April 29, 1952 E. G. KESLING 2,594,566

CALCULATOR DEVICE

Filed Nov. 25, 1949 2 SHEETS—SHEET 1

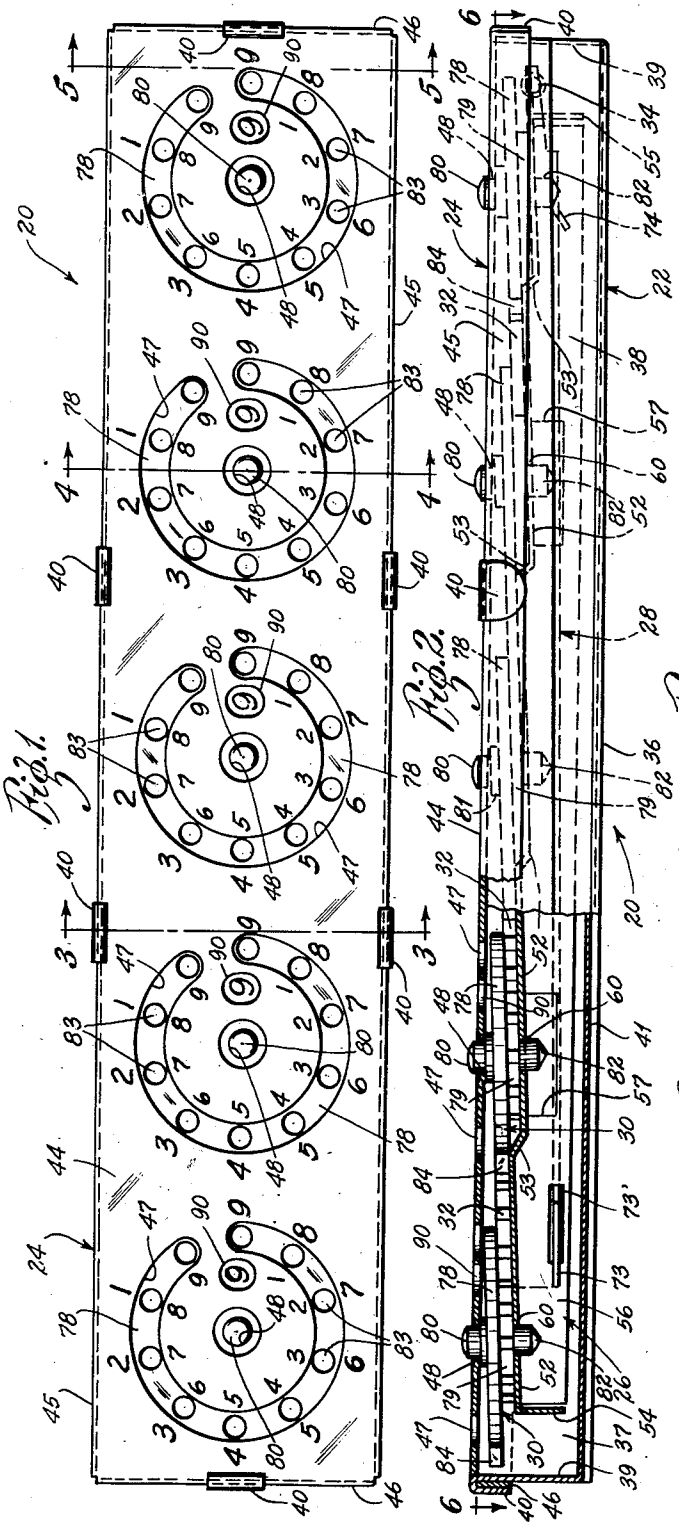


Fig. 1.

Fig. 2.

