United States Patent

Kasner

[15] **3,706,875**

[45] **Dec. 19, 1972**

[54] **CALCULATOR**

[72] Inventor: **William Kasner,** 1330 Hollydale, Fullerton, Calif. 92631

[22] Filed: **Dec. 2, 1970**

[21] Appl. No.: **94,222**

[52] **U.S. Cl.**.....**235/74,** 235/140
[51] **Int. Cl.**.....**G06c 27/00**
[58] **Field of Search**.....235/74, 114, 109, 139, 140

[56] **References Cited**

UNITED STATES PATENTS

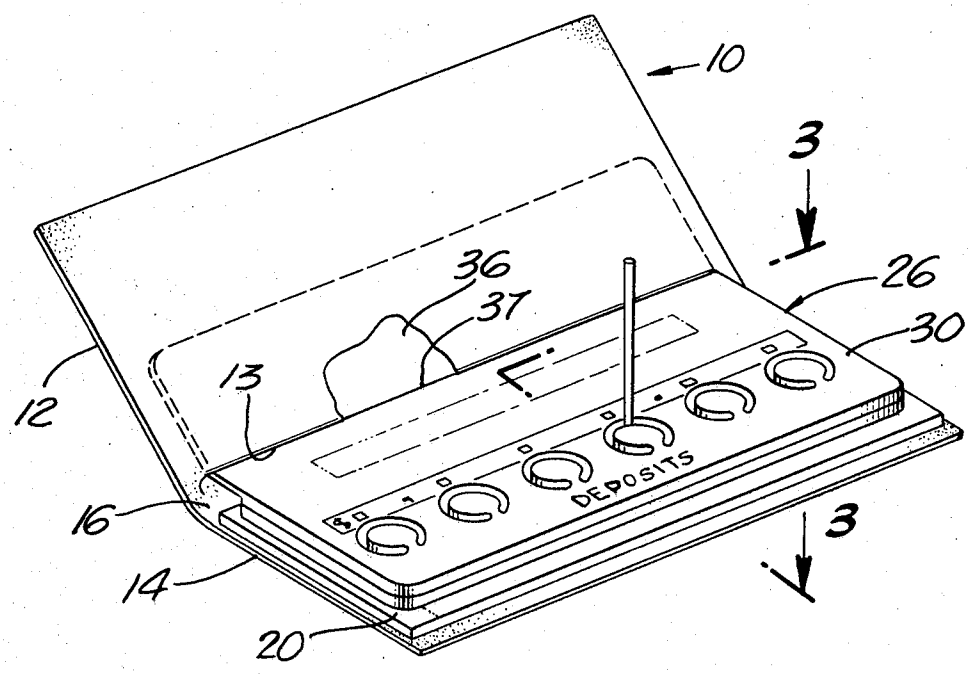
2,771,245	11/1956	Crowley	235/74
2,797,047	6/1957	Lehre	235/74
1,607,294	11/1926	Murphy	235/74 X
1,764,915	6/1930	Vethe	235/74
2,348,299	5/1944	Josepho	235/74
2,541,463	2/1951	Cummins	235/74
2,879,939	3/1959	Kesling	235/74

Primary Examiner—Richard B. Wilkinson
Assistant Examiner—Stanley A. Wal
Attorney—Herzig & Walsh and Edward C. Walsh

[57] **ABSTRACT**

A calculator of the type having digit or counter wheels which can be manually actuated for addition and subtraction. The calculator is in a relatively thin case or housing with opposite sides so constructed that access can be had to the digit or counter wheels from either side of the housing to actuate them with a stylus. The counter is hinged within a check book so that it can be readily moved to expose either side for making calculations. A digit or number is put in as an input by rotating any digit wheel with a stylus. Thus, a movement by the stylus on one side causes the machine to add and the same type or kind of movement on the opposite side causes the machine to subtract, the digit wheel being rotated in the opposite direction. The transfer means between digit wheels comprises idler wheels. Each idler wheel meshes with a digit wheel that is driven by it. Each idler wheel is driven by a digit wheel; each digit wheel has a single tooth positioned to effect the one-step transfer to an idler wheel when the digit wheel makes a complete revolution. The teeth on the idler wheels and the digit wheels are relatively displaced axially with respect to their hubs, alternate digit wheels and idler wheels being inverted to permit closer spacing with each idler wheel driving the next digit wheel but not meshing with the preceding digit wheel.

