United States Patent [19]

Young

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[54] **REGISTER PRICE WHEEL STRUCTURE**

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[52] **U.S. Cl.... 235/94 R;** 235/131 FD; 235/144 SM

[51] **Int. Cl.²..... B67D 5/22;** G06C 15/42

[58] **Field of Search.....** 235/94 R, 131 FD, 131 R, 235/144 SM, 144 D

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Primary Examiner—Stephen J. Tomsky

Attorney, Agent, or Firm—George L. Church; Donald R. Johnson; William C. Roch

[57] **ABSTRACT**

In order to increase the "sale" or "cost" registering capacity of a standard, conventional threewheel register (counter) used in gasoline dispensers, a modified price wheel has been developed as a substitute for the lowest-order price wheel of a conventional register. This new wheel carries indicia from zero to 99 and during counting makes one revolution for every one hundred cents' worth of gasoline dispensed. The new wheel has an antibacklash arrangement for eliminating inaccuracies during the counting mode, and has an improved reset stop and a linkage mechanism associated therewith, for providing accurate resetting and for preventing improper operation during the resetting mode.

16 Claims, 9 Drawing Figures

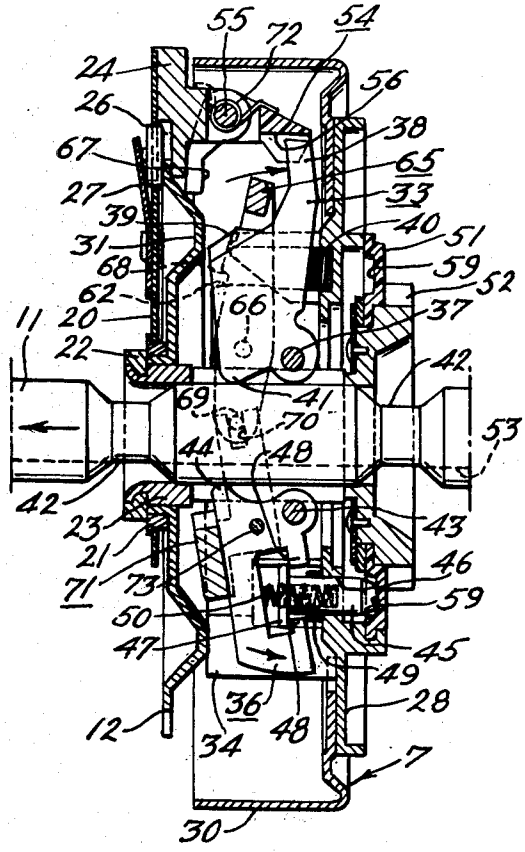


FIG. 1.

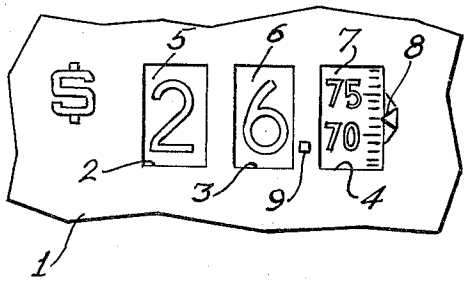


FIG. 2.

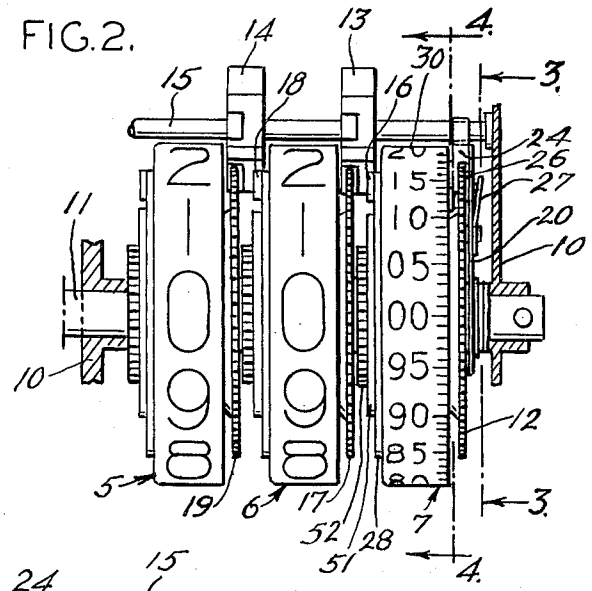


FIG. 3.

