Oct. 31, 1961 L. J. LAPOINTE 3,006,546

COUNTER MECHANISM

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Fig. 1.

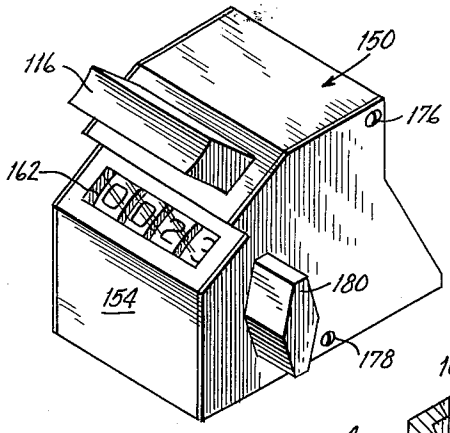


Fig. 2.

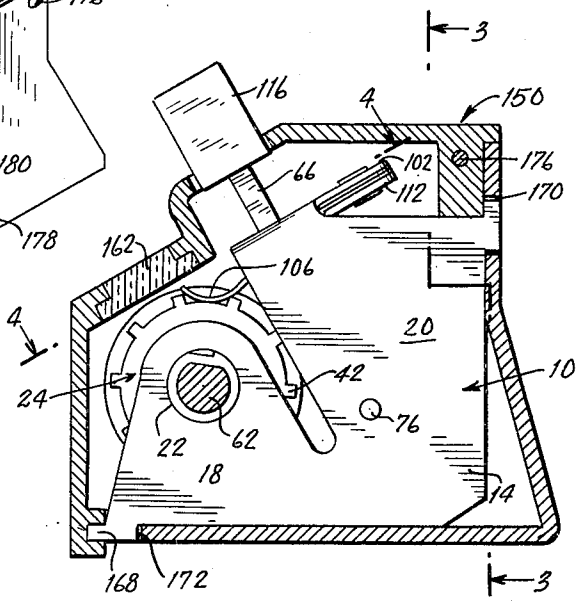


Fig. 3.

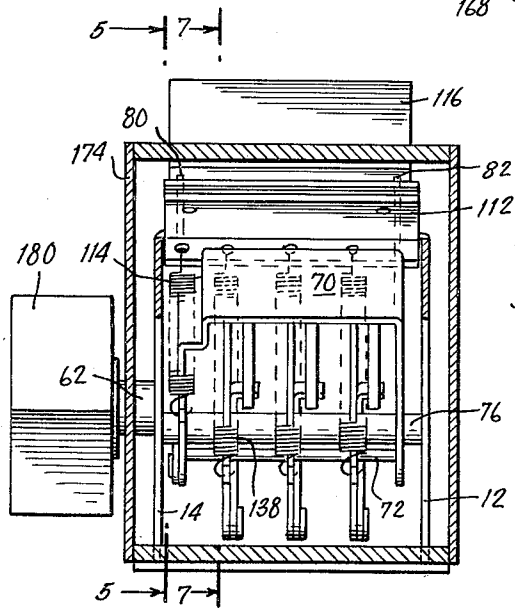
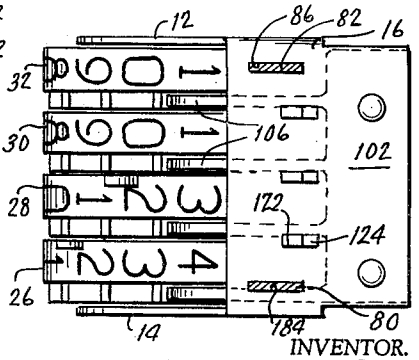


Fig. 4.



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Fig. 5.

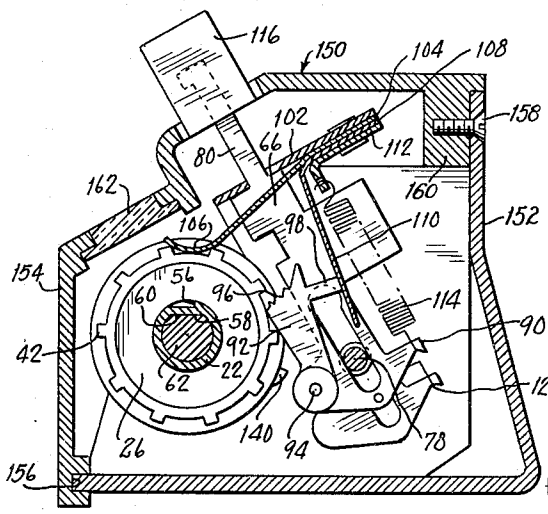


Fig. 6.

