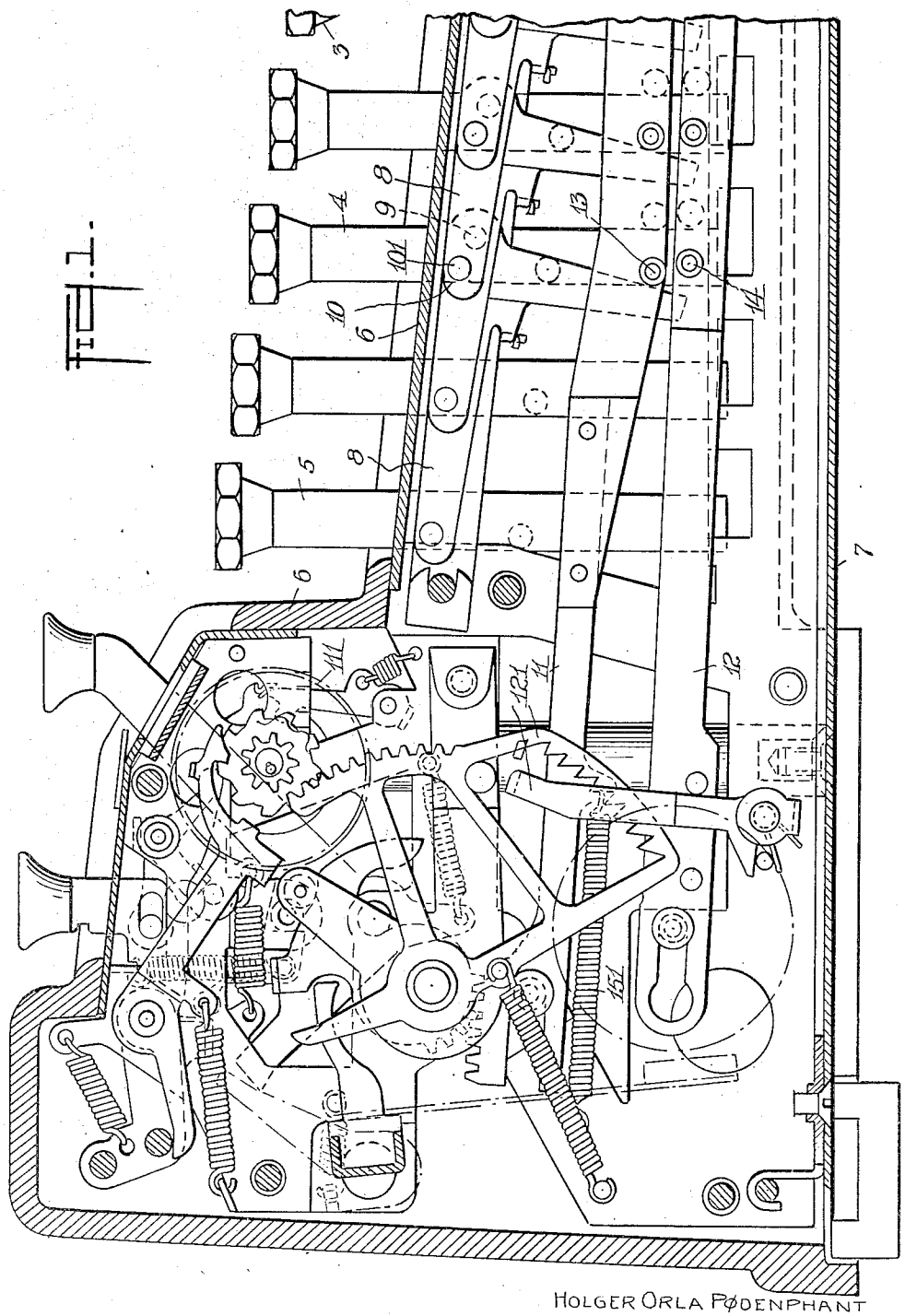
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CONTROL REGISTER FOR CALCULATING MACHINES

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FIG. 1.



