June 25, 1957 O. LEHRE 2,797,047

CALCULATOR

Filed April 30, 1954 2 Sheets-Sheet 1

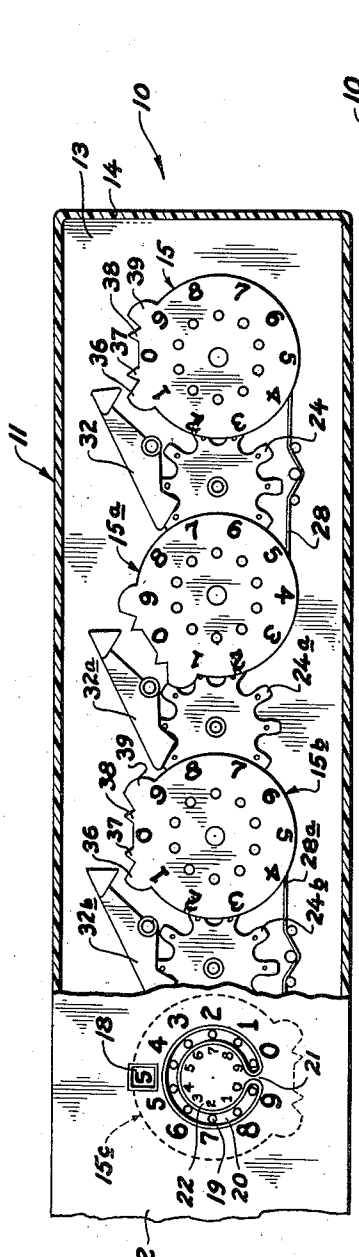

Fig. 1.

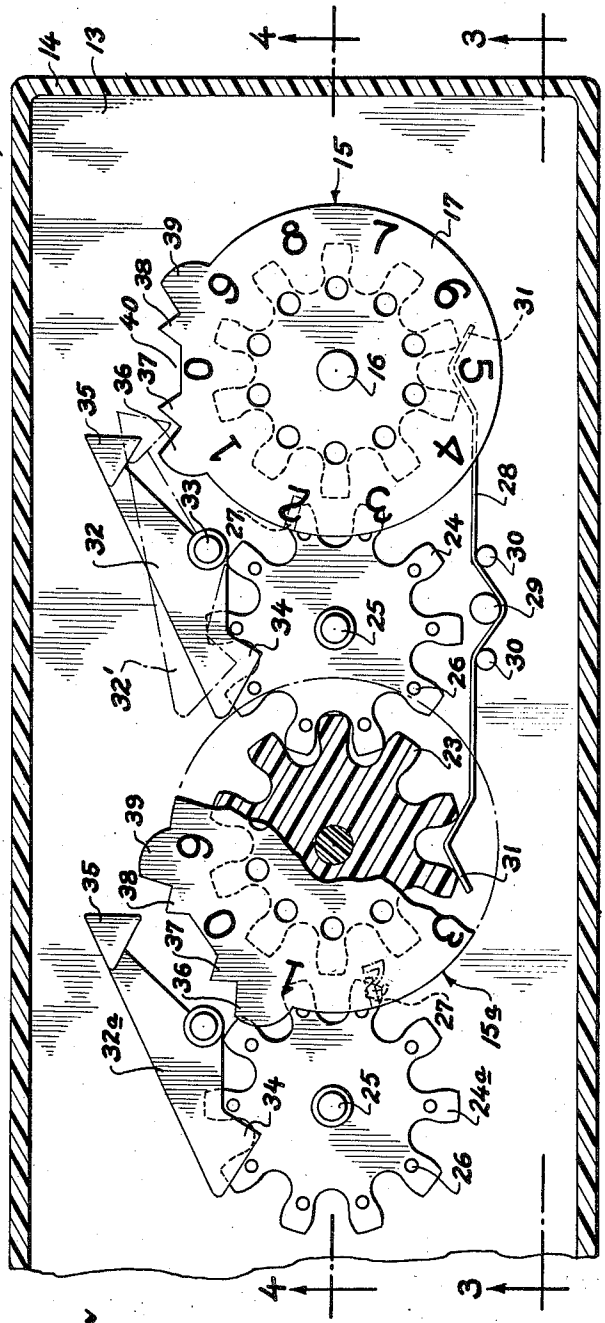

Fig. 2.