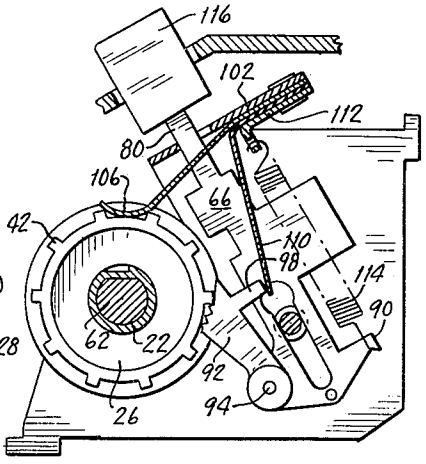


Fig. 7.

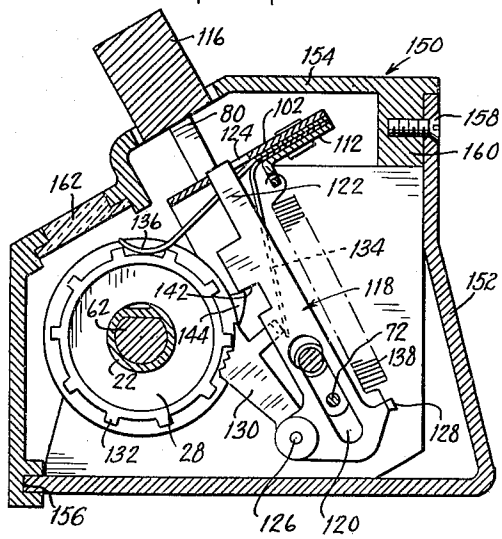
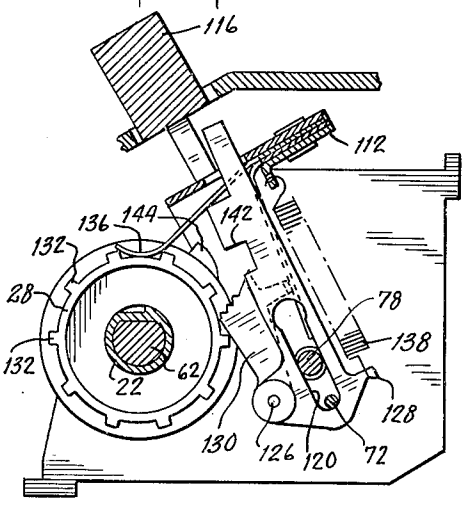


Fig. 8.



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Fig. 9.

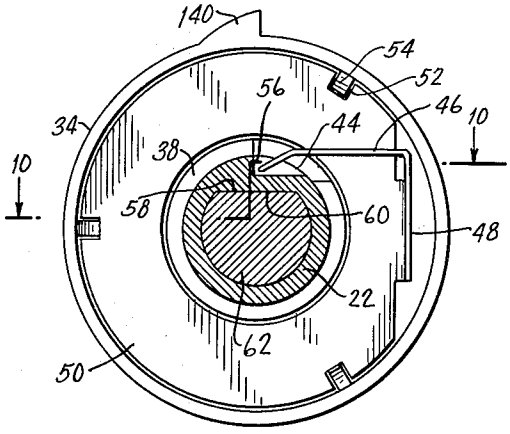


Fig. 11.

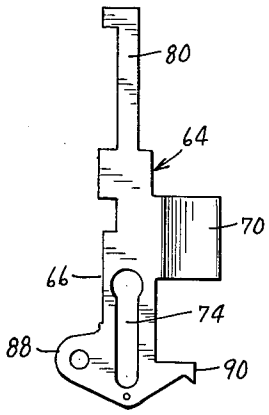


Fig. 10.

