

July 4, 1933.

C. M. F. FRIDEN
CALCULATING MACHINE

1,916,611

Filed Dec. 12, 1928

2 Sheets-Sheet 1

FIG. 1.

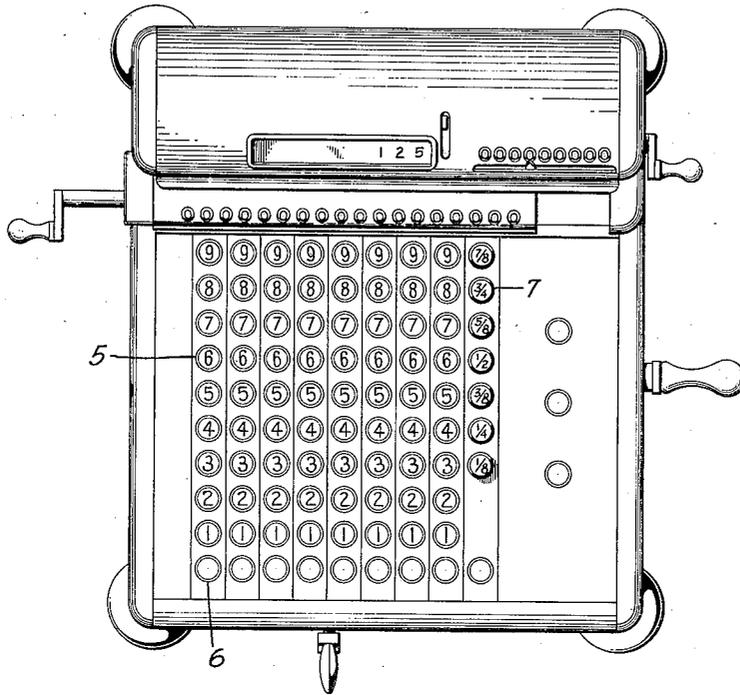


FIG. 3A.

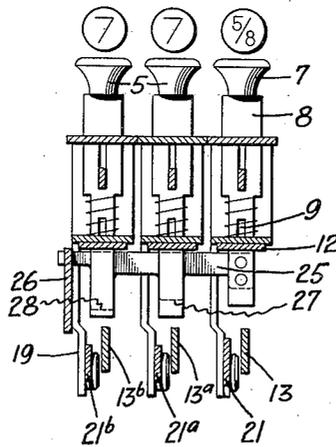


FIG. 3.

INVENTOR
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2 Sheets-Sheet 2

FIG. 4.

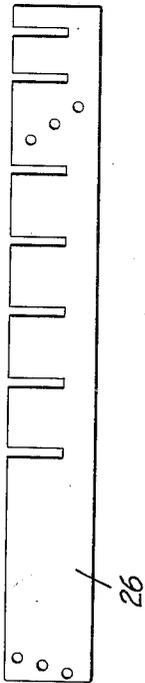


FIG. 2A.