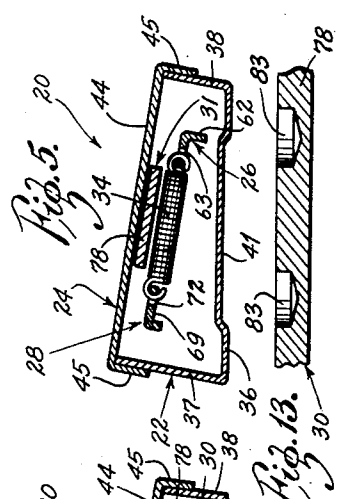


Fig. 5.

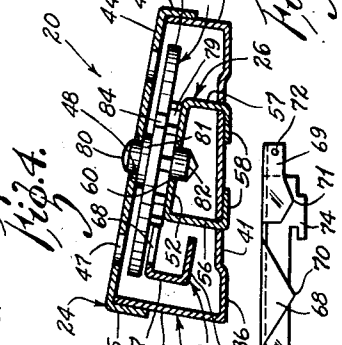


Fig. 4.

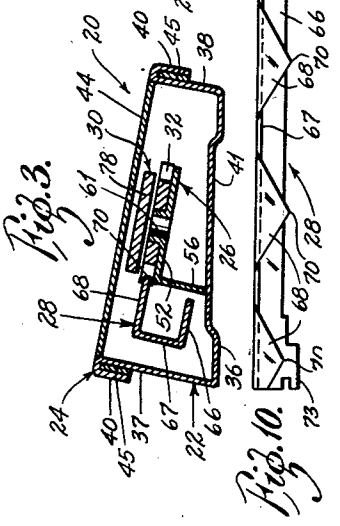


Fig. 3.



Fig. 10.

Fig. 13.

