April 12, 1960 H. N. BLISS 2,932,448

RESETTING MECHANISM FOR COUNTERS

Filed July 6, 1955 3 Sheets-Sheet 1

FIG. 1

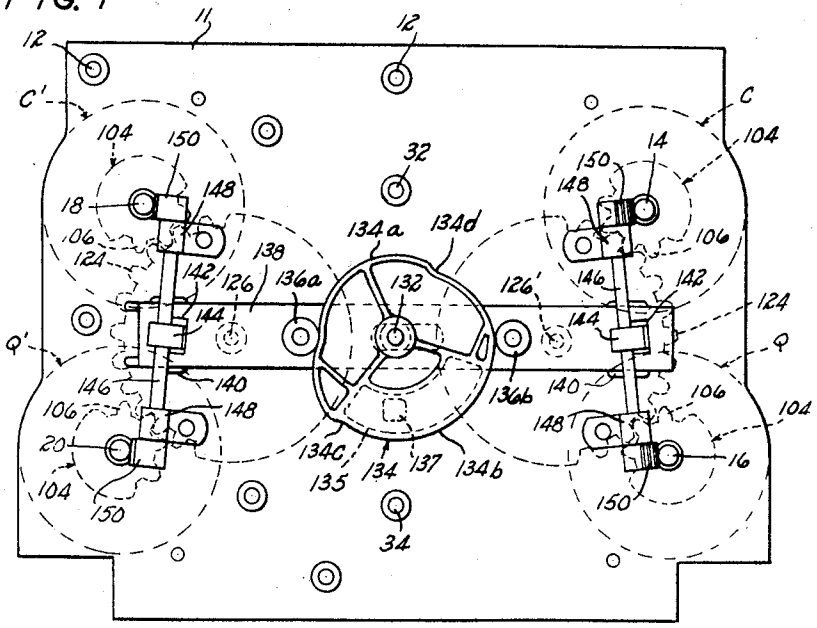
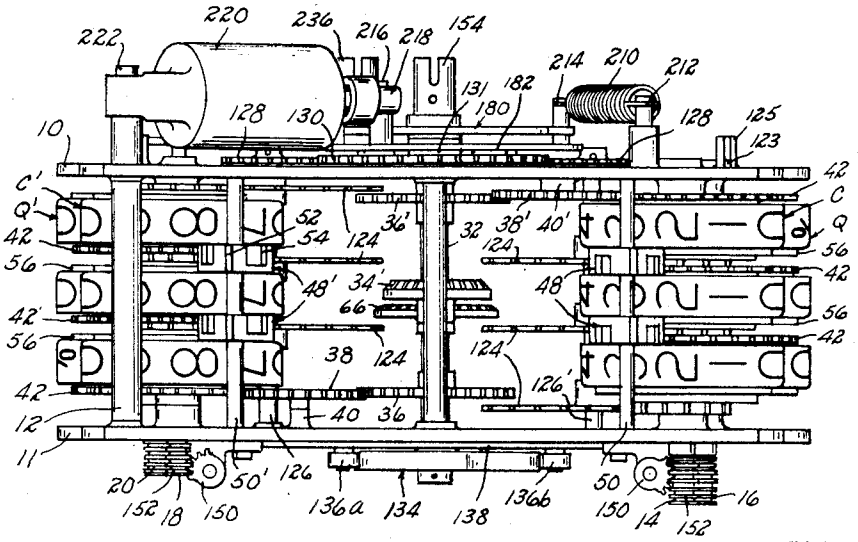


