Oct. 3, 1933. A. BAUMANN ET AL 1,928,874

INTEGRATING MECHANISM FOR CALCULATING MACHINES

Filed March 29, 1929 2 Sheets-Sheet 1

Fig. 1.

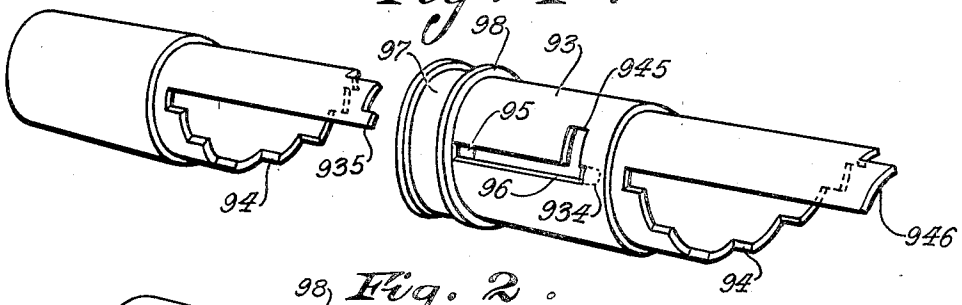


Fig. 2.

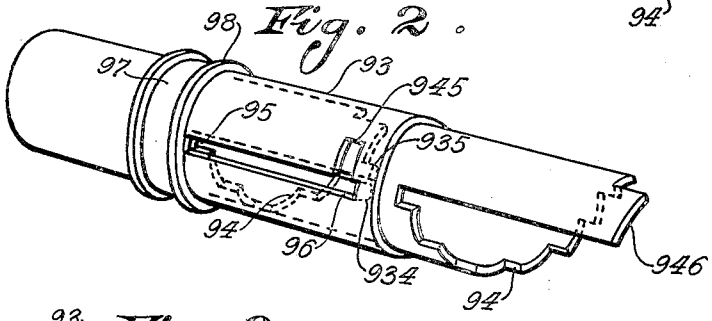


Fig. 3.

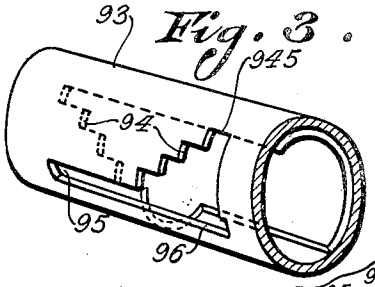


Fig. 4.

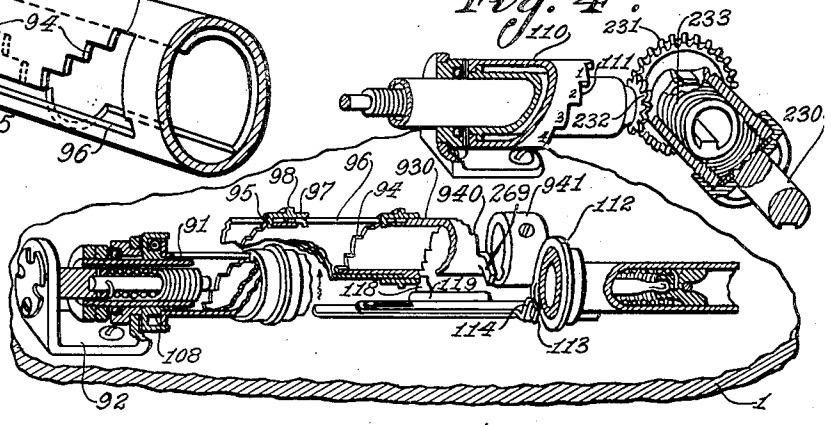
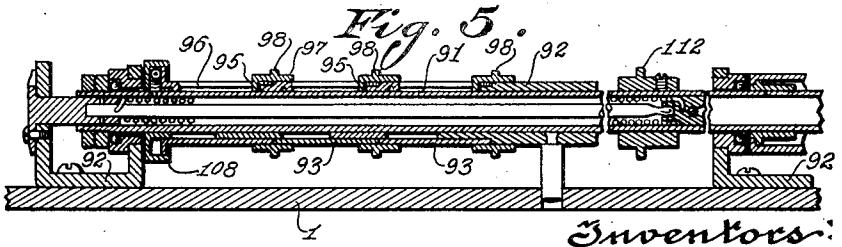


Fig. 5.