9 Claims, 11 Drawing Figures



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SHEET 1 OF 2

FIG. 1.

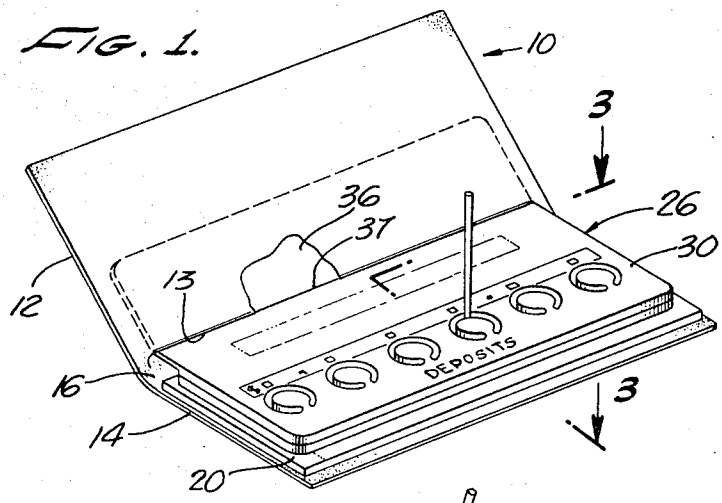
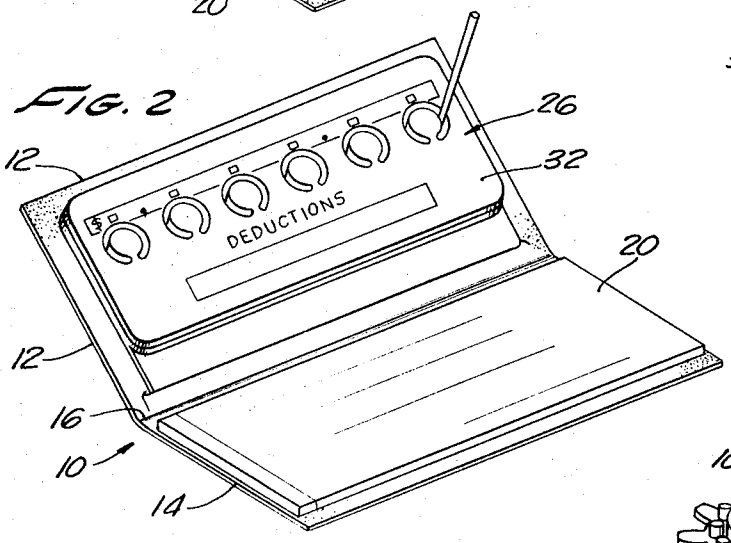


FIG. 2



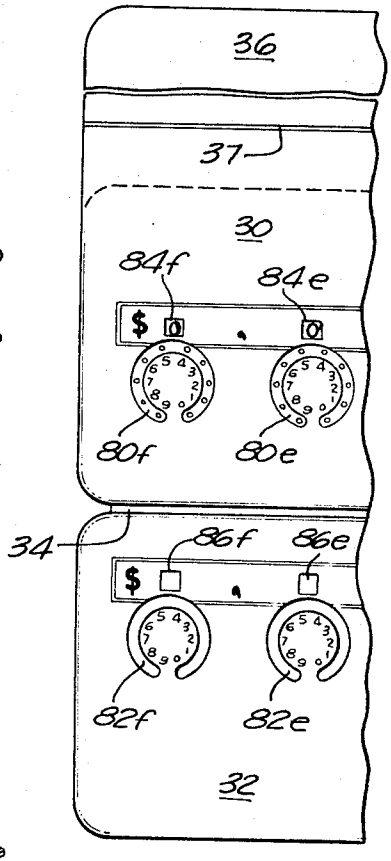


FIG. 4.

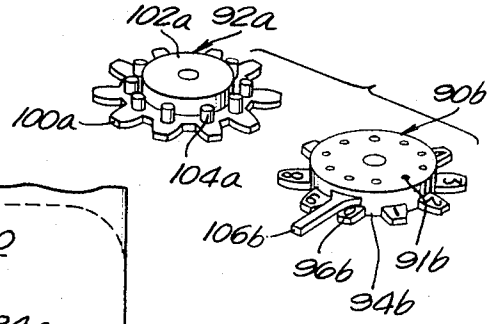


FIG. 5.