FIG. 2



INVENTOR
HARVEY N. BLISS

BY Lindsey and Prutzman
ATTORNEYS

April 12, 1960 H. N. BLISS 2,932,448

RESETTING MECHANISM FOR COUNTERS

Filed July 6, 1955 3 Sheets-Sheet 2

FIG. 3

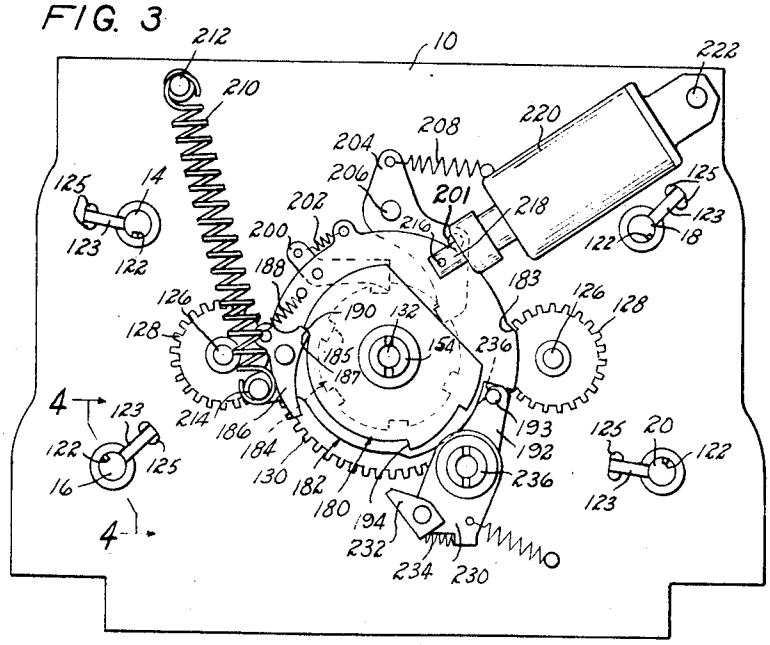
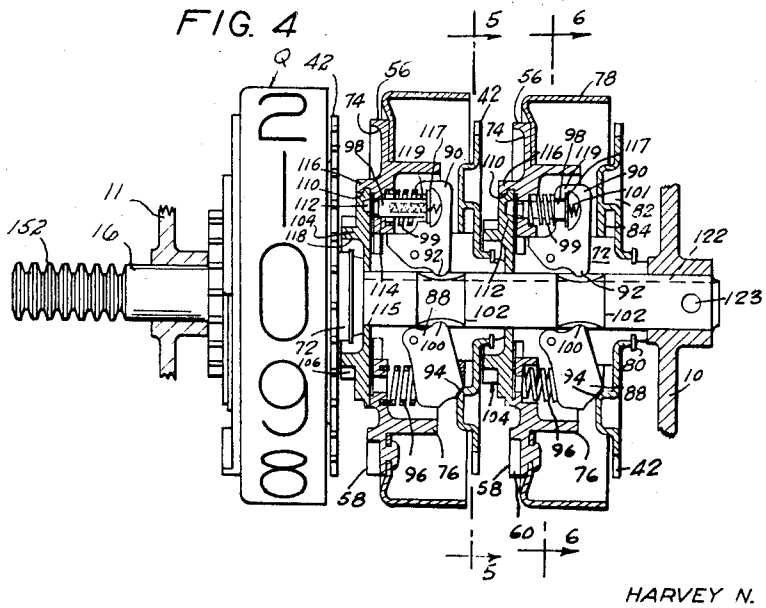