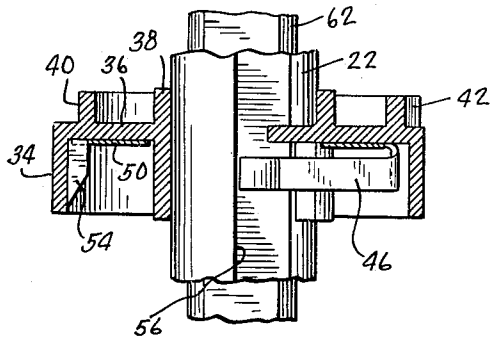


Fig. 12.

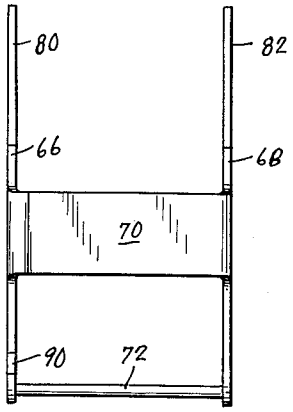


Fig. 14

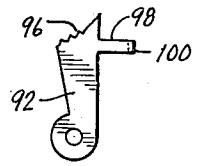


Fig. 15.

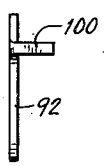
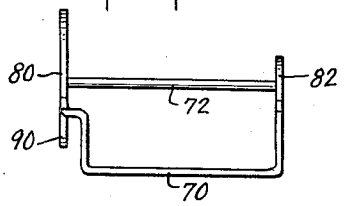


Fig. 13.



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3,006,546

COUNTER MECHANISM

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Filed Apr. 17, 1959, Ser. No. 807,080
7 Claims. (Cl. 235—134)

This invention relates to a counter. More particularly, the invention relates to a manually operated counter having a plurality of digit or number wheels mounted on a common shaft.

Ordinarily, hand operated counters are so constructed that the number wheels thereof are operated directly by the manual force applied by the operator, i.e., on the down stroke of the operating bar or lever. This renders the operation of the counter directly responsive to the variations in the force that is applied with the result that sometimes the number wheels will be only partially rotated through an indexing position, while at other times they will be over rotated. Thus, a light stroke on the operating bar or lever may result in only a partial operation of the counter wheel, while a heavy stroke may result in excessive operation thereof. In the latter case, an overthrow of the units wheel may result, and in severe cases, it may be reflected by the erroneous setting of wheels in the higher orders.

It is, therefore, the primary object of the invention to provide a counter of the stated class whose operation does not depend directly on the operating force which is manually applied, and which will, therefore, be not so sensitive to the variations in the force applied to operate the same.

The principal objective of the invention is attained by providing a counter whose number wheels are rotated under a uniform spring tension which is quite independent of the manual force applied to the operating bar or lever. In its more specific aspect, the counter herein provides a number wheel indexing mechanism which operates without effect on the counter wheels as it is being manually operated, but which is effective to operate the counter wheels under uniform spring control after the operating bar or lever is released from manual control.

According to the broad concept of the invention, all of the counter wheels can be operated under control of a spring which is functionally related with a unit slide such that a single spring is effective to rotate the unit wheel at each operation of the counter and also to provide the energy to effect the carry operation between orders.

Certain advantages are derived from the use of operating springs for each of the number wheels in the counter, and the invention has been so illustrated.

It is a further specific object of the invention to provide a counter mechanism in which the counter wheels of all of the orders higher than the units order are normally held under a constant spring tension while the counter wheel of the units order is normally without corresponding spring tension.

A further specific object of the invention resides in the provision of a counter mechanism in which the counter wheels of all the orders higher than the units order are normally under a latent operating tension, which when augmented by a force derived from the rotation of a number wheel of a next lower order, will serve to index such wheel of higher order independently of any manually applied operating force.

The stated advantages and objectives of the invention will be explained hereinafter and others will appear as the following specification is read in light of the drawings forming a part of this application.

