Nov. 20, 1956 J. J. CROWLEY 2,771,245

CALCULATING DEVICE

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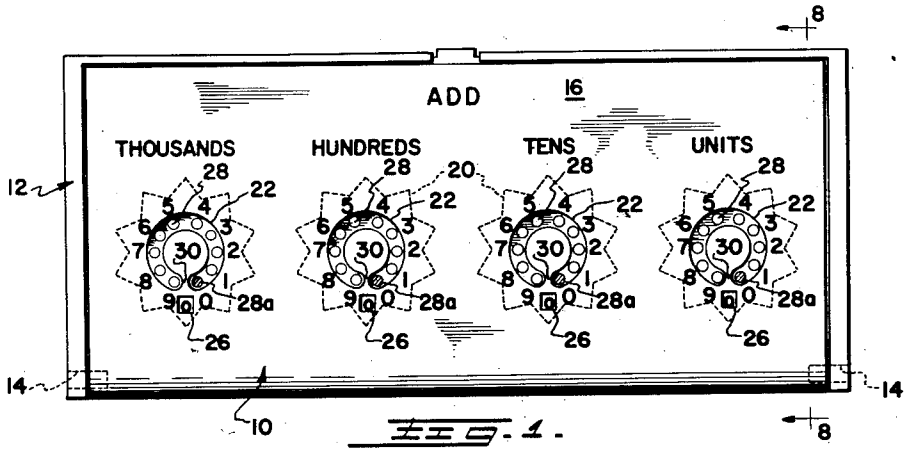


FIG. 1.

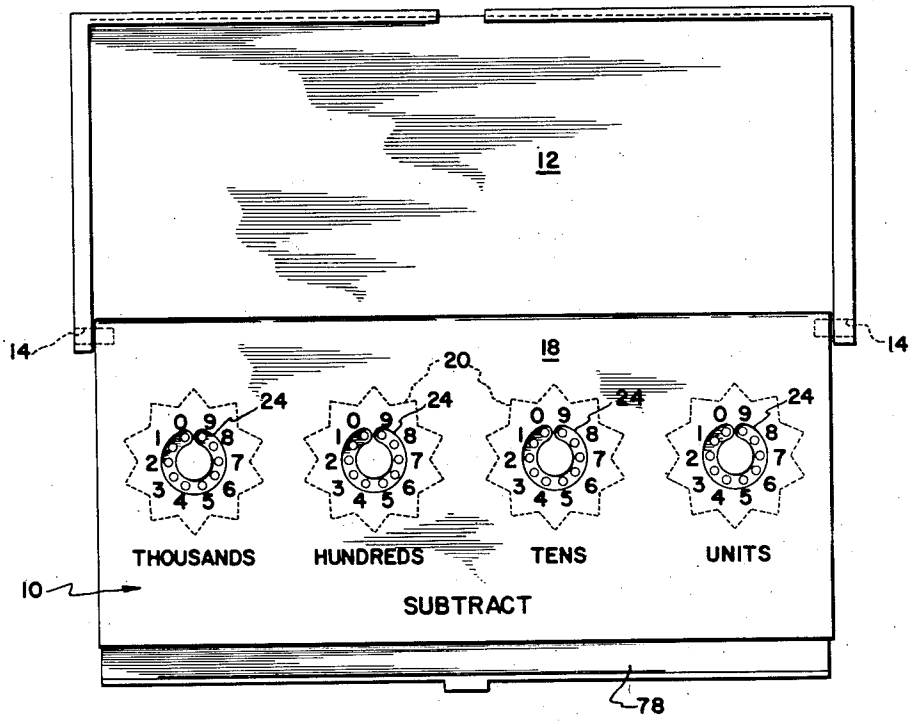


FIG. 2.