FIG. 4



INVENTOR
HARVEY N. BLISS

BY Lindsey and Prutzman
ATTORNEYS

April 12, 1960 H. N. BLISS 2,932,448

RESETTING MECHANISM FOR COUNTERS

Filed July 6, 1955 3 Sheets-Sheet 3

FIG. 5

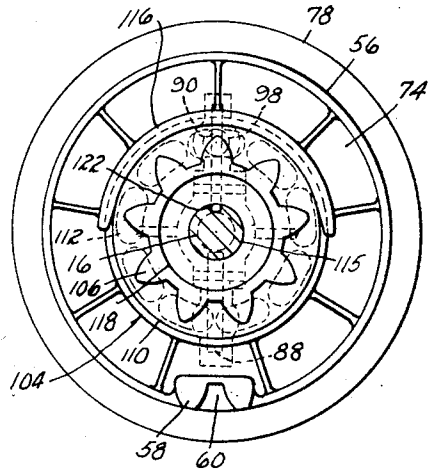


FIG. 6

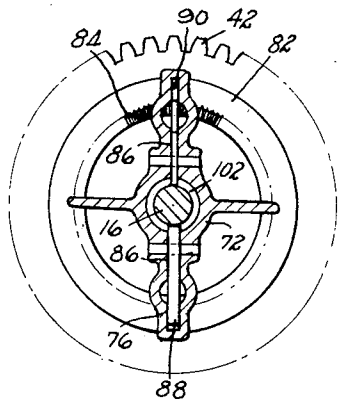


FIG. 7

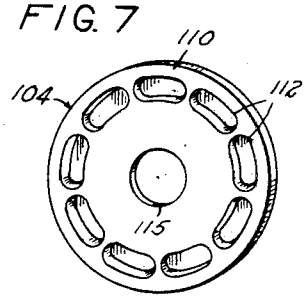


FIG. 8

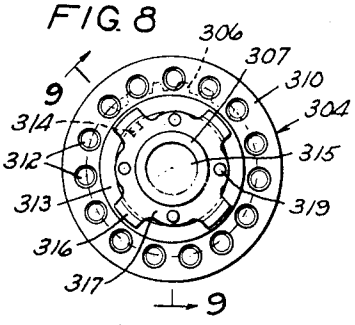
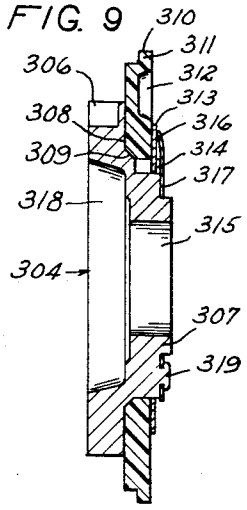


FIG. 9



INVENTOR
HARVEY N. BLISS

BY Lindsey and Prutzman
ATTORNEYS

United States Patent Office 2,932,448
Patented Apr. 12, 1960

2,932,448

RESETTING MECHANISM FOR COUNTERS

Harvey N. Bliss, Windsor, Conn., assignor to Veeder-Root, Incorporated, Hartford, Conn., a corporation of Connecticut

Application July 6, 1955, Serial No. 520,290

19 Claims. (Cl. 235—144)

The present invention relates generally to registers and counters and, more particularly, to an improved resetting mechanism for registers and counters.

The resetting mechanism of the present invention is applicable particularly to counters and registers of the type having a plurality of side-by-side number wheels on a supporting shaft and wherein it is desired to disconnect the number wheels from their respective driving gears by shifting the supporting shaft and to reset the number wheels to zero by means of rotatable resetting members mounted coaxially with the number wheels which will pick up the number wheel and rotate the number wheel therewith to zero position. A more specific application of the present invention is in the reseting mechanism of the more modern type of counter or register utilized in the gasoline dispensing field.

The aim of the present invention is to provide an improved arrangement for shifting the number wheel supporting shafts to disconnect the number wheels from their drives and for picking up the number wheels to return the number wheels to zero whereby resetting of the counter or register is facilitated.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the drawings:

Figure 1 is a side view of a register in which the present invention is embodied;

Figure 2 is a plan view thereof;

Figure 3 is a side view of the register taken from the side opposite from that shown in Figure 1;

Figure 4 is a fragmentary view partially in cross section of the number wheel assembly taken along the line 4—4 of Figure 3;

Figure 5 is a cross-sectional view taken along the line 5—5 of Figure 4;

Figure 6 is a cross-sectional view taken along the line 6—6 of Figure 4;

Figure 7 is a perspective view of the rotatable wheel pick-up unit;

Figure 8 is a side view of an alternative pick-up unit; and

Figure 9 is a cross sectional view taken along the line 9—9 of Figure 8.

The present invention is shown in the drawings as embodied in a counter or register of the type which is described and claimed in my copending application Serial No. 398,045, filed December 14, 1953, now Patent No. 2,814,444, of which the present application is a continuation in part. In order that the present invention may be fully understood, a description of much of the structure of the counter or register which is described in detail and claimed in the said copending application is repeated herein.

Referring to the drawings, and particularly Figures 1, 2 and 3 thereof showing the complete register, the register or counter is mounted on a frame consisting of side plates **10** and **11** held in spaced-apart relationship by spreader bars **12**. In this particular embodiment, the frame has slidably journaled therein four axially movable horizontal wheel-supporting shafts **14**, **16**, **18** and **20**, the shaft **14** having mounted thereon a set of rotatable number wheels for registering the cost of the gasoline dispensed, these wheels being hereinafter referred to as the cost wheels C. Similarly mounted on the shaft **16** is a group of number wheels which are utilized to register the quantity of the gasoline dispensed, which group of wheels is hereinafter referred to as the quantity wheels Q. In this type of apparatus, it is desired to provide a duplicate indication at opposite ends of the register so that the operator or customer may read the indication from either side of the dispensing apparatus. Accordingly, the shaft **18** is provided with a set of number wheels corresponding to the cost wheels C, and these will be referred to hereinafter as the cost wheels C'. In like manner, the shaft **20** has mounted thereon a group of number wheels for registering the quantity of gasoline dispensed, which correspond to the quantity wheels Q, and these will be referred to hereinafter as the quantity wheels Q'.

