July 3, 1934. E. F. BRITTEN, JR 1,964,975

CALCULATING MACHINE

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Fig. 1

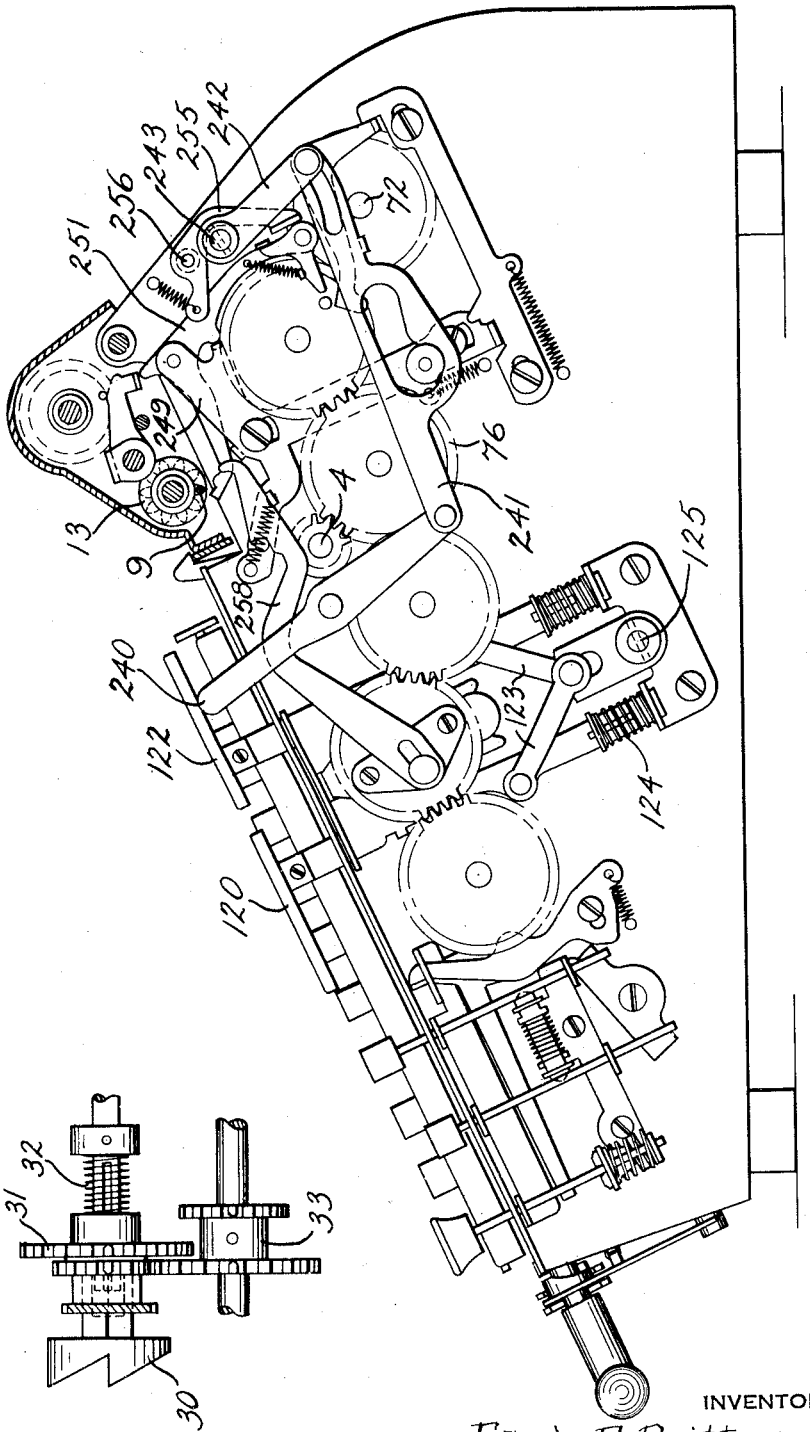