In the drawings like reference numerals indicate like parts, and:

FIG. 1 is a perspective view of a counter unit in which the invention herein is embodied;

FIG. 2 is a side elevational view of the counter shown in FIG. 1, with the side plate of the outer casing removed;

FIG. 3 is a sectional view on line 3—3 of FIG. 2;

FIG. 4 is a view on line 4—4 of FIG. 2, principally in full line and partially in section;

FIG. 5 is a sectional view on line 5—5 of FIG. 3 showing the normal position of mechanism associated with a units number wheel;

FIG. 6 is a view similar to that of FIG. 5 showing, however, the position assumed by the parts upon depression of an operating bar;

FIG. 7 is a sectional view on line 7—7 of FIG. 3 showing the normal position of the operating mechanism associated with the tens number wheel;

FIG. 8 is a view similar to that of FIG. 7 showing, however, the position of the related elements when the operating bar is depressed;

FIG. 9 is a radial sectional view through a number wheel sleeve, a related reset shaft, and showing a number wheel mounted thereon;

FIG. 10 is a view on line 10—10 of FIG. 9;

FIG. 11 is a side elevational view of a units wheel operating slide;

FIG. 12 is a rear elevational view of the slide of FIG. 11;

FIG. 13 is a top plan view of the slide of FIG. 11;

FIG. 14 is a side elevational view of a number wheel operating pawl; and

FIG. 15 is a corresponding rear elevational view of the pawl of FIG. 14.

The counter mechanism is housed in a counter frame 10 which may be stamped from sheet metal or molded of a suitable plastic molding composition. The frame consists of a pair of spaced side walls 12 and 14 interconnected by a crown 16 (FIG. 4). Each side wall is shaped to provide a counter wheel pedestal 18 (FIG. 2) and a slide housing 20. Mounted for free rotation in the counter wheel pedestals of the frame is a counter wheel reset sleeve 22 upon which a plurality of freely rotatable counter wheels 24 are mounted. The number of counter wheels determines the counting capacity of the counter, which herein is shown (FIG. 4) as including a units wheel 26, a tens wheel 28, a hundreds wheel 30 and a thousands wheel 32. The counter wheels are all alike, and the nature thereof is best illustrated in FIGS. 9 and 10; FIG. 9 being a view looking toward the inner face of one of the wheels. The wheel 24 in FIG. 9 has a peripheral number face 34 bearing the digits –0– through –9– in equally spaced sequence about the face. The digits of each counter wheel bear an identical relationship to a peripheral index which is the same for each wheel. The index point may be established in reference to a reset pawl. The number face 34 of the wheel 24 constitutes a flange extending inwardly from a web 36 which is connected to a hub 38 by which the wheel is mounted for rotation on the counter wheel reset sleeve 22. Extending outwardly from the web 36 is a drive face 40 having ten radial drive shoulders 42 disposed at equal intervals about its circumference.

The inner end of the hub 38 has a slot 44 adapted to receive the inturned free end of a resilient reset pawl 46. The reset pawl 46 is an extension of a flange 48 bent upwardly from an annulus 50 supported on the inner face of the web 36. The annulus has a plurality of peripheral notches 52 which are adapted to embrace an equal number of splines 54 formed in the inner face of the peripheral number flange of the wheel.

The counter wheel reset sleeve 22 has an axial reset shoulder 56 formed in the face thereof which constitutes

an abutment for the inturned end of the reset pawls 46 when the reset sleeve 22 is rotated in a clockwise direction, as viewed in FIGS. 9 and 10, or in a counterclockwise direction, as viewed in FIGS. 5 through 8. The reset sleeve 22 has a flat internal surface 58 which is adapted to contact a similar flat surface 60 on a reset shaft 62. Thus, if the reset shaft is turned, the reset sleeve 22 will also be turned.

The several number wheels are rotated in a counterclockwise direction, as viewed in FIGS. 5 through 8, by means of a slide and pawl mechanism individual to each of the number wheels. The units wheel 26 is indexed through a counting operation by means of a unit slide 64 illustrated in FIGS. 11 through 13. The remaining number wheels are indexed to transfer a count from a lower to a higher order by means of slide and pawl mechanism differing specifically from the units wheel slide and pawl as to be explained, but which is the same for the wheels of each higher order.