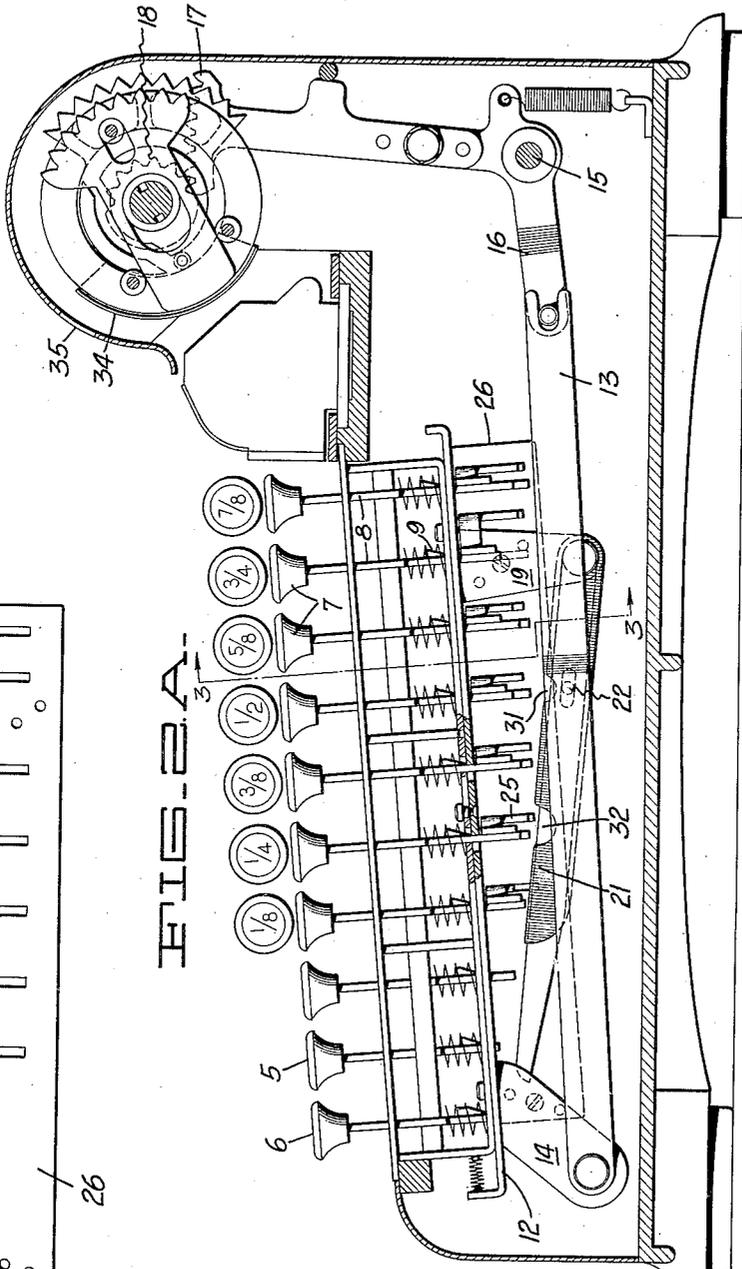


FIG. 2.

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UNITED STATES PATENT OFFICE

CARL M. F. FRIDEN, OF OAKLAND, CALIFORNIA, ASSIGNOR TO MARCHANT CALCULATING MACHINE COMPANY, OF EMERYVILLE, CALIFORNIA, A CORPORATION OF CALIFORNIA

CALCULATING MACHINE

Application filed December 12, 1928. Serial No. 325,555.

The invention relates to calculating machines adapted to perform problems in addition, subtraction, multiplication and division and relates particularly to means for introducing fractional values into the machine.

An object of the invention is to provide a calculating machine into which a value corresponding to any selected fraction may be introduced by the depression of a key.

Another object of the invention is to provide a calculating machine into which a mixed number may be introduced by depression of a whole number key and a fraction key.

Another object of the invention is to provide means operative by a single manual stroke for introducing the decimal equivalent of a fraction into the machine.

A further object of the invention is to provide means for displaying the decimal equivalent of the introduced fraction.

A further object of the invention is to provide means whereby some of the selecting units into which values are introduced by the depression of whole number keys associated therewith are also differentially positioned by the depression of the fraction keys.

The invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description, where I shall outline in full, that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. In the drawings I have shown one embodiment of my invention, but it is to be understood that I do not limit myself to such form, since the invention, as set forth in the claims, may be embodied in a plurality of forms.

Referring to said drawings, Figure 1 is a top or plan view of a calculating machine embodying my invention.

Figure 2 is a vertical longitudinal section through a calculating machine embodying the invention, showing the row of fractional value keys.

Figure 2A is a plan view of the adjacent keys of Figure 2.

Figure 3 is a section taken on the line 3—3 of Figure 2 and showing value keys in three successive rows.

Figure 3A is a plan view of the adjacent keys of Figure 3.

Figure 4 is an elevation of a guide plate which is employed in connection with the means for introducing the decimal equivalent of the fractional value.

For the purpose of simplicity, I have disclosed the invention as embodied in a hand driven calculating machine, but it is to be understood that the invention is applicable with equal efficiency, to motor driven calculating machines, such for instance as is shown in my United States Patent Number 1,643,710 of September 27, 1927.