The manner is which the cost wheels C, C' and the quantity wheels Q, Q' are driven in order to register the cost and quantity of the liquid dispensed is best shown in Figure 2 of the drawings. Referring to Figure 2, it will be seen that there is rotatably mounted midway between the ends of the frame an upper cross shaft **32** and a lower cross shaft **34**. The upper cross shaft **32** has fixed thereto adjacent the ends of the shaft a pair of gears **36**, **36'** which mesh with idler gears **38**, **38'** mounted on studs **40**, **40'**, which are respectively mounted in the opposite side plates **10**, **11**. The idler gears **38**, **38'** are in mesh with the driven gears **42**, **42'** which are connected, respectively, to the wheel of lowest order of the cost wheels C and C' in a manner to be more particularly described hereinafter. The shaft **32** has fixed thereto, intermediate its ends, a bevelled gear **34'** which is adapted to mesh with a bevelled gear on the out-put shaft of a variator or variable change speed gearing (not shown in the drawings) whereby the unit wheels of the cost wheels C and C' will be driven in unison at a speed commensurate with the price of the quantity of gasoline being dispensed.

In the specific embodiment shown, each of the number wheels of the groups of cost wheels C and C' is provided about its periphery with indicia consisting of the numerals 0 to 9 inclusive, and 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 the use of transfer pinions **48**, **48'** rotatably mounted on transverse shafts **50**, **50'** respectively. The transfer pinions **48**, **48'** are formed with alternate wide teeth **52** and narrow teeth **54**. The wide teeth **52** cooperate with a locking ring **56** formed on the side of each of the number wheels and which prevents the transfer pinion from turning except during a transfer operation. Upon each rotation of the wheel of lower order, the transfer pinion is engaged by a two-toothed driving gear **58** on the wheel of lower order and situated adjacent a gap **60** in the locking ring, which operates to impart a partial rotation to the transfer pinion. The transfer pinion also meshes with the driven gear **42** of the number wheel of next higher order, thus advancing the number wheel

of higher order one-tenth revolution each time the transfer pinion is actuated.

The quantity wheels Q, Q' are driven in similar manner by gears (not shown) operated by a bevelled gear **66** fixed intermediate the ends of shaft **32** and adapted to mesh with a bevelled gear on a shaft driven without any variable speed change by the meter (not shown). As is well known, there is employed in gasoline dispensing apparatus a meter through which is passed the gasoline dispensed and which is rotated thereby in an amount commensurate with the quantity of gasoline dispensed. The meter is utilized to drive the quantity register directly, while the drive to the cost register is through the variator which changes the speed of rotation in accordance with the price per gallon of the liquid dispensed.

The means to transfer the count of the wheels of lower order to the wheels of higher order in the groups of wheels Q, Q' whereby each wheel of higher order will be rotated one-tenth revolution for each complete revolution of the preceding wheel of lower order is the same as in the case of the cost wheels.

The counter or register is provided with number wheels of novel construction as best shown in Figures 4 to 6 of the drawings. Referring to these figures, it will be seen that each wheel has a hub **72** in which is formed a throughbore for accommodating the wheel-supporting shafts **14**, **16**, **18** and **20**, the hubs being rotatable and slidable relative to the shafts. Each hub **72** is provided with a side wall **74** and radiating webs **76** on which is mounted a cylindrical rim **78** bearing the numerals or indicia hereinbefore referred to. The outer portion of the side wall is integrally formed with the driving gear **58** and locking ring **56** previously referred to for cooperation with the transfer pinions.

Mounted on the hub **72** on the opposite side of the side wall **74** is the driven gear **42** which is freely rotatable on the hub, although it is held in place axially by means of a ring **80**. The driven gear **42** is formed with an inwardly projecting annular ridge **82** in which is formed a frusto-conical band of fine V-shaped serrations or teeth **84**. A pair of radially opposite webs **76** of each wheel is slotted as indicated at **86** for accommodating a pivoted driving pawl **88** and a pivoted resetting pawl **90**.