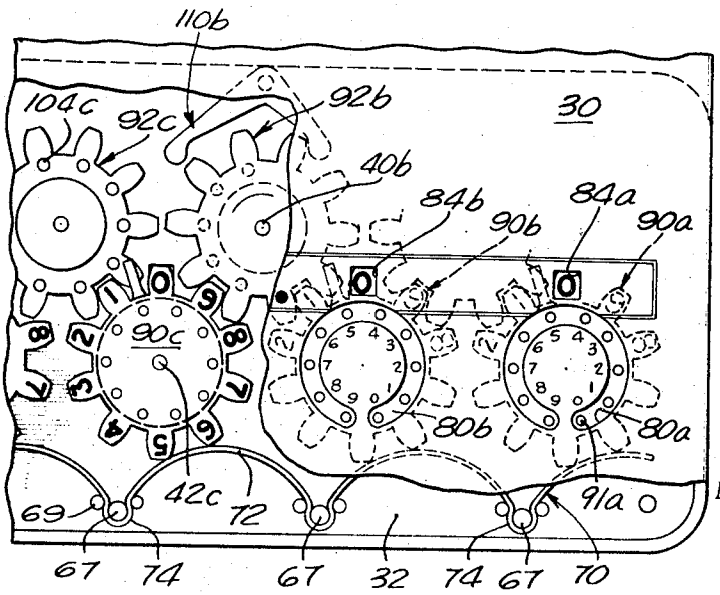


FIG. 3.

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SHEET 2 OF 2

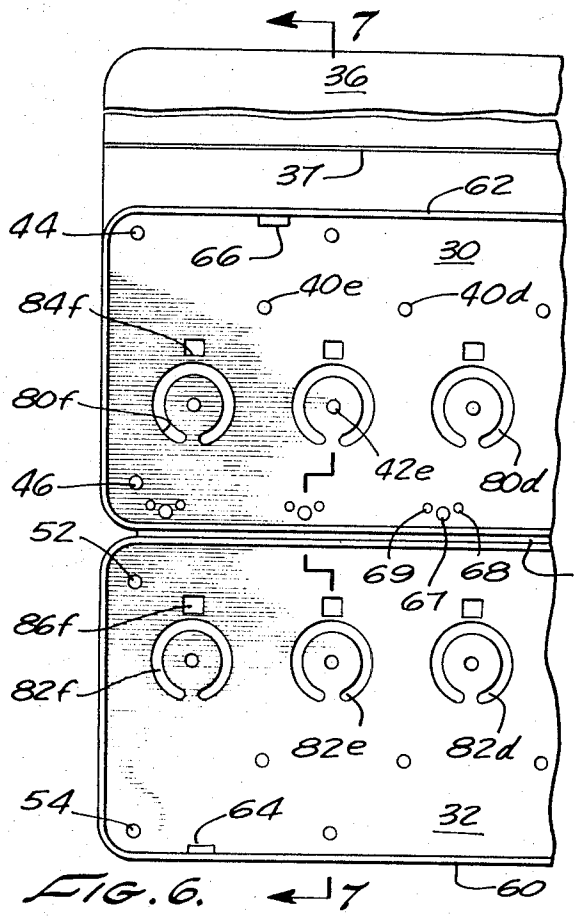


FIG. 6.

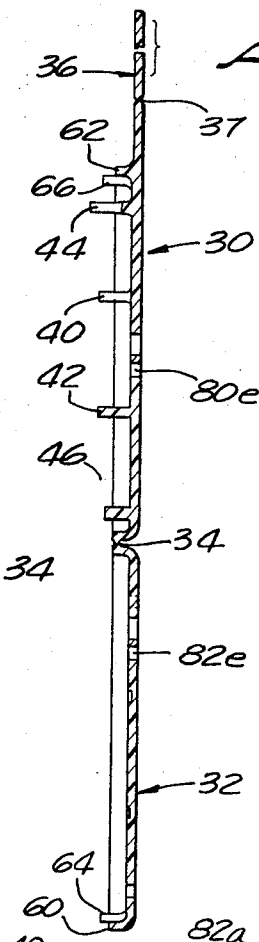


FIG. 7.