The calculating mechanism of the machine shown in this application, with the exception of the fraction introducing means, is substantially identical with the mechanism disclosed in my aforesaid patent. The calculating mechanism in said patent, comprises an actuator consisting of a plurality of actuator units each of which is associated with a selector unit which, when differentially positioned, determines the extent of actuation of the numeral wheel by the cooperating actuator unit. The selector units are differentially positioned by the depression of keys, there being ten keys, numbered from zero to nine inclusive, associated with each selector unit and consequently with each actuator unit. When a key in a row is depressed, it differentially positions the associated selector unit in accordance with the value appearing on the depressed key and, upon motion of the actuator, this value is transferred to the numeral wheel of the register.

In Figure 1 I have shown a calculating machine provided with eight rows of numeral keys 5, ranging from 1 to 9 inclusive, the foremost key 6 in each row being a 0 key, that is a key which when depressed returns the selector unit to zero position. Each row of keys is associated with a selector unit, so that there are eight selector units associated with the eight rows of keys. The machine is also provided with a row of fraction keys 7 and these keys are associated with a plurality

of selector units. This plurality of selector units may or may not include some of the units with which the keys 5 are associated, but for various reasons, I prefer to associate the keys 7 with the selector units which are associated with the last two rows of keys 5, lying at the right of the keyboard adjacent the row of keys 7. The row of keys 7 may represent any desired fractions depending upon the demands of the business in which the machine is employed and, in the present instance, I have indicated the fractions as eighths. In order to economize space, I prefer to also associate the fraction keys 7 with an additional selector unit which is disposed at the right end of the actuator, this unit being effective to cause a registration, only when one of the fraction keys has been depressed.

In Figure 2, I have shown the seven fraction keys 7, together with the two keys 5 in the next adjacent row and the zero key 6 in the fraction row. Each fraction key 7 is provided with a stem 8 which is provided with a projection 9 which, when the key is depressed, engages under the slide 12, to hold the key depressed. The depressed key is subsequently released by depression of the zero key or clearance key 6. Associated with the row of fraction keys 7 is a selecting lever which is variably depressed by the depression of the different keys and which is preferably positioned directly below the key stems. This lever preferably comprises a duplex lever, consisting of the main lever 13 which is pivoted at its forward end to a tongue 14 secured to and depending from the frame of the machine and is connected at its free or movable end with a bent lever 16 fulcrumed on the rod 15 and provided on its other end with a curved rack 17 meshing with the gear 18 which forms part of the selecting mechanism. Fulcrumed on a tongue 19 positioned between the ends of the lever 13 and nearer the free end thereof, is a secondary lever 21 which is pivoted by the pin 22 to the main lever 13, the pin being disposed in a slot in the lever 13 to accommodate the relative movement of the two levers. The lever 21 lies along side the lever 13 and is positioned to be engaged and depressed by the four forward fraction keys whereas depression of the three rearward fraction keys causes contact and depression of the main lever 13. Each of the rows of keys 5 is also associated with a similar duplex lever which is connected to a similar selecting unit and an actuator unit is associated with each selector unit, so that the values introduced into the machine by the depression of the keys, is transferred, on rotation of the actuator, to the numeral wheels of the register.

Since the majority of fractions employed in business calculations may be expressed in

three decimal places, I have provided means whereby the depression of a fraction key will differentially position the last three selecting units at the right of the actuator, thereby introducing into the machine the decimal equivalent of the fraction appearing on the fraction key. For instance, the decimal equivalent of $\frac{1}{8}$ is .125 and, by depression of the $\frac{1}{8}$ key, the selecting unit at the right end of the actuator is set at 5, the next selecting unit at 2 and the next at 1. If the fraction key $\frac{5}{8}$ is depressed, the last selector unit at the right is set at 5, the next at 2 and the next at 6, introducing .625 into the actuator.