Dealing first with the pivoted driving pawl **88**, it will be noted that it is in the form of a flat piece pivoted at one end to the hub for swinging movement in a radial plane which includes the longitudinal axis of the wheel. The free or outer end of the pawl is provided at its extreme end with a number of fine V-shaped serrations or teeth **94** which are complementary to and which are adapted to engage with the band of teeth **84** on the driven gear. The pawl is normally urged into cooperative engagement with the teeth **84** of the driven gear by a compression spring **96** extending between the pawl and the side wall **74**. Each of the pawls **88** has adjacent its pivoted end a lobe or projection **100** adapted to extend into the bore of the hub **72** for engagement with the supporting shaft. Each supporting shaft is provided with a series of circumferential grooves **102** (one for each wheel) which freely accommodate these lobes when the shafts are in registering position as shown in Figure 4, the supporting shafts being axially shiftable as previously mentioned. When the supporting shaft is in the position shown in Figure 4 so that no pivoting force is applied to the lobe **100** of the pawl by the supporting shaft, the pawl is engaged with the teeth **84** of the driven gear so that a positive driving engagement is obtained between the driven gear and the wheel. When the supporting shaft is shifted to the right, however, the lobe **100** of the pawl rides up on the periphery of the shaft, thus pivoting the pawl and disengaging it from the driven gear, thus freeing the wheel from its driving gear and conditioning the wheel for a resetting operation.

Turning now to the pivoted resetting pawl **90**, it will be seen that the pawl **90** is generally similar to the pawl **88** in that it also is formed of a flat piece pivoted at one end to the hub for swinging movement in a radial plane which includes the longitudinal axis of the wheel. The pawl **90**, however, is made somewhat thinner than the pawl **88** for the reason to be explained more fully hereinafter. Like the pawl **88**, pawl **90** has a lobe or projection **92** adjacent its pivoted end which also extends into the bore of the hub **72** for engagement with the supporting shaft or a circumferential groove **102** depending on the shifted position of the supporting shaft.

Each pawl **90** has associated therewith a plunger **98** which is axially slidable in a bore **114** in the side wall **74**. The inner end of the plunger **98** has a head **117** which is embraced by the finger-like projections **118** of the pawl **90**. The pawl **90** is urged in a clockwise direction as viewed in Figure 4 by reason of a spring **99** extending between the side wall **74** and the pawl and surrounding the plunger **98**. The plunger is urged outwardly of the wheel relative to the pawl by means of a spring **101**. As a result of this construction, the pawl **90** is normally urged in a clockwise direction so that, when its lobe or projection **92** is received in the circumferential groove **102**, it will draw in the plunger **98**. Conversely, when the pawl **90** is shifted in a counterclockwise direction by shifting of the supporting shaft, the plunger **98** is free to move outwardly under the influence of spring **101**.

The purpose of the plunger **98** and its carrying pawl **90** is to provide means whereby the wheel may be picked up and returned to zero position by external resetting means. In order to retract the plunger **98** so that the wheel is disconnected from the resetting means and to hold the wheel when the wheel is returned to zero position, each of the supporting shafts has a properly located longitudinal slot **122** which is sufficiently wide and deep to accommodate the lobes **92** of the pawls **90** when the pawls are in radial alignment therewith. Accordingly, when a wheel is rotated to the position where the lobe of the pawl **90** of that wheel falls into the slot **122**, the pawl immediately withdraws its associated plunger **98**, thus interrupting any further resetting movement of the number wheel and holding the wheel in zero position. As previously mentioned, the pawls **88** being thicker than the pawls **90** will ride over and not engage in the longitudinal slot **122** and thus will not interfere with the resetting operation.

The longitudinal slot **122** in each of the wheel supporting shafts is accurately positioned in relation to the pawls **90** of the number wheels so that, when the pawls engage in the slots, the wheels will be in exact zero position. The supporting shafts, although mounted for axial shifting movement, are retained against any rotational movement by pins **123** fixed on the outer ends of the shafts, which are slidably received between ears **125** formed in the side plate **10** of the frame.

The shifting of the wheel-supporting shafts **14**, **16**, **18** and **20**, in order to condition the register for a resetting operation or to recondition it for a registering operation, is accomplished by a mechanism disposed on the exterior of the side plate **11** shown in Figure 1 of the drawings. As shown in Figure 1, there is fixed to the main reset shaft **132** a cam **134** of which a segment **134***a* of varying radius cooperates with a roller **136***a* on slide **138** and a second segment **134***b* of reversely varying radius cooperates with a roller **136***b* mounted on slide **138**. Slide **138** is slidably mounted at its opposite ends on ears **140** provided on the side plate. The arrangement is such that, as the cam **134** is turned approximately 80° in a clockwise direction as viewed in Figure 1, the camming surface **134***a* will cam the roller **136***a* and hence the slide **138** to the left, and conversely, when the cam is turned in a reverse direction, the camming surface **134***b* by actuating roller **136***b* will move the slide to the right and return the slide to original position. An arcuate slot **135** in the cam **134** accommodating a stop **137** pro-

