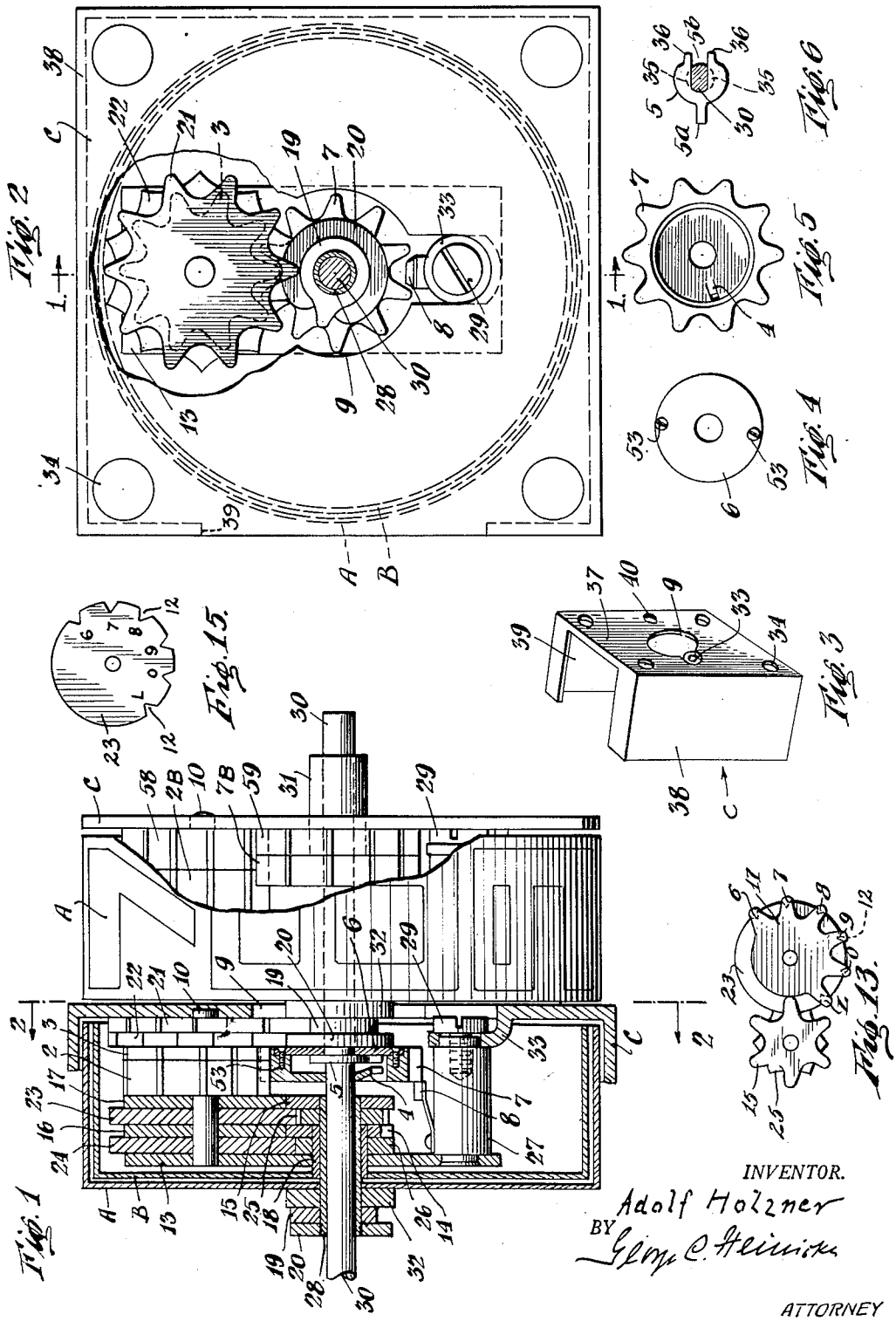
Feb. 6, 1951 A. HOLZNER 2,540,619

ZERO SETTING MECHANISM

Filed June 22, 1942 2 Sheets-Sheet 1



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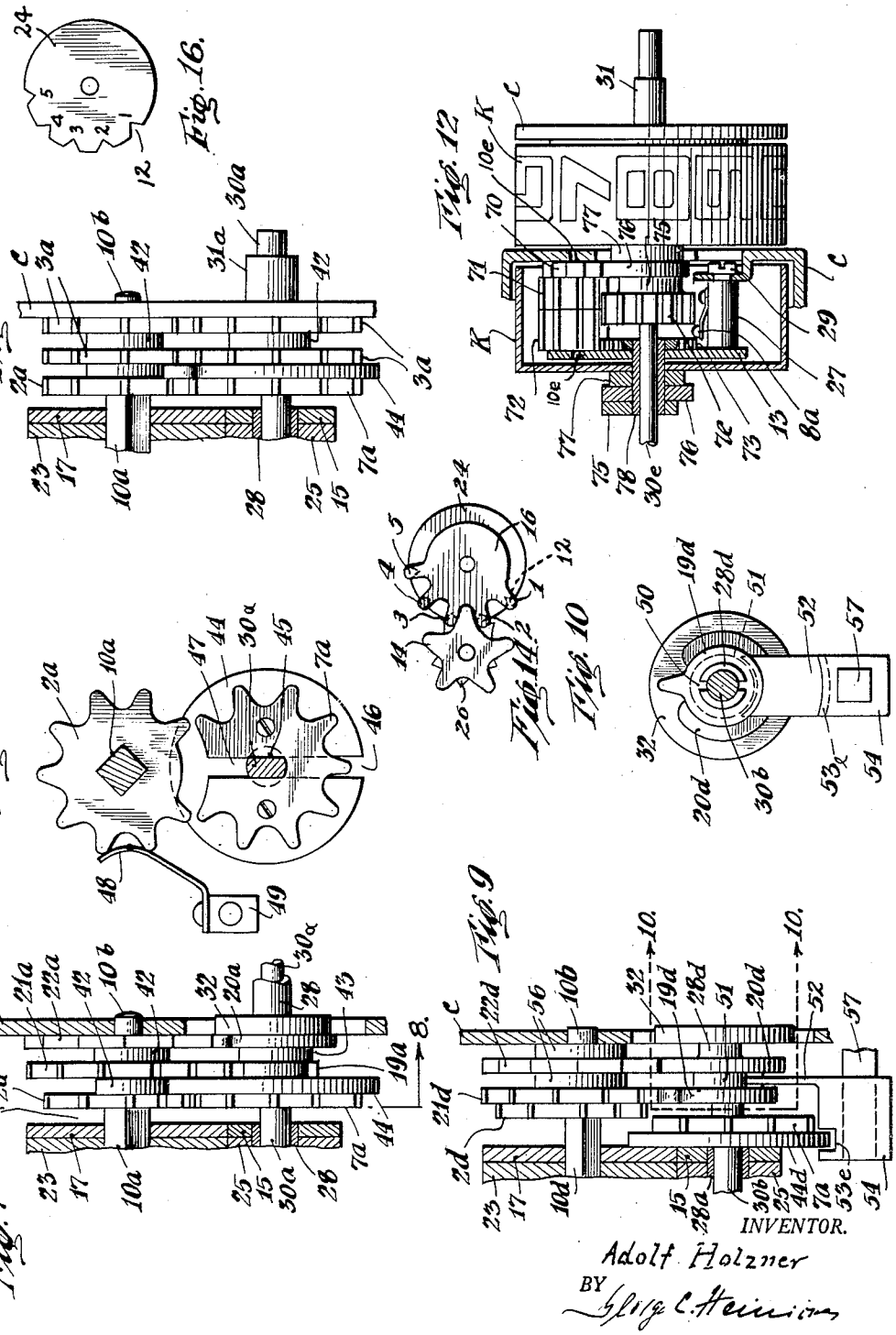

Patented Feb. 6, 1951 2,540,619

UNITED STATES PATENT OFFICE

2,540,619

ZERO-SETTING MECHANISM

Adolf Holzner, New York, N. Y.

Application June 22, 1942, Serial No. 447,898

16 Claims. (Cl. 235—144)

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The present invention relates to a zero setting mechanism for counters, and refers more particularly to counters of the type disclosed in my Patent No. 2,351,814 wherein the numerals 0 to 9 are distributed over a pair of nested number wheels, the numerals on each inside wheel being visible through an opening in its respective outside wheel. The mechanism may also be used however in conventional counters having the numerals 0 to 9 distributed around each wheel.