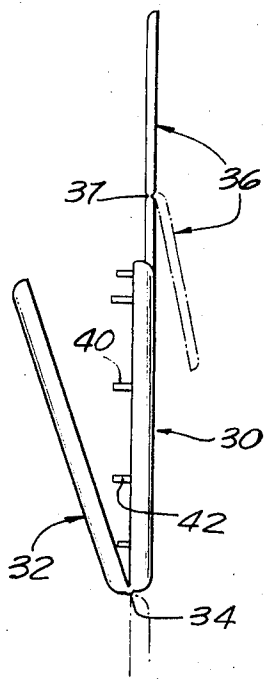


FIG. 8.

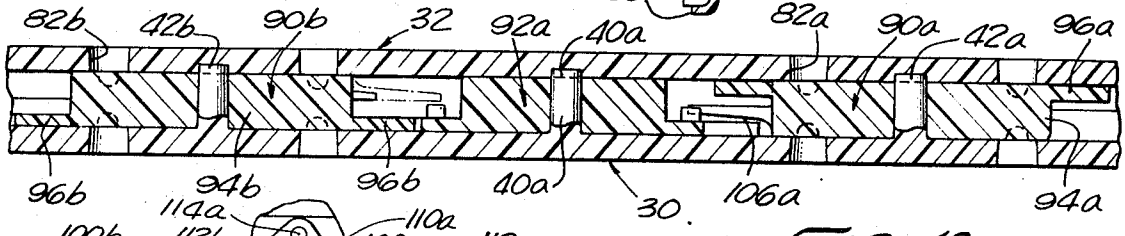


FIG. 10.

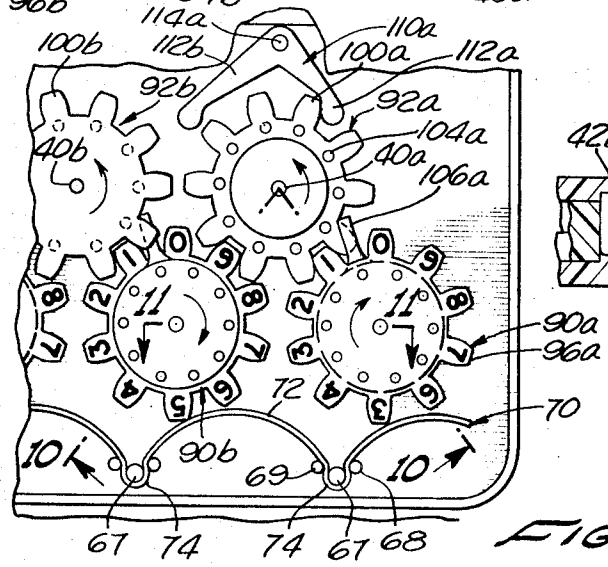


FIG. 9.

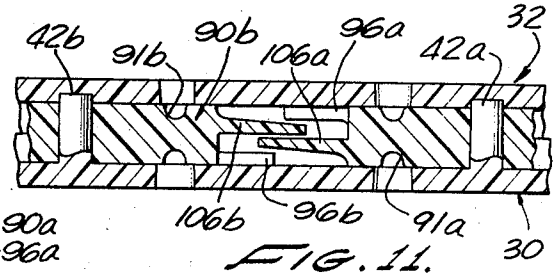


FIG. 11.

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CALCULATOR

SUMMARY OF THE INVENTION

The invention is a small adding machine or calculator of the type which is manually actuated by a stylus. Calculators of this type have a series of digit or counter wheels with transfer means between the wheels such that a full revolution of any wheel makes a step transfer movement of the next adjacent wheel, that is, a step of one unit, a tenth of a revolution, the counter wheels accordingly being identified as units, tens, hundreds, etc. wheels. Typically, counters of this type have the numbers from zero through nine on each wheel and an arcuate slot is provided so that each wheel can be turned by a stylus inserted through the slot into holes in the digit wheel.