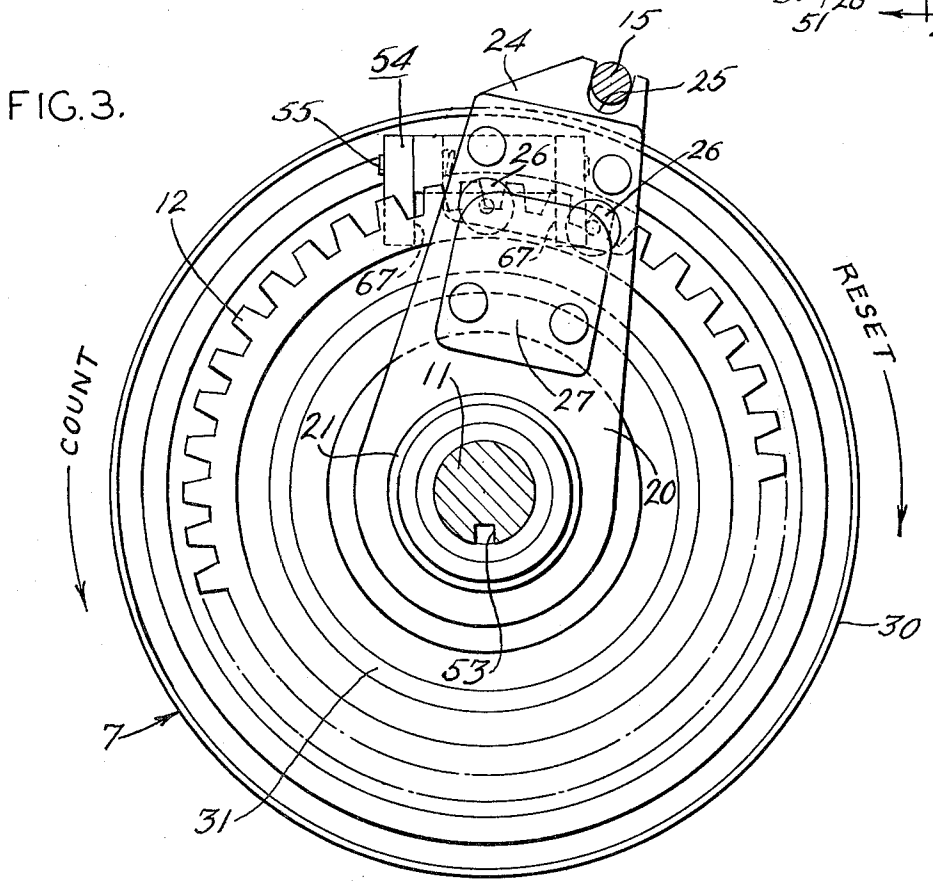


FIG. 4

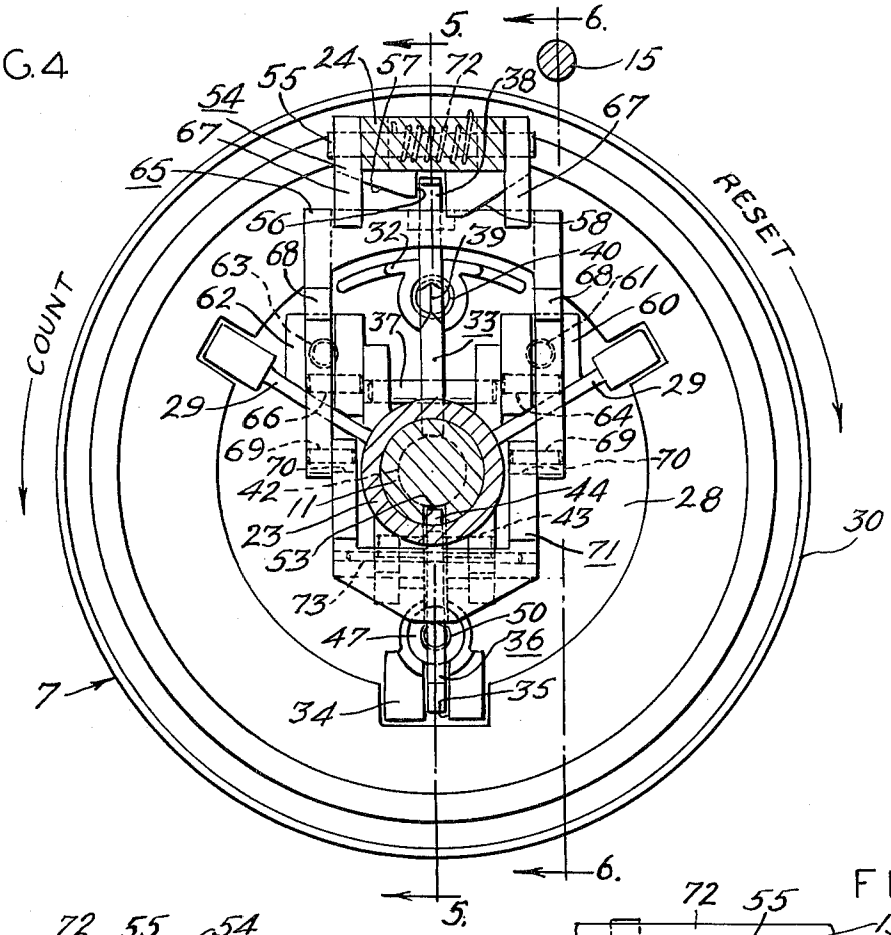


FIG. 5.

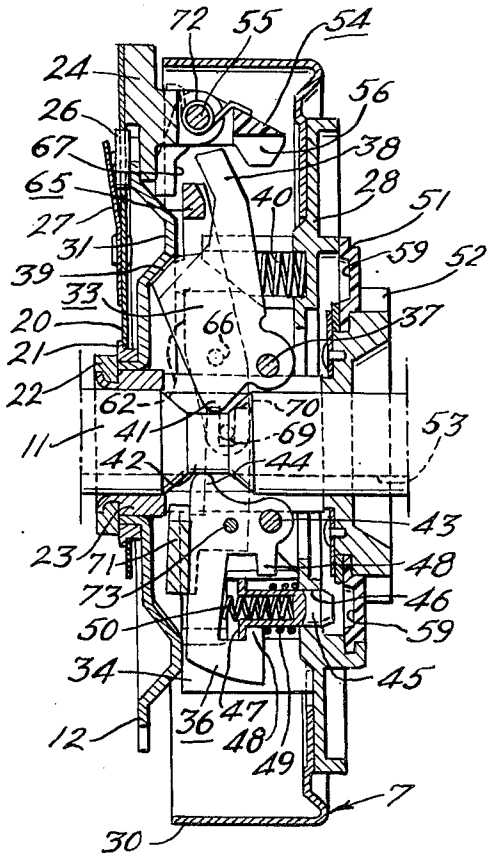


FIG. 6.

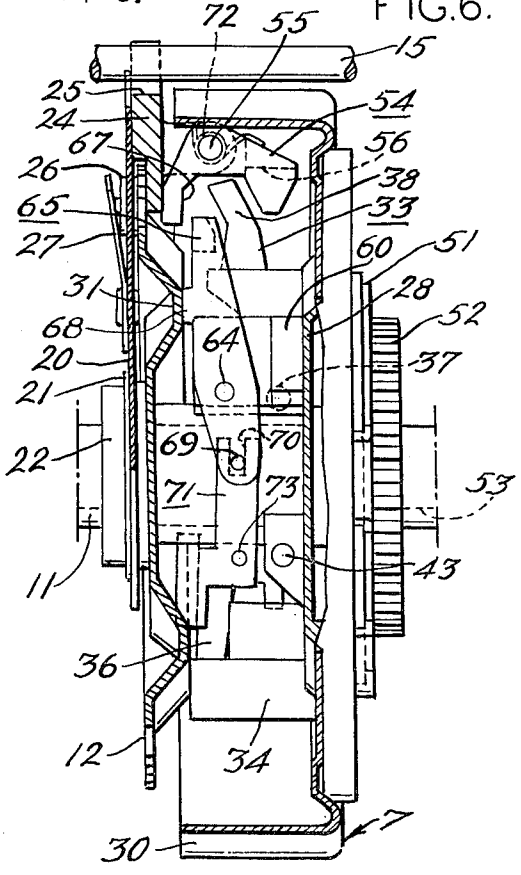


FIG. 7.

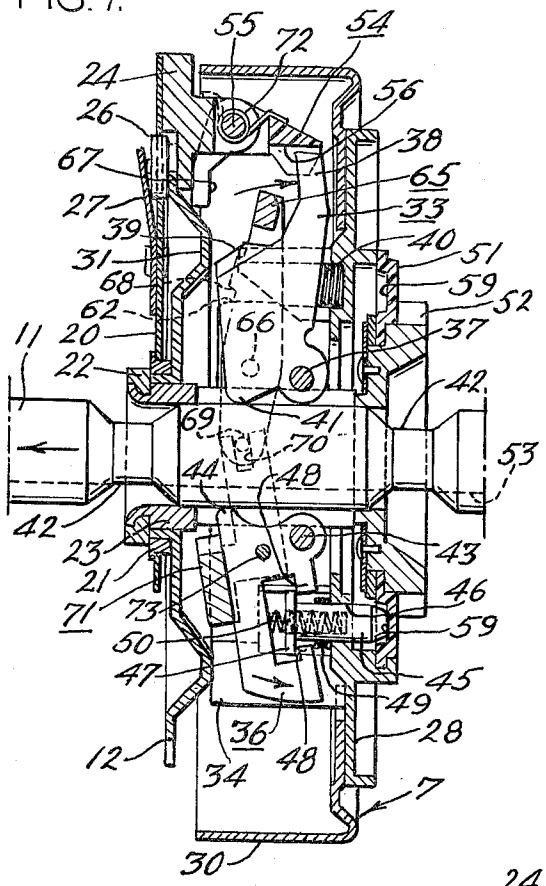


FIG. 8.

