Feb. 17, 1942. E. C. WALTER 2,273,237

REGISTER

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FIG. 3

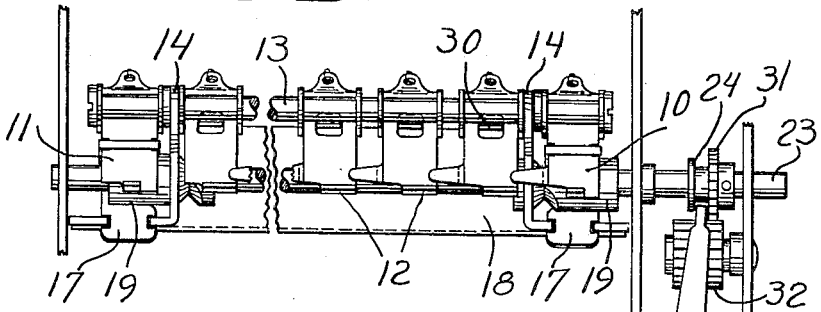

FIG. 2

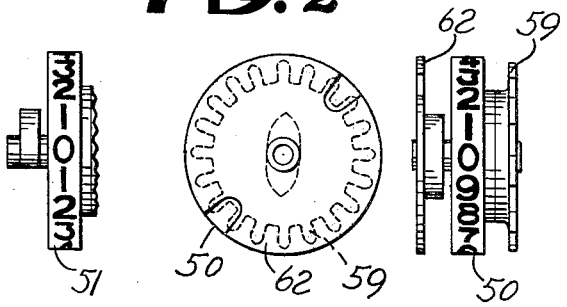

FIG. 1

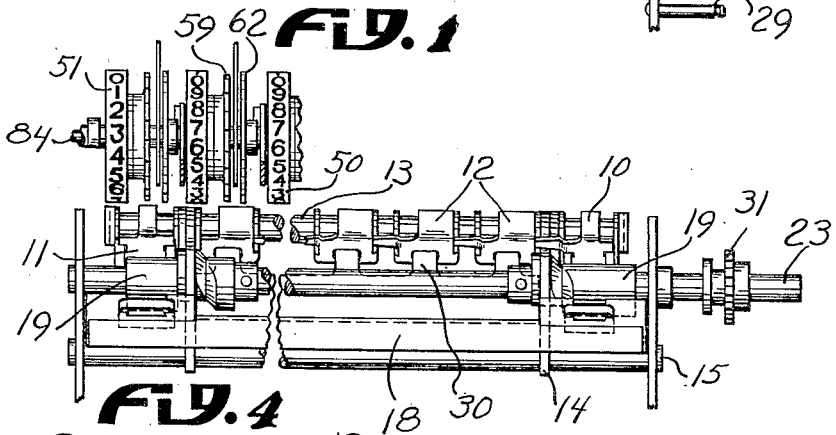

FIG. 4

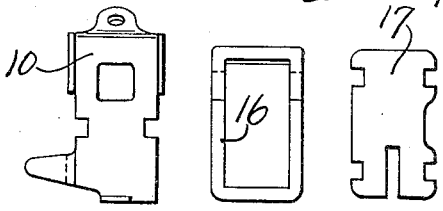

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FIG. 8

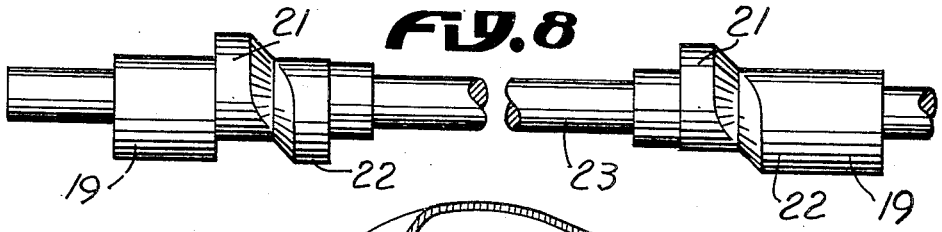

FIG. 5

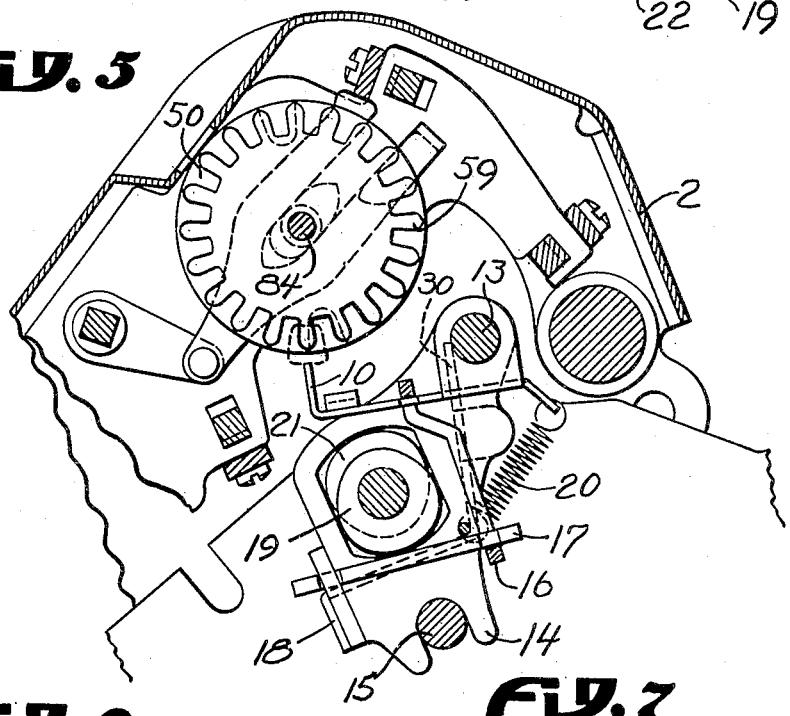

FIG. 6

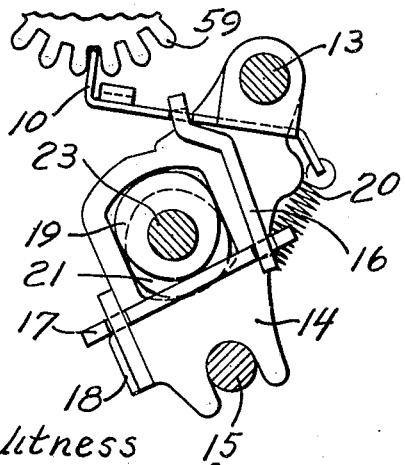

FIG. 7

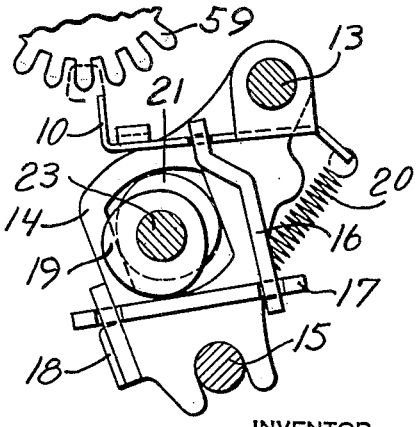

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FIG. 9

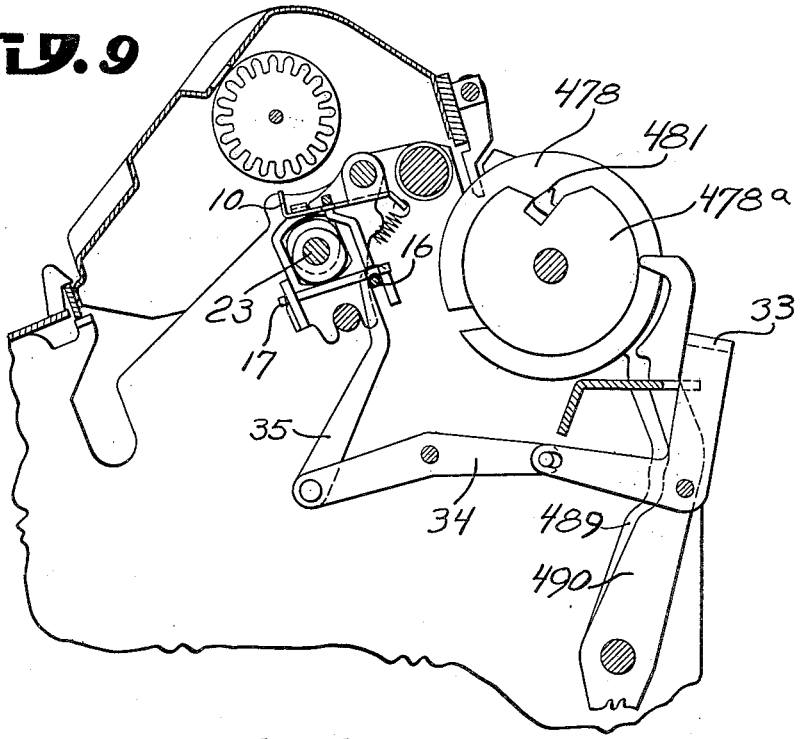