Fig. 6

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Fig. 2

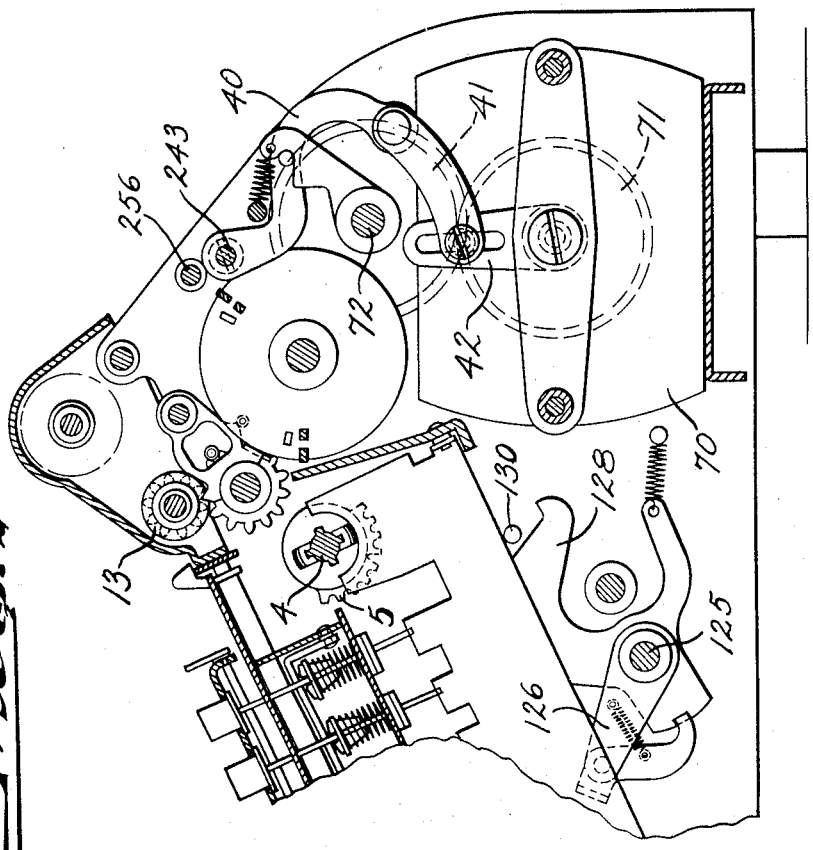
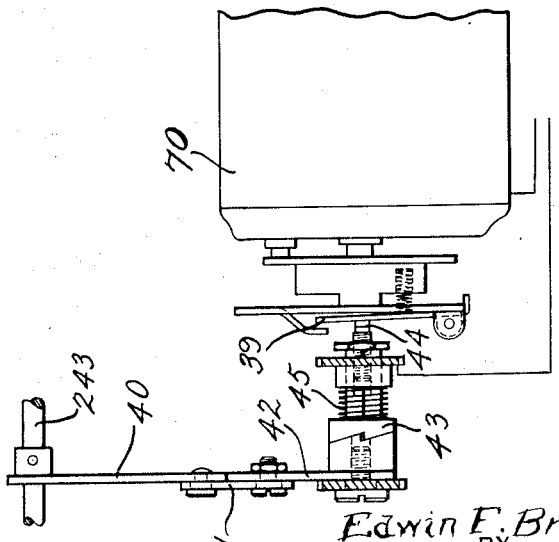