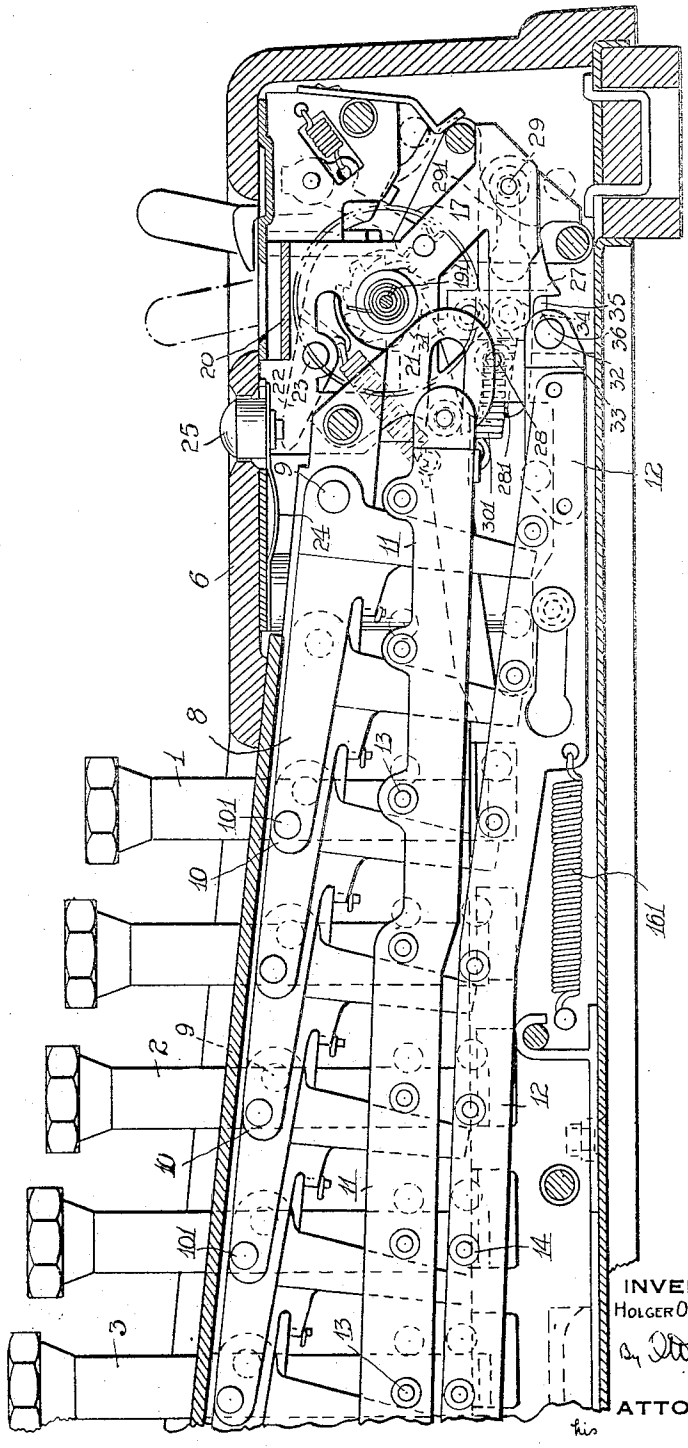
HOLGER ORLA PØDENPHANT
INVENTOR
By Otis Mitchell his ATTORNEY.

Feb. 24, 1948. H. O. PDENPHANT 2,436,668

CONTROL REGISTER FOR CALCULATING MACHINES

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FIG. 1A.