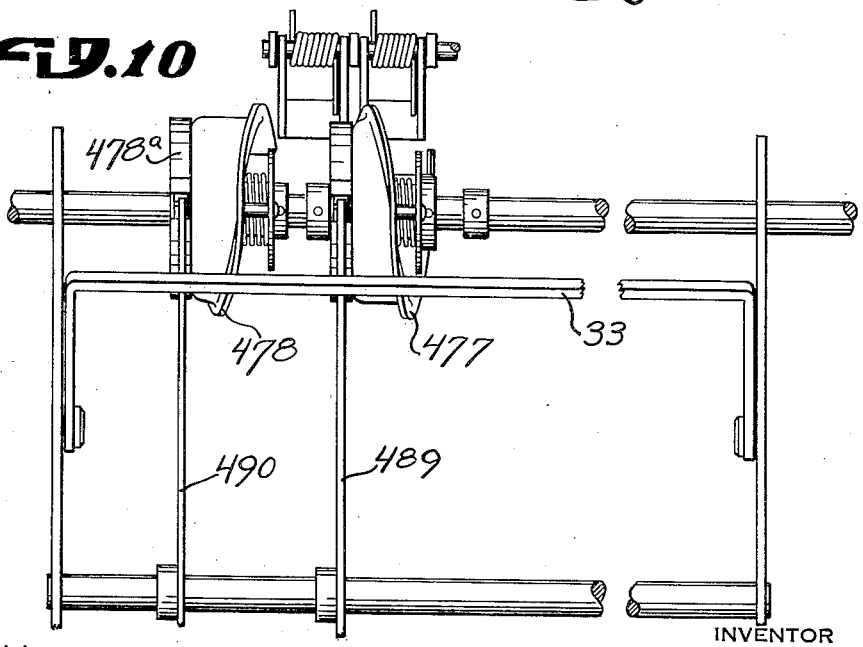


FIG. 10



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2,273,237

UNITED STATES PATENT OFFICE

2,273,237

REGISTER

Edward C. Walter, Orange, N. J., assignor to Monroe Calculating Machine Company, Orange, N. J., a corporation of Delaware

Application November 9, 1939, Serial No. 303,566

2 Claims. (Cl. 235—79)

The invention has relation to registers and more particularly to counting mechanism therefor, of the type commonly employed to count the cycles of operation of a calculating machine for the purpose of registering quotients, multipliers, etc.

The invention comprises the novel construction and combination of parts as set forth in the appended claims.

In the accompanying drawings, illustrating the invention,

Fig. 1 is a front elevation of parts of two sets of counting wheels, together with the associated operating devices, with parts broken away.

Fig. 2 shows detail side and front elevations of individual counting wheels.

Fig. 3 is a plan view of the counter operating and direction shifting mechanism, with parts broken away.

Fig. 4 is a detail plan view of the elements of a counting finger assembly.

Fig. 5 is an enlarged section taken immediately to the right of the right hand counting finger, showing the parts in full cycle position.