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CALCULATOR DEVICE

Filed Nov. 25, 1949 2 SHEETS—SHEET 2

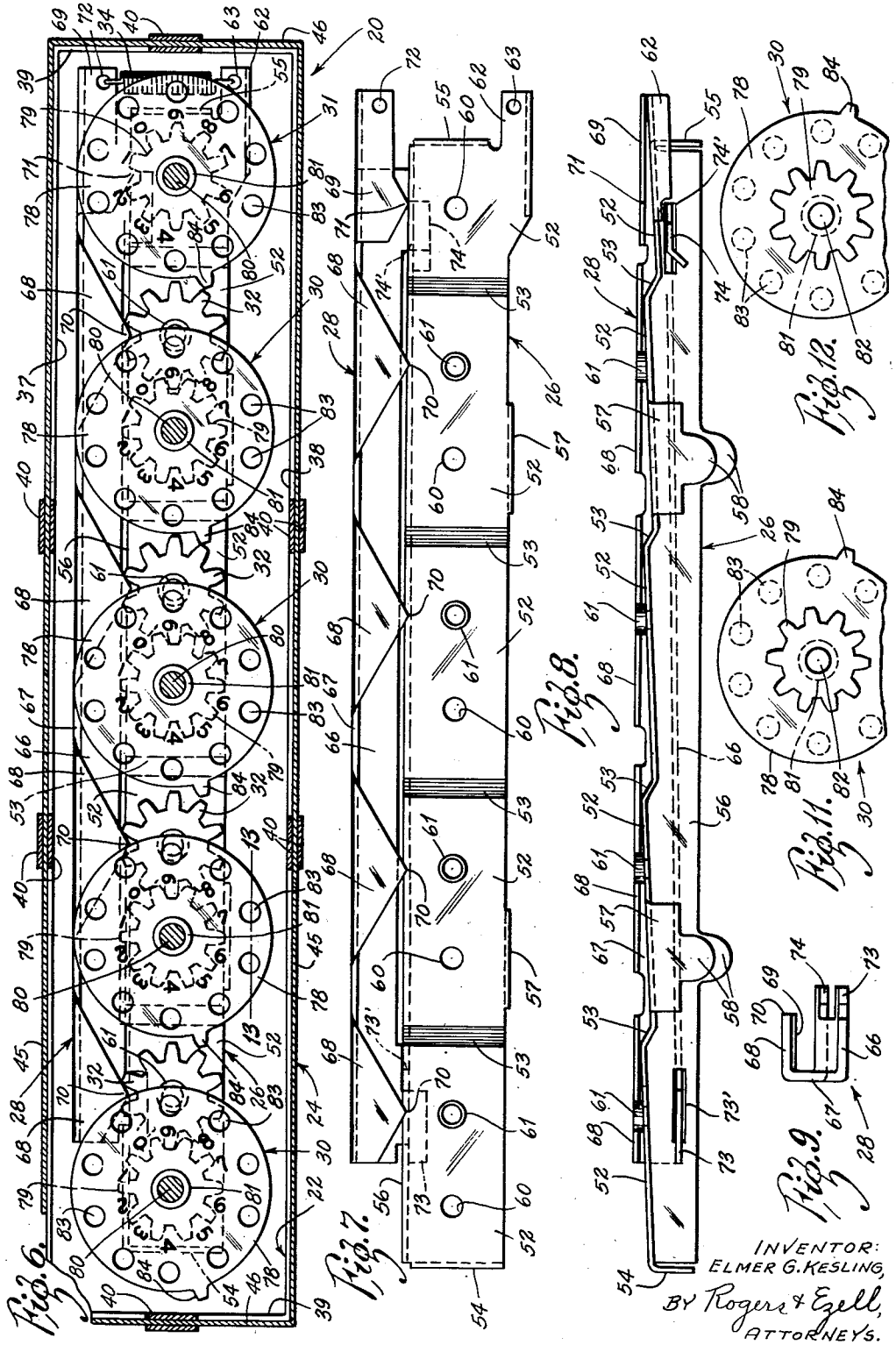


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 11.

Fig. 12.

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CALCULATOR DEVICE

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15 Claims. (Cl. 235—74)

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The present invention relates generally to calculator mechanisms, and more particularly to a detent device for adding and subtracting mechanisms of the type disclosed in my Patent No. 2,450,668, granted October 5, 1948.

In brief, the present adding and subtracting mechanism per se is similar in construction to the mechanism shown in my above-mentioned patent. The novel subject matter resides in the detent device which releasably holds the several dials in the positions to which they are advanced in the use of the calculator mechanism. Specifically, the present detent device comprises a spring-biased, pivoted detent bar having gear engaging points, the detent bar being so pivotally mounted that, in computing sums, upon the rotation of a particular gear through its dial thereby pivoting the spring-biased detent, gears related to dials of lower number than that dial presently being rotated are maintained against movement, whereas the gears associated with dials of higher number than that dial being rotated are released, so that detent releasing drag is eliminated at each dial rotated in a transfer count.

An object of the present invention is to provide a calculator mechanism of the adding and subtracting type which incorporates a novel detent device which facilitates computation.

Another object is to provide a calculator mechanism of the adding and subtracting type which incorporates novel detent construction adapted to free dials involved in a computation sufficiently to compensate for gear lash.

Another object is to provide a calculator device of the adding and subtracting type which incorporates a plurality of aligned gears and a novel detent device normally maintaining the gearing in the relationship to which moved, but which is adapted to release for computation purposes those gears and dials affected by a computation and to maintain stationary those gears and dials which cannot be affected by the computation.

Other objects are to provide a calculator mechanism incorporating a novel detent device which functions efficiently and effectively as desired during a computation, which renders dialing of sums during a computation easy upon the actuator and upon the calculator, which is of simple, compact, and inexpensive yet sturdy construction, and which is adapted to function for a long period of time with minimum maintenance.

