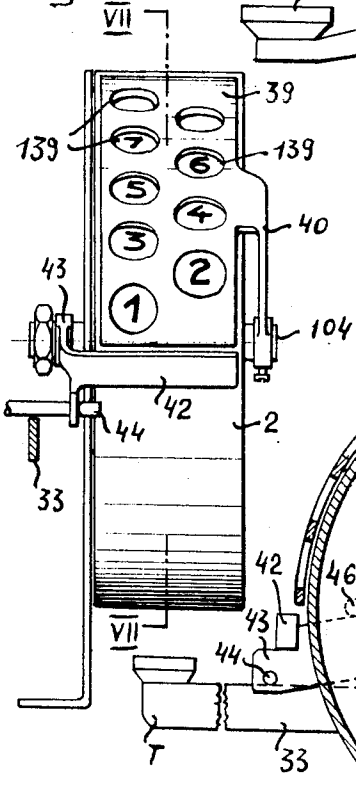


Fig. 5.

Fig. 6.



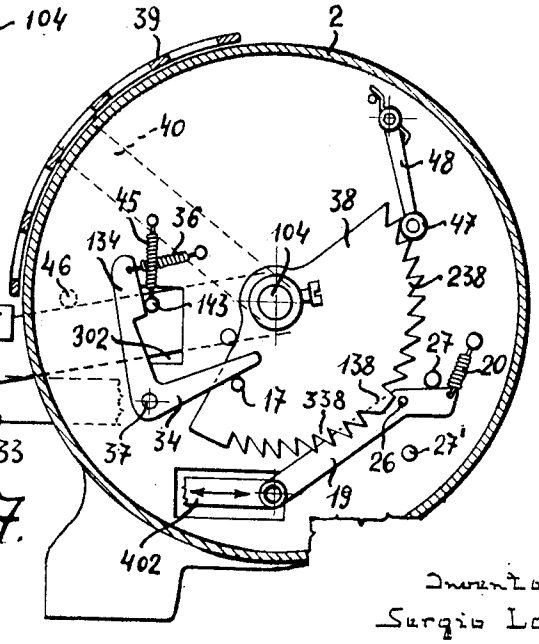


Fig. 7.

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2,655,313

UNITED STATES PATENT OFFICE

2,655,313

DEVICE FOR THE SETTING OF THE MULTIPLIER INTO MOTOR-DRIVEN CALCULATING MACHINES

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Application March 11, 1952, Serial No. 275,889
In Italy April 13, 1951

9 Claims. (Cl. 235—62)

1

This invention relates to key-set motor driven calculating machines and its object is to provide a multiplier-setting device which is much simpler in construction than existing devices of this kind and which can be fitted to a number of existing machines by which the multiplication is effected by setting the multiplicand and then effecting the multiplication by repeated addition in a manner well known for calculating machines in which the multiplier cannot be set by means of keys, digits or the like.

The known devices for setting the multiplier in key-set motor-driven calculating machines are based on the depression of a number of slightly different wedge-like members influencing the travel of racks and small gears. These devices require a very high precision finishing. Thus in ordinary electrically-operated machines usually only the multiplicand can be set while the multiplication is effected by starting the machine, previously stepped by hand into the positions corresponding to units, tens, hundreds, etc. and by operating same each time until the required number of complete turns has been effected. This requires great attention and many times requires a back operation in case of overrunning of the machine.

The invention refers to semi-automatic setting devices in which the setting is effected by means of a gear or of a segmental rack (which will be briefly referred to as "ratchet") provided with at least nine ratchet teeth and which is shifted by a number of teeth or of an angle corresponding to the figure set into the machine, whereby the said ratchet member is stepped back by one tooth at each complete revolution of the machine shaft. This "ratchet" in its turn controls a locking and unlocking device for the starting member of the machine. This latter device is so made as to start and keep the machine operating whenever the said figure gear is in a position other than the rest position. When on the contrary this "ratchet" comes into rest position, the calculating machine stops and leaves the starting members of the machine free to operate. Thus the calculating machine effects a number of revolutions that is exactly equal to the number of teeth by which the "ratchet" has been rotated by the setting of the multiplier figure.

The multiplier figure-setting device for motor driven calculating machines according to the invention is substantially characterised by the feature that the angular shifting of the figure gear and therefore the setting of every multiplier figure is effected directly by a corresponding angular shifting by the operator of a setting member (for example a setting arm) fastened to said ratchet.