In Figure 3, I have shown a cross section of the machine immediately in front of the $\frac{5}{8}$ fraction key so that in this figure there is shown two 7 keys and one $\frac{5}{8}$ key. The duplex levers associated with the number 7 key adjacent the $\frac{5}{8}$ key I have numbered 13—A and 21—A and the duplex lever associated with the next 7 key I have numbered 13—B and 21—B. Secured to the stem of the $\frac{5}{8}$ key is a cross bar 25 which is guided at its other end in the slotted plate 26. Secured to and depending from the cross bar 25 are two projections 27 and 28 overlying respectively the duplex levers 13a and 13b and the extensions 27 and 28 are of such lengths and are so positioned with respect to the levers 13a and 13b, that upon depression of the $\frac{5}{8}$ key the lever 13a is depressed to a distance to move the associated selector unit to the 2 position and the lever 13b is moved to move its associated selector unit to the 6 position. The stem 8 of the $\frac{5}{8}$ key engages the duplex lever 13, and moves the selector unit associated with this lever, to the 5 position, so that, by depression of the $\frac{5}{8}$ key the three selector units at the right of the actuator are respectively positioned in the 6, 2, 5 position thereby introducing the decimal .625 into the machine.

Each fraction key is provided with a similar cross bar 25 and depending members, which properly position the respective duplex levers, so that the decimal equivalent of the fraction is introduced into the last three places of the actuator. When the $\frac{1}{2}$ fraction key is depressed, its decimal equivalent .500 is introduced into the machine and, in order to prevent movement of the selecting lever 21, when the $\frac{1}{2}$ key is depressed, said lever is provided on its upper face directly below the $\frac{1}{2}$ lever, with a depression 31. Similarly, the lever 21 is provided with a depression 32 lying immediately below the $\frac{1}{4}$ key so that the lever 21 will not be moved by the depression of said key.

The $\frac{7}{8}$ key, is positioned behind the fulcrum of the lever 21 and, the stem of this key, engages the lever 13 when the key is depressed and similarly, the stems corresponding to the stems 27 and 28, and associated

with the $\frac{7}{8}$ key, also engage the levers 13—A and 13—B. The duplex lever is employed to provide for greater accuracy in the differential positioning of the selector units, but it is not essential to the operation of the machine, since it is apparent that a single lever, depressed to different positions by the different keys, might be equally well used.

It is to be understood that the keys 5 of the last two rows at the right of keyboard, may be used and are used to introduce whole numbers into the actuator, when the fraction keys are not employed. By virtue of this arrangement, these two rows of keys and their associated selector and actuator units, perform two functions, that is to indicate either whole numbers or the decimal equivalent of fractions. Therefore, by this construction, I am enabled by the addition of one selector and actuator unit, to indicate in three decimal places, the decimal equivalent of a fraction.

Associated with each selector unit is a curved surface 34 bearing on its face a series of numerals from 0 to 9 inclusive and this element, is secured to the selector unit and is differentially positioned therewith, so that the differential position of the selector is displayed thru an aperture 35 in the casing. That is, when the selector unit is moved to number 3 position, the Figure 3 is visible thru the aperture 35. Therefore, upon depression of a fraction key, the decimal equivalent of the fraction is displayed at the window 35.

Whole numbers may also be introduced by depression of keys in the rows not employed

for the introduction of fractions, thus permitting the operation of the machine to add subtract, multiply or divide mixed numbers. This is particularly advantageous in many businesses where mixed numbers, representing prices, are the rule rather than the exception.

I claim:

1. In a calculating machine, a plurality of value selecting units comprising levers adapted to be differentially positioned, a bank of keys located above the levers of each of said units and depressible to contact and position said levers differentially, and a fraction key carrying differentially proportioned elements overlying the levers associated with a plurality of adjacent banks of keys, said elements being adapted to directly contact and position said levers differentially upon depression of said fraction key.

2. In a calculating machine, a plurality of value selecting units comprising levers adapted to be differentially positioned, a bank of keys located above the levers of each of said units and depressible to contact and position said levers differentially, a bank of fraction keys having extensions adapted to directly contact and differentially position the levers associated with a plurality of said banks of keys, and a rigidly supported comb wherein the ends of said extensions remote from said fraction keys are guided.

In testimony whereof, I have hereunto set my hand.

CARL M. F. FRIDEN. 100

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