INVENTOR
HOLGER ORLA PDENPHANT
By
ATTORNEY

Feb. 24, 1948. H. O. PDENPHANT 2,436,668

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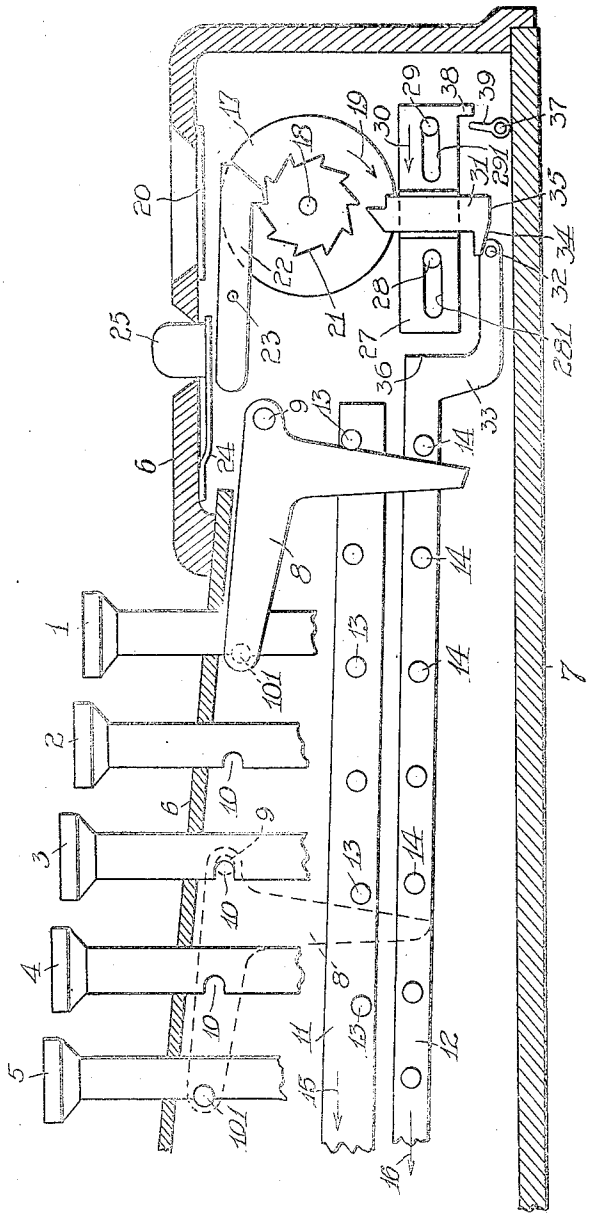


FIG. 2.

INVENTOR
HOLGER ORLA PØDENPHANT
BY
his ATTORNEY.

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CONTROL REGISTER FOR CALCULATING MACHINES

Holger Orla Pødenphant, Copenhagen, Denmark

Application August 7, 1945, Serial No. 609,365
In Denmark August 8, 1944

4 Claims. (Cl. 235—91)

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This invention relates to improvements in calculating machines, more especially to calculating machines of the kind having a row of nine keys for each computing wheel.

Such calculating machines can be directly used for addition and multiplication, but by using special methods they can also be used for subtraction and division. The necessary qualification to obtain a correct product is in each case that the keys used must be fully depressed and that a number of keys, which must be depressed a certain number of times before other keys are depressed, in case of multiplication in fact are depressed the correct number of times.

In known calculating machines of the said kind the person attending the machine is at any given time unable to control how many times in succession she has depressed each of a certain number simultaneously activated keys, which would be desirable. On the other hand in such machines devices are known enabling the person to control whether the keys have been fully depressed, a very complicated mechanism causes locking of the whole keyboard if only one key has not been fully depressed during the calculation.

The object of the present invention is to provide simple and effective means, by which the manipulations of the keys are controlled in such a way, that the calculator at any moment can see not only that the keys set in action really have been depressed sufficiently for actuating the computing wheels but also how many times such key has been depressed. Hereby the use of the calculating machine is facilitated and it is made possible to make computations, which could not be performed at all or only could be performed with uncertainness in using known machines of the kind referred to. This will be explained more fully below under reference to the drawing, on which

Fig. 1 shows the machine in vertical section along a key row and Fig. 1*a* is a continuation of the view shown in Fig. 1.

Fig. 2 the same in more diagrammatical form.

In the drawing 1, 2, 3, 4, 5 are keys of a row of 9 keys. The keys consist of vertical bars with buttons, being vertically movable in casing 6 of the calculating machine, which is closed at the bottom by means of a bottom plate 7. Digits 1, 2, 3, 4, 5, 6, 7, 8 and 9 are marked on the keys.

Each key is connected to an angular lever 8 pivotally mounted on pivot 9. In the vertical bars of the keys there are recesses 10, engaging pins 101 in the extreme end of the horizontal arms

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of the angular levers so that the levers turn round their pivots 9 when the keys are depressed.

When the keys are depressed the vertical arms of the turned levers force two bars 11 and 12 to the right. These bars 11 and 12 which are placed in bearings in such a manner that they can only be moved in their longitudinal direction are fitted with pins 13 and 14 respectively against which the vertical arms of the levers butt during their movement to the right. Bars 11 and 12 are forced in the direction shown by arrows 15 and 16 in Fig. 2 by springs 151 and 161.