The unit slide 64 is a compound structure made up of a pair of side members 66 and 68 which are connected by a U-shaped bridging member 70 located about midway along the length of the side members 66 and 68. A tie rod 72 interconnects the lower ends of side members 66 and 68. The side members 66 and 68 have slots 74 therein which are adapted to embrace a transverse guide shaft 76 mounted in the side walls of the counter frame. As shown in FIG. 5, the guide rod has circumferential grooves 78 in which the walls defining the slots 74 in the side members of the slide are seated such that the slide assembly is held against lateral movement. Stems 80 and 82 of the side members 66 and 68, respectively, extend through guide slots in the crown 16 of the counter frame (FIG. 4). The stem 80 is guided for reciprocation in a guide slot 84, while the stem 82 is guided for reciprocation in a similar guide slot 86. The lower end of the side member 66 has a forwardly projecting boss 88, and a rearwardly projecting spring anchor 90. The forwardly projecting boss 88 has pivoted thereto a drive pawl 92 (FIGS. 5 and 6). The drive pawl 92 extends upwardly from its pivot point 94 such that it presents a series of teeth 96 at its free end. The teeth 96 are adapted to engage the radial drive shoulders 42 on the units number wheel 26. The drive pawl 92 has a rearwardly extending projection 98 which includes a laterally extending spring rest 100 (FIGS. 14 and 15).

Extending rearwardly from the crown portion 16 of the counter frame is a flange 102 (FIG. 4) to the underside of which is attached a comb-like element 104 (FIGS. 5 and 6) having a forwardly projecting detent finger for each of the number wheels, including the detent finger 106 for the units number wheel. The detent fingers are formed of spring material and have an upwardly curved free end portion which is adapted to rest on the drive face 40 of the number wheels and between any adjacent two of the radial drive shoulders 42. The detent fingers, therefore, serve to hold the number wheels against turning, unless a positive turning force is applied.

Fixed to the flange 102 is a second comb-like member 108 having a spring finger depending downwardly therefrom for each of the drive pawls, including the spring finger 110 for the units drive pawl 92. The downwardly extending spring finger 110 rests in contact with the spring rest 100 of the drive pawl 92 thereby pressing the pawl forwardly in a counterclockwise direction about its pivot point 94 such that the teeth 96 at the free end of the drive pawl will engage with the radial drive shoulders 42 of the units wheel 26.

Also fixed to the flange 102 is a spring anchor 112 to which is connected one end of each of a plurality of slide springs such as the units slide spring 114, the other end of which is connected to the anchor 90 projecting rearwardly from the side member 66 of the units slide assembly.

The guide stems 80 and 82 of the units slide assembly extend above the crown 16 of the counter frame where they are interconnected by a finger bar 116 by which the units slide assembly 64 can be reciprocated. The normal position of the units slide is that shown in FIG. 5. It can be seen that if the finger bar 116 is pushed down, the teeth 96 at the free end of the pawl 92 will engage the next lower radial drive shoulder 42. Any one of the teeth 96 at the free end of the drive pawl 92 may engage under the next lower radial drive shoulder 42 when the finger bar 116 is depressed. This will insure a positive engagement between the drive pawl and the radial drive shoulder despite the fact that the slide assembly has not been operated fully to its depressed position. It is contemplated that when the slide assembly is fully depressed that the last tooth of the pawl 92 will engage the drive shoulder on the units wheel, as shown in FIG. 6. Depression of the units slide assembly will place the units slide spring 114 under tension such that when the finger bar 116 is released, the units slide assembly will spring back to its normal position as shown in FIG. 5. Since the drive pawl 92 is in engagement with a drive shoulder 42 on the units number wheel, the number wheel 26 will be rotated through one unit position. Each time, therefore, that the units slide assembly is depressed and released, a count of one will be entered into the counter.

FIGS. 7 and 8 show respectively the normal and the operated position of the advancing mechanism associated with the tens number wheel 28. These figures are representative of the mechanism associated with each of the number wheels of higher order since for all of the orders, higher than the units order the operating mechanism is identical. A description of the mechanism associated with the tens number wheel 28 will, therefore, serve as a description of any additional orders included in the counter.

In FIGS. 7 and 8, a tens slide 118 has a slot 120 at its lower end which embraces the guide bar 76 and it includes a guide stem 122 which extends through a guide slot 124 formed in the crown 16 of the counter frame. The lower end of the slide 118 has a forwardly projecting boss 126 and a rearwardly projecting spring anchor 128. A drive pawl 130 for the tens number wheel 28 is pivoted to the boss 126 of the slide 118 and extends upwardly therefrom to engage the radial drive shoulders 132 of the tens wheel. The drive pawl 130 is urged forwardly into engagement with the drive shoulders 132 by means of a spring finger 134. A detent finger 136 holds the tens number wheel 28 from rotating unless rotational force is applied thereto. A slide spring 138, interconnected between the spring anchors 112 and 128, tends to urge the slide 118 upwardly into the position shown in FIG. 8.