INVENTOR.
OTTO LEHRE
BY Pollard, Johnston, Smythe & Robertson
ATTORNEYS.

June 25, 1957 O. LEHRE 2,797,047

CALCULATOR

Filed April 30, 1954 2 Sheets-Sheet 2

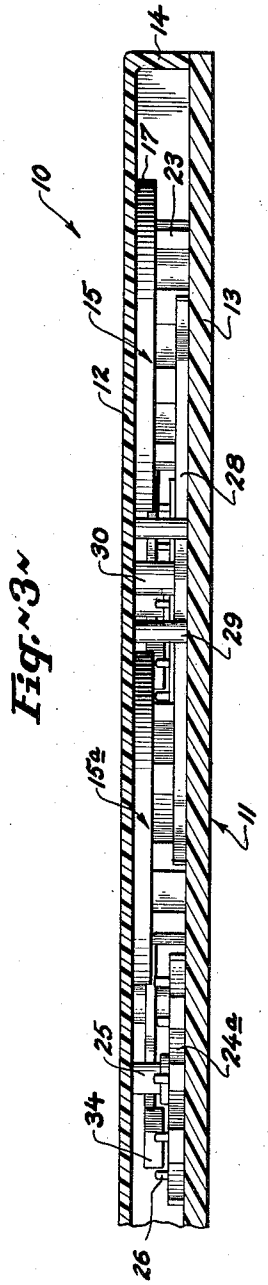

Fig. 3

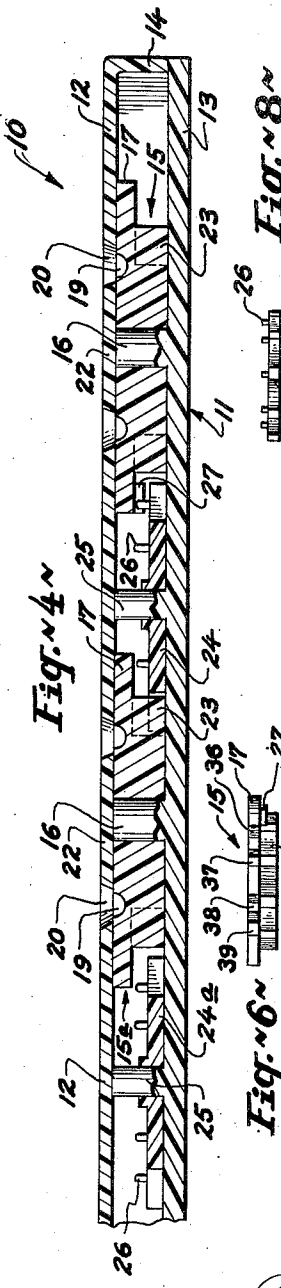

Fig. 4

Fig. 8

Fig. 7

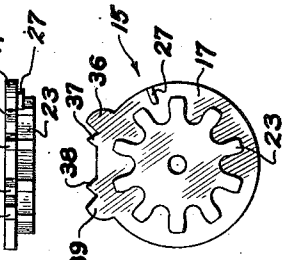

Fig. 6

Fig. 5

INVENTOR.
OTTO LEHRE
BY Pollard, Johnston, Smythe & Robertson
ATTORNEYS.

United States Patent Office

2,797,047

Patented June 25, 1957

2,797,047

CALCULATOR

Otto Lehre, Springfield, N. J., assignor to Sterling Plastics Co., Union, N. J., a corporation of New Jersey

Application April 30, 1954, Serial No. 426,807

6 Claims. (Cl. 235—74)

The present invention relates to improvements in calculators, particularly of the type having dials which are manipulated to introduce the problem into the calculator and then indicate the result of the calculation.

It is an object of the invention to provide a calculator of the described character made up of a relatively small number of parts which are easily assembled together to form a simple and compact structure capable of accurate addition and subtraction.

Another object is to provide a calculator of the described character capable of performing calculations involving a plurality of digits, and wherein identical and cooperating assemblies of parts are included for each of the digits, with such parts being simple in configuration as to be susceptible of manufacture from molded, or otherwise formed, plastic resin, thereby to make feasible the inexpensive, mass production of the calculator.