As appears from the drawing pins 13 are placed towards the left at a continually increasing distance from pivots 9 of the angular levers and bar 11 is thus moved various lengths to the right, the smallest distance by depressing the key bearing digit 1 and the longest by depressing the key bearing digit 9. Through its movement bar 11 turns a digit wheel 111 in the counting mechanism. This counting mechanism gives the direct results of addition, subtraction and multiplication.

Pins 14 are on bar 12 placed at different distances from the vertical arms of the angular levers, when these are at rest. Bar 12 is therefore only moved to the right during the last part of the downward movement of the keys. The drawing bar 12 is connected with a mechanism 121 locking the digit wheel 111 in question in the counting mechanism when it is turned so many digits as is indicated by the depressed key. This locking is made to ensure that the digit-wheel shall not by a quick depressing of the key and owing to inertia be turned more than the key-figure indicates.

The part of the calculating machine described above is standard and well-known in the trade. The part of the machine described above holds no device for the control of the full depression of the keys nor for the control of how many times in sequence a certain group of keys have been depressed at a given time.

According to the invention the machine is fitted with a control register mainly consisting of one digit-wheel 17 for each row of keys. All the digit-wheels can turn round a common shaft 18 and attempt to turn in the direction shown by arrow 19 by means of springs 191. The digits on the digit-wheel are visible through a window 20 and through the influence of the spring 191 the digit-wheels will attempt to move so far that digit 0 is seen through the window. Otherwise the digit-wheel can be held fast in any position by means of a ratchet wheel 21 with 10 teeth be-

ing in fast connection with the digit-wheel 17 and which cooperates with a possibly spring-loaded holding ratchet 22 which can turn round pivot 23. When pressing a push-button 25 attached to a plate-spring 24 the digit-wheel is set free in such a manner that, influenced by the spring 191, it will revert to "0" position, i. e., show digit 0 through window 20.

Underneath ratchet wheel 21 is placed a slide 27 movable in its longitudinal direction, guided by pins 28 and 29 which engage in slits 281 and 291 on the slide. By means of a spring 301 this slide is moved in the direction of arrow 30. A pawl 31 vertically movable is placed in a guide in the slide and at right angles to the longitudinal direction of same. Through moving this pawl 31 upwards from the position shown in the drawing its teeth can mesh with the teeth of ratchet wheel 21. The lower edge of pawl 31 has an inclined part 34 and an almost horizontal part 35. The inclined part braces against pin 32 on an offset part 33 of bar 12. When this bar is led to the right it will therefore first lift pawl 31 to mesh with ratchet wheel 21 whereafter the face 36 on bar 12 butts against slide 27 and leads this so much to the right that ratchet wheel 21 is led exactly one tooth forward and digit-wheel 17 is thus also led one digit forward. Pawl 31 can be held downwards in a well-known manner by means of a soft spring.

Some examples of the importance and mode of action of the control register are given in the following:

As part of a calculation may occur the calculation 247×5. With three fingers on keys 2, 4 and 7 in three rows of keys next to each other these keys are depressed simultaneously, all together five times. In order that the counting mechanism shows the correct result it is necessary to make sure that all three keys have been fully depressed and that the group of keys is depressed five times. Both can be controlled by looking at the control register, the corresponding three digit-wheels of which must show 1 after the first depression, 2 after the second depression, etc.

If, when the multiplication is done, all three digit-wheels show 5 the multiplication has been carried out without making faults and a recalculation will therefore be unnecessary. If all digit-wheels show 4 the keys have not been depressed one time and if one digit-wheel shows 4 while the others show 5 this means that one of the keys has not been fully depressed during the manipulation. If 247 is to be multiplied by 534 the fingers are placed—as previously explained—on keys 2, 4 and 7 and they are depressed five times. Control register now shows 555 but by means of two of push-buttons 25 the two figures five to the right are taken out. The three fingers touching keys 2, 4 and 7 are now removed one key-row to the right so that they still touch keys 2, 4 and 7. These keys are now depressed three times in succession and control register now shows 5333. By means of push buttons 25 the two threes to the right are taken out whereafter the three fingers are again moved a key-row to the right to new keys 2, 4 and 7 which in their turn are depressed four times in succession. The counting mechanism of the calculating machine now directly shows the product of the calculation in the ordinary manner, i. e., 131898, while control register shows figure 53444. As described above the two figures to the right are taken out and the figure 534 now is a control that no

faults have been made while multiplying with this figure and that the keys have been fully depressed at each manipulation. There can thus be no fault in the product shown in the counting mechanism. It is easy to understand from the foregoing that every time figures are taken out of the control register—the figures furthest to the right—a number is taken out which is one less than the number of digits in the multiplicator.