The herein invention provides particular improvements in calculators of the type. The calculator is so constructed that manual access may be had to the digit wheels from both sides of the calculator, or it might be said, from both the top and the bottom. Preferably, the calculator is carried in a folder or book which may typically be a check book with the counter hinged along one edge; and thus, it is eash to operate it from one side to perform addition, and then simply to flip it abouts its hinge to expose the other side and to operate it from that side. When operated from the other side, the calculator subtracts, and the movement for doing so is exactly the same on both sides. Thus, the calculator becomes a very convenient and handy instrumentality, particularly in connection with a check book since the user can conveniently keep a running account of his balance, adding in deposits with the calculator and subtracting withdrawals. This use of the calculator is of course only by way of example since it has many other similar uses.

In the exemplary form of the invention as described in detail herein and as referred to above, the calculator is preferably made thin so that it can be carried in a check book or the like as described without adding undue thickness or bulk to the article.

Further improvements are embodied in the invention in the construction of the digit wheels and the transfer means which are in the form of idler wheels that transfer one step from a digit wheel to the next digit wheel in sequence when the first digit wheel makes a complete revolution. In the preferred form of construction, the digit wheels and idler wheels are provided with hubs having teeth which are displaced axially on the hubs, that is, axially from the flat, radial end faces of the hubs. Each digit wheel has a single extending projection or tooth which engages teeth in the form of posts or pins on an adjacent idler wheel for transferring, that is, for moving the idler wheel one step when its driving digit wheel makes a complete revolution. Each idler wheel meshes with the digit wheel which it transfers to. In the calculator, the digit and idler wheels are mounted in the same plane with their shafts parallel. With the construction described, alternate digit wheels as well as idler wheels are inverted with respect to each other, so that the driving teeth then mesh in the manner just described. The arrangement is unique in minimizing the space required for the parts of the mechanism. The teeth on the digit wheels or gears do not mesh with the teeth on the next idler wheel because the respective sets of teeth are displaced from each other axially. The digit wheel has one long projection or tooth that effects the carryover or transfer to the next digit wheel. With this arrangement, the axes of the wheels can be closer together thus saving space and by simply inverting alternate digit wheels and idler wheels, the desired relationship is realized.

In light of the foregoing, the object of the invention is to make available a manually operable calculator of a type which can be operated to add or subtract by operations which are the same except made from different sides of the calculator.

Another object is to provide a calculator of this type adapted for use in connection with record keeping wherein sequences involving both addition and subtraction are involved, the calculator adapting itself to addition and subtraction from opposite sides.

A further object is to provide a calculator of the type referred to which is of relatively thin construction and which is combined with an article of the check book type wherein the calculator can be carried and kept within the holder or carrier of the check book itself.

A further object is to provide a combination as in the preceding object wherein the calculator is connected to a flap and hinged along one edge within a check book.

Another object is to provide improved transfer means as between digit wheels in a calculator, the transfer means comprising idler wheels which transfer but which are driven only when actuated one step by a driving digit wheel.

Another object is to provide improvements which reside in the construction of the digit wheels and idler wheels in that they are provided with hubs having teeth axially displaced on the hubs from the end faces of the hubs so that alternate wheels can be inverted to provide a sequence in which digit wheels drive idler wheels at the time a transfer is made, the idler wheels meshing constantly with digit wheels driven by them. A corollary to the object is to make it possible to simply invert digit wheels and idler wheels in the casing, to realize the correct drive and to realize the result of minimizing the space occupied by the parts, since the spacing between wheels can be closer.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and additional advantages of the invention will be become apparent from the following detailed description and annexed drawings wherein:

FIG. 1 is a perspective view of a preferred form of the invention showing addition being performed from one side of the calculator;

FIG. 2 is a view similar to that of FIG. 1, showing the calculator in position for performing subtraction from the opposite side of the calculator;

FIG. 3 is a partial plan view partly broken away showing the transfer arrangements in the calculator;

FIG. 4 is an explanatory view illustrating operation of the calculator;

FIG. 5 is a view illustrating the construction of the digit wheels and the transfer wheels;

FIG. 6 is a view showing the calculator cover without the digit wheels and transfer wheels;

FIG. 7 is a section view taken along line 7—7 of FIG. 6 on a slightly enlarged scale;

FIG. 8 is a view illustrating the hinging in the calculator;

FIG. 9 is a view showing the relationship between the digit wheels and the idler wheels;

FIG. 10 is a sectional view taken as indicated in FIG. 9; and

FIG. 11 is a sectional view taken along line 11—11 of FIG. 9.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more in detail to FIGS. 1 and 2 of the drawings, numeral 10 designates the typical holder in which a check book can be carried. It has a front 12 and a back 14 connected by a hinge 16 which is just a flexible part of the material that the cover is made of, such as plastic or leather. Within the folder is a check book 20. At its lefthand, it may have a cardboard flap, unshown, which is inserted into a slot formed in one wall of a double wall to hold the check book in position as is typical.