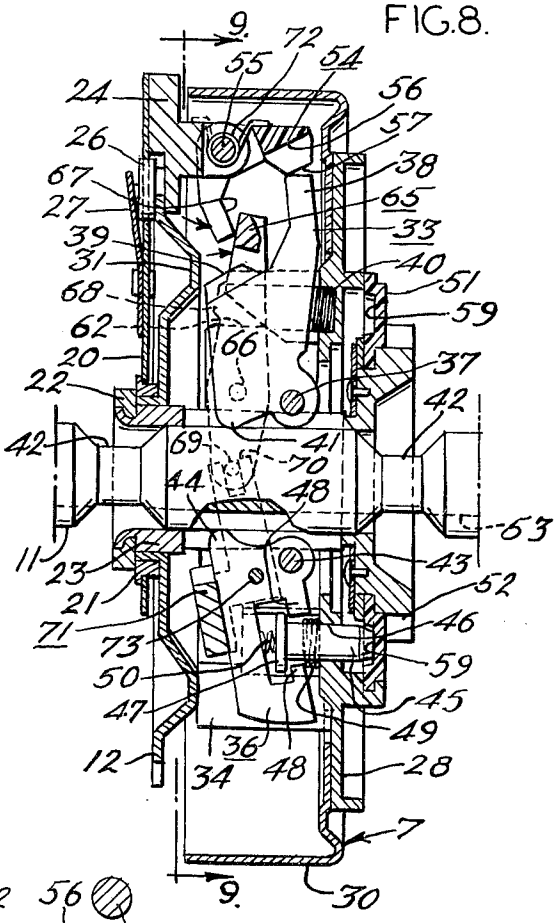
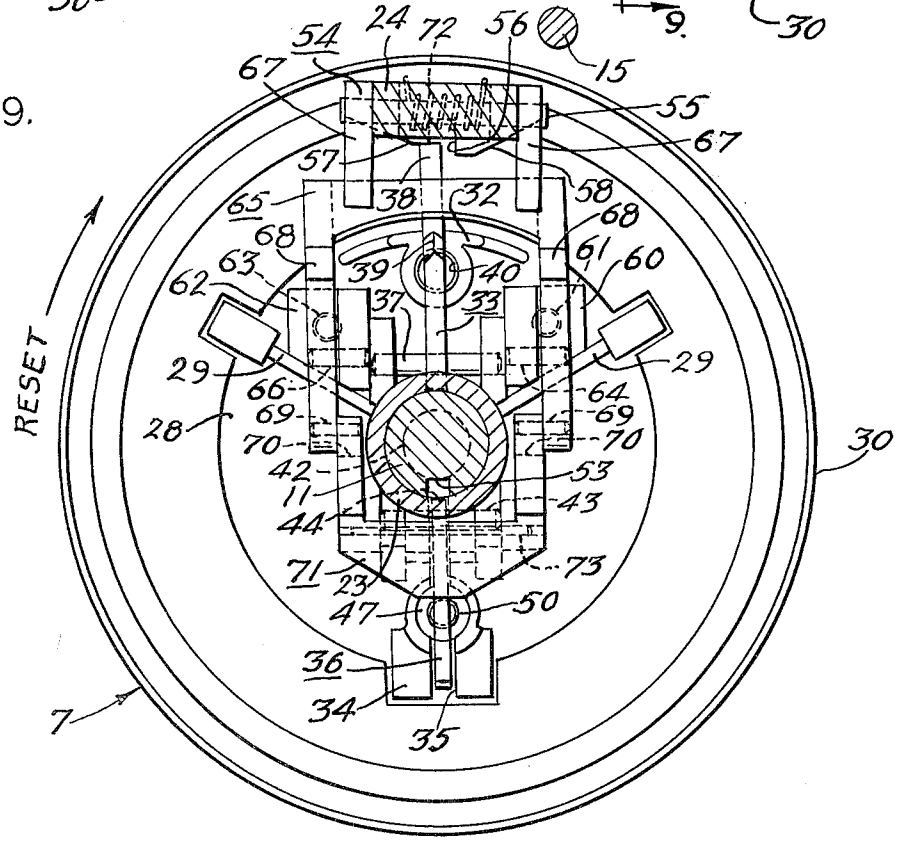


FIG. 9.



REGISTER PRICE WHEEL STRUCTURE

This invention relates to mechanically-driven counters, of the type illustrated, for example, in Bliss U.S. Pat. No. **2,814,444.** Counters of this type are in common use at the present time in gasoline dispensers (gasoline dispensing apparatus). Most counters presently in use in gasoline dispensers have three wheels each for sale or cost and gallons, as described in the aforementioned patent. Since each of these wheels is provided about its periphery with indicia consisting of the numerals **0** to **9** inclusive, the maximum sale capacity of these counters is **$9.99,** which is presently becoming inadequate.

A three-wheel counter (register) could be replaced by a four-wheel counter (which latter has a cost capacity of **$99.99**), but this would entail a large cost (involving the cost of the new register itself, the necessary new "pump" face, etc., plus the labor cost of the actual replacement); the total cost of this changeover would be extremely large, considering the very large number of three-wheel counters presently in use.

Therefore, an object of the present invention is to provide a novel means for increasing the capacity of a mechanically-driven counter, which is readily applicable to presently-existing counters.

Another object is to provide an arrangement for increasing the capacity of a mechanically-driven counter, without increasing the number of wheels in the counter.

A further object is to provide a novel price wheel structure for registers.

A still further object is to provide a register price wheel which can be used as a replacement wheel, in order to increase the capacity of the register.

Yet another object is to accomplish the foregoing objects in a relatively inexpensive manner.