A simple division may be made on a calculating machine of this kind by depressing the keys indicating divisor so many times that the counter of the machine shows the dividend or the lower figure which by addition to divisor would make a higher figure than the dividend. The product is thus obtained as the number of times the keys in question have been depressed while a remainder, if any, is seen as the difference between the dividend and the result shown in the counter.

The following example of a calculation is given in elucidation of the use and importance of the control register when dividing: 80370 is to be divided by 235.

Three fingers are placed on keys 2, 3 and 5 in three rows next to each other furthest to the left—2 the furthest to the left. The keys are depressed simultaneously while at the same time an eye is kept on the counting mechanism. After three depressions the counting mechanism shows 705 (3×235) and control register shows 333. By means of two of push-buttons the two last threes are taken out and the three fingers touching keys 2, 3 and 5 are removed one key-row to the right so that they again touch keys 2, 3 and 5. These keys are now depressed four times and counting mechanism now shows 7990 (799) and the movement is stopped as it is evident that another depression would make the counting mechanism show a figure higher than the four first digits in the dividend. The control register now shows 3444. By means of push-buttons 25 the two fours to the right are now taken out whereafter control register shows 34. The three fingers touching keys 2, 3 and 5 are again removed one key-row to the right and the new keys are depressed twice when it is seen that counter now shows dividend 80370. This shows that the division leaves no balance and the control register now shows 34222. The last twos are taken out as previously explained whereafter the control register shows the result of the calculation: 342. In this calculation the control register has controlled first the number of depressions of the keys for each part of the calculation, next that all the keys have been fully depressed as, after each part of the calculation, it shows three identical digits and finally the control register indicates the direct result of the calculation while, as a further control, the counting mechanism shows the dividend.

In machines of the said kind previously known but without a control register divisions can also be made but the calculation is then much more difficult to undertake.

The control register is generally of no real importance for additions and subtractions wherefore it is expediently adapted in such a manner that it may be disengaged when such calculations are to be made. The disengagement of the control register may, as indicated in the drawing, be done by means of arm 39 which can turn round pivot 37. If this arm is turned to the right it will butt against a nose 38 on slide 27 and take this slide so far to the right that it is out of contact with bar 12 and thus cannot be moved

by same. The movement forth and back of arm 39 may be carried out by means of a suitable handle, which might be fitted outside the row of push-buttons 25. There must of course be an arm 39 for each digit-wheel and all the arms are moved simultaneously by means of a common handle.

It is not necessary that according to the invention the counting mechanism and control register are placed on a calculating machine in relation to the rows of keys as shown and described. They may be fitted in each other's places or they can both be fitted at the same end of the row of keys and the design shall still be deemed to fall within the present invention.

I claim:

1. In calculating machines of the kind having a plurality of computing wheels, a row of nine keys for each computing wheel the combination with each row of keys of a digit wheel and means operative upon depressing a number of keys in different rows turning all the digit wheels appertaining to the selected rows one step upon every full depression of the respective keys.

2. In calculating machines of the kind having a plurality of computing wheels a row of nine keys for each computing wheel, the combination with each row of keys of a bar placed alongside the row of keys and having pins projecting in the path of levers rotatably mounted in the casing of the computing machine and engaging said keys, each of said bars being connected with means operative upon depressing a number of keys in different rows turning all the digit wheels appertaining to the selected rows one step upon every full depression of the respective keys.

3. In calculating machines as claimed in claim 2, the provision of pins upon said bars placed at such distances from the said levers, that upon actuating an optional key in the row, the corresponding computing wheel is turned before the bar is moved for turning the digit wheel one step.

4. In calculating machines as claimed in claim 1, the provision of manually operated means for individually resetting each of said digit wheels to zero at will.

HOLGER ORLA PØDENPHANT.

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