Still another object is to provide a calculator of the described character having means embodied therein to prevent over-running or incorrect indexing of the successive dials during accumulative angular displacement of the dials in response to rotation of the preceding dial.

A further object is to provide a calculator of the described character which is so simple and compact in construction as to make possible the mounting thereof in the cover of a box, for example, for pencils and the like.

In accordance with the present invention, the possibility of inexpensively manufacturing and assembling the various parts of the calculator is realized by providing an elongated, relatively flat casing including a top having suitable openings through which the dials can be manipulated and the totals viewed and a bottom having projections extending perpendicular thereto and on which all parts of the calculator, other than the casing, are mounted from above, thereby facilitating the formation of the casing from molded, or otherwise formed, plastic resin and the assembly of the parts on said projections of the bottom prior to closing of the casing by the top thereof.

A calculator according to this invention includes a plurality of independently rotatable dials, each corresponding to a digit in the numerical result of a calculation, which are mounted in a common plane with accumulating means co-acting between adjacent dials to effect accumulative angular displacement of one of the adjacent dials in response to rotation of the other. The accumulating means include a transmission gear rotatably mounted between the axes of any two adjacent dials, at least one of which has a gear mounted thereon and in mesh with said transmission gear so that the one dial and the transmission gear rotate together. The transmission gear carries a circularly arranged series of spaced indexing elements which project into the path of rotation of a driving abutment on the other of the adjacent dials, so that the abutment engages one of the indexing elements to angularly displace the transmission gear and

said one dial upon each complete revolution of said other dial. Thus the successive dials of the series may accumulate digits in orders of units, tens, hundreds, etc. and digits of any order may be added or subtracted and properly accumulated by the rotation of the corresponding dial.

In order to assure the proper degree of angular displacement of one dial in response to rotation of another, control means are provided which include a rockably mounted retainer or pawl having one end formed to engage between adjacent indexing elements on the transmission gear and another end that coacts with a projection or projections on said other dial of any two adjacent dials. The projection or projections have a fixed angular relation to the abutment on the same dial, and the several parts are so related that each action of the abutment to displace the coacting transmission gear is accompanied by a rocking of the pawl out of the path of the indexing elements on that gear yet is followed by positive movement of the pawl into an active position in which it blocks further angular displacement of the transmission gear.

Another feature of the invention resides in the provision of a single spring means cooperating with the dials in two adjacent digit assemblies of a calculator of the kind described above and preventing inadvertent rotation of said dials from registering positions.

The foregoing, and other objects, features and advantages of the invention, will be apparent in the following detailed description of an illustrative embodiment presented by way of example and to be read in connection with the accompanying drawings forming a part hereof, and wherein:

Fig. 1 is a top plan view of a calculator embodying the present invention, with a portion of the casing thereof being removed to show the internal mechanism;

Fig. 2 is a fragmentary, enlarged view of a portion of Fig. 1 with one of the dials included in the mechanism being partly broken away and in section to illustrate the cooperation thereof with other parts of the mechanism and with a pawl included in the mechanism being shown in broken lines in its released position;

Fig. 3 is a longitudinal, sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a longitudinal, sectional view taken along the line 4—4 of Fig. 2;

Fig. 5 is a bottom plan view of one of the dials included in the calculator embodying the invention;

Fig. 6 is a side elevational view of the dial of Fig. 5;

Fig. 7 is a bottom plan view of a transmission gear included in the illustrated embodiment of the invention; and

Fig. 8 is a side elevational view of the transmission gear of Fig. 7.

Referring to the drawings in detail, and initially to Figs. 1 to 4, inclusive, a calculator embodying the present invention is there illustrated and generally identified by the reference numeral 10. Calculator 10 includes a hollow, elongated and relatively flat casing 11 defined by a top wall 12, bottom wall 13 and side wall 14 maintaining the walls 12 and 13 in spaced apart relationship.

The calculator 10 illustrated in Fig. 1 is intended for the performance of calculations involving numbers of no more than four digits, but it is to be understood that calculators for more or less digits may be constructed in accordance with the invention. The calculator 10 includes a manipulating and indicating dial for each of the digits, and these dials are generally identified by the reference numerals 15, 15*a*, 15*b* and 15*c*, respectively.