Fig. 5



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CALCULATING MACHINE

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Fig. 3

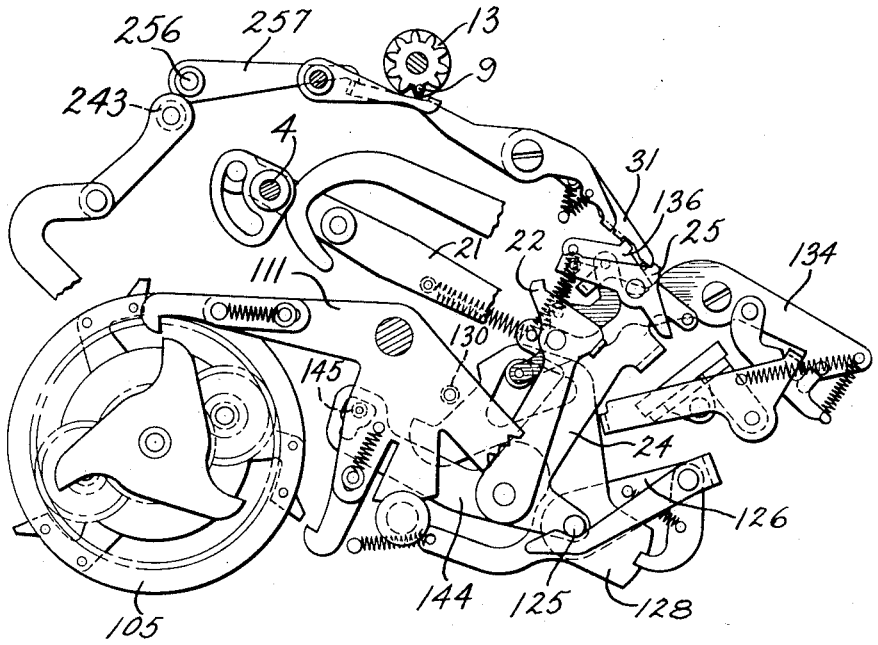
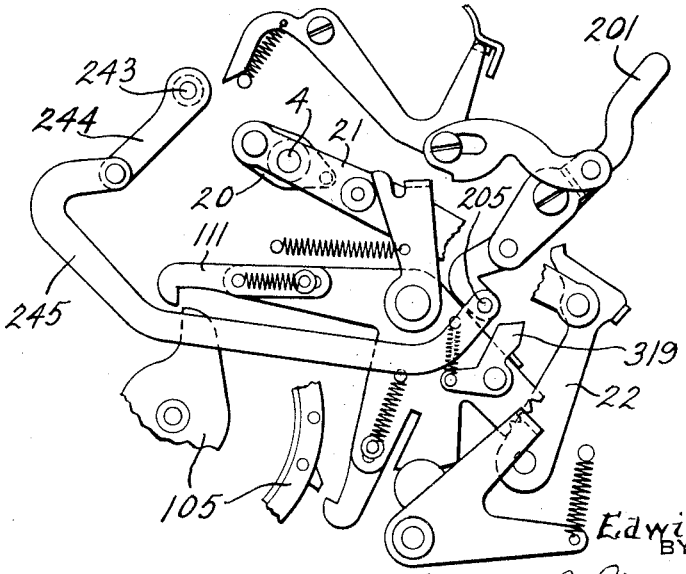


Fig. 4



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UNITED STATES PATENT OFFICE

1,964,975

CALCULATING MACHINE

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Application July 28, 1933, Serial No. 682,575

5 Claims. (Cl. 235—62)

The invention has relation to calculating machines, and particularly to high speed motor driven calculators.

The speed of motor operation attainable in calculating machines is frequently limited by mechanisms employed in some but not in all types of operation.

For instance, in the Monroe calculating machine, to which the invention is herein shown as applied, there are two sets of motor operation keys, the keys of one set controlling the duration of an operation by stopping means operated upon manual release of the key, and the other set of keys controlling such duration by automatically operated devices. The keys or levers of the latter type control multiplication and division operations, while the keys of the first named type comprise the plus and minus bars of the machine and, in some models, the right and left carriage shift keys.

The control of the motor operation devices of a machine by keys of both types is of considerable advantage, but it is found that the two types do not lend themselves equally to high speed operation, since in performing a plural cycle operation by means of the plus bar, for instance, the speed must be proportioned to the ability of the operator to count the cycles of operation and to release finger pressure upon the key in time to prevent an overrun.