A detailed description of the invention follows, taken in conjunction with the accompanying drawings, wherein:

FIG. **1** is a partial view of the face of a gasoline dispensing apparatus, illustrating a cost wheel arrangement utilizing this invention;

FIG. **2** is a view similar to FIG. **1,** but with the pump face removed, illustrating a cost wheel arrangement embodying this invention;

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

FIG. **4** is a cross-section taken on line **4—4** of FIG. **2;**

FIG. **5** is a cross-section taken on line **5—5** of FIG. **4,** showing the moving parts in the position which they assume during the counting mode of the register;

FIG. **6** is a section taken on line **6—6** of FIG. **4,** again showing the parts during the counting mode;

FIG. **7** is a view generally similar to FIG. **5,** but showing the moving parts in the position which they assume during the reset mode of the register;

FIG. **8** is a view similar to FIG. **7,** but showing the moving parts in the position which they assume when resetting the lowest-order cost wheel from a "**1**" position to a zero position; and

FIG. **9** is a cross-section taken on line **9—9** of FIG. **8.**

Refer first to FIG. **1.** The assembled register, as installed in a gasoline dispensing apparatus, is preferably provided with a protective cover **1** which is a generally

boxlike housing having three windows **2, 3,** and **4** situated in registry with the cost wheels **5, 6,** and **7** respectively so as to expose the reading line thereof to view, a fixed index marker or pointer **8** being positioned adjacent the lowest-order cost wheel **7,** in the conventional manner.

The two higher-order cost wheels **5** and **6** are each provided about their peripheries with indicia consisting of the numerals **0** to **9** inclusive, in the conventional manner, and these two wheels preferably are constructed as disclosed in the aforementioned patent.

However, according to this invention, the cost wheel **7** of lowest order is provided about its periphery with one hundred graduations (from **00** to **99** inclusive), and with the appropriate numerals adjacent each fifth graduation. This lowest order wheel may therefore be termed a "**100** cent" wheel, and is arranged to indicate, on the one wheel, the total number of cents of the sale, from **0** to **99.** Thus, the total capacity of the three wheels **5, 6,** and **7** is **$99.99,** with the dollars wheels **5** and **6** indicating individual dollars digits (**0** to **9**), and the single wheel **7** indicating both digits for the cents. A fixed decimal point **9** is painted on the cover **1** between the wheel **6** and the wheel **7.** The lowest order cost wheel **7** is of novel construction, and it is the construction of this wheel which is the essence of the present invention.

Refer now to FIG. **2,** which shows a set of cost wheels **5, 6,** and **7** forming a part of a register of the type particularly adapted for use in gasoline dispensing apparatus. The register or counter is mounted on a frame consisting of side plates **10** held apart by suitable spreader bars (not shown). The frame has slidably journaled therein a plurality (usually four) of axially movable but non-rotatable horizontal wheel-supporting shafts, one of which is illustrated at **11.** Shaft **11** has mounted thereon the set of rotatable number wheels **5, 6,** and **7** for registering the cost of the gasoline dispensed. Of the other three axially movable wheel-supporting shafts referred to, one carries a set of rotatable number wheels corresponding to the wheels **5–7** but mounted at the opposite end of the register (so that the operator or customer may read the indication from either side of the dispensing apparatus); a second shaft carries a set of rotatable number wheels which are utilized to register the quantity of the gasoline dispensed; a third shaft carries a duplicate set of quantity wheels mounted at the end of the register opposite to the previously-mentioned quantity wheels.

A counting gear **12,** which is rotatably mounted on shaft **11,** is connected or coupled, for the register counting mode, to the lowest-order cost wheel **7** in a manner to be more particularly described hereinafter. During the register counting mode (i.e., during the dispensing cycle), gear **12** is driven through suitable gearing (not shown) from a gear (not shown) mounted on the output of a variator (also not shown) which is set in accordance with the price per gallon of the liquid being dispensed. The arrangement is such that the lowest-order cost wheel **7** is driven from the variator at a speed commensurate with the price of the quantity of gasoline being dispensed, and at a speed such that this wheel makes one revolution for every **100** cent or **$1.00** worth of gasoline dispensed. The arrangement just referred to, for driving the cost wheel **7** of lowest order during the counting mode, is preferably quite similar to that disclosed in the aforementioned patent.

However, it should be pointed out that the gearing utilized in this invention differs in overall gear ratio as compared to that of the patent, since in the present invention the lowest-order cost wheel **7** makes one revolution for every **100** cents worth of gasoline dispensed, while in the patented arrangement the lowest-order cost wheel makes one revolution for every **10** cents worth of gasoline dispensed; that is to say, the cost wheel **7** rotates at one-tenth the speed of the lowest-order cost wheel in the patented arrangement.

It is the intention that for each complete revolution of a number wheel of lower order, the wheel of next higher order will be rotated one-tenth revolution. The transfer mechanism for transferring the count from the wheels of lower order to the wheels of higher order is somewhat conventional and includes, for the wheels **5–7**, the use of transfer pinions **13** and **14** rotatably mounted on a transverse shaft **15** which is fixed to the frame **10**, pinion **13** being located between wheels **7** and **6** and pinion **14** being located between wheels **6** and **5**. Upon each rotation of the wheel **7** of lowest order, the transfer pinion **13** is engaged by a two-toothed driving gear **16** on wheel **7**, which operates to impart a partial rotation to such transfer pinion. Transfer pinion **13** meshes with the counting gear **17** of the number wheel **6** of next higher order, thus advancing the number **6** one-tenth revolution each time the transfer pinion **13** is actuated. Similarly, upon each rotation of the wheel **6**, the transfer pinion **14** is engaged by a two-toothed driving gear **18** on wheel **6**, which operates to impart a partial rotation to such transfer pinion. Transfer pinion **14** meshes with the counting gear **19** of the number wheel **5** of next higher order, thus advancing the number wheel **5** one-tenth revolution each time the transfer pinion **14** is actuated. The transfer mechanism described is very similar to that disclosed in the aforementioned patent.

One end of a mounting arm **20** is fastened to a bushing **21** which is mounted rotatably with respect to the counting gear **12** but is maintained in a plane substantially parallel to the plane of this gear, between the gear face and a ring **22** which is swaged to the hub **23** of wheel **7**. At its opposite end, arm **20** is fixedly secured to a wheel bracket **24** having therein a U-shaped notch **25** which fits around the fixed shaft **15**, thereby to keep the bracket **24** and arm **20** fixed in position as the counting gear **12** and number wheel **7** rotate. A pair of friction buttons **26**, made preferably of nylon, which extend freely through respective holes in arm **20**, are adapted to frictionally engage (at their inner ends) the outer face of gear **12**, thereby to provide a continuous frictional force or drag against this gear as the latter rotates. This friction brake arrangement serves as an anti-backlash device, preventing movement of gear **12** when the force driving the same is removed. One end of a leaf spring **27** is fixedly secured to arm **20**, and the free end of this spring engages the outer ends of the buttons **26**, thereby to urge the latter against gear **12** with a predetermined spring force. This predetermined force governs the frictional force or drag of buttons **26** against the face of gear **12**.