The several dials are mounted in a row within casing **11** at locations which are spaced apart longitudinally for rotation about respective stub shafts **16** projecting from bottom wall **13**.

Each of the dials includes a substantially circular disc **17** (Figs. 2 and 5) having ten total figures, 0 to 9, printed, cut or otherwise formed on the upper surface thereof so as to be selectively visible through a related viewing opening or window **18** formed in upper wall **12** of the casing (Fig. 1). The upper surface of each disc **17** is also provided with a circularly arranged series of ten spaced apart pockets or recesses **19** which are preferably disposed radially inward with respect to the numerals 0 to 9 and which register with, and are accessible through, a related substantially circular slot **20** formed in top wall **12** of the casing. A neck or portion **21** extends radially across each slot **20** to support the central portion **22** of the top wall encircled by slot **20** and also to serve as a stop for an operating stylus or pencil inserted in a selected one of the pockets **19** for effecting rotation of the dial. The neck or stop **21** preferably is as wide as the distance between the successive pockets **19**, and the numerals 0 to 9 on the upper surface of disc **17** are circumferentially disposed relative to pockets **19** so that a selected one of the numerals will register with the opening **18** when a stylus or pencil engaged in a related one of pockets **19** comes into contact with one side or the other of stop **21**.

Addition and subtraction numerals 0 to 9 are printed, cut or otherwise formed on the upper surface of top wall **12** along each of the circular slots **20**. The addition numerals are placed consecutively anti-clockwise along the outer edge of the related slot **20** and starting from the stop **21**; while the subtraction numerals are placed consecutively clockwise on the top wall portion **22** along the inner edge of the related slot **20** and also starting from the stop **21**.

In order to provide for the accumulative angular displacement of each of the dials **15***a*, **15***b* and **15***c* in response to the rotation of the preceding dials **15**, **15***a* and **15***b*, respectively, each of the dials includes a spur gear **23** (Figs. 2, 5 and 6) disposed below disc **17** and preferably formed integral with the latter. Transmission gears **24**, **24***a* and **24***b* are disposed between the successive spaced apart dials and are rotatably mounted on suitable stub shafts **25** projecting from bottom wall **13** of the casing. The several transmission gears are arranged so that gear **24** meshes with gear **23** of dial **15***a*, gear **24***a* meshes with gear **23** of dial **15***b* and gear **24***b* meshes with gear **23** of dial **15***c*. While the teeth of gears **24**, **24***a* and **24***b* pass under the discs **17** of dials **15**, **15***a* and **15***b*, respectively, it is to be noted that the above enumerated transmission gears do not mesh with the gears **23** of the dials disposed to the right thereof, as viewed in Figs. 1, 2, 3 and 4 of the drawings.

Each of dial gears **23** and transmission gears **24**, **24***a* and **24***b* (Figs. 2, 5 and 7) preferably has ten teeth, and the several dials and transmission gears carry cooperating members effective to produce the angular displacement of the transmission gear and of the dial driven thereby through one-tenth of a revolution, that is, through an angle of 36 degrees, in response to the rotation of the dial disposed to the right, as viewed in the drawings, through a complete revolution. Thus, the rotation of dial **15** through a complete revolution is effective to produce a 36 degree displacement of the dial **15***a*; rotation of dial **15***a* through a complete revolution is effective to produce a 36 degree angular displacement of dial **15***b*; and rotation of **15***b* through a complete revolution is effective to produce a 36 degree angular displacement of dial **15***c*. In order to produce such accumulative angular displacement of the dials in response to rotation of the preceding dials, each of the transmission gears **24**, **24***a* and **24***b* is formed with a circularly arranged series of pins **26** projecting upwardly therefrom in radial alignment with the

teeth, and a driving abutment **27** depends from disc **17** of each of the dials to engage the pins **26** of the transmission gear disposed to the left of the related dial, as viewed in Figs. 1, 2, 3 and 4 of the drawings. Thus, the driving abutment **27** of dial **15** is engageable with pins **26** of transmission gear **24**, the driving abutment of dial **15***a* is engageable with pins **26** of transmission gear **24***a*, and the driving abutment of dial **15***b* is engageable with pins **26** of transmission gear **24***b*. Preferably, as shown in Fig. 2, the pins **26** are disposed adjacent the bases of the teeth of the related transmission gear, while the driving abutment **27** terminates, at its inner end, at the addendum circle of the gear **23** of the related dial so as to avoid contact with the pins **26** of the transmission gear meshing with the gear **23** of the related dial.