In the case of the units slide, the units slide spring 114 is stronger than the detent finger 106. Therefore, when the units slide is depressed and then released, the units slide spring 114 will return the slide and rotate the units number wheel 26 one position, as described. However, in the case of the remaining slides, the detent finger is stronger than the slide spring with the result that these slides can be depressed and will remain depressed under latent operating power of their slide springs until these slides are subsequently triggered and released. Thus, in the case of the tens slide 118, the detent finger 136 is stronger than the slides spring 138 with the result that the tens slide 118 can be depressed and it will remain depressed until triggered into operated position, as to be described.

All of the slides higher than the units order, are depressed by operation of the units slide assembly. In this connection, it may be noted that the tie rod 72 at the bottom end of the units slide is adapted to contact the bottom of the slide slots such as shown in connection with the slot 120 of the tens slide 118 in FIG. 8 when the latter is in its upper or released position. Therefore, if any of the higher order slides are in their released or upper position, depression of the finger bar 116 and operation of the

units slide assembly will depress any of the higher order slides and latch them, as described in connection with the tens order slide **118**. It can be seen, therefore, that all of the higher order slides are normally depressed as shown in FIG. 7, whereas the normal position of the units slide **64** is in its projected or elevated position, as shown in FIG. 5. Each one of the higher order slide mechanisms, therefore, is latently energized by its respective slide spring to elevate the slide mechanism and, by means of the drive pawl, rotate the number wheel of any of the slides that may be released.

It remains to be seen how a count is transferred from one wheel to another. In FIG. 5, the units wheel **24** has a transfer lug **140** extending outwardly from the peripheral number face **34**. The transfer lug **140** is located between digits –1– and –2–. The transfer lugs are so placed on the number wheels that they engage and operate the slide of the next higher order as the wheel, as viewed under the window, is passing from –9– to –0–. Thus, the position of the transfer lug **140**, for example, on the periphery of the units wheel **24** is dictated by the location of the shoulder **142** in the slide and its relation to the periphery of the wheel.

The transfer lug **140** of the units wheel in FIG. 5 is axially offset to operate in the plane of the tens slide **118** of FIG. 7. The tens slide has a shoulder **142** formed in the edge thereof which faces the number wheels. As the units number wheel **28** rotates in a counterclockwise direction, as viewed in FIG. 5, the transfer lug **140** will eventually contact the shoulder **142** in the tens slide. At this point, the force of the slide spring **138** is augmented by power from the slide spring **114** of the units slide with the result that the detent finger **136** will be overcome, the tens slide **118** will be released, and the tens number wheel **28** will be rotated through one position. All of the remaining slides of higher order will be operated in like fashion by a transfer lug of a lower order number wheel. Thus, in FIG. 7, the tens wheel **28** has a transfer lug **144** which will engage a shoulder on the hundreds slide which corresponds in every respect to the shoulder **142** of the tens slide.

It is apparent, therefore, that for each ten operations of the units slide, a count will be entered into the tens wheel by advancing the tens wheel through one position. By the same token, upon a complete revolution of the tens number wheel, a count will be entered into the hundreds number wheel by rotating the same through one position.

After any given counting operation, the counter wheels can all be reset to zero by rotating the reset shaft **62** in a counterclockwise direction, as viewed in FIG. 2, or in a clockwise direction, as viewed in FIGS. 9 and 10. While the specific structure of the reset mechanism was described in reference to the single number wheel of FIG. 9, it will be appreciated that the number wheels are identical and that each embodies a reset pawl, such as the pawl **46** in FIG. 9. If the reset shaft **62** is rotated in the proper direction, it will correspondingly rotate the counter wheel reset sleeve **22**. Rotation of the reset sleeve **22** in one direction will be ineffective to rotate the counter wheels since the detent fingers formed in the spring comb **104** will hold the number wheels stationary while the reset sleeve **22** rotates idly in contact with the reset pawls. However, when the reset shaft **62** is rotated in the opposite direction, e.g., in a clockwise direction as viewed in FIG. 9, the ends of the reset pawls **46** will engage the axial reset shoulder **56** on the counter wheel reset sleeve **22** and the wheels will rotate with the sleeve. Since the reset pawls **46** bear the same reference in each of the counter wheels, it can be seen that the wheels will be digitally aligned during a single revolution of the reset shaft **62** and that the counter reading can be returned to zero as may be desired.