An object of the present invention is the provision of means for setting an adding and subtracting counter to zero in one revolution of the zero setting shaft in either direction.

A further object is the provision of zerosetting means in which the zerosetting shaft may continue to revolve after zerosetting without causing revolution of the number wheels.

In accomplishing the objects of the present invention, there is provided an indexing pick up disk construction comprising a gear coupling which is part of the transfer mechanism of the counter, and which uncouples from the transfer mechanism for zerosetting.

An alternative construction is provided, comprising gap gears arranged as in my previous patents, 2,097,065; 2,117,168 and 2,180,590, and in which a novel means is provided for uncoupling the transfer and Geneva locking mechanism of the counter.

Other objects of this invention will in part be obvious and in part hereinafter pointed out. The invention accordingly consists in the features of construction, combinations of elements and arrangements of parts which will be exemplified in the constructions hereinafter described. In the accompanying drawing, in which are shown four of the various possible illustrative embodiments of this invention:

Figure 1 is a fragmentary front elevation, partly in section along the line 1—1 of Figure 2 and partly broken away, of a counter embodying the present invention.

Figure 2 is a section on the line 2—2 of Figure 1.

Figure 3 is a perspective view of housing *c* of Figures 1 and 2.

Figure 4 is a plan view of retainer plate 6, Figure 1.

Figure 5 is a plan view of coupling gear 7, Figures 1 and 2.

Figure 6 is a plan view of indexing disk 5, Figure 1.

Figure 7 is a vertical sectional view, corresponding to Figure 1, of a zerosetting construction of the gap gear type.

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Figure 8 is a section on the line 8—8 of Figure 7.

Figure 9 is a vertical sectional view of another zerosetting construction of the gap gear type.

Figure 10 is a side elevation of the guide 54 and guided parts in section of shaft 30*b* on line 10—10 of Figure 9.

Figure 11 is a view of a first or lowest order number wheel set for use with the construction of Figure 7.

Figure 12 is a view similar to Figure 1 and showing the invention applied to a counter with conventional 0 to 9 number wheels.

Figures 13 and 14 are front elevations of members illustrated in Figure 1 and looking leftward thereof.

Figures 15 and 16 are front elevations of locking discs 23, 24 of Figures 1, 13 and 14.

Referring now in detail to the drawings, in Figure 3 is illustrated the rectangular housing *c* comprising integrally the plate 37 and peripheral flange 38, the latter relieved on one side by the opening 39 through which may be viewed the indicia of the number wheels A, B. An inwardly offset portion 33 of plate 37 constitutes a mounting for a stud 27 fastened thereto by screw 29. Plate 37 further is relieved by a substantially central hole 9 and by holes 34 adjacent its corners, through which holes 34 a plurality of bolts, not illustrated, may be passed to fasten together any desired number of housings *c* to constitute a counter. Stud 27 carries the rear plate 13 which extends substantially parallel to plate 37.

The inner number wheel B carries the indicia 1, 2, 3, 4, 5 evenly distributed around its cylindrical circumference, and is fast on bushing 18, the latter being rotatably mounted on bushing 26 bushing 18 being located in rear plate 13. The cylindrical circumference of outer number wheel A surrounds number wheel B and is divided into six equal portions, one of which is completely relieved so as to provide an aperture through which the wheel B may be viewed, the other five portions exhibiting the indicia 6, 7, 8, 9, 0. Wheel A, flange 32, finger disk 19 and locking disk 20 are fast on bushing 28.

Zero setting shaft 30 is journaled in bushing 26, being supported along its length by a bushing 28 in each housing *c*, the mechanism contained within each housing *c* being identical except as noted hereafter with respect to the rightmost housing of a counter, as for instance illustrated

in the right half of Figure 1, said right side illustrating the wheels of the first set and lowest order, directly connected to the drive.

Finger disk 19 is a one toothed gear, and in the transferring position of the parts is axially coincident with and thus in position to mesh with gear 21. Gear 3, star wheel 22 and gear 21 are fixed against rotation relative one to the other and are freely rotatable as a unit on spindle 19 which is rotatably journaled in plate 37 and rear plate 13 parallel to zero shaft 30. A gear 2 is fast on spindle 10. Mutilated gears 16, 17 and their locking disks 24, 23 are fast on spindle 10 in the relative positions illustrated in Figures 13, 14, 15 and 16.