The foregoing and other objects and advantages are apparent from the following description taken with the accompanying drawings, in which:

Fig. 1 is a plan view of a calculator mechanism

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including a detent device constructed in accordance with the teachings of the present invention;

Fig. 2 is a side elevational view thereof, a portion being shown in vertical longitudinal cross section for illustration of details;

Fig. 3 is a vertical transverse cross-sectional view on substantially the line 3—3 of Fig. 1;

Fig. 4 is a vertical transverse cross-sectional view on substantially the line 4—4 of Fig. 1;

Fig. 5 is a vertical cross-sectional view on substantially the line 5—5 of Fig. 1;

Fig. 6 is a horizontal cross-sectional view on substantially the line 6—6 of Fig. 2;

Fig. 7 is a plan view of the dial support and the pivotally attached detent bar;

Fig. 8 is a side elevational view of the assembly shown in Fig. 7;

Fig. 9 is an end view of the detent bar;

Fig. 10 is a plan view of the detent bar on a full-sized scale for one form of pocket adding mechanism;

Fig. 11 is a bottom view of one of the dials to the left of the digits dial in rest position, a tooth extending vertically;

Fig. 12 is a bottom view of the digits dial in rest position illustrating a working relationship with the illustrative dial of Fig. 11; and

Fig. 13 is an enlarged fragmentary cross-sectional view through a pair of adjacent dialing wells formed in the upper face of a dial, taken on line 13—13 in Fig. 6.

Referring to the drawings more particularly by reference numerals, 20 indicates generally a calculator mechanism including a detent device incorporating the concepts of the present invention. Broadly, the present calculator mechanism 20 includes a base 22, a cover 24, a dial support 26, a detent bar 28, dials 30, idler gears 32, and a tension spring 34.

More specifically considering the several parts of the present calculator mechanism 20 and their relation to each other, the base 22 is of the configuration clearly shown in Figs. 1 through 5. The base 22 is of rectangular shape and is of U-cross section considered both transversely and longitudinally, including a bottom 36, parallel side walls 37 and 38 slantingly disposed relative to the bottom 36, and parallel end walls 39. An integral tab 40 extends upwardly from each of the end walls 39 and two spaced tabs 40 extend upwardly from each of the side walls 37 and 38. The bottom 36 has a recessed portion 41 for a purpose described below. The side wall 37 is of greater height than the side wall 38 in order to receive the

cover 24 at an angle which will render the reading of the numbers of the calculator mechanism easier for one using the device on a flat surface as is illustrated in the drawings.

The cover 24 is of rectangular form and includes a top 44, depending parallel sides 45, and depending ends 46. As is clear from Figs. 1 through 3, the top 44 of the cover 24 is provided with slots suitably spaced to receive the tabs 40 which are turned over as illustrated after insertion therethrough. Five equally spaced arcuate openings 47 are formed in the top 44, each of which is in substantially the form of the letter C. Centrally of each C shaped opening 47 is an aperture 48.

The dial support 26 is of the configuration clearly shown in Figs. 3 through 5, 7, and 8, including a plurality of stepped top portions 52 separated by sloped portions 53, depending end walls 54 and 55, a single side wall 56, and spaced depending side legs 57 opposed to the side wall 56 for cooperation therewith in mounting the dial support 26. Depending from each of the legs 57 is a tab 58, there being corresponding tabs 58 depending from the side 56 (Fig. 8). An aperture 60 is formed in each of the stepped top portions 52 for reception of a dial as is described below. An integral upwardly extending collar 61 is also formed in each of the stepped top portions 52 except the right hand one for the reception of the idler gears 32. An ear 62 extends outwardly from the right hand top stepped portion 52 and has an aperture 63 therein. As is clear from Fig. 4, the dial support 26 is mounted in the base 22 with the tabs 58 extending through suitable slots formed in the recessed portion 41 of the bottom 36. The tabs 58 are bent over as shown in Fig. 4 so that they lie in the plane of the supporting portion of the bottom 36.