In order to yieldably hold the several dials against inadvertent angular displacement from positions wherein selected ones of the numerals on the top surfaces of the related discs **17** are exposed at the openings **18** in top wall **12**, spring detents **28** and **28***a* are mounted within casing **11** and are engageable with gears **23** of the dials. In the illustrated embodiment of the invention, spring detent **28** cooperates with gears **23** of the dials **15** and **15***a* while spring detent **28***a* cooperates with the gears **23** of dials **15***b* and **15***c*. As seen in Fig. 2, each of spring detents **28** and **28***a* includes an elongated strip of spring metal interlaced between a central post **29** and two lateral posts **30** spaced from the central post, said posts extending from bottom **13** of the casing to support the spring detent, while the opposite ends of the spring detents are provided with bent noses **31** engageable between the successive teeth of the adjacent gears **23** and urged radially inward by the resilience of the detent toward the centers of rotation of the gears. Thus, at any time, the detents **28** and **28***a* are effective to yieldably hold the related dials in angular positions wherein one of the numerals on the top surface of each of the dials will be completely exposed at the related opening **18**.

In accordance with the present invention, control means are associated with each of transmission gears **24**, **24***a* and **24***b* to ensure that contact between the driving abutment or accumulating finger **27** of the adjacent dial with a pin **26** of the related transmission gear produces an angular displacement of the latter of only 36 degrees or one-tenth of a revolution. In the illustrated embodiment of the invention, such control of the step-by-step rotation of the transmission gears is effected by rockable retainers or pawls **32**, **32***a* and **32***b* which are respectively associated with the transmission gears **24**, **24***a* and **24***b*. Each of the pawls is rockably mounted, intermediate its ends, on a stub shaft **33** projecting upwardly from bottom wall **13** of the casing. At one end, each pawl is provided with a nose **34** having converging or inclined side edges and adapted to engage between successive pins **26** on the related transmission gear. Pawls **32**, **32***a* and **32***b* are respectively actuated by dials **15**, **15***a* and **15***b*, and such actuation is achieved by a follower portion **35**, at the end of each pawl remote from nose **34**, engageable by projections **36**, **37**, **38** and **39** extending from the periphery of the dial to the right, as viewed in the drawings, of the related transmission gear. As seen in Fig. 2, cam-like projections **36** and **37** are adjacent to each other and projections **38** and **39** are also adjacent to each other but spaced circumferentially from the projections **36** and **37** thereby to provide a recess **40** between the projections **37** and **38**. The projections **36** and **37** are operative to actuate the related pawl **32**, **32***a* or **32***b* during rotation of the related dial in the direction for addition, that is, during clockwise rotation of the dial, while the projections **38** and **39** actuate the related pawl during rotation of the dial in the direction for subtraction, that is, during counter-clockwise rotation. The projections **36**, **37**, **38** and **39** are arranged on the periphery of the dial so that during engagement between the abutment **27** and one of the pins **26** of an adjacent

transmission gear, radially opening recess **40** is registered with follower portion **35** of the related pawl, to permit movement of the follower portion radially inward toward the axis of rotation of the dial and corresponding radially outward movement of the nose **34** away from the axis of rotation of the transmission gear.