The present invention, therefore, provides means for adjusting the driven speed in accordance with the nature of the operation to be performed.

The invention consists in the novel construction and combination of parts as set forth in the appended claims.

In the accompanying drawings illustrating the invention:

Fig. 1 is a right hand elevation of a calculating machine embodying the invention, with the casing removed.

Fig. 2 is a fragmentary vertical section through the keyboard of the machine.

Fig. 3 is a detail left hand elevation of the clutch control mechanism.

Fig. 4 is a similar view of the control mechanism associated with the multiplier and division keys.

Fig. 5 is a detail rear elevation of the speed governor and associated parts.

Fig. 6 is a similar view of a change speed gearing used as an alternative form of the invention.

The machine is driven from an electric motor 70 (Fig. 2), through an orbital gear clutching and reversing mechanism 105 (Fig. 3), gears 71, cross-shaft 72 and gears 76 (Fig. 1) which drive the shaft 4 on which the differentially set numeral wheel actuators 5 are mounted.

A plus bar 120 and a minus bar 122 control the clutching mechanism 105 by means of a rock shaft 125 connected to said keys by links 123 and arm 124 (Fig. 1). At its opposite ends, shaft 125 is provided with an arm 126 (Figs. 2 and 3), connected to a lever 128 which is engageable with a pin 130 secured in the reversing clutch lever 111. Depression of key 120 or 122, therefore, acts to rock the lever 111 into engagement with normally rotating parts of the orbital gear mechanism 105, which acts to hold one leg of the differential gearing and effect a drive of the driven element of the gearing, connected with gear 71.

The drive is continued as long as finger pressure is maintained on the key, and means are provided for disengaging the clutch to terminate the operation at the end of a cycle during which the key has been released by the operator. This means comprises a lever 134 which is put under a spring tension upon the depression of a key 120 or 122, by means of the lever 128. Upon release of the key, the lever 134 will be allowed to move toward its normal position, carrying a pawl 136 mounted on the rear end of the lever into engagement with a trigger 31 and lifting said trigger from engagement with a pawl 25 mounted on an arm 24. A rock arm 22 is driven from shaft 4 through arm 20 and link 21, and upon release, pawl 25 will drop upon the free end of rock arm 22, so that when the parts 20, 21 come into their rearward dead center position, said pawl will drop behind a shoulder of the rock arm and will connect the arms 22 and 24 for movement in unison. The parts passing through dead center position, arm 24 will be carried forward, and an extension 144 of said arm will be moved to bring a cam surface thereof against a pin 145 of the reversing clutch lever 111, whereby said lever will be moved into its central or unclutching position.

Multiplication is performed under the control of a key or lever 240 (Fig. 1) connected by a link 241 and arm 242 with a cross-shaft 243, which at its other end is connected, through arm 244 (Fig. 4) and link 245 with the lever 201. Lever 201 is provided with a pin 205 engaging a pawl 319 of the reversing clutch lever 111, and acting to engage said lever with the orbital gear mechanism 105 in the same manner as this engagement is effected by the plus bar 120. Lever 240 also acts through the link 241 to raise a frame

249, carrying a counting finger 258 into position to cooperate with the pinion attached to one of the register wheels 13. Counting finger 258 is so operated that at each cycle of the machine the related wheel 13 will be moved one step in a subtractive direction. A lever 251 is mounted on the frame 249, and is lifted thereby into position with its forward end in the path of movement of a pin 9 of the numeral wheel 13 related with the counting finger 258. When this wheel 13 has been rotated subtractively to a registering position of zero, pin 9 will operate lever 251, which, through arm 255, cross-shaft 256 and arm 257 (Fig. 3) will operate the trigger 31 and trip the pawl 25 to effect an unclutching adjustment of the lever 111 in the manner previously described. The wheel 13 above-mentioned having been set to represent a digit of the required multiplier, the machine will be allowed to make a number of cycles of revolution corresponding to the figure registered on such wheel, whereupon the wheel will have completed its return to zero registering position. This provides for the automatic determination of the required product, by the well known repeated addition method.