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Fig. 7.

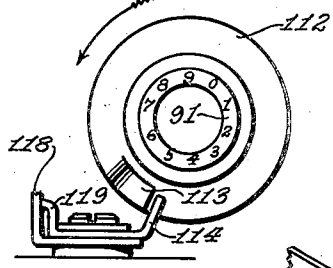


Fig. 9.

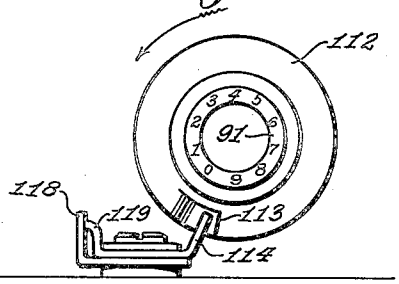


Fig. 8.

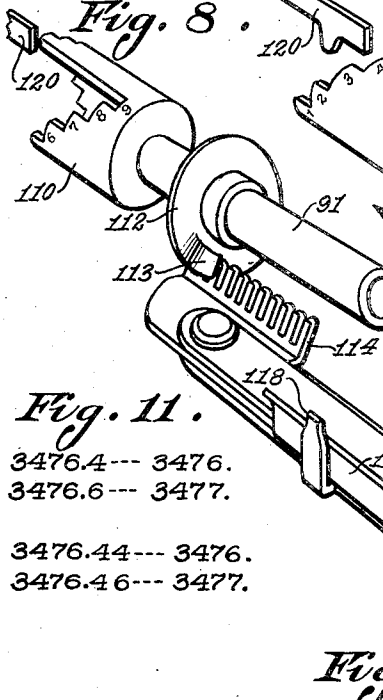


Fig. 10.