The detent bar 28 is of the configuration clearly shown in Figs. 3 through 9. The detent bar 28 is elongated in form and includes a bottom portion 66, a side portion 67, and spaced top segments 68 and 69. Each of the top segments 68 is of triangular form and includes an apex 70. The top segment 69 includes a portion having an apex 71. Extending outwardly from the bottom portion 66 are two spaced tabs 73 and 74. As is clear from Figs. 7 and 8, the tabs 73 and 74 are disposed through slots 73' and 74' in the side wall 56 of the dial support 26. The tip of the tab 73 extends forwardly beyond the slot 73' and the tip of the tab 74 is bent downwardly after insertion into the slot 74', as is clear from Fig. 8, so that there is a locked pivotal relationship between the detent bar 28 and the dial support 26. It is to be observed that the side portion 67 narrows from a maximum width at the left to a minimum width at the right (Fig. 8). Hence, the tab 74 is at a higher elevation relative to the base level of the dial support 26 than is the tab 73. This relationship of configuration and pivotal mount effects a desired movement of the apexes 70 and 71 as is more particularly described below.

The dials 30 are identical in configuration, and the digits dial 31 differs from the dials 30 only in the relative arrangement of its elements, which, individually, are identical to those of the dials 30. Thus, each dial 30 and the digits dial 31 include a disc 78, a gear 79, an upper post 80, a collar 81 between the post 80 and the disc 78, and a lower post 82. Dialing wells 83 are formed in the upper face of each disc 78 in

equally spaced relation near the periphery in position to be exposed through the C shaped arcuate opening 47 and each of the discs 78 includes an integral finger 84 disposed on an imaginary radial line which bisects the arc defined by two adjacent dialing wells 83. As is clear from Figs. 11 and 12, the only difference between the individual dials 30 and the digits dial 31 is in the position of the gear 79 relative to the dialing wells 83 and the finger 84. It will be noted that, in respect to the dial 30 of Fig. 11, each tooth of the gear 79 bisects an angle defined by radial lines extending through adjacent dialing wells 83, whereas, in respect to the digits dial 31 of Fig. 12, each tooth of the gear 79 coincides with a radial line extending through a dialing well 83. In assembled relation, the dials 30 and the digits dial 31 are arranged with the latter on the right and are disposed with the posts 82 rotatably mounted in the openings 60 formed in the stepped top segments 52 of the dial support 26, and with the upper posts 80 extending through the openings 48 in the cover 24. Each of the discs 78 includes an integral finger 84.

The idler gears 32 are disposed respectively adjacent the dials 30, being freely mounted on the collars 61 and in mesh with the adjacent gear 79 in position to be rotated by the finger 84 of the disc 78 to the right thereof. It is to be observed that the gear 79 of the digits dial 31 is not in mesh with an idler gear 32.

The tension spring 34 is anchored at one end in the opening 63 formed in the projection 62 of the dial support 26 and is anchored at the other end in the opening 72 formed in the top segment 69 of the detent bar 28. The spring 34 biases the detent bar 28 into the position shown in the drawings, but permits the detent bar 28 to be pivoted or rocked about the tabs 73 and 74 as an axis which is counterclockwise considering Fig. 4.

Suitable numerals are supplied at each dial 30 and at the digits dial 31 for adding and subtracting computations and for the totals. Addition numerals 1 through 9 are arcuately marked counterclockwise on the upper surface of the top 44 of the cover 24 outside of the C shaped openings 47, and subtraction numerals are disposed thereon in clockwise sequence inside of the same openings. The two series of addition and subtraction numerals are disposed opposite the dialing wells 83, the counterclockwise addition series of numerals beginning at the well 83 spaced from the upper end of the opening 47, and the subtraction series of numerals being disposed in the same relationship as respects the lower end of the openings 47. A series of numerals running from 1 through 9 and including the zero between the 9 and the 1 is disposed on the upper face of each of the discs 78 on about the radius of the subtraction numerals and appear one at a time through an opening 90 formed in the cover 24 above each disc 78.

Operation

The addition and substraction operation of the present calculator mechanism 20 is the same as that shown in the calculator disclosed in my above-identified patent. The digits dial 31 receives digits and, considering the dials 30 to the left thereof, the same in succession receive tens, hundreds, thousands and ten thousands. The result of computation is shown through the openings 90, the sum shown on the calculator mecha-

nism in Fig. 1 being 99,999, 9,999.9, etc., as the particular case may be.