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CALCULATING DEVICE

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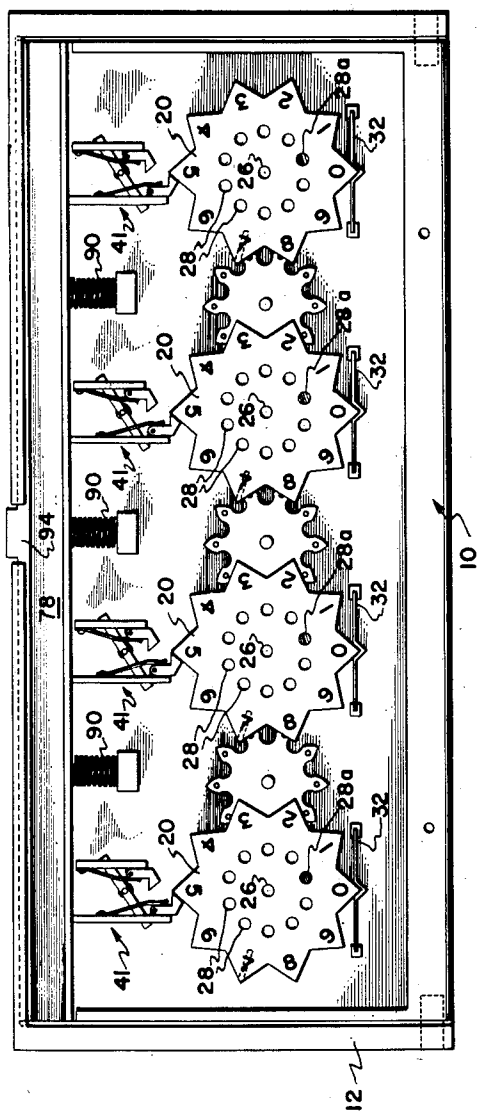


FIG. 3.

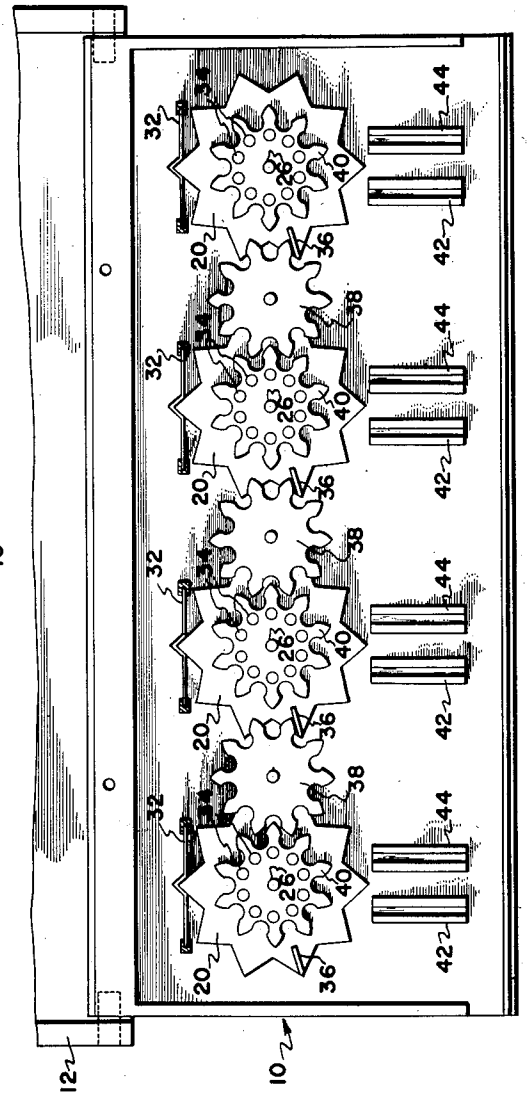


FIG. 4.

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CALCULATING DEVICE

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FIG. 5.