2

According to one embodiment, this setting member is in form of a telephone-like dial or of a drum co-axial with the gear and rigidly connected thereto or to its shaft, by means of a radial arm. The dial or the drum, as the case may be, is provided with the usual nine finger holes arranged at equal angular distances and marked by the numerals 1 to 9, whereby a stop member is provided against which the finger or the stylus or the like abuts at the end of the setting of the chosen figure. This stop or abutment member is preferably such as to start the movement of the machine when it is acted upon at the end of the setting stroke, by being operatively connected to the starting key.

Other objects and advantages of the invention will appear from the following specification with reference to the annexed drawings, in which:

Figure 1 is a view from the exterior of one embodiment of the setting device according to the invention.

Fig. 2 is a plan view of the interior thereof.

Fig. 2*a* is a section on line A—A of Fig. 2.

Fig. 2*b* is a section on line B—B of Fig. 2*a*.

Fig. 3 is an axial section through the device shown in Figures 1 and 2, some of the members being omitted for clarity.

Fig. 4 is a plan view of a second embodiment.

Fig. 5 shows an elevation with parts in section the fitting of the device to a calculating machine.

Fig. 6 is a front elevation of a third embodiment, and

Fig. 7 is a cross section on line VII—VII of Fig. 6:

Referring now to Figures 1 through 3, 1 indicates an electrically or motor-operated calculating machine to which the box 2 of the multiplier-setting device is fitted. In this box 2 a ratchet wheel 3 having at least nine teeth is rotatably mounted on shaft 4. Wheel 3 is provided with a hub 103 passing through the box cover 6 and carrying a telephone-like dial or setting disk 7 provided with nine finger holes 107 marked 1 through 9 (impressed on the underlying cover 6). The angular distance between two adjacent dial holes corresponds to the angular distance between two adjacent teeth of gear 3. A torsion spring 9 housed within the hub 103 tends to drive the dial and attached part in rest position, when it is angularly shifted. A leaf spring

5 pressing on gear 3 brakes this return movement. In mesh with the teeth of gear 3 is an escapement anchor 10 fulcrumed at 11 to box 2 and provided with an arm 110 extending outwardly through a slot and bent in such a manner as to come into the path of an excentric pin 12 fastened to the machine shaft 13 (or other part rotating at the unison therewith) and which at each revolution acts on escapement arm 110 and causes anchor 10 to swing and to permit of gear being pulled back by spring 9 of an angle corresponding to the distance between two teeth of gear 3. The setting device is operatively connected to the machine-starting means, such as addition key T, which is provided with a finger 14 passing through a slot into box 2, and resting with its free end near the outer end 116 of lever 16 fulcrumed at 15 and pulled by spring 18 so that its inner end comes against a pin 17 fastened to ratchet wheel 3. The lever end 116 is grooved as shown in Figures 2*a* and 2*b* in such a manner that, when ratchet gear 3 is turned to bring pin 17 out of the path of lever 16 and key T is depressed, the end of finger 14 thereof snaps into the grooved part of 116 and keeps addition key T depressed, until by the backward rotation of ratchet 3 pin 17 comes again to the position shown in Fig. 2 and lever end 16 out of the path of bar 14, thus permitting the lifting of the addition key and consequently the stopping of the driving motor of the machine.

In this manner when a given number has been set as multiplier by turning the dial 7 of a number of finger holes corresponding to an equal number of teeth of ratchet 3, at the end of the step-by-step return of both dial 7 and ratchet 3 in rest position the calculating machine shaft will have been effected a number of revolutions corresponding to the figure of the multiplier and the machine will automatically stop just at the end of the last revolution of said machine shaft. Of course this same operation might be effected in a number of equivalent manners, such as shown, for example, with reference to Figures 4 and 5.

According to this embodiment dial 7, which in Fig. 4 is supposed to be above the plane of the sheet is connected by shaft 4 to a ratchet wheel 3' having nine ratchet teeth, spaced apart at the same angle as the finger holes of the operating dial and a cam tooth 203 extending for an angle equal to the sum of two ratchet teeth. No spring is provided for returning the dial in rest position in which over this cam tooth lies a pin 26 projecting out of an arm 19 hinged to a shaped extension 22 of an oscillating lever 23 fulcrumed at 25 and carrying roller 233 rolling all around a cam 24 keyed on a machine shaft. As shown in Figure 5 this lever extension 22 penetrates into the box 2 through a slot 202.

On the other hand through this same slot 202 passes the bent extension 108 of the abutment member 8' for the fingers operating the dial 7. This abutment extension is pivotally mounted on shaft 4 and carries a pin 35 projecting into the path of an arm 134 of a bell-crank lever fulcrumed on pivot 37 fastened to box 2. This arm 134 has a notched part adapted to engage projecting pin 35 of abutment extension 108. The other arm 34 of the same bell-crank lever is normally pulled by a spring 36 against a pin 17 carried by ratchet wheel 3'. To the abutment extension 108 is hinged a link 28 connected by its other end to the end of a lever 29 fulcrumed on the same pivot 25 of key lever 33 and provided at its opposite end with a pin 30 projecting into the path of an extension 133 of said key lever 33.

