March 31, 1931. F. BLEY 1,799,037

MECHANISM FOR ADJUSTING DECIMAL SIGNS IN CALCULATING MACHINES

Filed Nov. 12, 1924 2 Sheets-Sheet 1

Fig. 2

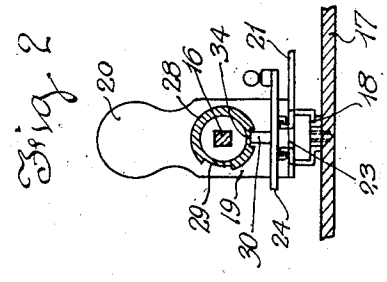
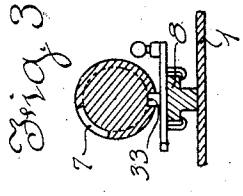


Fig. 1

Fig. 3



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MECHANISM FOR ADJUSTING DECIMAL SIGNS IN CALCULATING MACHINES

Filed Nov. 12, 1924 2 Sheets-Sheet 2

Fig.5a

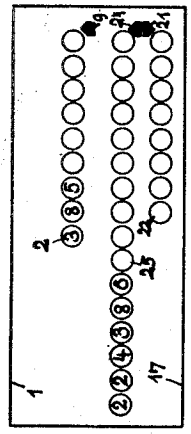


Fig.5b

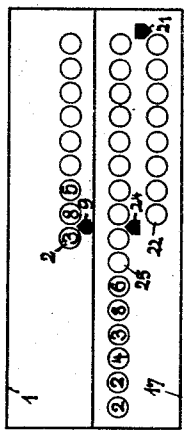


Fig.5c

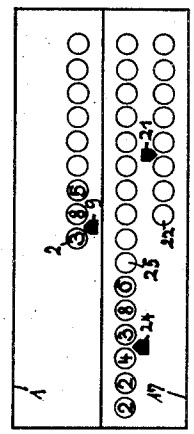


Fig.5d

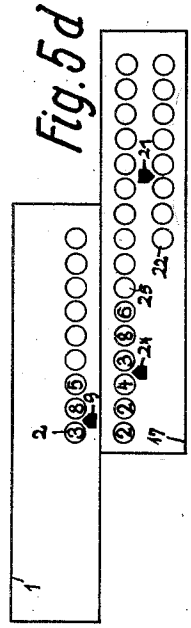


Fig.5e

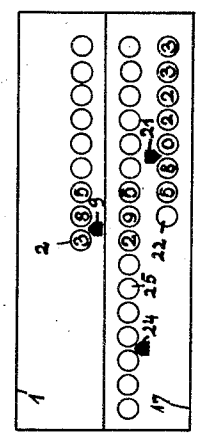


Fig. 4a

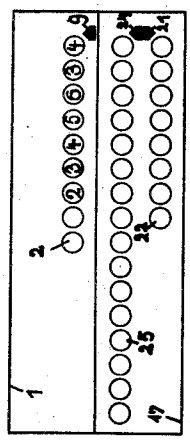


Fig. 4b

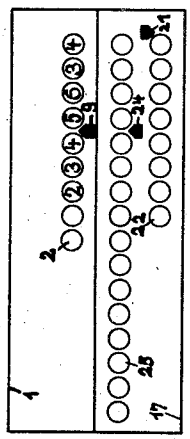


Fig. 4c

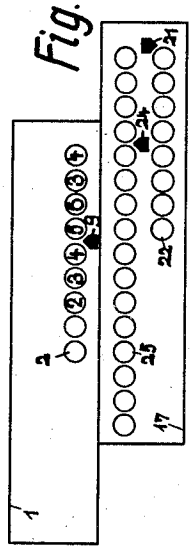
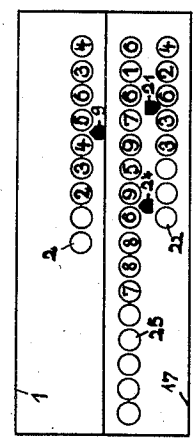


Fig. 4d



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1,799,037

UNITED STATES PATENT OFFICE

FRITZ BLEY, OF ZELLA-MEHLIS, GERMANY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO MERCEDES BÜRO-MASCHINEN-WERKE AKTIENGESELLSCHAFT, OF ZELLA-MEHLIS, THURINGIA, GERMANY, A JOINT-STOCK COMPANY OF GERMANY

MECHANISM FOR ADJUSTING DECIMAL SIGNS IN CALCULATING MACHINES

Application filed November 12, 1924, Serial No. 749,530, and in Germany November 15, 1923.