The internal construction of the number wheel **7** is best shown in FIGS. **4–6**. Referring to these figures, it will be seen that wheel **7** has a hub **23** in which is formed a throughbore for accommodating the wheel-supporting shaft **11**, the hub being rotatable and slidable relative to the shaft. Hub **23** is provided with a side wall **28** and radiating webs **29** on which is mounted a cylindrical rim **30** bearing the numerals and graduations hereinbefore referred to. The outer portion of the side wall **28** is integrally formed with the driving gear **16** previously referred to for cooperation with the transfer pinion **13**.

Mounted on the hub **23** opposite to the side wall **28** is the counting gear **12** which is freely rotatable on the hub, although it is held in place axially by means of the ring **22**. The counting gear **12** is formed with an inwardly-projecting annular ridge **31** in which is formed a frusto-conical band of fine V-shaped serrations or teeth (not shown). One web **32** of the wheel **7** is slotted for accommodating a pivoted driving pawl **33**, and a radially opposite web **34** is slotted as indicated at **35** for accommodating a pivoted resetting pawl **36**.

Dealing first with the pivoted driving pawl **33**, it will be noted that it is in the form of a flat piece pivoted at one end, as by means of a pin **37**, to the hub **23**, for swinging movement in a radial plane which includes the longitudinal axis of the wheel. The free or outer end of the pawl comprises a tail **38** which will be referred to further hereinafter. Intermediate its ends, this pawl is provided with a knife-edge **39** which is adapted to enter into and engage one of the notches in the V-shaped teeth on counting gear **12**. The pawl is normally urged into cooperative engagement with a notch of the counting gear **12** by a compression spring **40** extending between the pawl and the side wall **28**.

The pawl **33** has adjacent its pivoted end a lobe or projection **41** adapted to extend into the bore of the hub **23** for engagement with the supporting shaft **11**. The supporting shaft **11** is provided with a series of circumferential grooves **42** (one for each of the wheels **5**, **6**, and **7**; one of these is shown in FIG. **5**) which freely accommodates lobe **41** when the shaft **11** is in registering or counting position as shown in FIG. **5**, the supporting shaft being axially shiftable as previously mentioned. When the supporting shaft **11** is in the position shown in FIG. **5** (groove **42** in registry with lobe **41**) so that no pivoting force is applied to the lobe **41** of the pawl by the supporting shaft, the pawl is engaged with the teeth of the counting gear **12**, so that a positive driving engagement is obtained between this driven gear and the wheel. When the supporting shaft **11** is shifted to the left, as illustrated in FIG. **7** of the drawings, the lobe **41** of the pawl rides up on the periphery of the shaft, thus pivoting the pawl **33** and disengaging its knife-edge **39** from the driven gear **12**, thus freeing the wheel **7** from its driving gear **12** and conditioning the wheel for a resetting operation.

Turning now to the pivoted resetting pawl **36**, it will be seen that the pawl **36** is generally similar to the pawl **33** in that it also is formed of a flat piece pivoted at one end, as by means of a pin **43**, to the hub **23**, for swinging movement in a radial plane which includes the longitudinal axis of the wheel. The pawl **36**, however, is made somewhat thinner than the pawl **33** for the reason to be more fully explained hereinafter. Like the pawl **33**, pawl **36** has a lobe or projection **44** adjacent its pivoted end which also extends into the bore of the hub **23** for engagement with the supporting shaft **11** or circumferential groove **42**, depending on the shifted position of the supporting shaft.

Pawl **36** has associated therewith a plunger **45** which is axially slidable in a bore **46** in the side wall **28**. The inner end of the plunger **45** has a head **47** which is em-

braced by the finger-like projections **48** of the pawl **36.** The pawl **36** is urged in a clockwise direction as viewed in FIGS. **5** and **7** by reason of a spring **49** extending between the side wall **28** and the pawl, and surrounding the plunger **45.** The plunger is urged outwardly of the wheel relative to the pawl by means of a spring **50** between the plunger **45** and pawl **36.** As a result of this construction, the pawl **36** is normally urged in a clockwise direction so that, when its lobe or projection **44** is received in the circumferential groove **42,** it will draw in the plunger **45** (see FIG. **5**). Conversely, when the pawl is shifted in a counterclockwise direction by shifting of the supporting shaft **11,** the plunger **45** is free to move outwardly under the influence of spring **50** (see FIG. **7**).

Rotatably mounted on the outer side of the side wall **28** is a disc **51** having fixed thereto a gear **52.** The disc **51** is rotatably supported on the side wall **28** and is retained axially by means of a plurality of integral overhanging members which engage and hold the disc **51.** The disc **51** is provided on its inner face with a plurality of holes **59** which are circularly arranged at a distance from the axis of the wheel such that they may be brought into registry with the plunger **45** which, as previously mentioned, is associated with the pawl **36.** The result is that when the wheel supporting shaft **11** is shifted axially to pivot the pawl **36** in a counterclockwise direction (see FIG. **7**), the wheel may be picked up and rotated by rotating the gear **52.** In the event one of the holes in the disc **51** is not lined up with the plunger **45** when the pawl **36** is pivoted counterclockwise, the plunger **45** will not move, but instead will merely further compress the spring **50.** However, as soon as any rotation is applied to the disc **51** by rotating the gear **52,** one of the disc holes will quickly be brought into registry with the plunger **45,** and the spring **50** will move the plunger outwardly into engagement therewith.

As previously mentioned, the supporting shaft **11** during a resetting operation is in the shifted position shown in FIG. **7,** so as to disengage the number wheel **7** from the driven gear (counting gear) **12** and so as to permit the wheel to be picked up by its associated disc **51** upon rotation of the resetting gear **52,** whereupon the wheel may be returned to zero position (in the clockwise or "Reset" direction, as viewed in FIG. **4**) upon continued rotation of the gear **52.** There is a longitudinal slot **53** in the supporting shaft **11,** this slot being sufficiently wide and deep to accommodate the lobe **44** of the pawl **36** when the pawl is substantially in radial alignment therewith. As will be appreciated, as soon as the lobe **44** of the pawl **36** actually falls into the slot **53,** the pawl immediately withdraws its associated plunger **45** from the disc **51,** thus interrupting any further resetting movement of the number wheel **7,** even though further additional turning movement may be applied to the associated gear **52** and hence the disc **51.**

The pawl **33,** being thicker than the pawl **36,** will ride over and not engage in the longitudinal slot **53,** and thus will not interfere with the resetting operation.