The five toothed gear 14 and its star wheel 26 are fast on bushing 18, thus locked to number wheel B, and are in mesh with five toothed mutilated gear 16 and its locking disk 24 respectively. Six toothed gear 15 and its star wheel 25 are fast on bushing 28, thus locked to number wheel A, and are in mesh with six toothed mutilated gear 17 and its locking disk 23 respectively.

Referring to Figures 13, 14, 15 and 16, the teeth of the gears 16, 17 are grouped on each gear at intervals of 36 degrees, the teeth 1 and L being coincident angularly of shaft 10 and the other teeth being spaced equally thereabout so that the circle is divided into ten equal parts by the eleven teeth of which two are coincident as just mentioned. Eleven triangular depressions or recesses 12 are formed in the circumferences of the locking disks 24, 23 angularly coincident with the respective teeth of gears 16, 17.

Zero setting gear 7 is loose on shaft 30 for rotation and axially sliding. Gear 7 is hollow cylindrical and has one integral end wall portion formed with a hook 4 extending axially inwardly, the hook 4 being integral with gear 7 and having its free end pointing radially outward from a point near the center of the gear, as illustrated in Figures 1 and 5.

Indexing disk 5, Figures 1 and 6, is a one toothed gear fast on shaft 30, being slotted as at 5b so as to slip into transverse grooves 35 on shaft 30 and further comprising two deformable tips 36, which when pinched towards each other firmly fasten the disk to the shaft. The tooth 5a of disk 5 engages the hook 4 of gear 7 for zerosetting. Disk 5 is at all times located within the hollow interior of gear 7, being held therein by the integral end wall of the gear and by retainer plate 6 which is secured on an internal shoulder of gear 7 by screws 53, Figures 1 and 4.

Leaf spring 8, Figures 1 and 2, extends upward from stud 27 to a position between the teeth of gear 7, but spaced axially therefrom in the illustrated transfer position of gear 7.

The following mechanism is peculiar to the rightmost housing c of a counter as viewed in Figure 1. Bushing 31 is secured to gear 59 and extends through plate 37 and is freely rotatable on shaft 30. Gear 58 is loose on shaft 10 and engages gear 59. Gear 7B in this housing is similar to gear 7 previously described, and gear 2B is identical to gear 2. In the transfer position of the parts as illustrated, gear 7B engages both gears 2B and 58. All four gears have ten teeth each.

In operation, bushing 31 is connected to a driver the revolutions of which are to be counted. Bushing 31 drives gear 59, revolution thereof being transmitted through gear 58 to gear 7B and thence to gear 2B to drive the counter as

will be described more particularly with reference to the left hand set of number wheels of Figure 1. For zerosetting the gear 7B is displaced to the left until it is freed from gear 58, thus disconnecting the counter drive and permitting zerosetting as described hereafter with reference to the left hand set of wheels.

In the left hand set, finger disk 19 of the right hand set, fast to the right hand outside wheel A, upon making one complete revolution, actuates gear 21 through one tenth of a revolution. By reason of the conventional association of locking disk 23 with finger disk 19 and of star wheel 22 with gear 21, the revolution of gear 21 is by steps each equal to one tenth of a revolution. Gear 3 being fast to gear 21 and star wheel 22 revolves therewith and drives zero gear 7 step by step, the latter imparting step by step motion through gear 2 to shaft 10 and thus to gears 16, 17 and locking disks 24, 23 fast on shaft 10.

Suppose the left hand set of nested wheels A and B to be showing zero, not illustrated. Referring to Figures 13 and 14 in which the gears 16, 17 revolve counterclockwise, the next teeth of gears 16 and 17 to be in mesh with gears 14, 15 will be the coincident teeth L and 1. Tooth L moves the zero tooth of gear 15 out of indicating position to bring the aperture of wheel A into indicating position, as illustrated by the upper vertical position of tooth L in Figure 13. The engagement of locking disk 23 and star wheel 25 prevents further motion of outer wheel A until the counter shall have counted to 5. As the aperture of wheel A moves into position, tooth 1 of gear 16 has simultaneously pushed tooth 5 of gear 14 out of position bringing the 1 of wheel B into view in the aperture of wheel A. The aperture remaining in indicating position as explained, tooth 2 of gear 16 pushes tooth 1 of gear 14 out of position, bringing tooth 2 into indicating position as illustrated. Tooth 5 of gear 16 being in advance of tooth 5 of gear 14, as the driving tooth 5 moves away the inner wheel B remains locked with its numeral 5 in indicating position but now hidden by the numeral 6 of wheel A which has moved into indicating position.