Fig. 6 is a detail view of certain parts shown in Fig. 5, in mid cycle position.

Fig. 7 is a similar view with the parts shown in five-sixths cycle position.

Fig. 8 is a detail plan view of the counter operating shaft.

Fig. 9 is a side elevation of mechanism operable to hold the counting fingers inoperative during carriage shifting.

Fig. 10 is a rear view of the same.

The invention is shown as applied to a calculating machine having multiplier and quotient counters of the type disclosed in U. S. Patent No. 1,504,741, issued to George C. Chase on August 12, 1924, and entitled "Counting wheel carry mechanism."

As shown in this patent, two series of counting whels **50**, **51** are provided, Figs. 1 and 2, the wheels **50** having series of fingers running progressively about the face of the wheel in a single direction. Patent No. 1,504,741 shows a counting wheel **50** with a single series of figures, while the present disclosure shows a wheel with two series of figures, the second series being a mere duplication of the first series and the wheels operating in the same manner as in the patent. The wheels **51** are provided with two reversely progressing series of figures running from 0 to 9 in either direction of rotation, the two series of figures being customarily distinguished by contrasting color, to indicate the number of cycles made in additive or in subtractive operation.

The numeral wheels **50** and **51** are mounted in a shiftable carriage **2**, in which carriage the product wheels of the calculating machine (not shown) are customarily mounted.

As shown, the operating mechanism for the counters is located in the stationary frame of the machine, immediately adjacent the counting wheels, and comprises a counting finger **10** for the wheels **50**, a counting finger **11** for the wheels **51** and a series of fingers **12** for carrying up the tens in the wheels **50**. These fingers are moved forwardly or reversely through the teeth of gears **59**, individual to the wheels **50** and **51**, by elements having driving connection with the cycling mechanism of the calculating mechanism (not shown) according to the well known arrangement.

In Patent No. 1,504,741 the counting wheels **50** are intended to show the true multiplier, whether this has been obtained by repeated addition or by the well known short cut method, the latter requiring the transfer of the tens between the numeral wheels. Wheels **50** will also show the complement of the quotient in division. The wheels **51** will show the true quotient, or the true multiplier in multiplication by repeated addition only. This is due to the fact that in this patent the direction of operation is always the same during additive calculations and is always reversed during subtractive calculations. According to the present disclosure, the usefulness of these counting mechanisms has been increased by providing a settable reversing mechanism whereby the wheels will be operated either like or unlike the sign of the calculating machine operation, this arrangement being used in the known Monroe calculating machine.

According to the present invention, an improved means for reversing the direction of the counter operation relative to the calculating machine operation is provided, and the parts have been modified to provide for simplicity of design and assembly.

The fingers **10**, **11** and **12** are mounted on a rod **13**, this rod forming, together with the end plates **14**, **14**, and plate **18**, a frame pivotally movable about the rod **15**, secured in the stationary framing of the machine.

Fingers 10 and 11 are connected each by link **16** with a plate **17**, pivotally supported upon a projection of the related plate **14** of the pivoted frame, each plate **17** being held in contact with a cam **19** by means of a spring **20**. Cams **19**, **19**

are so designed that in full cycle position of the parts the fingers 10 and 11 are held downwardly against the tension of springs 20, out of contact with the gears 59, and will be allowed to rise into full meshing position with the gear teeth in mid cycle position of the parts. The fingers 12 (except as restrained from engagement with gears 59, as described hereinafter) will partake of the same movements as fingers 10 and 11, being provided with springs 20 and with overlapping portions whereby downward movement of finger 10 will pull the fingers 12 downward therewith.

The frame 13, 14, 18 is given an oscillatory movement about the supporting rod 15 which, in connection with the oscillatory movement of the fingers 10, 11 and 12 about the rod 13, will give the free ends of the fingers an approximately rectangular path of movement. That is to say, the fingers will be engaged with the teeth of the respective gears 59; moved to advance the gears a single tooth space; disengaged and returned to normal position.