As described hereinabove, when the supporting shaft **11** is in the shifted (resetting) position illustrated in FIG. **7,** the number wheel **7** is disengaged or decoupled from the driven or counting gear **12,** and is coupled to the resetting gear **52,** by way of disc **51,** plunger **45,** and pawl **36.** During the register resetting mode which follows, the resetting gear **52** is preferably driven by a conventional spring-powered pawl-and-plate mechanism (not shown) which may be, for example, constructed and arranged as disclosed in the aforementioned patent, and particularly in FIGS. **12-15** of said patent. As described in such patent, each disc such as **51** is rotated by its resetting gear such as **52** at least one turn, and preferably one turn plus a fraction, to ensure that all of the wheels in the register will be picked up and returned to zero position. The Reset direction for number wheel **7** (during the resetting mode, when disc **51** is coupled to the wheel and counting gear **12** is uncoupled therefrom) is clockwise as viewed in FIGS. **3** and **4.** The "Count" direction for this wheel (during the counting mode, when disc **51** is uncoupled from the wheel and counting gear **12** is coupled thereto) is counterclockwise as viewed in FIGS. **3** and **4.**

It is absolutely essential, in a register of the type hereinbefore referred to, that the number wheels be reset accurately to zero, which is to say that when the wheels are stopped during the resetting operation, they must be in exact zero position. On the number wheel **7** of this invention, the indicia (i.e., the adjacent graduations, representing cents) are quite close together. For example, a typical cylindrical rim **30** may have a circumference of **10** inches, and since there are one hundred graduations on the circumference, adjacent graduations are one-tenth inch apart. In the register described in the aforementioned patent, the number wheels were stopped, during the resetting mode, as soon as the wheels were rotated to the position wherein the lobes of the resetting pawls (the lobe denoted by numeral **44** herein) fell into the shaft slot (the slot denoted by numeral **53** herein). However, due to manufacturing tolerances and wear in the pawl lobe and slot, and due also to the fact that this stopping means is located at such a small radial distance from the center of shaft **11,** this reset stopping means is not sufficiently accurate for the number wheel **7** of this invention (taking into account the close spacing of the graduations on such wheel). Therefore, according to this invention a novel reset stopping means is provided for the lowest-order cost wheel **7,** and such means will now be described.

A reset detent denoted generally by numeral **54** and made of a hard, long-wearing material such as nylon, is pivotally mounted by means of a pin **55** on the fixed wheel bracket **24,** on the inner side thereof, opposite the arm **20.** From FIG. **4,** it may be seen that this detent **54** is located just radially inside the cylindrical rim **30** of the wheel. Pin **55** is fixed in a pair of integral, spaced, parallel outstanding ears (not specifically referred to) on bracket **24.** The reset detent **54,** mounted on its fixed pivot pin **55,** is adapted to swing in a radial plane, counterclockwise from its rest position as viewed in FIG. **5.** Detent **54** is biased toward its "normal" or rest position (FIGS. **5** and **7**) by means of a torsion spring **72** which surrounds pin **55;** one end of this spring engages the detent **54** and the other end engages fixed bracket **24.**

Viewed in cross-section as in FIG. **5,** the detent **54** is of somewhat inverted U-shape. Speaking in this sense, the "inner leg of the U" comprises a central slot **56** (which is adapted to receive therein, at certain times, the tail **38** of the driving pawl **33;** see FIG. **4**) bounded respectively by two beveled portions **57** and **58** (beveled toward the center of the wheel). In the counting mode, the pivoted driving pawl **33** is so oriented that its

tail 38 is located in an axial plane between the two "legs of the U" of detent 54; thus, the detent 54 does not interfere with the rotation of pawl 33 during the counting mode (see FIG. 5).

However, when the shaft 11 is shifted to move the parts to the reset mode (see FIG. 7), the tail 38 of the driving pawl 33 is swung into an axial plane such that it can cooperate with the inner leg of the U, and the latter can then serve as a detent for the driving pawl 33 and, hence, for the number wheel 7. The beveled portion 58 of the reset detent 54 extends further radially inwardly, toward the center of shaft 11, than does the other beveled portion 57.

When the resetting mode first begins, the driving pawl 33 will in general (though not always, as will be described hereinafter) be at some angular position away from the fixed reset detent 54. The driving pawl 33 rotates with the number wheel 7 during resetting (as well as during the counting mode). When the tail 38 of pawl 33 comes into engagement with the beveled portion 57 of detent 54, this detent is pushed aside (causing counterclockwise pivoting, viewed in FIG. 7, of this detent) to permit the tail of the pawl to enter slot 56 from the left side thereof (viewed in FIG. 4). The wall of beveled portion 58 bounding slot 56 serves as a stop for the pawl tail, the action thus causing the pawl tail 38 to snap into and remain in slot 56. The action described (when the tail 38 of pawl 33 enters and is stopped in the detent slot 56, in which position it is shown in FIG. 4) results in the positive stopping of the number wheel 7, even though the disc 51 may continue to rotate.

The fixed detent slot 56 in reset detent 54 is accurately positioned in relation to the pawl 33 (and to the number wheel 7) so that, when the tail 38 of this pawl engages in the slot, the wheel will be in exact zero position. The location of this slot at a radial distance from the center of the wheel which is large as compared to the radius of shaft 11 enhances the accuracy of positioning of the wheel at zero.

When the number wheel reaches the immediate vicinity of its zero position, lobe 44 of the resetting pawl 36 falls into shaft slot 53, thus interrupting further resetting movement of the number wheel 7 (by withdrawal of plunger 45 from disc 51, as previously described). Even though this may occur slightly before the number wheel reaches its exact zero position, there is sufficient inertia in the resetting mechanism to carry the wheel to its exact zero position (which latter is determined by the pawl tail 38 entering detent slot 56, as previously described).

With the construction so far described, the number wheel 7 may not reset properly under certain conditions. This may come about by reason of the following. To prevent resetting errors, the number wheel must be reset to zero from positions close to zero (i.e., 99 cents, or 1 cent), as well as from all other positions. When the number wheel 7 stops at 99 cents, or at 1 cent, the lobe 44 of resetting pawl 36 would be substantially aligned with shaft slot 53, and would tend to fall thereinto. This is because of wear and manufacturing tolerances of the pawl and slot, and also taking into account the fact that the individual graduations on the rim 30 are only one-tenth inch apart, for example, and this rim has a radius from the center of the wheel (actually, from the center of the shaft 11) which is large compared to the radius at which the shaft slot 53 is located. As previouslly described, when pawl 36 falls into slot 53, the resetting gear 52 is disconnected or decoupled from number wheel 7, so that if this should occur when the number wheel stops at 1 cent, or at 99 cents, no resetting to zero could take place.

According to this invention, a linkage mechanism, now to be described, comes into play when the wheel stops at 99 cents, or at 1 cent, to prevent this decoupling from taking place, thus assuring proper resetting to zero of the wheel.

Refer now more particularly to FIGS. 8 and 9. An L-shaped bracket 60 is mounted in the corner formed between one end of pin 37 (which pivots driving pawl 33) and one web 29, one leg of this bracket being secured to side wall 28 by means of a screw which threads into a tapped hole 61 in the bracket. A similar L-shaped bracket 62 is mounted in the corner formed between the opposite end of pin 37 and the other web 29, one leg of bracket 62 being secured to side wall 28 by means of a screw which threads into a tapped hole 63 in this bracket.