The counter frame **10** is mounted in a suitable casing **150** which is conveniently formed of a pair of metal or plastic extrusions. Reference to FIGS. 5 and 7 will show that the casing **150** is composed of a base member **152** which provides the back and the bottom wall of the casing, and a cover member **154** which provides the top and face walls of the casing. The cover member **154** has a groove **156** formed therein which is adapted to receive the forward free edge of the bottom wall of the base member **152**. The base member **152** and the cover member **154** are joined together by means of a screw **158** which passes through the upper edge of the back wall of the base member **152** and into a rib **160** depending downwardly and being located forwardly from the free edge of the top wall of the cover member **154**. The cover member has a transparent window **162** located over the number wheels such that the count registered on the wheels may be read. The finger bar **116** of the units slide mechanism projects through a slot **164** formed in the cover member just above the window **162**.

The slide housing at each side of the counter frame has an ear **166** formed at the upper edge thereof and the counter wheel pedestal **18** at each side has a similar ear **168** formed at the lower forward corner thereof; these ears being adapted to register with corresponding slots **170** and **172**, respectively, formed in the base extrusion **152**. This arrangement serves to anchor the counter mechanism within the housing. Side plates, such as the plate **174** (FIG. 1), are attached to opposite sides of the housing to form an enclosure for the counter mechanism. These plates are conveniently fixed to the base extrusion **152** by means of a pair of screws **176** and **178**. The reset shaft **62** extends beyond the side wall **174** and has an operating knob **180** attached to its extending end.

While the fundamentally novel features of the invention have been illustrated and described in connection with a specific embodiment of the invention, it is believed that this embodiment will enable others skilled in the art to apply the principles of the invention in forms departing from the exemplary embodiment herein.

I claim:

1. In a counter, a plurality of number wheels representing successive higher orders mounted on a common shaft for rotation from one digit position to the next higher digit position, an operating lever for each of said number wheels mounted for manual reciprocation from a first to a second position in a plane tangent to said number wheels, a spring connected to said operating levers to return the same to said first position after manual operation thereof into said second position, a pawl mounted on each of said levers, means for engaging said pawls with said number wheels when said levers are in their second position, means for holding said levers in said second position when moved thereinto, means on each of said number wheels operative upon a complete revolution thereof for engaging in driving relation the operating lever of the number wheel of immediately higher order whereby the force of the spring of said last named operating lever is augmented by the rotational force of the number wheel of immediately lower order and said number wheel of immediately higher order is rotated from one digit position to the next higher digit position.

2. In a counter, a plurality of number wheels representing successive higher orders mounted on a common shaft for rotation from one digit position to the next higher digit position, an operating lever for each of said number wheels mounted for manual reciprocation from a first to a second position in a plane tangent to said number wheels, a spring connected to each of said operating levers to return the same to said first position after manual operation thereof into said second position, a pawl mounted on each of said levers, means for engaging said pawls with their respective number wheels when said levers are in their second position, means for holding said levers in said second position when moved thereinto, means on each of said number wheels operative upon a complete revolution thereof for engaging and releasing the operating lever of the number wheel of immediately

higher order from the influence of said holding means whereby the same is rendered responsive to its spring and is thereby reciprocated from said second position to said first position and said number wheel of immediately higher order is rotated from one digit position to the next higher digit position by the pawl on said lever.

3. In a counter, a plurality of number wheels representing successive higher orders mounted on a common shaft for rotation from one digit position to the next higher digit position, an operating lever for each of said number wheels mounted for manual reciprocation from a first to a second position in a plane tangent to said number wheels, a spring connected to said operating levers to return the same to said first position after manual operation thereof into said second position, an abutment on each of said levers, a pawl mounted on each of said levers, means for engaging said pawls with said number wheels when said levers are in their second position, means for holding said levers in said second position when moved thereinto, a carry lug on each of said number wheels operative upon a complete revolution thereof for engaging in driving relation the abutment on the operating lever of the number wheel of immediately higher order whereby the force of the spring of said last named operating lever is augmented by the rotational force of the number wheel of immediately lower order and said number wheel of immediately higher order is rotated from one digit position to the next higher digit position.