This invention relates to an arrangement in calculating machines and the like for the automatic adjusting of subdivision signs by adjusting one of the same by hand. According to the invention the subdivision signs mounted on a stationary part of the calculating machine are coupled with those subdivision signs mounted upon a part of the calculating machine which, with regard to the stationary part of the same, is shiftable, through the intermediary of a driving element which, at the shifting of the movable part of the calculating machine does not influence the subdivision signs mounted on this movable part, but if one of the subdivision signs is being adjusted by hand, so that the driving element is operated, adjusts accordingly the subdivision signs on the movable part of the calculating machine.

The invention is shown in a perspective view in Fig. 1 of the accompanying drawings by way of example in connection with a Mercedes-Euklid calculating machine, which is fully shown and described in Patent 1,011,617, the mechanism being shown in the position after adjusting, with the counting mechanism carriage in the right hand position.

Fig. 2 is a section on the line 2—2 of Fig. 1,

Fig. 3 is a section on the line 3—3 of Fig. 1,

Figs. 4*a* to 4*d* show diagrammatically the adjusting procedure of the decimal signs in multiplication, and Figs. 5*a* to 5*e* show diagrammatically the adjusting procedure in division.

On the stationary part 1 of the calculating machine, transversely to the windows 2 of the figure-adjusting mechanism 3, a shaft 4 is journaled in the bearings 5 and 6. In the surface of this shaft 4 a groove 7 is cut which extends along any spiral line.

On a stationary guide 8 slides the decimal sign 9 which has a pin 10 engaging with the spiral-shaped groove 7 so that this sign can be shifted in the direction of the arrow 11 or 11ª when the shaft 4 rotates. For revolving the shaft 4 there is a crank handle 12 at the left end of said shaft. A toothed wheel 13 keyed on shaft 4 meshes with a toothed wheel 14 which is keyed on a shaft 16 of rectangular cross section revolubly mounted at 15 so that it is revolved together with shaft 4.

A carriage guide 18 is further fixed on the carriage 17 of the machine, this guide 18 permitting the shifting of a frame 19 through the intermediary of a handle 20. On frame 19 is fixed a decimal sign 21 for the mechanism 22 for counting the rotations. On a bar 23 mounted on frame 19 the demical sign 24 for the main counting mechanism is slidable and its displacement is controlled by a sleeve 28 which is journaled at 26 and 27 in the frame 19 and has a spiral-groove 29 with which a pin 30 of the decimal sign 24 engages.

At the left end a guide plate 31 is fixed on the sleeve. This guide plate has a rectangular hole in which the rectangular shaft 16, the length of which is selected according to the extreme right hand position of the carriage, is mounted in such a manner that the plate 31 and the mechanisms connected with the same are slidable on said shaft. Owing to this connection the carriage 17 and the frame 19 mounted on the same may be freely shifted while every rotation of the rectangular shaft 16 is transmitted to the sleeve 28 and produces a shifting of the decimal sign 24 in the main counting mechanism. The toothed wheel transmission of the toothed wheels 13 and 14 is selected in such a manner that a shifting of the decimal sign 9 through a number of places in the adjusting mechanism 2 produces a shifting of the decimal sign 24 through a similar number of places with regard to the frame 19. The frame 19 is, as stated above, shiftable, the decimal sign 21 indicating the number of places it is shifted and the decimal sign 24 participating in this shifting.

The friction of the shiftable frame 19 and consequently of the decimal sign 21 with regard to the counting mechanism carriage 17, which friction may be increased in any well known manner, is much greater than the friction of the rectangular shaft 16 in the guide disk 31. The frame 19 and the decimal signs 21 and 24 are therefore drawn along with the shifting of the counting mechanism carriage 17.

The manipulation and operation of the device will now be explained with reference to examples of computation.

Normally the decimal signs 9, 24 and 21 are in the positions shown in Figs. 4*a* or 5*a*. If, for example, 234.5634 is to be multiplied by 33.624, first the one factor 2345634 is set up in the adjusting mechanism 2 (Fig. 4*a*). In order to divide off the necessary number of decimal places in this figure, the crank 12 is turned in the direction of the arrow *a* (Fig. 1), until the decimal sign 9 is between the numerals 4 and 5 of the factor 2345634 (Fig. 4*b*). In this way the decimal sign is moved four places to the left by the spiral 7. At the same time the decimal sign 24 has also been moved four places to the left by the above-mentioned driving connections 13, 14, 16, 31, 26 and 30, while the decimal sign 21 and frame 19 still remain in their extreme right position.