The front 12 is provided with a double wall in which there is an entrance slot 13 formed in the inner wall for a purpose as will be described. The calculator itself is designated 26.

In the preferred form of construction as described herein, the calculator embodies a casing or housing comprising parts that may be referred to as front and back, or two side parts which may be made of any suitable material, such as plastic or metal, the construction being such as to provide a thin calculator adapted to the purposes as described in the foregoing. Preferably, the case may be formed from a plastic stamping having two halves 30 and 32 connected by a thin flexible web 34 forming a hinge. The two halves are shown in cross section in the view of FIG. 7, which also shows the flap 36 which is connected by a hinge 37 to the half 30. It is insertable in slot 13. It will be observed that the one side 30 has a plurality of integral pins 40 and 42 which form the spindles or arbors for the digit wheels and the idler wheels as will be described. Also, there are stake pins 44 and 46 which come in to sockets, as shown at 52 and 54 when the sides are in assembled relationship with the wheels in place as will be described. Both halves 30 and 32 have a peripheral edge flange as shown at 60 and 62 which come together and can be cemented or held by a snap lock securement formed by extending detent tabs 64 and 66.

Numerals 67, 68, and 69 designate one group of extending integral pins, each group of which form one of the holders for a detent spring 70 having a plurality of arcuate bows as shown at 72 which engage teeth of the digit wheels as shown in FIG. 9 to fix their stopping positions. Spring 70 has arcuate formations as shown at 74 which fit over pins 67 between these pins and pins 68 and 69 to hold the spring.

Each side or front and back 30 and 32 has a series of parallel arcuate slots 80*a*, *b*, *c*, *d*, *e*, and *f* for the side 30 and 82*a*, *b*, *c*, *d*, *e*, and *f* for the other side 32, these arcuate slots being in registry with the digit wheels when the calculator is assembled as will be described. As will be seen in FIG. 7, in a position which is above each of the arcuate slots is a square window identified by the numerals 84*a*, *b*, *c*, *d*, *e*, and *f* and 86*a*, *b*, *c*, *d*, *e*, and *f*, which are the windows in which the answer numerals appear when adding and subtracting as will be described.

As pointed out, the digit wheels mount on the gear pins as described; the relationship between the gears, that is, the digit wheels and the idler wheels being as illustrated in FIGS. 3, 9, 10, and 11.

As can be appreciated in designing and constructing a calculator for the purposes intended herein, severe limitations are imposed with respect to not only the thickness but the dimensional size of the calculator. A unique design has been arrived at in order to meet the space limitations. In the figures, the drive gears or digit wheels are identified by the numerals 90*a*, *b*, *c*, *d*, *e*, and *f* and the idler wheels are identified by the numerals 92*a*, *b*, *c*, *d*, *e*, and *f*.

FIG. 5 shows one of the digit wheels 90*b* and one of the idler wheels 90*a*. It will be noted that the digit wheel 90*b* has radial gear teeth and in its flat radial face, it has ten holes 91*b* which are receptacles to receive the stylus by which it is turned. It has a generally cylindrical hub 94*b* and teeth 96*b*; and it will be observed they are displaced axially towards one flat radial face of the hub. The idler wheel 92*a* has gear teeth 100*a* as shown extending from hub 102*a* which has flat radial faces; and as will be observed again, the gear teeth are displaced axially on the hub. Each of the gear teeth has an axial pin 104*a* as shown which are the pins that are picked up to effect the transfer from one digit wheel to the next. It will be observed that the digit wheel 90*b* in FIG. 5 has one relatively long extending projection finger or tooth 106*b* which is the tooth which once per revolution picks up the idler wheel and rotates it one step, that is, one tenth of a revolution which is transferred to the next digit wheel.