The novel subject matter of the present invention resides in the detent bar 28 and its relationship to the dial support 26, and to the idler gears 32 and to the gear of the digits dial 31. Considering Figs. 1 and 6, the rotation of the digits dial 31 clockwise one digit will cause all fingers 84 of the discs 78 to contact the associated idler gear 32 to rotate it and its associated gear 79 a distance between adjacent wells. Each apex 70 engages between the teeth of an idler gear 32 and the apex 71 engages between the teeth of the gear 79 of the digits dial 31. Upon the application of a pencil or other device into the dialing well 33 opposite the numeral 1 of the addition series and movement clockwise to the end of the opening 47, the gear teeth of the gear 79 will pivot the detent bar so that the apex 71 is cleared. The apexes 70 will, through this action, clear their respective idler gears 32, permitting ready adding by the calculator mechanism 20.

If the addition involved, by way of example, the application of a sum in the hundreds, as one hundred, the center hundreds dial 30 will be manually rotated in the same manner as was the digits dial 31. The idler gear 32 in engagement with the gear of the hundreds dial 30 will be rotated through the force applied in dialing to raise the apex 70 thereby pivoting the detent bar 28. In this pivotal action, the apex 70 engaging the idler gear 32 meshing the gear 79 of the tens dial 30 will remain in locking engagement therewith. Similarly, the apex 71 will not release the gear 79 of the digits dial 31. However, the apexes 70 engaging the idler gears 32 in mesh with the gears 79 of the thousands and ten thousands dials 30 will be moved to permit free movement of these two idler gears 32. This relationship of the detent bar 28 upon being pivoted by an idler gear 32 derives from the fact that the pivotal axis of the detent bar 28 is angularly disposed in respect to the base line of the dial support 26, yet the top plane of the detent bar 28 is in the same general plane with the top of the dial support 26. Hence, in pivotal movement of the detent bar 28, the actual movement of the top segments 68 and 69 will increase as the segment considered becomes further removed from the right hand side, considering Fig. 8. The apex 71 will travel the least distance and the left hand apex 70 will travel the greatest distance in pivotal movement of the detent 28. This factor is important, for it compensates for inevitable gear lash or lost motion. The increasing gap between detent and gears allows the detent bar 28 to begin relocking action with the manually rotated dial 30 or 31 before the higher number affected dials are actually turned in the computation, the delay being due to gear lash.

Thus, in making computations with the mechanism 20, the pivotal relationship of the detent bar 28 with the dial support 26 releases those idler gears 32 in mesh with dials 30 to which sums may be added, whereas the unaffected idler gears 32 and the digits gear to the right will remain locked and cannot be inadvertently rotated, which latter would, of course, destroy the accuracy of the mechanism 20.

It is manifest that there has been provided a construction which fulfills the objects and advantages sought therefor.

It is be understood that the foregoing description and the accompanying drawings have been given by way of illustration and example. It is also to be understood that changes in form of the elements, rearrangement of parts, and substitution of equivalent elements, which will be obvious to those skilled in the art, are contemplated as within the scope of the present invention which is limited only by the claims which follow.

What is claimed is:

1. In a calculator mechanism including spaced rotatable addition and subtraction dials each including a gear, and dial interrelating elements, in combination, a detent releasably maintaining said dials against rotation in their respective positions, said detent being biased into its position maintaining said dials against rotation, said detent comprising a pivotally mounted member having a plurality of spaced extensions, each of said extensions being adapted for restraining engagement with a respective movable element connected to a respective dial, said extensions being disposed different distances from the pivotal axis of the detent member whereby a predetermined amount of rotation of any dial in making a computation is effective to release all dials of higher number.