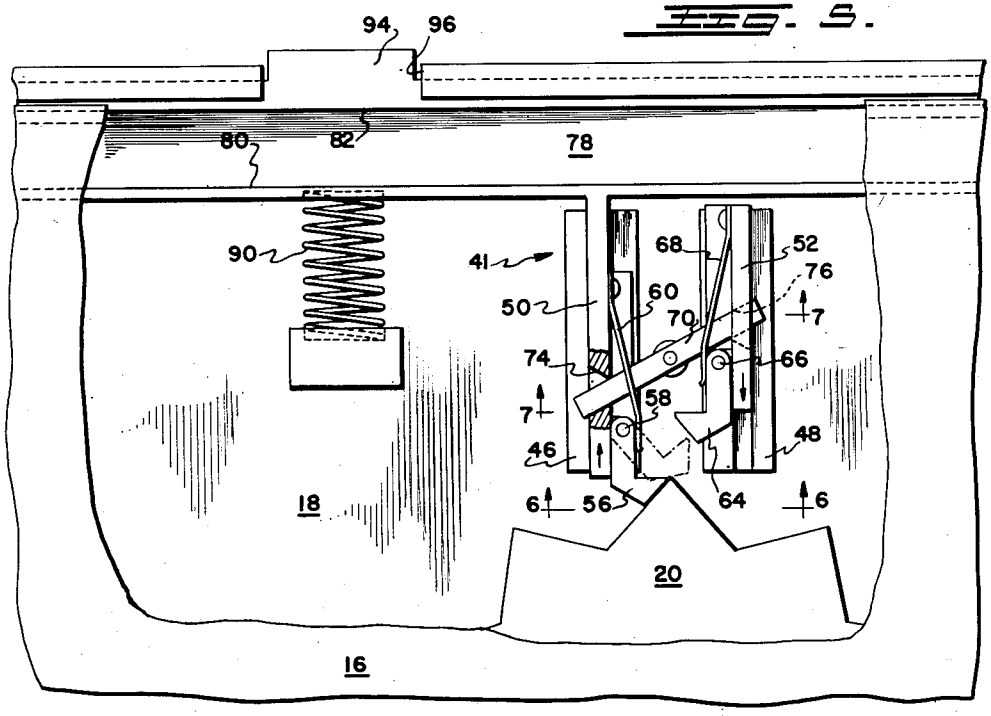
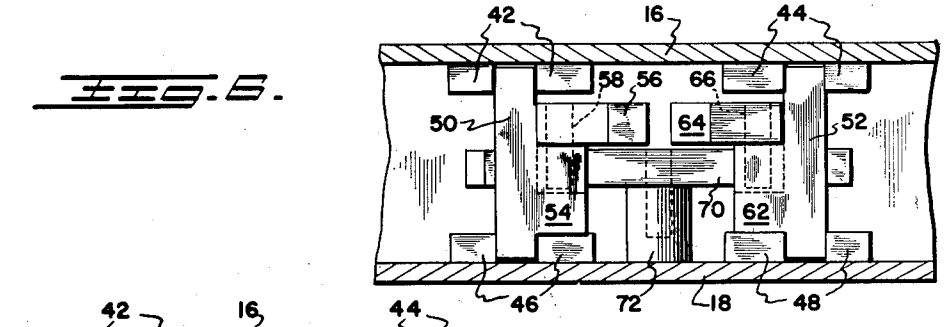


FIG. 6.



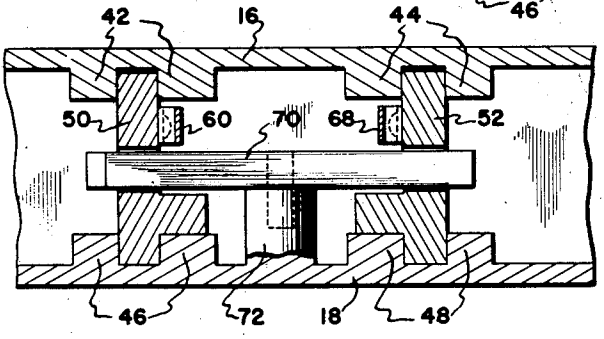


FIG. 7.