FIGS. 9, 10, and 11 illustrate the relationship between the digit wheels and the idler wheels as respect to the positions of the teeth on these wheels and the relationship between the pickup projection or tooth 96 and the pins or posts 104 on the idler wheels. FIG. 10 shows the front and back of the casing 30 and 32 and three of the gear pins on which the digit wheels and idler wheels are journalled. This figure shows one idler wheel 92*a* and two digit wheels 90*a* and 90*b*. All of the digit wheels and the idler wheels are alike. In the assembly as shown in FIGS. 10 and 11, alternate idler wheels and alternate digit wheels are inverted which brings about the relationship described above. It will be observed that wheel 90*a* drives idler 92*a* in steps. Idler 92*a* drives digit wheel 90*b*. The pins 104*a* of idler 92*a* are not engaged by finger 106*b* of digit wheel 90*b*.

It will be observed that the idler wheels are not in between the digit wheels but are spaced laterally therefrom so that the centers of two digit wheels and an idler wheel form a triangle. By this arrangement, space limitations are met. In FIGS. 3 and 7 as will be described, the digit wheel 90 a transfers or carries over to an idler wheel 92*a* which in turn drives the next digit wheel 90*b*. The teeth of digit wheel 90*a* do not mesh with the teeth of idler wheel 92*a* because the teeth on these two respective wheels are displaced axially with respect to their hubs as will be described. This makes it possible to have these gears close together without one driving the other.

As will be observed in FIG. 10, teeth 96*a* of digit wheel 90*a* are displaced axially, that is, they are at the top of the hub 94*a*; whereas the opposite is true of digit wheel 90*b* in this figure. In this figure, the teeth 100*a* on

the idler wheel **92***a* are displaced axially on the hub **102***a*, that is, at the bottom so that these teeth do not mesh with the teeth **96***a* on the digit wheel **90***a* because they are at a lower level; whereas, they do mesh with the teeth **96***b* on the digit wheel **90***b* which are at the same level.

In FIG. **9**, it will be observed that the long projection or tooth **106***a* on the digit wheel **90***a* extends to engage with the pins or posts **104***a* on the idler wheel **92***a*. The long projection or tooth **106***b* on the digit wheel **90***b* drives the next idler wheel **92***b* in the sequence which would appear like idler wheel **92***a* in FIG. **10** inverted. Thus, briefly summarizing again, digit wheel **90***a* transfers one step to the idler wheel **92***a* when it makes a complete revolution, and this idler wheel or gear which is in mesh with the teeth of the digit wheel **90***b* drives it and transfers the one step to it. The relationship between succeeding digit wheels and idler wheels is similar.

Numeral **110***a* designates a pawl in the form of a bell crank lever having arms **112***a* and **112***b* each of which has a knob at the end as shown. Pawl member **110***a* is pivoted on a pivot **114***a*. The pawl member **110***a* cooperates with the teeth of idler **92***a*. Each idler wheel has a similar cooperating pawl. Their function is to reduce or limit velocity of rotation during a step transfer movement and to thereby control the movement which in cooperation with the spring detents causes the digit wheels to stop in the correct positions without overrun. In operation, as wheel **92***a* rotates clockwise, a tooth pushes on arm **112***a* rotating pawl **110***a* counterclockwise. The end of arm **112***b* moves in between teeth so a tooth strikes its end with a tapping action which accurately stops and indexes the wheel in the correct position. The operation is similar in the opposite direction. Thus, a simplified device is provided to insure accuracy of the device and to prevent inaccuracy which might result from rapid dialing. The pawl or control member **110***a* cooperates directly with the idler or transfer wheel **92***a* although it could cooperate similarly with pins **104***a*. The member **110***a* provides for accurate transfer, that is, step movement from one digit wheel to the next of the correct number of degrees so that each digit wheel accurately shows the digit it should show.