Now since the multiplier is to be 33.624, the counting mechanism carriage 17 is, in known manner, moved to the right until the fifth place from the right of the revolution counting mechanism 22 is under the units place of the adjusting mechanism 2 (Fig. 4*c*). Now, in the known manner, in the fifth place from the right the multiplicand is multiplied by three, in the fourth place from the right by three, in the third place from the right by six, etc. Upon finishing the multiplication, that is, when the counting mechanism carriage 17 has again assumed its position of rest, the second factor has appeared in the revolution counting mechanism, while in the result mechanism the product is 78869597616 (Fig. 4*d*). Now in order to point off the proper number of decimal places in this product, it is only necessary to point off the known number of decimal places in the factor 33624. This is accomplished by moving the frame 19 to the left by handle 20 until the decimal sign 21 comes between figures 3 and 6. In this way the decimal sign 24 is, of course, also moved automatically the same number of places toward the left, that is, three, so that altogether it has been moved four plus three or seven places toward the left and accordingly brought to the correct place in the result mechanism 25, namely, between the figures 6 and 9. It is obvious that the decimal sign 21 can also be adjusted before the multiplication by the factor 33624, that is, before the carriage 17 is drawn out, or directly after the carriage 17 has been drawn out into the position shown in Fig. 4*c*. In this case the decimal signs 21 and 24 are adjusted between the window of the counting mechanisms 22 and 25 which still show zeros.

Naturally the adjustment can also be made by starting from the position shown in Fig. 4*a*, first moving the frame 19 to the left until the decimal sign 21 lies between the third and fourth places from the right of the revolution counting mechanism 22. At the same time the decimal sign 24 has moved the same number of places to the left. Thereupon the crank 12 is turned in the direction of arrow *a* until the decimal sign 9 is between the fourth and fifth figures of the factor set up in the adjusting mechanism. In the manner previously described, the decimal sign 24 takes part in this displacement and thereby comes to the correct position in the result mechanism 25. The operation is therefore the same, regardless of whether the sign 9 is adjusted first and then the sign 21, or whether the sign 21 is adjusted first and then the sign 9.

The adjusting procedure in division is as follows:

Suppose, for example, 224.386 is to be divided by 3.85, the dividend 224386 is, in known manner, set up at the left end of the result mechanism 25, while the divisor 385 is set up at the left end of the adjusting mechanism 2 (Fig. 5*a*). Thereupon the decimal place is first pointed off in the divisor 385, which is accomplished by turning the crank 12 in the direction of the arrow *a* until the decimal sign 9 is between the figures 3 and 8 of the adjusting mechanism 2 (Fig. 5*b*). The decimal sign 9 is thereby displaced eight places to the left, whereby the decimal sign 24 has also moved for the same number of places to the left, while the decimal sign 21 and the frame 19 still remain in their extreme right position (Fig. 5*b*). Now in order to point off the decimal place in the dividend, it is only necessary to move the frame 19 to the left by handle 20 until the decimal sign 24 comes between the figures 4 and 3 of the result mechanism 25 (Fig. 5*c*). Thereby the decimal sign 24 is moved five places further to the left, so that in all it has moved eight plus five or thirteen places to the left. By the adjustment of the frame 19 the decimal sign 21 on it has also been moved automatically five places to the left (Fig. 5*c*) and stands in the correct place in the quotient which is to appear in the revolution counting mechanism 22. Now the counting mechanism carriage 17 is brought to its extreme right position, in known manner, (Fig. 5*d*), for the purpose of dividing. During the division the counting mechanism carriage 17 is returned stepwise toward the left into its position of rest shown in Fig. 5*e*, in which then the revolution counting mechanism 22 shows the quotient 5802233, in which the correct number of decimal places is pointed off by the previously adjusted decimal point 21, namely, 58.02233.

From the above explanation it is evident that the decimal sign 24 is moved to the left for the sum of the places pointed off from the right in the revolution counting

mechanism 22 and in the adjusting mechanism 2, in both multiplication and division.

On bar 23 of frame 19 or on guide 8 several decimal signs either in constant or changeable spaced relation may be arranged for the purpose of subdividing the figure at several points (as into billions, millions and thousands, etc.).

For this purpose the shaft 4 and sleeve 28 have longitudinal grooves 33 and 34, respectively, and the decimal points 9, 35, 38 and 24, 36, 39 have adjusting knobs 37, only shown in Figs. 2 and 3. Decimal points 38 and 39, whose spaced relation to their associated decimal points is variable also have knobs 37. If shaft 4 and sleeve 28 are in the illustrated position so that pins 10, 30, etc. are in the grooves 33 and 34, the decimal points may be shifted axially relative to shaft 4 or sleeve 28 by means of knobs 37 to the desired position. As shown in Fig. 1 the cents may be pointed off by the mark 9, while the position of marks 35 and 38 gives a three-part subdivision of the dollar mark. The decimal marks retain their relations upon rotation of crank 12.

A similar transmission may further be used for another counting mechanism carriage (for instance for calculating machines with double ruler).