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CALCULATING DEVICE

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FIG. 8.

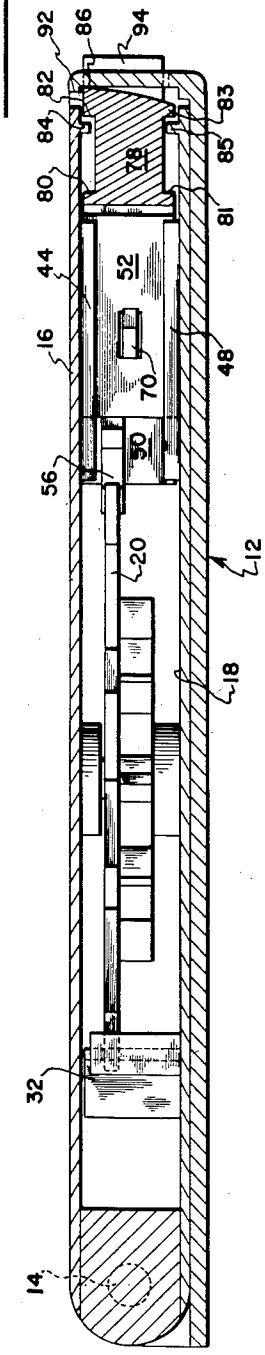


FIG. 9.

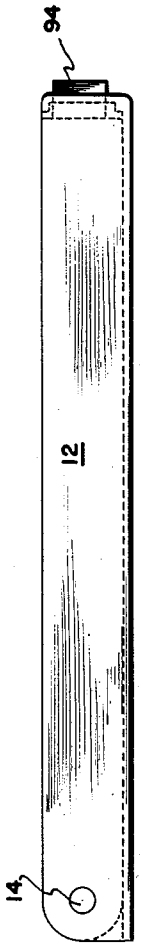
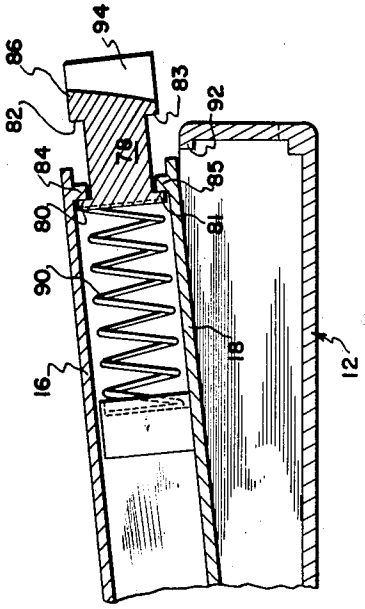


FIG. 10.



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2,771,245

CALCULATING DEVICE

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Application May 16, 1955, Serial No. 508,586

6 Claims. (Cl. 235—74)

This invention relates to calculating devices and more particularly to pocket type calculators in which a numeral wheel is manually actuated by means of a stylus to perform mathematical computations such as addition and subtraction.

Devices of the general type with which my invention is concerned usually take the form of a flat, rectangularly shaped case within which a series of numeral wheels are operatively associated with each other. Conventionally, the casing of the device is provided with a series of openings which are in registry with means by which the numeral wheels are engaged, for example, by a stylus or pencil point for purposes of manual actuation. Indicator windows are associated with each order of numerals and, by suitable manipulation of the appropriate wheels, as described hereinafter, operations of addition or subtraction may be performed and the sum or difference is registered at the indicator windows. As a general rule, the numerical wheels are accessible only from one face of the device and are rotated in one direction to effect addition and rotated in the opposite direction to effect subtraction. Oftentimes the operator becomes confused as to which direction the numeral wheel should be rotated and inadvertently rotates the wheel in the wrong direction. If this error is not detected, the total indicated by the device is obviously incorrect. Even in the case where such an error is detected, correction of the error requires additional manipulations of the numeral wheels, first to remove the error and then to effect the desired operation in the correct manner.