Normally, pawls **32**, **32***a* and **32***b* are disposed as shown in Figs. 1 and 2, with the noses **34** thereof positioned between two successive pins **26** on the related transmission gear thereby to position the latter and the dial having the gear **23** with which the transmission gear is in mesh. However, when the transmission gear is angularly displaced by contact of the driving abutment **27** of the dial to the right thereof, as viewed in Figs. 1 and 2, one or the other of the pins **26** between which nose **34** engages rides against the confronting inclined side edge of nose **34** and rocks the pawl in the clockwise direction to the position shown in broken lines on Fig. 2 and there identified by the reference numeral **32'**. Thus, nose **34** of the pawl is displaced radially out of the path of travel of the pins **26** to permit angular displacement of the transmission gear, and during such angular displacement of the transmission gear, follower portion **35** of the pawl engages in the outwardly opening recess **40** at the periphery of the dial. As soon as the transmission gear has been angularly displaced to an extent sufficient to bring the pin **26**, mentioned above as riding against the inclined side edge, past the apex of nose **34**, one or the other of the cam-like projections **37** or **38**, depending upon the direction or rotation of the dial, strikes against follower portion **35** to displace the latter radially outward with respect to the axis of rotation of the dial and thereby rocks the associated pawl in the counter-clockwise direction, as viewed in Fig. 2, to at least partially introduce nose **34** of the pawl between the next successive pins **26** on the transmission gear for preventing over-running or jumping of the latter. Further rotation of the dial brings either the projection **36** or the projection **39**, depending upon the direction of rotation of the dial, into engagement with the follower portion **35** of the related pawl. Since the projections **36** and **39** extend radially outward further than the projections **37** and **38**, engagement of the projection **36** or the projection **39** with the follower portion **35** produces additional counter-clockwise rocking of the pawl thereby to complete movement of the nose **34** radially inward toward the axis of rotation of the related transmission gear to its normal position wherein the converging side edges of nose **34** engage the pins **26** at the opposite sides of the nose to again positively position the associated transmission gear and the dial with which the latter is in mesh.

From the foregoing, it is apparent that each of transmission gears **24**, **24***a* and **24***b* can be displaced through only one tenth of a revolution for each complete revolution of the dial disposed to the right thereof, as viewed in the drawings, thereby to prevent jumping of inaccurate indexing of the driven dials, that is, excessive angular displacement of the latter and resultant inaccuracies in the total, when the manipulated dial is quickly rotated to provide a substantial impact between its driving abutment **27** and the pins of the adjacent transmission gear.

In operating the above described calculator, dials **15**, **15***a*, **15***b* and **15***c* are manipulated, by engaging a stylus or pencil in pockets **19** exposed at the circular slots **20**, until the numeral 0 on each of the dials is exposed at the related opening **18** of top wall **12** of the casing. In effecting the addition of two numbers, for example, the numbers 789 and 252, a pencil or stylus is engaged in the pocket **19** of dial **15***b* registering with the numeral 7 of the series appearing on top wall **12** along the outside of circular slot **20**, and dial **15***b* is rotated, in the clockwise direction, until the pencil or stylus strikes against stop **21**. Such rotation will expose the numeral 7 on dial **15***b* at the related opening or window **18**. The dials **15***a* and **15** are similarly manipulated to expose the numerals

8 and 9, respectively, at the related openings **18** of the top wall. Then, dial **15***b* is further manipulated, in the clockwise direction, by inserting the stylus or pencil in the pocket **19** thereof registered with the numeral **2** at the outside of the related circular slot and rotating the dial until the pencil or stylus again contacts stop **21**. Similarly, dials **15***a* and **15** are again manipulated, in the clockwise direction through angular displacements from the outside numerals 5 and 2 of their respective circular slots to the respective stops **21**, corresponding to the addition of 52 to the preceding total, whereupon the numbers exposed at the several windows **18** give the final total of 1041.

If, for example, it is then desired to subtract 333 from the above total of 1041, a pencil or stylus is engaged in the pocket **19** of each of the dials **15***b*, **15***a* and **15** in radial registration with the numeral 3 of the series of numbers extending along the inside edge of the related circular slot **20**, and the several dials are then rotated in the counter-clockwise direction until the pencil or stylus comes into contact with stop **21**. Such counter-clockwise rotation of the dials **15***b*, **15***a* and **15** causes angular displacement of dial **15***c* to a position in which the numeral 0 thereon is exposed at the related opening **18**, while the numerals 7, 0 and 8 of the dials **15***b*, **15***a* and **15**, respectively, are exposed at the related openings or windows **18**. Thus, the described calculating device can be employed to obtain the solutions to problems of addition and subtraction wherein the result does not exceed 9,999. It is apparent that the solutions to problems having greater numerical results can be obtained merely by employing a calculating device having a suitably larger number of dials and associated accumulating mechanism arranged successively in the manner described above and illustrated in the drawings.