For zerosetting, the shaft 30 is moved leftward of Figure 1, the indexing disk 5 first moves leftward within the interior of zero gear 7 and then moves gear 7 leftward out of engagement with gear 3, thus disconnecting the counter drive. Gear 7 having been kept in step by step register by engagement with the counter as explained, before becoming completely disengaged therefrom has become engaged with spring 8 so that zerosetting actuation proceeding from it will also be step by step and it will further always be in register for reengagement with gear 3. Tooth 5a of indexing disk 5 will now pick up hook 4 of zero gear 7 upon rotation of shaft 30 in either direction and gear 7 will drive the nested number wheels through the same mechanism as for counting, it being necessary in this form of the invention to cease actuation of shaft 30 when zero shows in aperture 39 if zerosetting is desired, as the number wheels will continue to rotate as long as shaft 30 is rotated. The counter is reengaged by actuation of shaft 30 rightwards of Figure 1.

In Figures 7 and 8 is illustrated a modified embodiment of my invention, which has the additional advantage that the zerosetting shaft may be revolved after zero has been set, and the number wheels will not rotate. The structure ab-

sent from Figure 7 and necessary to an operative mechanism is identical to the structure of Figure 1. Corresponding parts have reference characters indicating their correspondence to Figure 1. A unit consisting of a gap gear 2*a*, a spacer 42, a gear 21*a*, another spacer 42 and a star wheel 22*a* has the aforesaid components fastened together and slidably mounted on the square rod 10*a* which is revolvably mounted by its cylindrical end portions 10*b* in plate 37 and plate 13. Finger disk 19*a* spacer 42 and locking disk 20*a* are secured to bushing 28. Finger disk 19*a* is therefore effective in the illustrated position to transfer a count to gear 21*a*.

The zero setting gap gear 7*a* and flange 44 are secured to shaft 30*a* as follows: flange 44 and gear 7*a* have radial slots 46, 47 respectively by which they may be shipped into transverse grooves 45 in shaft 30*a* from opposite directions and screwed together, thereby being fixed against both sliding and rotation relative to shaft 30. Gears 2*a* and 7*a* each have nine teeth spaced 36 degrees apart, leaving in each gear a 36 degree gap. In the zero position of a set of nested number wheels, the gap of gear 2*a* lies on the line between the shaft centers of the gap gears. In any other position, gear 2*a* will be actuated by gear 7*a* when the latter is actuated for zerosetting, but in zero position gear 7*a* will revolve in the gap of 2*a* without actuating the latter. The gap in gear 7*a* permits gear 2*a* to revolve during transfer operations. To set to zero, shaft 30*a* is moved leftward, thus causing flange 44 to move the unit on square rod 10*a* leftward, moving gear 2*a* into space 41 where it engages the spring 48, illustrated in Figure 8 only. Spring 48 is mounted on stud 49 mounted in any convenient place on housing *c*.

Figure 11 illustrates a construction for the first or lowest order number wheel set of a counter according to Figures 7 and 8. The finger disk 19*a*, locking disk 20*a*, gear 21*a* and star wheel 22*a* of Figures 7 and 8 is each replaced by a ten toothed gear 3*a*. Disconnecting the drive for zerosetting is done by pushing the shaft 30*a* leftward, and the zerosetting proceeds as in Figures 7 and 8.