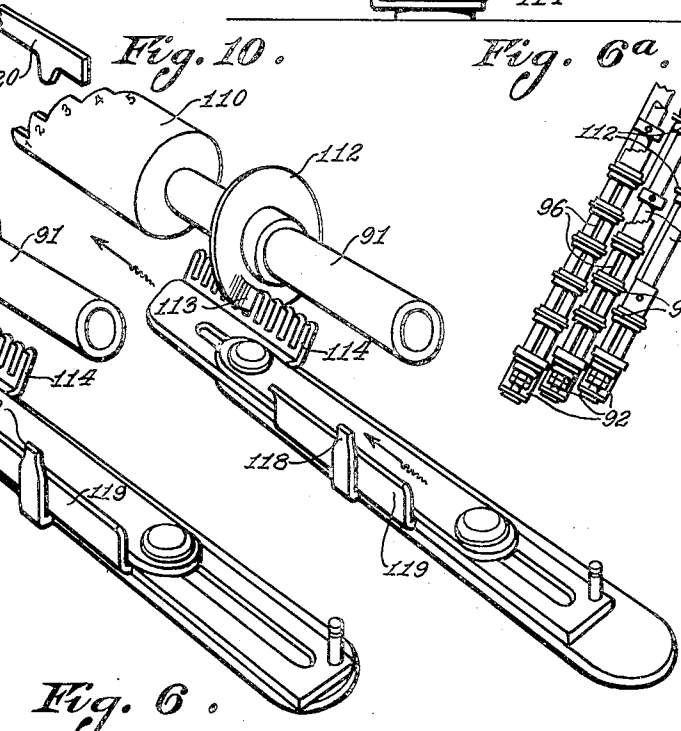


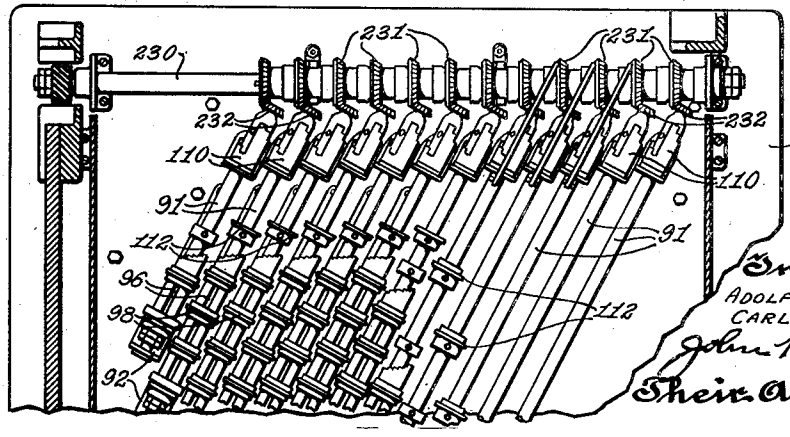
Fig. 6a.

Fig. 11.

3476.4--- 3476.
3476.6--- 3477.

3476.44--- 3476.
3476.46--- 3477.

Fig. 6.



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UNITED STATES PATENT OFFICE

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INTEGRATING MECHANISM FOR CALCULATING MACHINES

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Application March 29, 1929. Serial No. 351,059

12 Claims. (Cl. 235—61)

This invention relates to integrating mechanism and more particularly to integrating mechanism for calculating machines of the character disclosed in application Serial No. 182,766, filed April 11, 1927 corresponding to British Patent No. 307,407.

In the calculating machine referred to in the above application, the partial products resulting from the multiplication of two numbers are segregated into a series of receivers. These receivers are arranged in banks and in orders corresponding to the orders of the final product. The settings of the receivers are condensed into a series of heads on which the result appears and from which it can be taken by any suitable mechanism to designating or printing mechanism. The excess setting of a receiver bank is transferred to the bank of the next higher order by suitable mechanism.

A receiver of the character disclosed in the application referred to comprises an element having a series of steps, extending helically, and co-operating with each receiver is an index which is shiftable along these steps. Since in a multiplying machine the number of steps on a single receiver may be as many as seventeen, it will be seen that, with a receiver of a given dimension, the steps may not only become fine, but the end step may become weakened due to the fact that there is not the desired amount of metallic backing, particularly circumferentially of a cylindrical receiver.

One of the objects of this invention, therefore, is to provide integrating mechanism of the character described, in which the index is so arranged and mounted and controlled with reference to the receiver as to permit a reduction of the receiver steps and a corresponding increase in spacing, as well as a greater backing.

In a machine of the character described, in which the excess setting is transferred from a lower to a higher order, it is desirable to avoid a multiplicity of figures and at the same time permit the result to be closely secured to the desired number of places. Thus, if the last digit is, for instance, 4, while the preceding digit is 8, it will be sufficiently accurate to have only the digit 8 appear, while the following digit 4 may be disregarded; if, however, the last digit is 6, then it is desirable that the preceding digit appear as one higher—namely, 9. In general, it is desirable if the last digit is below 5, to disregard it; while if the last digit is above 5, the next higher digit should be increased by one.

Another object, therefore, is to provide a machine of the character described, in which means is provided for transferring the excess setting from a lower to a higher order in such a manner that such transfer will take place when the designation or value of the lower order reaches the middle or 5 digit.

Further objects will appear from the detail description, taken in connection with the accompanying drawings, in which—

Figure 1 is a perspective view, showing a pair of co-operating receivers with their co-operating index;

Figure 2 is a view, showing the receivers and index assembled;

Figure 3 is a view of a receiver, illustrating another embodiment of this invention;

Figure 4 is a perspective view, illustrating receivers and carrying mechanism;

Figure 5 is a section through one of the receiver shafts;

Figure 6 is a partial plan view, showing a series of receiver shafts and result heads;

Figure 6a is an extensional view of Figure 6.