The frame is oscillated by means of cams, 21, 21 or 22, 22 mounted upon the shaft 23 which carries the cams 19. Assuming that shaft 23 rotates counter-clockwise as seen in Figs. 5, 6 and 7 during additive calculation of the machine, the cams 21 will be normal registration cams. The numerals of the counting wheel 50 will be brought progressively beneath the sight opening of the carriage 2 when addition is performed, while during subtraction, shaft 23 will be rotated in a clockwise direction, and the numerals of wheels 50 will appear at the sight opening in retrogressive order. For this purpose, the cams 21 will engage the walls of elongated perforations of the plates 14.

The cams 19, 21, 22 are generated from three points of an equilateral triangle, the curved surfaces of the cams blending into one another to give a smooth, approximately rectangular movement of the tips of the counting fingers, as indicated in dotted lines, Figs. 5 and 7. Thus, starting rotation of the cam shaft 23 from normal position, the first sixty degrees of movement will rock the frame and thereby the fingers, by the action of cam 21 or 22, but the fingers will not begin to rise before about thirty degrees of rotation. During the next sixty degrees of rotation the frame will not move but the fingers will rise and enter between the teeth of the gears. During the next one hundred and twenty degrees of movement the frame and fingers will rock in the opposite direction, thus moving the gears a tooth space. During the last thirty degrees of this rocking movement the fingers will be partly withdrawn from the gear teeth but will remain between the teeth at the end of the advancing movement so that any momentum of the dials and gears caused by rapid operation will be stopped by the fingers. During the next sixty degrees of rotation the frame will remain stationary while the fingers are further withdrawn; while during the final sixty degrees of movement the frame is rocked back to normal position, the fingers being fully withdrawn during the first thirty degrees of this rocking movement.

In order to set the counting mechanism for reverse operation, shaft 23 is shifted axially, disengaging the cams 21 from the plates 14 and bringing the opposed cams 22 into engagement therewith. To insure a smooth shifting action of the shaft and to permit the shift to be effected while the machine is cycling, the adjacent edges of the cams 21, 22 are beveled, as best seen in Fig. 8, and each pair of cams 21, 22 are made as a unit or mounted as a unit upon shaft 23. If desired, shaft 23 could be held optionally in mid shifted position, whereupon no advance of the wheels 50 and 51 would occur.

Fig. 3 shows a mechanism for setting the shaft into one or the other axially adjusted position, comprising a sleeve 24, fast to the shaft, an intermediately fulcrumed lever 25 engaging said sleeve and provided with cam faces engaged by a pin 26 mounted in a crank extension of a shaft 27 extending up through the framing of the machine and provided with a crank handle 28. Pin 26 is held in either of two adjusted positions by means of a spring 29 and acts, through the cam faces of lever 25, to hold the parts in either extreme adjusted position. Obviously, any other convenient means may be employed for locating shaft 23 in adjusted position.

Shaft 23 is driven by means of a pinion 31, fast upon said shaft, and engaging a wide gear 32 in any shifted position of the shaft, gear 32 being in driving connection with the cyclically driven parts of the calculating machine.

The cams 21 and 22, being oppositely arranged about the shaft 23, will obviously act upon the plate 14 in opposite directions during any given portion of the cycle, thereby engaging the fingers 10, 11 and 12 either forwardly or rearwardly of the gear tooth to be operated upon, and will move the fingers in opposite directions when said fingers are in position of engagement with the gears 59.

The parts 12, 16 and 17 are designed for ready assembly in the machine and for the avoidance of close adjustments and small tolerances. The fingers 12 are located along the rod 13 by means of tooth extensions 30 of the plate 18, engaging perforations of the fingers.

The links 16 are of endless or loop formation, and are designed to engage notches of the fingers 10 and 11 and of the plates 17, the parts being moved to bring the link and the notches into registering position and then given a quarter turn to set the link in the notches. The plates 17 are provided with a second set of notches to engage within notches of the projections of plates 14, into engagement with which they are slipped and held by the spring action of the fingers and the fulcrum provided by the cams 19.