It is a primary object of my invention to provide a calculating device of the type herein described in which errors in manipulation cannot occur.

Another object of my invention is to provide a calculating device in which the numeral wheels may be moved only by an actuating movement in a single direction (e. g., clockwise direction) regardless of whether the amount being entered is to be added or subtracted.

Still another object of my invention is to provide a novel stop mechanism, especially designed to aid in the achievement of the foregoing objects.

These, and other objects, are achieved in a calculating device wherein the mechanism-containing casing is pivotally supported within a frame or open housing.

In the preferred embodiment of the invention a calculating mechanism of more or less conventional design is disposed within the case, and the opposite faces of the numeral wheels of this mechanism are accessible from each side of the case. A stop mechanism is mounted within the case and cooperates with portions of the frame in such a manner that the numeral wheels may be manually actuated only in a clockwise direction with respect to the side of the case from which they are accessible.

To enter a number to be added, the operator selects the number from a first side of the case, inserts a stylus or the like in the means adjacent the number and rotates the numeral wheel in a clockwise direction until it reaches a stop means for that number. In order to enter a number to be subtracted, the operator must enter the number from the second (opposite) side of the case and in so doing rotates the numeral wheels in a clockwise direction, as viewed by the operator.

In order to bring the second side of the case into operative position for purposes of entering a number to be subtracted, it is necessary for the operator to oscillate the case with respect to the frame and this movement is employed to shift the stop mechanism, thereby limiting the limit and direction in which the numeral wheel is permitted to rotate.

The foregoing objects and advantages of my invention may be best appreciated by reference to the following specification taken in conjunction with the drawings.

In the drawings:

Fig. 1 is a front elevation view of my calculating device showing the case disposed within the frame;

Fig. 2 is a front elevation of my calculating device showing the case pivoted out of the frame;

Fig. 3 is a view similar to Fig. 1 with the top surface of the case removed;

Fig. 4 is a view similar to Fig. 2 with the case surface removed;

Fig. 5 is a plan view showing details of the stop mechanism;

Fig. 6 is a detail view of the stop mechanism taken from the line **6—6** of Fig. 5;

Fig. 7 is a cross sectional view of the stop mechanism taken on the line **7—7** of Fig. 5;

Fig. 8 is a cross sectional view of the device taken on the line **8—8** of Fig. 1;

Fig. 9 is a side elevation of the device as shown in Fig. 1; and

Fig. 10 is a cross sectional view of the device as shown in Fig. 8, showing the relationship of these elements immediately after the case has been disengaged from the frame.

Referring first to Figs. 1 and 2, the outward appearance of the device discloses a case **10** which is pivotally secured to a frame or open housing **12** by means of pivot pins **14**. As shown in Figs. 1 and 2, the case **10** is rotatable with respect to the frame **12** from the position shown in Fig. 1, wherein one side plate **16** is exposed, to a position 180 degrees from the position of Fig. 1 to expose the opposed side plate **18** as shown in Fig. 2. As indicated by the legends upon the side plates **16** and **18**, the plate **16** is exposed when an addition operation is to be performed, while the plate **18** is exposed when a subtraction operation is to be performed.

A plurality of numeral wheels **20** are rotatably mounted within the casing and suitably located access openings **22** and **24** are provided in side plates **16** and **18** respectively. In addition, indicating windows **26** are provided in side plate **16** whereby the total entered into the device may be read by the observer.