Figure 7 is an end view; and Figure 8 is a perspective view, illustrating mechanism for transferring the excess setting from a lower order to a higher order as employed in receiver banks of higher orders;

Figures 9 and 10 are views similar to Figures 7 and 8 as applied to receiver banks of a lower order; and

Figure 11 is a table, showing the results obtained.

Referring to the accompanying drawings and more particularly, first, to Figures 4, 5 and 6 (in which the reference characters are as employed in the application referred to), 91 designates a shaft of which there is a series arranged in parallel relation in Figure 6, the shafts being mounted on brackets 92 on the base 1. Mounted on the shaft is a series of receivers 93, each receiver having steps 94 as also shown in Figures 1 and 2. These receivers are shown in telescoping relation, while slidable therealong are indices 95 slidable in guide slots 96 and co-operating with the receiver steps 94. Each index is in the form of a lug 95 formed on a sleeve 97 having a collar 98 arranged for coupling with suitable mechanism, whereby the index sleeve may be set to various positions along the receiver. The coupling is such that the index sleeve may freely rotate. The end receivers (at the left, Figures 1, 2, 4 and 5) are suitably connected to the heads 108 on the left brackets 92, so as to be, in effect, held stationary. The end receivers at the other end of each bank are connected as follows: In the

first bank from the right (Figures 6 and 6ª, the receiver is directly connected to a shaft 91. In the case of the end receivers in the other banks, these are shown at 930, provided with steps 940 arranged to be engaged each by a shiftable lug or index 118, while each receiver 930 also has a lug 269 arranged to engage a bracket 119. Each end receiver 930 is connected with its shaft 91 by means of a collar 941. Each receiver, furthermore, has a lug 934 at the end of its slot 96 for co-operating with the back face of the end 935 on the co-operating receiver to determine the set-back position. Each shaft 91 has a cam head 112 provided with a cam 113 arranged to engage teeth on a rack 114 to which is connected the stop 118 co-operating with the steps on the receiver 930; the purpose of this mechanism is to transfer the setting from a lower bank to a higher bank. The end of shaft 91 is connected to a product or result head 110 having a series of steps 111 arranged for engagement by fingers 120 connected with suitable designating or printing mechanism. Each shaft has a bevel gear 232 meshing with a bevel gear 231 on a shaft 230 through a spring 233.

The mechanism so far described (except as will appear) is fully shown and described in the application referred to. As the partial products are segregated, the indices 95 are shifted in accordance with the settings. After the various indices are thus set and the shaft 230 rotated, thereby yieldingly rotating the shafts 91, the receiver settings will be accumulated, each in its own bank. Furthermore, the excess setting from a bank of a lower order will be transferred to the bank of the next higher order. Accordingly, the final product or result will appear at the heads 110.

Referring now to Figures 1, 2 and 3, the receiver 93 is provided with the slot 96 as heretofore described. This slot has an offset 945 providing a single step, as shown in Figures 1 and 2, or a series of steps, as shown in Figure 3; hence, the number of steps 94 on the co-operating receiver may be decreased accordingly. The end of the receiver 946 may, therefore, be made of the desired stability; and, moreover, the steps may be proportioned between the receivers in any manner as may be desired. It will, of course, be seen that as the index 95 travels along the slot, it will be held against rotative movement, and, therefore, the steps on the co-operating receiver only come into play. When the index 95 reaches the offset 945, movement of the shaft at such time will cause this offset to come into play and permit the index to move therein, so that the total relative movement of the telescoping receivers will be that due to the sum of their steps 94 and 945.