jecting from the frame limits rotation of the cam **134** and acts as a safety stop in the event the operator attempts to turn the shaft **132** too far. The opposite ends of the slide **138** are formed with notches **142** for accommodating and engaging the tails of pawls **144** which are fixed to upright shafts **146** journaled as at **148** at opposite ends on the side plate. The extremities of the shafts **146** are provided with gear segments **150** meshing with a series of circumferential teeth **152** on the adjacent protruding ends of the wheel-supporting shafts **14, 16, 18** and **20**. Consequently, when the main reset shaft **132** is in the position shown in Figure 1 of the drawings, which is the registering position, the wheel-supporting shafts **14, 16, 18** and **20** are retained in the position shown in Figure 4 of the drawings, the number wheels then being engaged with their respective driven gears. However, when the main reset shaft is rotated to the other position, the slide **138** is shifted to the left from the position shown in Figure 1 of the drawings, causing rotation to be applied to the upright shafts **146** which in turn axially shift the wheel-supporting shafts **14, 16, 18** and **20** to the right from the position shown in Figure 4 of the drawings, whereupon the number wheels are disengaged from their respective driven gears and are in condition for resetting. An important feature of the cam **134**, in accordance with the present invention, is a shallow notch **134***c* and an oppositely positioned small promontory **134***d* which are formed in the cam for the purpose of producing a slight backing up of the slide **138** after it is moved to the left by camming surface **134***a*. This in turn causes a slight retraction of the wheel supporting shafts **146** after they have been shifted to condition the number wheels for the resetting operation. This is important because it has been discovered that the shifting of the shafts **146** which in turn cams the pawls **88** and **90** of each of the number wheels to resetting position produces a considerable side thrust on the number wheels tending to crowd them together sufficiently to create considerable frictional resistance seriously interfering with the resetting operation. In accordance with the present invention this is entirely overcome by the slight retraction of the shafts **146** after they have been shifted to resetting position.

In order to pick up the number wheels, i.e. engage the projecting plunger **98** and return the number wheel to zero, there is provided in accordance with the present invention a novel rotatable pick-up unit **104** which is shown individually in Figure 7 and which is shown in association with a number wheel in Figures 4 and 5. The pick-up unit **104** is shown in the specific embodiment as a relatively thick disc having a radial flange **110** in which a plurality of elongated arcuate pockets **112** are circularly arranged in spaced relationship adjacent the periphery of the flange. The unit has a central opening **115** to accommodate the supporting shaft and the disc is retained in assembled position by the projection of the flange **110** into a semi-circular recess formed by the overhanging lip **116** formed on the side of the locking ring **56**. As will be appreciated, this mounting arrangement simplifies the assembly of the number wheel and its associated pick-up unit **104** whereby the pick-up unit **104** is securely held closely adjacent the associated number wheel and at the same time is freely rotatable relative to the number wheel.

The pick-up unit **104** is adapted to be rotated by means of a gear **106** which is integrally formed at the outside of the flange **110** and is dished out as in dicated at **118** to accommodate the protruding hub **72** of the next adjacent number wheel, thereby keeping the spacing of the number wheels to a minimum.

As previously mentioned, the counter or register is conditioned for a resetting operation by shifting the wheel supporting shafts, which in turn axially shift the pawls **90**, causing them to pivot in a counterclockwise direction and thus extend the associated plungers **98**. In the event one of the elongated openings **112** is in alignment with the plunger **98**, the plunger will engage in the opening. If it should happen that one of the openings **112** is not in alignment with the plunger **98**, the plunger cannot initially move into one of the openings **112** and this will merely further compress the spring **101**. However, as soon as any rotation is applied to the resetting member **104** by rotating the gear **106**, one of the openings **112** will quickly be brought into registry with the plunger **98** and the spring **101** will move the plunger **98** outwardly into engagement with the opening.

One of the purposes of using the elongated openings **112** in the pick-up unit **104** is that there is avoided any close fitting of the plunger **98** relative to the opening **112** so that engagement therebetween will take place smoothly and there will be no tendency for the plunger to jump over the openings **112** in the event the pick-up unit is rotated at a rapid speed. The more important reason for the use of elongated openings **112**, however, is that they render it possible to insure a clearance between the plunger **98** and the edges of the openings **112** when the number wheel is closely adjacent to its zero position, as explained more fully hereinafter. This is important because the location of a number wheel at the zero position aligns the lobe of the pawl **90** of that wheel with the longitudinal groove **122** of the wheel supporting shaft and, if the counter or register has come to rest at the end of a counting operation prior to the resetting operation with one or more of the wheels very close to the zero position, it is possible that upon shifting the wheel supporting shaft the lobe **92** of such a wheel will partially engage in the longitudinal groove **122** at the same time that the plunger **98** partially engages the resetting member. Thus it is possible to lock the resetting member against turning movement by connecting it through the pawl **90** with the non-rotatable wheel supporting shaft thereby interfering with the resetting operation.