I claim:—

1. In combination with a calculating machine having a fixed portion and a movable table, series of number windows on said fixed portion and said table, a subdividing sign adapted for travel before each of said series, an adjusting device, and means connecting said adjusting device with each of said signs for moving the same simultaneously, said connecting means being adapted to allow the table to move without affecting the position of said signs with respect to their associated windows.

2. In combination with a calculating machine having a fixed portion and a movable table, series of number windows on said fixed portion and said table, a sub-dividing sign adapted for travel before each of said series, a frame on which the table sign is mounted, means mounting said frame for sliding movement with respect to said table, and a common actuating element for inducing a simultaneous movement of said table sign relative to said frame and of the sign associated with said fixed portion series relative to the latter.

3. An arrangement on calculating machines and the like for the automatic adjusting of subdividing signs by adjusting one of the same by hand, comprising in combination with the stationary part of the calculating machine, subdividing signs adjustably mounted on said stationary part, a movable part of the calculating machine, subdividing signs adjustably mounted on said movable part, a driving element coupling the subdividing signs on the stationary part with the subdividing signs on the movable part, said driving element including a sliding joint adapted to allow the shifting of the movable part of the calculating machine without influence upon said subdividing signs.

4. An arrangement of the type described comprising in combination with the stationary part of the calculating machine, a subdividing sign shiftably mounted on said stationary part, a spindle having a spiral groove adapted to be rotated by the shifting of said subdividing sign, a movable part of said calculating machine consisting of a carriage, a driving element consisting of a polygonal shaft, means for transmitting the rotating movement of said spindle to said polygonal shaft, a support on said movable part, a subdividing sign on said support, a movable counting mechanism, a worm connected with said polygonal shaft so that it revolves with the same, and a third subdividing sign engaging with said worm and shifted by the movement of the same so that it separates in said movable counting mechanism a number of places which correspond with the sum of those in the two other counting mechanisms.

5. In a calculating machine comprising a stationary portion and a movable portion, division, dividend and quotient windows, one series being on one portion of the machine and the other series being on the other portion movable decimal point indicating devices associated with each series of windows, and means interconnecting said devices whereby the setting of the decimal point for the divisor and dividend automatically sets the decimal point for the quotient, said interconnecting means including a sliding joint permitting shifting of the movable portion of the machine without changing the position of said indicating devices with respect to their associated series of windows.

6. The combination with a calculating machine having a stationary portion and a shiftable portion, and series of multiplicand, multiplier, and product windows, one series of windows being on one portion of the machine and the other series being on the other portion, of a decimal indicating device comprising an indicator cooperating with each series of windows, and connections between the indicator for said product windows and each of the other two indicators such that the indicator for said product windows will be moved by movement of either of said other indicators, the connections between said indicators including a sliding joint permitting free movement of the movable portion of the machine without effect upon the positions of said indicators relative to their respective series of windows.

7. The combination with a calculating machine comprising a stationary portion having a series of multiplicand number windows,

and a movable portion having a series of product number windows and a series of multiplier number windows, of a decimal indicating device comprising a first decimal indicator cooperating with said multiplicand number windows, a second decimal indicator cooperating with said product windows, a third decimal indicator cooperating with said multiplier windows, means for simultaneously moving said first and second decimal indicators, and means for simultaneously moving said second and third decimal indicators, said moving means for said first and second indicators including a sliding joint permitting movement of the movable portion of the machine without effect upon the positions of said indicators in relation to their respective series of windows.

8. In a calculating machine having three series of number windows for multiplicand, multiplier, and product respectively, a decimal pointer mounted for sliding movement along each series of windows, a pair of spirally grooved cylinders, mounted parallel to the number windows, connections between said two cylinders for simultaneously rotating the same, means on said product pointer and one of the other pointers for engaging the spiral grooves of the respective cylinders, and means for simultaneously sliding said product pointer, said third pointer, and the cylinder cooperating with said product pointer, the connections between said two cylinders being such as to permit free relative longitudinal motion.

9. In a combination with a calculating machine having a fixed portion and a movable table, series of number windows on said fixed portion and said table, a subdividing sign adapted for travel before each of said series, an adjusting device, and means connecting said adjusting device with each of said signs for moving the same simultaneously, said connecting means including a sliding joint adapted to allow the table to move without affecting the position of said signs with respect to their associated windows.

The foregoing specification signed at Zella-Mehlis, Thuringia, this 21st day of October, 1924.

FRITZ BLEY.

CERTIFICATE OF CORRECTION.

Patent No. 1,799,037. Granted March 31, 1931, to

FRITZ BLEY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, lines 94 and 95, claim 5, strike out the word "division" and insert the words series of divisor; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 28th day of April, A. D. 1931.

M. J. Moore,
Acting Commissioner of Patents.

(Seal)