Referring now to Figures 7 and 8, which show the transfer mechanism for the banks of higher orders (for instance, from the third to the fourth banks, Figure 6), it will be seen that carrying takes place when the head 110 moves from 9 to 0 position. This is the usual carrying that is required and is described in the application referred to. As, however, previously pointed out, it is desirable, particularly in the first bank, that the setting be transferred from the first to the second bank when the head of the first bank reaches the middle digit. In such a case, and as shown in Figure 6 (in detail), the first shaft 91 is provided with a cam disc 112, with associated mechanism co-operating with a receiver 930 (which need, however, only have one step), and this cam is so placed with reference to the head 110 on the first shaft 91 so that, when this head reaches the 5 position, the setting will be transferred to the second bank. The same arrangement may be applied to the second bank, so that, when the setting of the head 110 in the second bank reaches the 5 position, its setting will be transferred to the third bank. It will be understood that when the feature is applied to the first bank, the head 110 and the associated finger 120 and the printing type element therefor may be omitted; the same is true when the feature is applied to any other bank. This is because the figures in such a bank or banks need not appear—where, for instance, they are to the right of the decimal point.

Figure 11 shows an example of the operation. Let us take, first, the two upper figures, where the decimal point is placed one digit from the right. A number such as 3476.4 will appear as 3476, while a number such as 3476.6 will appear as 3477. On the other hand, if the decimal point is placed two digits from the right, as shown in the second set of figures (Figure 11) a number 3476.44 will appear as 3476; however, a number 3476.46 will appear as 3477. The latter is due to the fact that the setting from the first bank to the right being transferred to the second bank, it will appear there as 5, and this in turn will be transferred to the third bank and appear there as 7.

It will be understood, of course, that the procedure may be carried into any of the banks.

While the invention is particularly applicable to the general type of machines specifically shown and described in the application referred to, it will be understood that as to some of its features, the invention is applicable in many cases to other forms and types of machines. It will, furthermore, be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and sub-combinations; that is contemplated by and is within the scope of the appended claims. It will, furthermore, be understood that various changes may be made in details, within the scope of the appended claims, without departing from the spirit of this invention. It is, therefore, to be understood that this invention is not to be limited to the specific details shown and/or described.

Having thus described the invention, what is claimed is:

1. In a machine of the character described, a receiver having a series of steps, a co-operating index, and a guide for said index and having a step.

2. In a machine of the character described, a receiver having a series of steps, a co-operating index, and a guide for said index and having a series of steps formed to provide with said first steps means for progressively locating said index.

3. In a machine of the character described, a receiver having a series of steps, a co-operating index, and an element for guiding said index to positions opposite any of said steps and having a step in continuation of said receiver steps.

4. In a machine of the character described, a cylindrical receiver having a series of steps extending helically, a co-operating index shiftable along said receiver, and a guide for said index formed to permit the same to shift rotatively therein.

5. In a machine of the character described, a cylindrical receiver having a series of steps extending helically, a guide telescoped with said

receiver and having a slot provided with a stepped offset, and an index movable in said slot and co-operating with the receiver steps.

6. In a machine of the character described, a cylindrical receiver having a series of steps extending helically, a guide telescoped with said receiver and having a slot including a series of steps, and an index movable in said slot and co-operating with said receiver and guide steps.

7. In a machine of the character described, a plurality of stepped receivers arranged in series for relative movement, an index shiftable along one receiver and co-operating with the steps on another receiver, and means for mounting said index to shift laterally of the receiver along which it shifts.

8. In a machine of the character described, a plurality of cylindrical helically stepped and telescoping receivers, and an index shiftable along a stepped guide on one receiver and co-operating with the steps on another receiver.

9. In a machine of the character described, a receiver having a series of steps, a cooperating index longitudinally shiftable to positions opposite any of said steps, and an index guide along which said index moves to such positions, said guide having a way adapted to permit said index to shift laterally therein.

10. In a machine of the character described, a receiver having a series of steps, a cooperating index longitudinally shiftable to positions opposite any of said steps, and an index guide along which said index moves to such positions, said guide having a way provided with steps adapted to permit said index to shift laterally therein.

11. In a machine of the character described, a receiver, a receiver-locating element, a shiftable index cooperating with said receiver and said element to locate said receiver, and means on said receiver and said element for controlling the shift of said index relative to said locating element.

12. In a machine of the character described, a receiver, a receiver-locating element, a shiftable index cooperating with said receiver and said element to locate said receiver, and means for controlling the shift of said index relative to said locating element divided between said receiver and said element.

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