In order to impart turning movement to the gears **106** for resetting purposes, each of the gears **106** is meshed with one of the gears **124** which are fixed to transverse shafts **126, 126'**. The shafts **126, 126'** protrude through the side plate **10**, as best shown in Figure 3, and are provided at their outer ends with pinions **128**, which mesh at opposite sides with the spur gear **130**, which is rotatably mounted on the main reset shaft **132**. Thus, by turning the gear **130** a predetermined amount, it is possible to reset all of the number wheels to zero in one operation.

In order to obtain the full benefit of the elongated openings **112** in the pick-up unit **104**, which is particularly desirable when one or more of the number wheels is adjacent the zero position, it is necessary to move the main resetting gear **130** a predetermined exact amount and to time or co-ordinate the setting of the pick-up unit **104** therewith. As explained more fully hereinafter, the main resetting gear **130** in the specific embodiment illustrated in the drawing is adapted to be moved during a resetting operation an angular distance corresponding to the distance between two of the notches **185** in the notched member **184**, which in turn is fixed to or is integral with the main reset gear **130**. Since six such notches are provided, the main reset gear is turned exactly 60° during the resetting operation although it will be understood, of course, that any other angular turning movement could have been selected. Once the precise turning movement of the main reset gear **130** is established, it is possible to select suitable sizes of the gears **128** and **124** so that the pick-up unit **104** will be rotated sufficiently to turn the number wheels to zero position. This will require at a minimum a turning movement of 360° plus the lost motion inherent in the use of the elongated openings **112**. In accordance with the invention, the gearing is selected so that turning the main resetting gear **130** through a predetermined movement—in this

case 60°—will result in a turning movement of the pick-up units 104 through an angle of 360° plus the distance between centers of two adjacent elongated openings 112 or a multiple thereof.

Assuming that the proper gearing has been selected to cause turning of the pick-up unit 104 through 360° plus the exact distance between centers of the adjacent elongated openings 112 or a multiple thereof, then it is necessary, in accordance with the invention, to assemble the counter or register so that when the main reset gear 130 is in the "at rest" position one of the elongated openings 112 will have its center in alignment with the plunger 98 when the wheel is at the zero position. This result is facilitated by constructing the pick-up unit 104 so that it has the same number of elongated openings 112 as there are teeth in the gear 106 forming part of the pick-up unit 104. This is further facilitated by utilizing gears 106 and 128 of the same size and mounting them on the shafts 126, 126' in aligned relationship.

Since the arrangement of the gearing is such that the pick-up unit 104 is always rotated 360° plus a multiple of the distance between centers of the adjacent openings 112, it will be appreciated that if the counter or register is assembled so that the plunger 98 will be situated at the center of an elongated opening 112 when the wheel is in the zero position, this relationship will be maintained through the life of the counter. It is thus assured that there can be no binding of the plunger 98 with an elongated opening 112 in the event the number wheel is in position such that the pawl 90 is partially engaged in the longitudinal groove 122.

An alternative form of the pick-up unit which may be utilized in accordance with the invention is shown in Figs. 8 and 9 of the drawings and bears the reference numeral 304. The pick-up unit 304 is generally similar to the pick-up unit 104 except that it is of two-piece construction arranged to permit slippage when torque in excess of a predetermined amount is applied.

Referring particularly to Fig. 9, it will be noted that the gear 306 which corresponds to gear 106 of the previously described unit, has an integral hub 307 dished out at 318 to accommodate the protruding hub 72 of the next adjacent number wheel and a central bore 315 to accommodate the wheel supporting shaft. Supported against the side surface 308 of gear 306 and positioned concentrically by the beveled shoulder 309 is a ring 310 preferably formed of a plastic material such as a phenolic resin. The ring 310 has a flange 311 for engagement under the overhanging lip 116 of the number wheel and is provided in its side facing the wheel with a series of spaced apart circularly arranged pockets 312 for cooperation with the plunger 98.