From the foregoing, it is apparent that a calculator embodying the present invention includes a casing, an indicating and manipulating dial for each digit of the numerals involved in a calculation, a detent spring **28** for each pair of dials in the assembly, transmission gears numbering one less than the number of dials in the assembly and a pawl for each of the transmission gears. Thus, the calculator is formed of a casing and assemblies of only four different kinds of parts, the casing and such parts, with the exception of the spring detents, being easily molded or otherwise formed of suitable plastic resin materials. Further, all of the above mentioned parts are assembled from above on the shafts or parts which are normal to the bottom wall of the casing and integral with the latter so as to facilitate the inexpensive molding of the casing and mass production of the calculator.

While a particular embodiment of the invention has been described in detail herein and illustrated in the accompanying drawings, it is to be understood that the invention is not limited to that precise embodiment and that various changes and modifications may be effected herein, by one skilled in the art, without departing from the scope or spirit of the invention as defined in the appended claims.

What is claimed is:

1. A calculator comprising a plurality of dials rotatably mounted in a row and each corresponding to a digit in the numerical result of a calculation, accumulating means co-acting between adjacent dials to effect accumulative angular displacement of one of the adjacent dials in response to rotation of the other, said accumulating means including a transmission gear rotatably mounted between said adjacent dials, at least one of said adjacent dials having a gear mounted thereon, said gear of only one of said dials being in mesh with said transmission gear, said transmission gear having a circularly arranged series of pins projecting therefrom, a driving abutment on said other dial following a circular path into which said pins project so that, upon each complete revolution of said

other dial, said abutment engages one of said pins to drive the latter out of said circular path thereby to angularly displace said transmission gear and said one dial, and control means acting on said transmission gear and actuated by said other dial to limit the angular displacement of said one dial during each complete revolution of said other dial, said control means including a rockably mounted pawl having a nose at one end engageable between two adjacent pins of said series of pins on the related transmission gear to rotationally position the latter, said nose having inclined side edges so that said nose can be moved radially out of the path of said pins by riding of the pins against said side edges when said transmission gear is angularly displaced through the action of said driving abutment on one of said pins, and cam-like projections on the periphery of said other dial engageable with said pawl to rock the latter in the direction again projecting said nose between two adjacent pins upon release of said driving abutment from said one pin, said cam-like projections including a first projection followed circumferentially by a second projection, said second projection being radially larger than said first projection so that contact of the latter with said pawl effects partial return of said nose to a position projecting between said pins thereby to prevent over-running of said transmission gear, while subsequent contact of said second projection with the pawl completes the return of said nose to its position between adjacent pins wherein the latter contact said inclined side edges of the nose to positively position said transmission gear and said one dial.

2. A calculator according to claim 1; wherein said cam-like projections include two circumferentially spaced apart sets of first and second projections with said first projection of one of said sets circumferentially preceding the second projection of said one set in one direction of rotation of said other related dial, while said first projection of the other of said sets circumferentially precedes the second projection of said other set in the other direction of rotation of said other related dial, whereby said pawl is operative to prevent over-running of the related transmission gear when said other related dial is rotated for effecting either addition or subtraction.

3. A calculator comprising a plurality of independently rotatable dials mounted in a common plane on spaced parallel axes, accumulating means co-acting between adjacent dials to effect accumulative angular displacement of one of the adjacent dials in response to rotation of the other, said accumulating means including a toothed transmission gear rotatably mounted between the axes of said adjacent dials, at least one of said adjacent dials having a toothed gear mounted thereon, said toothed gear of only one of said dials being in mesh with said transmission gear, said transmission gear carrying a circular series of spaced indexing elements, a driving abutment on the other of said adjacent dials, said elements projecting into the path of rotation of said abutment so that upon each complete rotation of said other dial said abutment engages one of said elements to angularly displace said transmission gear and cause it to displace said one dial in the angular direction of the rotation of said other dial, and control means to limit the angular displacement, said control means including a rockably mounted pawl having a nose at one end engageable between any adjacent two of said elements, said nose having a cam surface engaged by an adjacent element upon rotation of said transmission gear to rock said pawl to an inactive position in which said nose is outside the path of said elements, a radial projection on said other dial, the other end of said pawl lying in the path of rotation of said projection when said pawl is in said inactive position, said projection being operative upon said other end to rock said pawl so as to return said nose to an active position between an adjacent two of said elements following each angular displacement of said transmission gear by said abutment, said one dial being rotatable independently of said pawl when said pawl is in its inactive position and said other dial being rotatable independently of said pawl when said pawl is in its active position.