Figures 9 and 10 illustrate another gap gear construction. A unit consisting of gear 19*d*, spacer 51 and locking disk 20*d* is keyed to bushing 28*d* by the keys 50 extending radially thereinto. Gear 7*d* and flange 44*d* are mounted on shaft 30*b*, in this case with flange 44*d* at the left. Flange 44*d* engages a slot 53*e* of guide 54. The latter has a square hole by which it is slidably mounted on square rod 57 mounted on housing *c*. The gears 2*d*, 21*d*, spacer 56, star wheel 22*d* and another spacer 56 are secured to square rod 10*d*. An arm 52 of guide 54 extends between finger disk 19*d* and locking disk 20*d*. When shaft 30*b* is pushed to the right of Figure 9, flange *d* takes along guide 54 and arm 52 moves the members 19*d*, 51 and 20*d* up to hub 32, disengaging 19*d* and 20*d* from gear 21*d* and star wheel 22*d* respectively, and gear 7*d* is in line with gap gear 2*d* for zerosetting as in Figures 7 and 8. In Figure 12 the invention is shown applied to a counter having conventional number wheels K each of which has a full set of numerals 0 to 9 inclusive. The mechanism of this figure is most similar to Figures 1 to 6 inclusive. The spindle 10*e* has secured thereto a gear 72 in mesh with gear 73, the latter secured to bushing 78 to which wheel K is fast, the hub 77, finger disk 75 and locking disk 76 also being secured

to bushing 78. Gear 71 is loosely rotatable on shaft 10*e* and is fast to star wheel 70. Every revolution of finger disk 75 rotates gear 71 one tenth of a revolution, the gears 72 and 71 being coupled by the engagement of zerogear 7*e* with both during transfer.

For zerosetting in Figure 12, shaft 30*e* is moved leftwards, until gear 7*e* disengages gear 71 and zerosetting then takes place as in Figure 1. Spring 8*a* operates like spring 8 of Figure 1.

A further advantage of my construction is that when the zero setting shaft 30, 30*a*, 30*b*, or 30*e* is uncoupled, the individual wheels may be engaged by the finger of an operator and moved forward or backward without transferring of values.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use. As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A counter having a plurality of sets of nested number wheels and the numerals from 0 to 9 inclusive distributed around the nested wheels of each set and including a transfer mechanism and a Geneva locking mechanism, comprising means to operate said counter for addition when operated in one direction and for subtraction when operated in the reverse direction, and a means to disengage the transfer and locking mechanism from the operating means for resetting the sets of nested number wheels to zero in either direction.

2. The combination of a counter including a plurality of sets of nested number wheels and a transfer mechanism with a Geneva locking means, and a means for resetting the sets of number wheels to zero after each operation, said counter operating for adding when operated in one direction and for subtraction when operated in the reverse direction.

3. In a zerosetting mechanism for a series of pairwise arranged, nested number wheels of counters, including a transfer mechanism, an indexing pick up mechanism including a gear coupling for uncoupling the transfer mechanism to independently return the series of pairwise arranged, nested number wheels to zero.

4. In a counter displaying on one wheel the numerals from 0 to 9, a hub for said wheel, a bushing and a finger disc associated with said hub, a stub shaft, and a comparatively wide gear on said stub shaft, a resetting shaft and a gear thereon in mesh with said wide gear, both gears having 10 teeth so that every time the finger disc engages the gear on the stub shaft the same makes $\frac{1}{10}$ of a revolution, said resetting shaft adapted to be pushed out to disengage the two gears and the zerosetting can take place when the resetting shaft is turned in either direction.

5. A driver for a counter with a series of number wheels including a transfer mechanism, a transfer shaft and a zero setting shaft, two gears on said transfer shaft, one operatively connected to the number wheel, and the other independently and freely rotating thereon, a drive gear

in mesh with the gear independently rotating on the transfer shaft, said drive gear being loose on the zero setting shaft, and said zero setting shaft extending through the series of number wheels, a gear located on the zero setting shaft and in mesh with both gears on the transfer shaft while the counter is in operation and disengaged from the independent gear on the transfer shaft while the zero setting takes place, thus providing a means for uncoupling the driver from the counter while the zero setting mechanism is in operation.

6. In a zero setting mechanism for a counter with a plurality of number wheels, each number wheel having a frame composed of a pair of plates, a zero setting shaft, a shaft located parallel to and above the zero setting shaft and journaled in the pair of plates, a gear on said shaft in direct operation with the number wheel, and a unit on said shaft movable in longitudinal direction thereon, the said unit comprising a gap gear, a fully toothed gear and a locking disc, each number wheel provided with a finger disc or mutilated gear and a locking cam, the finger disc or mutilated gear of one number wheel periodically in mesh with the fully toothed gear on the next adjoining number wheel while the locking cam is in line with the locking disc during the transfer operation, another gap gear secured to the zero shaft, and means thereon to disengage the fully toothed gear from the finger disc or mutilated gear and the locking cam from the locking disk and the gap gear on the zero setting shaft meshes with the gap gear of the unit, and yielding means for locking the unit to keep the number wheels in place and in alignment while the zerosetting takes place.