Division may be accomplished by a manual operation of the key or lever 201, which serves as above-noted to engage the clutch. In this case, the machine would be initially started in additive rotation, in accordance with the method described in U. S. Patent 1,827,837. In division the clutch is disengaged under the control of a pin 9 of one of the left hand or higher order numeral wheels 13, said pin moving trigger 31 when a tens transfer in the wheels is carried up to the extreme left hand end of the register. All this is well known automatic division control mechanism.

The motor 70 is provided with a speed governor 39 (Fig. 5) of standard construction, and in order to set this governor so that high speed may be attained by the driven parts during a multiplication or a division operation, the cross-shaft 243 which is connected with the multiplier key 240 and with the division key 201, is provided with an arm 40 (Fig. 2) having link connection with an arm 42 mounted on the governor shaft. Arm 42 has a cam hub engaging a cam 43 connected with one of the contact points 44 of the governor, whereby the arm holds the spring pressed governor arm 39 in adjusted position, against the tension of a spring 45. The tension of spring 45 may be varied by means of the usual adjustment. The degree of increase of speed to be given to the driven parts may be varied by adjustment of the connection of link 41 with arm 42.

When shaft 243 is rocked, to start a multiplying or dividing operation, the cam hub of arm 42 will force the outer contact 44 against the contact of the arm 39, moving said arm toward its centrifugally thrown position, and allowing the generation of higher speed before the contact 44 is broken by the governor.

Obviously, instead of changing the speed of the motor, the object of the invention can be equally attained by the adjustment of change speed gearing in the drive train between said motor and the driven parts of the machine. Such a change speed gearing is shown in Fig. 6, wherein cam 30 corresponds to the cam 43 described above, and is operable by a similar connection with shaft 243 to shift the pair of gears 31 from the position illustrated in Fig. 6, against the tension of a spring 32, into opposite engagement with the pair of driven gears 33 to effect higher speed operation of the driven parts.

In this form of the invention the speed governor is retained, since a universal current motor is commonly used with these machines. In fact, a principal feature of both forms of the invention consists in the provision of a change speed mechanism which may be adjusted without interfering with the normal functioning of the speed governor.

I claim:

1. In a calculating machine having motor driving means; the combination with a plurality of motor operation keys, differential operation control devices selectively settable by a given motor operation key and differently settable by a second motor operation key, of an adjustable speed governor for the driving means, and an adjustment connection between one of the two designated keys and said governor.

2. In a calculating machine having motor driving means; the combination with a plurality of motor operation keys, normally inactive operation stopping means, means for actuating the stopping means upon manual release of a given motor operation key, and means settable by a second motor operation key and operable automatically to actuate the stopping means, of an adjustable speed governor for the driving means, and an adjustment connection between one of the two designated keys and said governor.

3. In a calculating machine having driving means including an electric motor; the combination with a plurality of motor operation keys, differential operation control devices selectively settable by a given motor operation key and differently settable by a second motor operation key, of a speed governor for said motor provided with a speed adjusting arm, and an operating connection between one of the two designated keys and said arm.

4. In a calculating machine having motor driving means; the combination with a governor operable to provide for approximately constant motor speed, means for adjusting the governor and thereby regulating such speed, a plurality of motor operation keys, differential operation control devices selectively settable by a given motor operation key and differently settable by a second motor operation key, of adjustable change speed gearing interposed in the driving train, and an adjustment connection between one of the two designated keys and said gearing.

5. In a calculating machine having motor driving means; the combination with a governor operable to provide for approximately constant driving speed, a plurality of motor operation keys, differential operation control devices, selectively settable by one and differently settable by another of the motor operation keys, of control means adjustable to change the effective speed of said driving means to a predetermined extent and adapted to maintain the governor in control of said speed, and an adjustment connection between one of the two designated keys and said control means.

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