2. In a calculator mechanism including spaced rotatable addition and subtraction dials each including a gear, and interrelating idler gears, in combination, a detent device releasably engaging said idler gears to normally maintain the same and the associated dials in moved positions, said detent device comprising a pivotally mounted member having a plurality of spaced extensions, each of said extensions being adapted for restraining engagement with a different idler gear, said extensions being disposed different distances from the pivotal axis of the detent member whereby a predetermined amount of rotation of any dial in making a computation is effective to release all dials of higher number.

3. In a calculator mechanism including spaced rotatable addition and subtraction dials each including a gear, and dial interrelating elements, in combination, a detent releasably maintaining said dials against rotation in their respective positions, said detent being biased into its position maintaining said dials against rotation, said detent comprising a pivotally mounted member having a plurality of spaced extensions, each of said extensions being adapted for restraining engagement with a respective movable element connected to a respective dial, said extensions being disposed different distances from the pivotal axis of the detent member whereby a predetermined amount of rotation of any dial in making a computation is effective to release all dials of higher number, said detent maintaining said dials of higher number released beyond the initiation of relock of the rotated dial to allow for gear lash.

4. In a calculator mechanism including spaced rotatable addition and subtraction dials each including a gear, and dial interrelating elements, in combination, a detent releasably maintaining said dials against rotation in their respective positions, said detent being biased into its position maintaining said dials against rotation, said detent being movable upon predetermined amount of rotation of any dial in making a computation to release all dials of higher number, said detent in said movement maintaining all dials of lower number locked against rotation, said detent comprising a single member movable between two extreme positions of movement, said member including different portions connectable with each dial, said portion having greater traverse between

said extreme positions of movement progressively from the portion connectable with the unit dial through the portions connectable with the higher number dials.

5. In a calculator mechanism including a dial support, spaced addition and subtraction dials rotatably mounted on said dial support each including a dialing disc and a gear fixed thereto, and idler gears rotatably mounted on said dial support arranged one meshing with each dial gear except the base dial gear and rotatable by the dialing disc of the dial to its right in computations, in combination, a movable detent device including portions having different extents of movement releasably engaging said idler gears and the gear of the base dial to maintain the same against accidental rotation, said detent device being predeterminately yieldable during computations to simultaneously release idler gears meshing gears of dials of higher number than the dial being rotated and to maintain in locked relation idler gears meshing gears of dials of lower number and the gear of the base dial, and spring means biasing said detent device into gear engaging position.

6. In a calculator mechanism including a dial support, spaced addition and subtraction dials rotatably mounted on said dial support each including a dialing disc and a gear fixed thereto, and idler gears rotatably mounted on said dial support arranged one meshing with each dial gear except the base dial gear and rotatable by the dialing disc of the dial to its right in computations, in combination, a detent bar pivotally mounted on said dial support and including portions releasably engaging said idler gears and the gear of the base dial to maintain the same against accidental rotation, said detent bar being of substantially "U" cross section and including two legs and a bight portion of increasing width from the base dial toward the dials of higher number, said legs being in diverging planes from the base dial toward the dials of higher number, one leg including said gear engaging portions and being disposed in a plane parallel with the average plane of said gears, said other leg pivotally engaging said dial support along its free edge to comprise the pivotal axis of said detent bar, whereby actual pivotal movement of the free edge of the said one leg increases from the base dial toward the dials of higher number.

7. In a calculator mechanism including a dial support, spaced addition and subtraction dials rotatably mounted on said dial support each including a dialing disc and a gear fixed thereto, and idler gears rotatably mounted on said dial support arranged one meshing with each dial gear except the base dial gear and rotatable by the dialing disc of the dial to its right in computations, in combination, a detent bar pivotally mounted on said dial support and including portions releasably engaging said idler gears and the gear of the base dial to maintain the same against accidental rotation, said detent bar being of substantially U cross section and including two legs and a bight portion of increasing width from the base dial toward the dials of higher number, said legs being in diverging planes from the base dial toward the dials of higher number, one leg including said gear engaging portions and being disposed in a plane parallel with the average plane of said gears, said other leg pivotally engaging said dial support along its free edge to comprise the pivotal axis of said detent bar, whereby actual pivotal movement of the free edge of the said one leg increases from the base dial toward the dials of higher number, and spring means biasing said detent bar into gear engaging position.