The operation of the above described device is as follows: When a multiplier figure is set by means of dial 7, the abutment 8' is shifted (towards the left) until pin 35 (Fig. 4) is latched by notch of arm 134. At the same time link 28 pulls lever 29 so that the pin 30 through key lever extension 133 depresses the addition key T, thus starting the operation of the machine.

As dial 7 is not in zero or rest position, pin 26 of arm 19 comes to be between two teeth of ratchet 3'. As however arm 22 is oscillated by action of cam 24 on roller 233, at each oscillation of arm 22 pin 26 which is engaged between two ratchet teeth, pulls back one of the teeth and then rides over the subsequent tooth. At the end pin 17 through lever arm 34 pulls arm 134 in clockwise direction until pin 35 snaps out of the notch of said arm 134 and thus abutment 8—108, lever 29 and addition key T return immediately in rest position (as shown), while pin 26 comes again over cam portion 203 of ratchet wheel 3.

The embodiment shown in Figures 6 and 7 is substantially like that shown in Figures 4 and 5, with the difference that the disk-like dial is replaced by a drum sector 39 provided with nine finger holes 139 and keyed by means of a radial arm 40 to a shaft 104 carrying a toothed sector 38 provided with nine active ratchet teeth 338 angularly spaced like the finger holes 139 and corresponding each to a figure from 1 to 9. Adjacent the first active tooth of the set is a cam tooth 138 and on the side of this cam tooth opposite to the active teeth 338 the sector carries another set of stop teeth 238 against which bears at roller 47 carried by a spring-pressed arm 48. Near this sector is arranged a swinging arm 19 hinged to an existing oscillating part 402 of the calculating machine which can pull same against an abutment member 27' and is pulled by a spring 20 against an abutment member 27. The arm 19 carries a pin 26 which, when the sector is in operative or non-rest position and the oscillating member 402 (which could be also a slide moving to and fro) moves anticlockwise, is adapted to engage one ratchet tooth and during its leftward movement pulls same clockwise by an angular distance of one tooth. The exact position is determined by roller 47 snapping from between two teeth 238 into two subsequent ones.

The abutment member 42 for the fingers operating the dial 39 is carried by arm 43 hinged to pivot 104 and pulled upwardly against a stop 46 by a spring 45 and adapted to depress by means of a projecting rod 44 the lever 33 of the addition key T.

Arm 43 carries a projecting pin 143 against which is pulled by a spring 36 the notched arm 134 of a bell-crank fulcrumed at 37 to a stationary part of the machine and whose other arm 34, when the device is at rest, bears against a pin 17 projecting out of sector 38.

When however the dial 39 is operated, pin 17 is shifted counterclockwise (in Fig. 7) out of contact with arm 34 and when the arm 43 is depressed until it depresses key T to start the machine motor, pin 143 snaps into the notch of arm 134 which is pulled clockwise by spring 36 thus locking lever 33 in operating position.

In this position member 402 oscillates to and fro and pin 26 pulls sector 38 clockwise by a step-by-step movement until, after the last active

tooth pin 26 reaches cam tooth 138, pin 17 pushes lever arm 34 anticlockwise and causes pin 143 to snap out of the notch of arm 134 thus permitting of arm 43 being pulled upwardly by spring 45 and releasing addition key lever 33 which thus stops the machine.

From the described three embodiments of the same device, it will be seen that same might be embodied in a number of formally different but substantially equivalent ways, all based on the same principle and remaining within the spirit of the invention or the scope of the appended claims.

Thus the ratchet wheel or rachet sector might be provided with a number of active teeth multiple of 9, when the shaft or the reciprocating member of the machine controlling the return of the ratchet makes more than one revolution or more than a reciprocation at each complete addition effected.

Furthermore the term "ratchet" shall include also other types of wheels, or sectors, acting like the ratchet wheels, for example the pin wheels.

I claim:

1. In combination with a key-set electric motor-driven calculating machine, provided with at least one shaft making one revolution for each addition effected by the machine and further provided with a member, hereinafter called "starting key," which in one position permits the operation of the calculating machine and in the other position stops same, a multiplier-setting device comprising a rotating member provided with nine or a multiple of nine active ratchet teeth, and briefly referred to as the "ratchet," a setting member adapted to directly shift said ratchet from a zero position by a number of teeth corresponding to the multiplier figure set into the machine, means connected with said setting member for setting the said starting key in operating position at the end of the setting of the multiplier figure, means for locking the said starting key in operating position while the said ratchet is in a position other than the zero one, means operated by a moving part of the calculating machine for moving said ratchet back of an angle corresponding to one unit at each revolution of the machine shaft, until the zero position is reached and means for unlocking the said starting key as soon as said ratchet has reached the zero position and for bringing said starting key to machine-stopping position.