Referring now to Fig. 3, it will be seen that each of the numeral wheels **20** is shaped in the form of a ten pointed star. Each numeral wheel **20** has a central bore which receives a pin **26** which supports the numeral wheel **20** for rotation within the casing **10**. A series of ten sockets or indentations **28** in the side surface of the wheel **20** are equally spaced along the circumference of an imaginary circle centered on the axis of pin **26**. The sockets or indentations **28** are adapted for engagement by a stylus by means of which the operator may manually rotate the numeral wheel any desired amount. The socket **28***a* on each numeral wheel is provided with a special identifying mark to assist in clearing the device, as will be discussed more fully in the description of the operation of the device. Returning to Fig. 1, it will be seen that the sockets **28** are exposed by access openings **22** and a series of numerals are disposed adjacent the

circumference of access opening 22 to enable the operator to readily ascertain the correct socket to employ when entering a given amount. For example, to enter the numeral 5, the operator engages the stylus in the socket 28 adjacent the numeral 5 on the casing surface and rotates the numeral wheel clockwise until the stylus engages the bridge portion 30 at the end of the access opening 22.

In order to preserve the desired alignment between the sockets 28 on numeral wheel 20 and the indicating numerals adjacent the access opening 22, a V shaped leaf spring 32 is fixedly mounted within the casing 10 to engage the pointed peripheral surface of the numeral wheel 20 and establish its rest position. The V shaped spring 32 also assures the central location of the numerals disposed upon the numeral wheel with respect to indicating windows 26.

Referring now to Fig. 4, it will be seen that the opposite side surface of numeral wheel 20 is likewise provided with sockets 34 similar to and in alignment with the sockets 28. Referring now to Fig. 2, it will be seen that the access openings 24 in the side plate 18 of casing 10 likewise expose the sockets 34 in the same manner as the sockets 28 are exposed through access openings 22.

The mechanism by which the numeral wheels are coupled to each other is best illustrated in Fig. 4. Since this mechanism is of conventional construction, only a brief description will be given. As seen in Fig. 4, each numeral wheel 20 is provided with a single projection 36 at one location adjacent the periphery. Intermediate each numeral wheel an idler gear 38 is pivotally supported within the casing and is adapted to engage a gear 40 which is integrally formed with numeral wheel 20. Thus, when any given numeral wheel makes a complete revolution, the projection 36 will engage the idler gear 38 and impart a certain amount of rotation to gear 38. Rotation of gear 38 is transferred to the next higher order numeral wheel by the engagement of the gear 38 with the gear 40 formed upon the next higher order numeral wheel. The amount of rotation transferred in this manner is one-tenth of a revolution and thus, the next higher order numeral wheel is rotated one step for each complete revolution of the lower order wheel.

The details of the stop mechanism 41 which are employed to prevent an incorrect mode of actuating input from being applied to a numeral wheel are best illustrated in Figs. 5, 6 and 7. Referring first to Figs. 6 and 7, it is seen that the inner surface of side plate 16 is formed with a series of spaced pairs of integral upstanding ridges 42 and 44. Likewise, side plate 18 is provided with similar sets of upstanding ridges as at 46 and 48. When the sides 16 and 18 are assembled, the various ridges 42, 44, 46 and 48 are aligned with each other and the spaces between the respective ridges define aligned slots which are adapted to slidably receive latch carrying members 50 and 52. Pivotally supported upon ledge 54 of latch carrying member 50 is latch member 56. As best seen in Fig. 5, latch member 56 can pivot about its pivot pin 58 between the full line position shown in Fig. 5 and the dotted line position. Latch 56 is biased to the full line position of Fig. 5 by leaf spring 60 which is fixedly secured to the latch carrying member 50. Thus, with the stop mechanism in the position shown in Fig. 5, numeral wheel 20 may rotate clockwise by pivoting latch member 56 against spring 60 to the position shown in dotted lines in Fig. 5. However, counterclockwise movement of numeral wheel 20 is prohibited since movement of numeral wheel 20 in this direction drives latch member 56 against the latch carrying member 50.