8. A detent device for releasably maintaining spaced gears of an addition and subtraction calculator against accidental rotation, comprising an elongated body of substantially U cross section including two legs and a bight of increasing width, one leg including spaced gear engaging portions, said other leg having means for pivotally mounting said device upon a support.

9. A calculating mechanism comprising a plurality of operating dials mounted for rotation in either direction; means for rotating said dials individually; means between said dials for effecting a computation; a detent including a single spring for resiliently holding said dials in any normal position; and means in combination operative by turning any one of said dials to maintain locked the dials of lower denomination than said one of said dials and to entirely free the dials of higher denomination than said one of said dials.

10. A calculating mechanism comprising a plurality of operating dials mounted for rotation in either direction; means for rotating said dials individually; means between said dials for effecting a computation; a detent including a single spring for resiliently holding said dials in any normal position; means in combination including consecutively engageable means operative by turning any one of said dials for releasing only the dials to the left thereof; whereupon detent releasing drag is eliminated in said means effecting computation.

11. A calculating mechanism comprising a plurality of operating dial units rotatably mounted upon a support including actuating dials and means between adjacent dials interrelating the same for computation, and a releasable detent normally maintaining said dial units against rotation, said detent being related to said dial units for consecutive release of dial units of higher number and to maintain locked dial units of lower number.

12. A calculating mechanism comprising a plurality of operating dials mounted for rotation in either direction; means for rotating said dials individually; means between said dials for effecting a computation; a detent resiliently holding said dials in any normal position; and means in combination operative by turning any one of said dials to maintain locked the dials of lower denomination than said one of said dials and to entirely free the dials of higher denomination than said one of said dials thereby affording free action of the second named means in effecting a computation.

13. A calculating mechanism comprising a plurality of operating dials mounted for rotation in either direction; means for rotating said dials individually; means between said dials for effecting a computation; a detent resiliently holding said dials in any normal position; means in combination operative by turning any one of said dials for consecutively releasing only the dials to the left thereof; whereupon detent releasing drag is eliminated in said means effecting computation.

14. In a calculator mechanism comprising a plurality of dials rotatably mounted in spaced relation, driving means intermediate each pair of adjacent dials for turning the left hand dial of a pair in response to movement of any dial to the right of said left hand dial, a biased detent mounted for rocking movement releasably to en-

gage said means and normally to maintain the same and the several dials in a moved position, said detent being rockable by rotation of any one dial consecutively to release only all of said means to the left of said one dial whereby the dials to the left of said one dial are freed from detent action.

15. In a calculator mechanism comprising a plurality of dials rotatably mounted in spaced relation, driving means intermediate each pair of adjacent dials for turning the left hand dial of a pair in response to movement of any dial to the right of said left hand dial, a biased detent mounted for rocking movement and having a plurality of triangular portions releasably to engage said means and normally maintain the same and the several dials in a moved position, said triangular portions being simultaneously movable by rotation of any one dial consecutively to release only all of said means to the left of said one dial whereby the dials to the left of said one dial are freed from detent action.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
39,904	Elliott	Sept. 15, 1863
176,426	Chesterman	Apr. 25, 1876
177,928	Elliott	May 30, 1876
546,748	Richards	Sept. 24, 1895
550,123	Cole	Nov. 19, 1895
1,171,535	Oliver	Feb. 15, 1916
1,283,488	Floyd	Nov. 5, 1918
1,354,778	Pitman	Oct. 5, 1920
2,450,668	Kesling	Oct. 5, 1948

FOREIGN PATENTS

Number	Country	Date
603,660	France	Apr. 21, 1926