The tens transfer fingers 12 operate in the same manner as the corresponding parts disclosed in Patent No. 1,504,741, hereinbefore referred to. The engaging ends of the fingers are of sufficient breadth to engage the gear 59 of a higher order wheel and also a notched disk 62 of the lower order wheel. Disk 62 is designed to hold the counting finger away from the teeth of the gear 59 until the lower order wheel 50 moves into zero registering position, thereby rotating the attached plate 62 into position within a notch of the plate will lie opposite the finger 12, allowing the finger to engage gear 59 of the higher order wheel and to advance the wheel during the rotation of shaft 23.

It may be desirable to allow the machine to cycle and at the same time to prevent entry of the counting fingers into the numeral wheel gears. For instance, the counting mechanism might be used in a calculating machine such as that disclosed in U. S. Patent No. 1,811,607, issued to Edwin F. Britten, Jr., on June 23, 1931, this patent showing an arrangement whereby the numeral wheel carriage might be shifted without

interruption of the cycling of the differential actuators of the machine. This method of operation is known, being employed in the "Madas" calculating machine. Means for holding the fingers inactive during cycling are therefor shown in Figs. 9 and 10, as applied to a carriage shifting mechanism such as that disclosed in U. S. Patent No. 2,096,465 issued to A. A. Overbury on October 19, 1937.

The shifting mechanism is adapted to move the carriage selectively toward the right or toward the left, for which purpose two oppositely disposed worms **477**, **478** engage between spaced elements secured to the numeral wheel carriage and acting as a rack or comb. Each worm is fast with the driven element of a clutch **478***a*, which is engaged with the driving element of the clutch upon rearward movement of a detent **489** or **490**, respectively, this movement serving to release a spring actuated clutch pawl **481** and allow it to drop into engagement with the driving element of the clutch.

The counting finger disabling means comprises a bail **33** extending in rear of the detents **489**, **490**, the supporting arms of said bails being extended forwardly and provided each with pin and slot connection with a lever **34**. The levers **34** are each provided with a link **35** having an upper hook end extending over the lower bar of link **16** (of the fingers **10** and **11**) but normally occupying a raised position, which will allow the link to move freely during the operation of the cams.

However, upon displacement of a detent **489** or **490**, bail **33** will be rocked, and will be held in rocked position during the carriage shifting operation by engagement of the detent with the peripheral face of the clutch drum **478***a*. In this position of the parts, levers **34** will be rocked, and links **35** will be pulled downward, holding the links **16** retracted. It will be noted that the plates **17** are notched, as seen in Fig. 4, to allow the links **35** to engage links **16**. The counting finger **10** being held retracted, it will be obvious that the tens transfer fingers **12** will also be held because of the overlapping portions thereof, while the counting finger **11** will be held inactive by the left hand link **35**.

Obviously, the links **35** may be operated by other mechanism of the calculating machine, to hold the counting fingers inoperative, either during carriage shifting or during other operations.

A known type of clearing means for wheels **50** and **51** is shown in the drawings, but forms no part of the present invention.

I claim:

1. In a register having counting mechanism comprising a numeral wheel, a gear operatively connected therewith, a counting finger, a cyclically driven shaft, means for reversing the direction of rotation of said shaft, and a cam on said shaft operable to raise and lower said finger; two opposed radial action cams fast on said shaft, and means for moving said shaft axially to bring one or the other opposed cam into operative position, one of said opposed cams being operable to move the raised finger forwardly or alternatively rearwardly in accordance with the direction of rotation of the shaft and the other opposed cam being adapted to move the raised finger oppositely in either said direction of rotation, to advance said gear in one or in the other direction, respectively.

2. In a register having counting mechanism comprising a numeral wheel, a gear operatively connected therewith, a counting finger, and means for cyclically raising and lowering said finger; a cyclically operable cam unit comprising two opposed radial action cams having a common axis and a beveled guide face intersecting the peripheries of the cams, a cam follower operatively connected with the counting finger, and means for adjusting said cam unit axially whereby the guide face will displace the follower to bring one or the other opposed cam into operative relation with said follower, one of said opposed cams being operable through the follower to move the raised finger rearwardly and the other opposed cam being operable through the follower to move the raised finger forwardly, to advance said gear in one or in the other direction, respectively.

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