4. In a counter, a plurality of number wheels representing successive higher orders mounted on a common shaft for rotation from one digit position to the next higher digit position, an operating lever for each of said number wheels mounted for manual reciprocation from a first to a second position in a plane tangent to said number wheels, a spring connected to said operating levers to return the same to said first position after manual operation thereof into said second position, a pawl mounted on each of said levers, means for engaging said pawls with said number wheels when said levers are in their second position, means in contact with each of said number wheels for holding the same against rotation whereby said levers are held in said second position when moved thereinto, means on each of said number wheels operative upon a complete revolution thereof for engaging in driving relation the operating lever of the number wheel of immediately higher order whereby the force of the spring of said last named operating lever is augmented by the rotational force of the number wheel of immediately lower order and said number wheel of immediately higher order is rotated from one digit position to the next higher digit position.

5. In a counter, a plurality of number wheels representing successive higher orders mounted on a common shaft for rotation from one digit position to the next higher digit position, an operating lever for each of said number wheels mounted for manual reciprocation from a first to a second position in a plane tangent to said number wheels, an operating spring connected to said operating levers to return the same to said first position after manual operation thereof into said second position, a pawl mounted on each of said levers, means for engaging said pawls with said number wheels when said levers are in their second position, a leaf spring bearing on each of said number wheels with a pressure greater than the rotative force applied to said wheels by said operating springs for holding said number wheels against rotation whereby said levers are held in said second position when moved thereinto, means on each of said number wheels operative upon a complete revolution thereof for engaging in driving relation the operating lever of the number wheel of immediately higher order whereby the force of the operating spring of said last named operating lever is augmented by the operating spring of the number wheel of immediately lower order as the latter rotates and the pressure of the leaf spring of said number wheel of immediately higher order is overcome and said number wheel of immediately higher order is rotated from one digit position to the next higher digit position.

6. In a counter, a plurality of number wheels representing successive higher orders mounted on a common shaft for rotation from one digit position to the next higher digit position, an operating lever for each of said number wheels mounted for manual reciprocation from a first to a second position in a plane tangent to said number wheels, an operating spring connected to said operating levers to return the same to said first position after manual operation thereof into said second position, an abutment on each of said levers, a pawl mounted on each of said levers, means for engaging said pawls with said number wheels when said levers are in their second position, a leaf spring bearing on each of said number wheels with a pressure greater that the rotative force applied to said wheels by said operating springs for holding said number wheels against rotation whereby said levers are held in said second position when moved thereinto, a carry lug on each of said number wheels operative upon a complete revolution thereof for engaging in driving relation the abutment on the operating lever of the number wheel of immediately higher order whereby the force of the spring of said last named operating lever is augmented by the rotational force of the number wheel of lower order and said number wheel of immediately higher order is rotated from one digit position to the next higher digit position.

7. In a counter, a plurality of number wheels representing successive higher orders mounted on a common shaft for rotation from one digit position to the next higher digit position, an operating lever for each of said number wheels mounted for manual reciprocation from a first to a second position in a plane tangent to said number wheels, an operating spring connected to said operating levers to return the same to said first position after manual operation thereof into said second position, an abutment on each of said levers, a pawl mounted on each of said levers, means for engaging said pawls with said number wheels when said levers are in their second position, a leaf spring bearing on each of said number wheels with a pressure greater than the rotative force applied to said wheels by said operating springs for holding said number wheels against rotation whereby said levers are held in said second position when moved thereinto, a carry lug on each of said number wheels operative upon a complete revolution thereof for engaging the abutment on the operating lever of the number wheel of immediately higher order whereby the force of the operating spring of said last named operating lever is augmented by the operating spring of the number wheel of immediately lower order and the pressure of the leaf spring of said number wheel of immediately higher order is overcome and said number wheel of immediately higher order is rotated from one digit position to the next higher digit position.

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