A similar arrangement is employed upon the latch carrying member 52, member 52 having a ledge 62 upon which latch member 64 is pivotally supported by pin 66. Leaf spring 68 acts to bias the latch member 64 against the inner side surface of latch carrying member 52. The action of the latch 64 is similar to the action of the latch 56 except that the allowed direction of rotation is the reverse from that permitted by latch 56.

Latch carrying members 50 and 52 are interconnected by an arm 70 which is pivotally supported upon a lug 72 midway between the latch carrying members. The arm 70 (see Fig. 5) is received adjacent its outer ends within beveled slots 74 and 76 which extend through the respective latch carrying members. Thus, reciprocating movement of one of the latch carrying members in a first direction is transferred by means of the arm 70 to the other latch carrying member, causing the second latch carrying member to move in a direction opposite to that in which the first latch carrying member is reciprocated. By this means, a positively acting arrangement is provided whereby only one of the latch members may be engaged with the numeral wheel at a given time.

In order to actuate the latch carrying members, each of the latch carrying members 50 is secured to or integrally formed with a bar-like element 78 which, as best seen in Fig. 2, extends entirely across the mechanism case. The bar 78 is received between the two opposed side plates 16 and 18 and is adapted to reciprocate between two positions which are determined by the engagement between flanges 80, 81, 82 and 83 upon bar 78 with flanges 84 and 85 located on the inner surfaces of side plate 16 and 18. When the bar 78 is at its innermost position, as shown in Figs. 3, 5 and 8, latch carrying member 50 is likewise in its innermost position and latch member 56 is engaged with the numeral wheel periphery. When the case 10 is pivoted upwardly from the position shown in Fig. 8 to the position shown in Fig. 10, springs 90 act to bias the bar 78 to its outermost position. As the bar 78 moves to its outermost position, it carries with it the associated latch carrying members 50 and withdraws them from the numeral wheel. As the latch carrying members 50 are withdrawn, the pivotal movement of arm 70 simultaneously drives the latch carrying members 52 inwardly toward the numeral wheel periphery to engage latch members 64 with the numeral wheel.

The bar 78 performs a second function in that it is employed to latch case 10 within frame 12. Referring now to Fig. 8, it is seen that the vertical side portion of frame 12 is an inwardly extending flange portion 92 along its upper edge. When bar 78 is in the position illustrated in Fig. 8, the spring 90 forces bar 78 outwardly against the vertical side surface of frame 12 and thus causes the upper edge 86 of bar 78 to be engaged beneath the inwardly extending flange 92 on the vertical side surface. In order to release the bar 78 from this position, a button portion 94 projects outwardly from the bar 78 through an interruption as at 96 in the vertical side surface of frame 12. By pressing inwardly on the button portion 94, the operator can force the edge 86 to a position where it will clear the inwardly extending flange 92, thus permitting the case 10 to be pivoted upwardly out of the frame member 12.

The operation of the device is as follows. In order to perform an addition operation, the case 10 is secured within frame 12 in the manner shown in Fig. 1. The operator may then employ a stylus or similar implement to engage and actuate the appropriate numeral wheels in a manner well known to those skilled in the art. With the case 10 disposed within the frame 12 as in Fig. 1, the stop mechanism is oriented in the position shown in Fig. 5. Thus, actuation of the various numeral wheels is permitted only in a clockwise direction, since the latch member 56 is so disposed as to prohibit counterclockwise rotation as seen in Fig. 5.

In order to perform a subtraction operation, the case 10 is pivoted out of the frame, by disengaging edge 86 from beneath flange 92, and manually moving the case 10 to the position shown in Fig. 2. This exposes the reverse side of the numeral wheel to the operator through access openings 24 and, as the bar 78 has now been released from the rear surface of frame 12, the stop mecha-

nism has been shifted from the position shown in Fig. 5 to a position in which the latch member 64 is engaged with numeral 20 and latch member 56 has been withdrawn and no longer engages the wheel 20. This orientation of the stop mechanism permits only counterclockwise rotation as with respect to surface 16. However, surface 16 is now hidden from the operator and surface 18 is exposed. The actuation of the numeral wheels thus is formed from their opposite side, and thus the actuating movement which is applied to them must again be in a clockwise direction.