2. A multiplier-setting device for motor-driven calculating machines of the kind described and comprising a ratchet wheel section having at least nine ratchet teeth, a pin on said ratchet wheel, a double-armed lever pulled by a spring against said pin on said ratchet wheel, when this latter is in zero position and pulling the grooved opposite arm of said lever against a part integral of the starting key of the calculating machine, upon depression of said key, so as to lock same, an escapement anchor in mesh with the ratchet teeth, a spring pulling this anchor to engage the teeth and a projecting part of a rotating member of the machine engaging a part of said escapement anchor once at each turn, and pushing the engaged tooth thereof out of engagement with a ratchet tooth, a rotatable dial fastened to said ratchet wheel, torsion means for rotating said dial by predetermined angular fractions, and a torsion spring anchored by one of its other ends to a fixed part, said spring being wound by the setting movement of the dial and subsequently driving the said ratchet wheel towards zero position.

3. A multiplier-setting device according to claim 2, in which the ratchet wheel section is in the form of a ratchet wheel.

4. A multiplier-setting device according to claim 2, in which the ratchet wheel section is in the form of a sector.

5. A multiplier-setting device according to claim 2, in which the ratchet wheel section-operating member is in the form of a telephone dial provided with nine finger holes marked 1 to 9.

6. A multiplier device according to claim 2, in which the ratchet wheel section-operating member is in the form of a driven sector provided with nine finger holes.

7. A multiplier-setting device for motor-driven calculating machines of the kind described, and comprising a rotatable ratchet wheel section or "ratchet" having nine active ratchet teeth or a multiple thereof and a cam tooth extending for an angle substantially equal to the sum of two ratchet teeth, said ratchet having a zero or rest position and nine active positions, a pin projecting from said ratchet, a bell-crank lever having a notched arm fulcrumed near said ratchet wheel, a spring pulling said bell-crank lever towards said pin projecting from said ratchet wheel, a dial provided with nine finger holes for rotating said ratchet of an angle corresponding to the multiplier number to be set into the calculating machine, an abutment member for the fingers shiftably mounted for a limited angle, means operatively connecting said abutment member to the addition key lever existing on the calculating machine and adapted to shift said key to operating position, means for locking said abutment member in addition key-operating position when the ratchet is not in rest position, a cam or eccentric member on the calculating machine and a lever oscillated by said cam and connected to a spring-pulled pawl-like member fitted near the said ratchet and acting thereon by pulling same by the angular space of one tooth towards zero position at each revolution of said cam, whereby when the ratchet has reached its zero position the pin on the ratchet acts on said bell-crank lever to disengage the abutment member and permits the addition key operatively connected thereto to return in calculating machine-stopping position.

8. A multiplier-setting device for motor-driven calculating machines of the kind described and comprising in combination a ratchet sector rotatable through a predetermined angle from a rest or zero position to a 9-position, and having nine active ratchet teeth and a cam tooth extending for a greater angle than the said ratchet teeth, and provided further with nine further teeth, spaced like the active ratchet teeth and co-acting with a spring-holding means, a spring-pulled pawl-like member arranged with its active part adjacent the ratchet teeth, said active part of the pawl-like member extending above said cam tooth when the sector is in rest position, means connecting a reciprocating member of the calculating machine to said pawl-like member, an abutment pin projecting from said ratchet sector, a spring-pulled bell-crank lever having a notched arm arranged near said abutment pin of the sector and pulled against said pin when the sector is in rest position, a dial having nine finger holes operatively connected to said ratchet sector and rotating at the unison therewith, an abutment member pivotally mounted under the last finger hole of the last named abutment member, a part integral of the addition key fitted on

the path of said abutment member when said abutment is shifted in the direction of operation of the dials, a pin projecting from the said abutment member-carrying means, said pin being fitted near the notched part of said bell-crank lever and being engaged thereby upon completion of the dial actuation, whereby the addition key lever is depressed, the calculating machine is put into operation and the reciprocating part by acting on the said pawl-like member pulls stepwise the toothed sector back until the rest position is reached in which the pin on the sector disengages the bell-crank lever from the pin on the finger abutment member-carrying lever, thus permitting the return of addition-lever in rest position.

9. A multiplier-setting device according to claim 8, in which the dial is in the form of a drum sector having the holes aligned in two parallel rows, the finger holes of one row being shifted with respect to the holes of the other row by half the distance of two subsequent holes of each row.

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