The upstanding leg of bracket 60 pivotally carries, as by means of a pin 64, one leg of a U-bar 65 (which is U-shaped in front elevation, as seen in FIGS. 4 and 9) the base of which is located radially outwardly beyond web 32. The upstanding leg of bracket 62 pivotally carries, as by means of a pin 66, the other leg of U-bar 65. The fixed pivot pins 64 and 66 are both located at points intermediate the ends of the respective legs of U-bar 65.

The "outer leg of the U" of detent 54 (viewed in cross-section as in FIGS. 5-8) comprises a pair of depending integral legs 67 which are adapted, upon counterclockwise rotation (viewed as in FIG. 8) of detent 54 from its "rest" position of FIG. 5, to engage the base of U-bar 65 (as illustrated in FIG. 8), on the side thereof which faces counting gear 12. (How this rotation of detent 54 is brought about will be described hereinafter.)

The described rotation of detent 54 causes U-bar 65 to swing about its pivots 64 and 66, in the clockwise direction as viewed in FIGS. 5 and 8, from its rest position of FIG. 5 to the position illustrated in FIG. 8.

As illustrated in FIG. 6, each of the legs of U-bar 65 has, intermediate its ends, a raised pad 68 of rather small area (one-eighth inch by one-eighth inch, for example), which contacts the inner surface of ridge 31 of counting gear 12 to limit the movement of U-bar 65 in the counterclockwise direction.

A pin 69 is fixedly secured to the outer end of each respective leg of the U-bar 65, and these pins are pivotally engageable in respective bifurcations 70 formed in the ends of each of the two legs of a U-shaped pawl actuator 71 (U-shaped in front elevation, as seen in FIGS. 4 and 9). The two legs of actuator 71 span the hub 23 of the number wheel, as do also the two legs of the U-bar 65 (though the U-bar legs are spaced further outwardly from the hub than are the actuator legs); the base of actuator 71 is located just radially outwardly of hub 23. As may be seen particularly in FIGS. 5 and 7, the base of actuator member 71 extends over that edge of resetting pawl 36 which faces the counting gear 12.

The base of actuator member 71 is pinned (i.e., fixedly secured) to the resetting pawl 36, as by a pin 73 which is press-fitted into holes provided in the actuator member and in the pawl. This rigid pinned connection

is at the end of actuator member 71 opposite to the bifurcated arm couplings 70.

When U-bar 65 is caused to swing about its pivots 64 and 66 in the clockwise direction (as described previously, in connection with FIG. 8), actuator member 71, which is pivotally coupled to the U-bar at 69, 70 and is rigidly connected at 73 to the resetting pawl 36, causes said pawl to pivot about its pin 43 in the counterclockwise direction as viewed in FIG. 8. This rotational force acting on pawl 36 prevents the pawl lobe 44 from moving clockwise into the shaft slot 53, even though the pawl may then be aligned therewith, as illustrated in FIG. 9. Also, of course, since this counterclockwise pivotal movement of pawl 36 is equivalent to that produced by the shaft-shifting operation (for resetting) described in connection with FIG. 7, the plunger 45 moves outwardly to couple the resetting disc 51 (and gear 52) to the number wheel 7.

Summarizing the foregoing, the counterclockwise rotation of detent 54 illustrated in FIG. 8 causes, by means of the linkage 65, 71, a shifting of the pawl 36 in a counterclockwise direction, with a resultant engagement of the plunger 45 with the resetting disc 51. Thus, under these conditions the number wheel 7 remains coupled to the resetting gear 52, even though the pawl 36 is then aligned with the shaft slot 53 (which alignment, absent the aforementioned linkage, would result in the pawl dropping into the shaft slot, with a consequent decoupling or uncoupling of the number wheel from the resetting disc 51 and gear 52).

FIGS. 8 and 9 illustrate the positions of the parts at the beginning of a resetting operation, when the number wheel 7 has stopped counting at its 1 cent position. Under these conditions, the tail 38 of the driving pawl 33 is not aligned with the slot 56 of detent 54 (since the number wheel is then not at its zero position), even though the resetting pawl 36 may be aligned with shaft slot 53 (see FIG. 9). Now, when the shaft 11 is shifted (as in FIG. 7) to place the number wheel in the resetting mode, driving pawl 33 pivots as usual, but now tail 38 of this pawl comes into engagement with beveled portion 57 of detent 54 to pivot this detent counterclockwise as shown in FIG. 8. This counterclockwise rotation of the reset detent results in shifting the pawl 36 in a counterclockwise direction by means of a linkage 65, 71, engaging plunger 45 with resetting disc 51 as previously described, and thus coupling the number wheel 7 to the resetting gear 51 so that this wheel can properly reset to zero (by clockwise rotation of the wheel in FIG. 9, as indicated, and as previously described, until the pawl tail 38 enters slot 56 of the detent 54). Entry of pawl tail 38 into detent slot 56 stops the number wheel at its zero position, as described previously, and when the pawl tail enters slot 56 detent 54 returns to the rest position of FIG. 7, releasing the linkage 65, 71 so that lobe 44 of pawl 36 is then free to fall into shaft slot 54 to decouple the number wheel 7 from the resetting disc 51 and gear 52.

An operation similar to that just described takes place at the beginning of a resetting operation when the number wheel 7 has stopped counting at its 99 cents position. Under these latter conditions, the pawl tail 38 is not aligned with the slot 56 of detent 54 (since the number wheel is then not at its zero position), even though the resetting pawl 36 may be aligned with shaft slot 53 (similar to the showing in FIG. 9). Now, when the shaft 11 is shifted (as in FIG. 7) to place the number wheel in the resetting mode, driving pawl 33 pivots as usual, but now tail 38 of this pawl comes into engagement with beveled portion 58 of detent 54 to again pivot this detent counterclockwise from its rest position. This counterclockwise rotation of the reset detent, from its rest position, again results in shifting the pawl 36 in a counterclockwise direction by means of the linkage 65, 71, engaging plunger 45 with resetting disc 51 as previously described, and thus coupling the number wheel 7 to the resetting gear 52 so that this wheel can be properly reset to zero (by clockwise rotation of the wheel as indicated in FIG. 4, and as previously described, until the pawl tail 38 enters slot 56 of the detent 54). Entry of pawl tail 38 into detent slot 56 stops the number wheel at its zero position, as described previously, and when the pawl tail is in this slot the linkage 65, 71 is released so that lobe 44 of pawl 36 is free to fall into shaft slot 54 to decouple the number wheel 7 from the resetting disc 51 and gear 52.