FIGS. **4** and **6** illustrate the relationship as between the arcuate slots in the two sides of the case. Adjacent to each of the arcuate slots in the half **30** of the cover, there appears in a circle at the inside of the slot the numerals zero through nine which are opposite the holes **91** in the digit wheels which as should be pointed out are in both sides of the wheels, the slots being opposite each other in the opposite sides of the case. It will be observed, however, that the interruption in the slot on the one side is not directly opposite the interruption in the slot on the other side. It is 180° from it. It will be observed also that the windows in which the answer is read in the one side are not opposite the windows in which the answer is read in the other side of the case. However, it is to be noted that the pattern of arcuate slots and numbers which is observed on deposits side is exactly the same as the pattern which is observed on the deductions side. Furthermore, the operation to add is exactly the same as that to subtract, that is, the stylus is inserted in an arcuate slot to the appropriate number, and the digit wheel is dialed clockwise. The answer appears in the square windows; and as stated, it is additive on the deposit side and subtractive on the deduction side. It will be observed that dialing with the stylus on the two sides produces clockwise rotation on both (either) side of the digit wheels. The numbers of digits on opposite sides of the digit wheels, that is, both the numbers used for dialing and those which appear in the answer window are reversed on the opposite sides, zero on one side being opposite five on the other side. This same relation applies between all numbers diametrically opposite each other.

From the foregoing, those skilled in the art will readily understand the nature of the construction of the invention and its operation and the manner in which it achieves and realizes all of the objects as set forth in the foregoing. An extremely small calculator is realized which also is very thin, adapting it to be carried in the manner described in the pocket. It is readily operable either to add or subtract merely by dialing with a stylus or ballpoint pen. The operation of adding is exactly the same as subtraction except that it is done on a different panel.

The unique construction of the gears enables the device to meet the required space limitations.

The foregoing disclosure is representative of a preferred form of the invention and is to be interpreted in an illustrative rather than a limiting since, the invention to be accorded the full scope of the claims appended hereto.

What is claimed is:

1. In a calculator of the type having a series of digit wheels, transfer means between the digit wheels whereby a complete revolution of a digit wheel transfers a step movement to a subsequent digit wheel, means whereby an individual digit wheel can be engaged for rotating it an angular amount corresponding to an individual digit, the improvement comprising means whereby digital inputs may be made to individual digit wheels from opposite sides of the wheels, said wheels being free to rotate in both directions at all times, clockwise manual actuations from opposite sides rotating a wheel in opposite directions for addition and subtraction

openings being provided for access to the digit wheels from both sides, there being numerals positioned adjacent the openings to identify inputs, the numerals being arranged to appear in the same position and order on both sides.

2. A device in claim **1**, wherein the digit wheels have numerals thereon to provide a readout, the numerals being on both sides of the digit wheels to allow readout on both the addition and subtraction sides.

3. A device as in claim **2**, wherein the numerals on the digit wheels are in reverse order on the opposite sides of the wheels and the numerals on one side are 180° out of phase with the numerals on the other side.

4. A device as in claim **1**, wherein said openings are arcuate and are relatively inverted on opposite sides to appear alike when entering inputs from either side.

5. In a calculator of the type having a series of digit wheels and transfer means between digit wheels whereby a full revolution of a digit wheel transfers an incremental step to subsequent digit wheel means comprising idler transfer wheels in the form of toothed

wheels, each of which constantly meshes with a toothed digit wheel each digit wheel having means for driving an idler transfer wheel whereby to impart to another digit wheel an incremental step at each revolution of the said digit wheel;

said toothed digit wheels having hubs, the teeth being axially displaced relatively to the hubs, the toothed idler wheels also having teeth axially displaced relative to the hubs, all digit wheels and idler wheels lying in a place with alternate digit wheels inverted relative to each other, whereby the teeth of alternate digit wheels mesh with the adjacent idler wheel whereas the other digit wheels do not have teeth meshing with idler wheels.

6. A device as in claim 5, wherein the idler transfer wheels are constructed to have teeth meshing with the teeth of a toothed digit wheel driven thereby and the teeth on the idler transfer wheel and the teeth on its driving digit wheel being so related as to not intermesh.

7. A device as in claim 5, wherein the transfer means comprises a single tooth on each digit wheel, which drives an idler wheel.

8. A device as in claim 5, wherein the wheels have equally angularly spaced projections, a control member cooperable with projections of each of certain wheels, the said member having two end parts positioned to engage spaced parts of the same wheel, one end part positioned to ride over a tooth while the other end part moves between teeth whereby to constrain the wheel to accurate step movements without overrun.

9. A device as in claim 8, wherein said control member is a pivoted bell crank lever.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,706,875 W. Kasner Dated December 19, 1972

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 7, line 10, change "place" to --plane--.

Signed and sealed this 25th day of December 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

UNITED STATES PATENT OFFICE
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