4. A calculator comprising a plurality of independently rotatable dials mounted in a common plane on spaced parallel axes, said dials being rotatable in either direction, accumulating means co-acting between adjacent dials to effect accumulative angular displacement of one of the adjacent dials in response to rotation of the other, said accumulating means including a toothed transmission gear rotatably mounted between the axes of said adjacent dials, at least one of said adjacent dials having a toothed gear mounted thereon, said toothed gear of only one of said dials being in mesh with said transmission gear, said transmission gear having a circularly arranged series of spaced indexing elements thereon, a driving abutment on the other of said adjacent dials, said indexing elements projecting into the path of rotation of said abutment so that upon each complete rotation of said other dial said abutment engages one of said elements to angularly displace said transmission gear and cause it to displace said one dial in the angular direction of the rotation of said other dial, and control means to limit the angular displacement, said control means including a rockably mounted pawl having a nose at one end engageable between any adjacent two of said elements, said nose having cam surfaces at opposite sides thereof, one of said surfaces being engaged by an adjacent indexing element upon rotation of said transmission gear in either direction to rock said pawl to an inactive position in which said nose is outside the path of said pins, said other dial having a plurality of radial projections thereon and a recess between said projections to receive the other end of said pawl when said pawl is rocked to inactive position through a displacement of said transmission gear by said abutment, at least one of said projections being operative upon said other end to rock said pawl so as to return said nose to an active position between an adjacent two of said elements upon the rotation of said other dial in either direction beyond the point of action of said abutment, whereby digits may be added by rotating either of said adjacent dials in one direction and may be subtracted by rotating the same in the opposite direction.

5. In a calculator, two circular dials adapted to carry digits on one side and mounted in a common plane for independent rotation on spaced parallel axes, a gear on one of said dials, a rotary transmission gear meshing with said dial gear to rotate therewith, a circular series of spaced indexing elements on said transmission gear, the other of said dials carrying an abutment rotatable into the path of said elements to displace said elements and thus index said transmission gear and said one dial, a projection on said other dial in angularly spaced relation to said abutment, and a retainer rockably mounted for movement between an active position in which one of its ends lies between two adjacent indexing elements on said transmission gear and an inactive position in which said one end lies outside the path of elements on said transmission gear and the other end lies in the path of said projection, said retainer being moved to said inactive position by each indexing movement of said transmission gear and being returned to said active position by said projection upon each complete rotation of said other dial.

6. In a calculator, two circular dials adapted to carry digits on one side and mounted in a common plane for independent rotation on spaced parallel axes, a gear on the underside of one of said dials, a rotary transmission gear lying in the plane of and meshing with said dial gear to rotate therewith, a circular series of spaced pins projecting upwardly from said transmission gear, the other of said dials carrying on its underside an abutment rotatable into the path of said pins to displace said pins and thus index said transmission gear and said one dial, a radial projection on the periphery of said other dial in angularly spaced relation to said abutment, and a re-

tainer having cams at its opposite ends and rockably mounted for movement between an active position in which one of its ends lies between two of said pins and an inactive position in which said one end lies outside the path of said pins and said other end lies in the path of said projection, said retainer being moved to said inactive position by each indexing movement of said transmission gear and being returned to said active position by said projection upon each complete rotation of said other dial.

References Cited in the file of this patent

UNITED STATES PATENTS

176,426	Chesterman	Apr. 16, 1876
349,459	Shattuck et al.	Sept. 21, 1886
431,365	Lang	July 1, 1890
486,030	Claudin et al.	Nov. 8, 1892
491,537	Durant	Feb. 14, 1893
1,764,915	Vethe	June 17, 1930
2,533,443	Farbman	Dec. 12, 1950
2,541,463	Cummings	Feb. 13, 1951