By this means, confusion as to which direction the numeral wheel must be rotated is entirely eliminated, since when the case is within the frame as in Fig. 1, the surface 18 is inaccessible to the operator. With the device disposed in a position, as in Fig. 1, to perform an addition operation, it is impossible to enter a substraction input to the calculating device. When the device is disposed in a position to perform a subtraction operation, the surface 18 is the only one visible to the operator, and thus he would not in the ordinary course of procedure attempt to make an entry from the addition side of the case. In performing either an addition or subtraction operation, the user rotates the numeral wheel in a clockwise dierction and is compelled to make the entries from different faces of the device, thus calling to this attention the particular operation which is to be performed. Once the user has selected the correct side of the case from which the entry is to be made, it is impossible for him to make the entry by rotating the wheel in the wrong direction.

In order to clear or "zero" the device, the operator merely inserts the stylus into the marked socket 28*a* and rotates the wheel 20 clockwise until the stylus engages bridge portion 30, thus driving the numeral wheel to zero. In clearing the device, the operator performs the foregoing operation on each numeral wheel, starting with the rightwardmost or units order wheel and continuing across the device from right to left. The marking of the socket 28*a* eliminates the necessity for the operator to perform any mental calculation to determine the input necessary to clear the device.

It will be apparent to those skilled in the art that the embodiment of my invention which has been described above is capable of structural modifications. Therefore, I wish it to be understood that the foregoing description is to be considered as exemplary rather than limiting and the true scope of my invention is that defined in the following claims.

I claim:

1. A calculating device comprising a case, a numeral wheel rotatably supported within said case, said numeral wheel being rotatable in a first direction to perform an addition operation and rotatable in the opposite direction to perform a subtraction operation, means adapted to permit manual actuation of said numeral wheel from either of the opposed side surfaces thereof, and a stop mechanism engageable with said numeral wheel to limit rotation of said numeral wheel to a clockwise direction with respect to the side surface of said numeral wheel employed for actuation.

2. A calculating device comprising a case, a numeral wheel rotatably mounted within said case, a stop mechanism located within said case, said stop mechanism comprising a first element adapted to be engaged with portions of said numeral wheel whereby rotative movement of said numeral wheel is limited to a first direction, a second element adapted to be engaged with portions of said numeral wheel whereby rotative movement of said numeral wheel is limited to a direction opposite to said first direction, and means for selectively engaging either of said elements with the periphery of said numeral wheel.

3. A calculating device as recited in claim 2 wherein said last mentioned means comprises a frame in which said case is pivotally supported and a member mounted in said case for engagement with portions of said frame.

4. A calculating device adapted to perform addition and subtraction operations comprising a case, a plurality of interconnected numeral wheels rotatably mounted within said case, means adapted to permit said numeral wheels to be manually actuated from either of two opposed sides of said case, and means for restricting the rotation of said numeral wheels to a single rotary direction with respect to the side of said case from which said wheels are actuated.

5. A calculating device adapted to perform addition and subtraction operations comprising a frame, a case pivotally mounted in said frame for movement between a first position wherein one side surface of said case is exposed and a second position wherein an opposed side surface of said case is exposed, a plurality of interconnected numeral wheels rotatably mounted within said case, means adapted to permit said numeral wheels to be manually actuated from either of the side surfaces of said case when the surface is exposed, and means for restricting the rotation of said numeral wheel to a clockwise direction with respect to the exposed side surface.

6. A calculating device as recited in claim 5 wherein said last mentioned means comprises stop mechanisms associated with each of said numeral wheels and an element commonly connected with each of said stop mechanisms for simultaneous actuation thereof.

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