It should now be apparent that, according to this invention, counting errors (which might otherwise arise as a result of backlash in the counting gear train) are overcome by the use of the friction braking arrangement 26, 27, which provides a constant frictional force or drag against the counting gear 12.

Also, the fixed reset detent 54, located near the radially-outer edge of the number wheel 7, cooperates with the tail 38 of the driving pawl 33 to provide an accurate reset stop (at the zero position) for the number wheel.

In addition, the mechanical linkage 65, 71 prevents inappropriate uncoupling of the number wheel from the resetting disc 51 (when resetting is from the 1 cent or 99 cents position of the number wheel 7), thus assuring proper resetting of the number wheel.

Although the invention has been described in relation to price wheels, and to the lowest order of a set, it is to be understood that the invention may also be used for other number wheels, e.g. quantity wheels, and for higher order wheels of a set.

That invention claimed is:

1. In a counter, an axially shiftable shaft, a number wheel rotatably mounted on the shaft, a rotatable driven gear coaxially disposed at one side of the wheel for rotating the number wheel during a counting operation, a displaceable element in the number wheel actuatable by the shaft for selectively connecting the number wheel to the driven gear, a rotatable member coaxially disposed at the other side of the wheel for rotating the number wheel during a resetting operation, means shiftably mounted on the number wheel and actuatable by the shaft for selectively connecting the number wheel to said member, and fixed stop means engageable by said element to retain the number wheel in zero position upon resetting of the same.

2. Mechanism defined in claim 1, wherein said element comprises a pawl pivotally mounted in the number wheel for pivoting movement in an axial plane in response to axial shifting of said shaft, said pawl having means for engaging the driven gear.

3. Mechanism of claim 1, wherein said element and the first-mentioned means connect the number wheel selectively with the driven gear and the rotatable member.

4. Mechanism defined in claim 1, wherein said element comprises a pawl pivotally mounted in the number wheel for pivoting movement in an axial plane to a reset rsition in response to axial shifting of said shaft;

said stop means being adapted to engage the tail of said pawl when the same is in its reset position, thereby to retain the number wheel in zero position upon resetting of the same.

5. In a counter, an axially shiftable shaft, a number wheel rotatably mounted on the shaft, a rotatable driven gear coaxially disposed at one side of the wheel for rotating the number wheel during a counting operation, a rotatable member coaxially disposed at the other side of the wheel for rotating the number wheel during a resetting operation, displaceable pawl means mounted in the number wheel normally connecting the number wheel to the driven gear and shiftable with the shaft to a position disconnecting the number wheel from the driven gear and connecting the number wheel to the rotatable member, means associated with said pawl means for disconnecting the number wheel from the rotatable member, detenting means for retaining the number wheel in zero position, and means operated by said detenting means for preventing operation of said disconnecting means unless said number wheel is in zero position.

6. Mechanism defined in claim **5,** wherein the last-mentioned means comprises a mechanical linkage coupled to said detenting means and to said disconnecting means, and operated by said detenting means when said number wheel is in a non-zero position close to the zero position.

7. In a counter, an axially shiftable shaft, a number wheel rotatably mounted on the shaft, a rotatable member coaxially disposed at one side of the number wheel for rotating the number wheel during a resetting operation, a shiftable element in the number wheel engageable with the rotatable member to connect the number wheel with the rotatable member, means on the shaft for shifting the shiftable element into engagement with the rotatable member when the shaft is shifted axially, means on the shaft adapted to engage the shiftable element to disengage the shiftable element from the rotatable member, detenting means for retaining the number wheel in zero position, and means operated by said detenting means for preventing engagement of said shiftable element with said second-mentioned means unless said number wheel is in zero position.

8. Mechanism defined in claim **7,** wherein the last-mentioned means comprises a mechanical linkage coupled to said detenting means and to said shiftable element, and operated by said detenting means when said number wheel is in a non-zero position close to the zero position.

9. Mechanism defined in claim **7,** wherein the first-mentioned means comprises a shoulder on the shaft.

10. Mechanism defined in claim **7,** wherein the second-mentioned means comprises a notch in the shaft.

11. Mechanism set forth in claim **10,** wherein the means for shifting comprises a shoulder on the shaft.

12. In a counter, an axially shiftable shaft, a number wheel rotatably mounted on the shaft, a rotatable driven gear coaxially disposed at one side of the wheel for rotating the number wheel during a counting operation, means for applying a frictional force against said gear, thereby to exert a substantially constant drag upon said gear as the latter rotates; a displaceable element in the number wheel actuatable by the shaft for selectively connecting the number wheel to the driven gear, a rotatable member coaxially disposed at the other side of the wheel for rotating the number wheel during a resetting operation, means shiftably mounted on the number wheel and actuatable by the shaft for selectively connecting the number wheel to said member, and fixed stop means engageable by said element to retain the number wheel in zero position upon resetting of the same.

13. In a counter, an axially shiftable shaft, a number wheel rotatably mounted on the shaft, a rotatable driven gear coaxially disposed at one side of the wheel for rotating the number wheel during a counting operation, a driving pawl pivotally mounted in the number wheel for pivoting movement in an axial plane and having means for engaging the driven gear; said pawl being actuatable by the shaft to shift the pawl out of engagement with the driven gear when the shaft is shifted axially, a rotatable member coaxially disposed at the other side of the wheel for rotating the number wheel during a resetting operation, a resetting pawl pivotally mounted in the number wheel for pivoting movement in an axial plane and having means for engaging the rotatable member; said resetting pawl being actuatable by the shaft to shift the pawl into engagement with the rotatable member when the shaft is shifted axially, and fixed stop means engageable by said driving pawl to retain the number wheel in zero position upon resetting of the same.

14. In a counter, an axially shiftable shaft, a number wheel rotatably mounted on the shaft, a rotatable driven gear coaxially disposed at one side of the wheel for rotating the number wheel during a counting operation, a driving pawl pivotally mounted in the number wheel for pivoting movement in an axial plane and having means for engaging the driven gear; said pawl being actuatable by the shaft to shift the pawl out of engagement with the driven gear when the shaft is shifted axially, a rotatable member coaxially disposed at the other side of the wheel for rotating the number wheel during a resetting operation, a resetting pawl pivotally mounted in the number wheel for pivoting movement in an axial plane and having means for engaging the rotatable member; said resetting pawl being actuatable by the shaft to shift the pawl into engagement with the rotatable member when the shaft is shifted axially, detenting means for retaining the number wheel in zero position, and means operated by said detenting means for preventing said rotatable member engaging means from becoming disengaged unless said number wheel is in zero position.

15. Mechanism defined in claim **14,** wherein said detenting means comprises a fixed stop engageable by the tail of said driving pawl.

16. Mechanism defined in claim **14,** wherein the last-mentioned means comprises a mechanical linkage coupled to said detenting means and to said resetting pawl, and operated by said detenting means when said number wheel is in a non-zero position close to the zero position.

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