7. In a zerosetting mechanism for counters including a series of number wheels, a zerosetting shaft, a transfer shaft above said zerosetting shaft, a unit composed of a transfer gear and a gap gear secured to one another and movable on said transfer shaft in a longitudinal direction, a disc and a gap gear secured to said zerosetting shaft, said disc on the zerosetting shaft disengaging the transfer gear from the finger disc or mutilated gear of the number wheel of the lower order upon movement of the zerosetting shaft in a longitudinal direction, and for zerosetting by turning the zerosetting shaft in either direction for restoring the number wheels to zero setting through the gap gears of the zero setting shaft and the transfer shaft and yielding means, normally disengaged from said unit during transfer operation, rendered operative during the resetting operation.

8. In a counter zerosetting for a series of number wheels, a zerosetting shaft for all the number wheels, each wheel having a frame including a pair of plates, the number wheels held in position against longitudinal displacement by the pair of plates, a spindle journaled in the pair of plates, parallel to the zerosetting shaft, a zerosetting gear freely turning on the zerosetting shaft, two gears on said spindle, and the zerosetting gear in mesh with both spindle gears during the transfer operation, the zerosetting gear being disengaged from one of said gears during the zerosetting operation but remaining in steady mesh with the other of said spindle gears to turn the number wheels to zero as described, and yielding means secured to the frame to engage the zerosetting gear while the zerosetting operation is effective.

9. In a counter zerosetting mechanism for a

series of number wheels aligned on a common spindle including a transfer mechanism, a transfer shaft for each number wheel parallel to the spindle, a gear thereon, a transfer finger disc or mutilated gear of the adjoining number wheel in alignment with the gear on the transfer shaft as described, and a means for disengaging the transfer gear from the finger disc or mutilated gear in a longitudinal direction each number wheel surrounding the mechanism.

10. In a counter zerosetting mechanism for a series of number wheels aligned on a common spindle including a transfer mechanism, a transfer shaft for each number wheel parallel to the spindle, a gear thereon, a transfer finger disc or mutilated gear of the adjoining number wheel in alignment with the gear on the shaft, and a means for disengaging the finger disc or mutilated gear from the gear on the transfer shaft in a longitudinal direction each number wheel surrounding the mechanism.

11. In a counter, the combination with a series of pairs of nested number wheels having the numbers from 0 to 9 distributed on each pair of nested wheels as described, and a means for restoring all the pairs to zero position.

12. In a counter resetting mechanism, a series of aligned pairs of nested number wheels, each pair comprising an operating shaft including means to operate the nested number wheels having the numerals from 0 to 9 inclusive distributed on the nested wheels, and a means for zerosetting the nested wheels by turning the operating shaft to its zero position in either direction, as described.

13. In a counter zero setting mechanism for a series of number wheels aligned on a common spindle including a locking mechanism, a transfer shaft for each number wheel parallel to the spindle, a locking cam thereon, a locking disc of the adjoining number wheels in alignment with the locking cam on the shaft, and a means for disengaging the locking disc from the locking cam on the shaft in a longitudinal direction each number wheel surrounding the mechanism.

14. In a counter including operating means for a series of pairs of nested number-wheels having the numerals from 0 to 9 inclusive distributed on each pair of nested wheels and having a transfer mechanism and means for disengaging the operating means from the transfer mechanism to independently return the series of nested wheels to zero.

15. In a counter zerosetting mechanism including a transfer mechanism and locking mechanism, a gear operative for the transfer operation and also operative for the zerosetting operation, a spindle parallel to said gear, two gears on said spindle, said first mentioned gear being in mesh with both spindle gears during the transfer operation and disengaged from one of said spindle gears during zerosetting, thus providing means for disengaging the transfer mechanism during zerosetting operation.

16. In a zerosetting mechanism for counter wheels including a transfer and locking mechanism, a shaft passing through all the counter wheels, a gap gear on said shaft, a second gap gear, said second gap gear further being a transfer gear and being slidably supported, and yielding means out of alignment with said second gap gear during transfer operations, said second gap gear being slidable into engagement with

said yielding means during zerosetting for step by step registering of said counter wheels.

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