The ring 310 is urged into frictional engagement with gear 306 by a washer 313 mounted on hub 307 and having a tongue 314 engaged in a suitable notch in the hub 307. The washer 313, in turn, is engaged by the fingers 316 of an annular spring 317 which, in the specific embodiment, is fastened to the hub by four spun over spuds 319 integrally formed on the hub 307.

The parts of pick-up unit 304 are so designed that, in the event the pawl 90 of the associated number wheel is partially in the longitudinal groove 122 at the same time the plunger 98 is partially in one of the pick-up holes or pockets 312 which might effectively block rotation of the number wheel and the ring 310 of pick-up unit 304, the gear 306 can turn relative to the ring 310 and thus will not block operation of the counter resetting mechanism. The fact that the associated number wheel is not turned during the resetting operation, in the event of such occurrence is of no moment for the condition referred to can occur only when the number wheel is in substantially zero position and, therefore, does not have to be reset. While the amount of friction between ring 310 and gear 306 is insufficient to prevent operation of the counter resetting mechanism, it nonetheless is ample to prevent slippage when there is no abnormal blocking of the wheel or disc.

It will be apparent from the preceding description that, in order to reset the register, all that it is necessary for the operator to do is to turn the main reset shaft 132 sufficiently to cause shifting of the number wheel supporting shafts and then impart rotation to the spur gear 130 which in turn will cause rotation of the gears 106 which rotate the discs 104, or 304, whichever is used, to cause them to pick up the number wheels and return them to zero position. Thereafter, the main reset shaft may be again turned to shift the wheel supporting shafts back to original supporting position, thus conditioning the register for a registering operation. Although all of the foregoing operations could be carried out manually by direct actuation, it may be preferred to arrange the counter for simple semi-automatic operation.

Turning now to the semi-automatic arrangement for turning the main reset shaft 132 and rotating the gear 130, this is shown in Figs. 2 and 3 of the drawings. The outer end of the main reset shaft 132 is provided with a coupling 154 for receiving a manually operated actuating member (not shown) which can be a crank or any other suitable means. The resetting gear 130 is rotatably mounted on a hub 131 which in turn is rotatably mounted on the reset shaft 132 between the coupling 154 and the side plate 10. Fixed to the coupling 154 is a drive plate 180 which, by reason of such mounting, is adapted to turn with the reset shaft. Immediately behind the drive plate 180 and secured to the hub 131 is a control plate 182. Behind the control plate 182 is the notched disc 184 which is fixed to the gear 130. In the specific embodiment, the notched disc 184 is, in fact made integral with the resetting gear 130.

Pivoted on the outer face of the control plate 182 adjacent the periphery thereof is a drive pawl 186, which is biased in a clockwise direction by means of a spring 188. The drive pawl 186 has a nose portion 187 which is adapted to cooperate with a shoulder 190 on the drive plate 180. Consequently, when the apparatus is in the position shown in Figure 3, which is the position at the end of a counting operation, the operator can turn the shaft 132 in a counterclockwise direction and drive plate 180, by engagement of the drive pawl 186 with the shoulder 190, will cause similar counterclockwise movement of the control plate 182. This turning movement is continued by the operator until the drive plate 180 is moved sufficiently so that the nose of a latching pawl 192 will fall into the notch 194 in the drive plate 180. As will be realized, the engagement of the latching pawl 192 in the notch 194 will prevent reverse turning of the drive plate 180.

On the inner side of the control plate 182 there is pivoted a second drive pawl 200, the pawl 200 being pivoted in a clockwise direction into engagement with the notched disc 184 by a spring 202. The direction in which the pawl 200 faces is such that, when the control plate 182 is rotated in a counterclockwise direction in the manner just described, the nose of the pawl 200 will merely ratchet over the edge of the notched disc 184 and will impart no movement thereto. To insure that no movement will be imparted to the notched disc 184 by reason of the drag of the pawl 200, there is provided a combination stop and no-back pawl 204 pivoted at 206 on the frame and biased into engagement with the notched disc 184 by means of a spring 208.

The control plate 182 is urged in a clockwise direction by means of a relatively heavy spring 210, which is connected at one end 212 to the side plate 10 and which is connected at its other end to a projection 214 on the control plate 182. Also connected to the control plate 182 at 216 is the plunger 218 of a dashpot 220 which is pivotally connected at its outer end 222 to the side plate 10. The arrangement is such that the dashpot will control the speed of rotation of the control plate 182 in a

clockwise direction but will provide little opposition to rotation of the control plate in the opposite or counterclockwise direction. The main spring **210** is loaded by counterclockwise movement of control plate **182**. During this operation no movement is imparted to the resetting gear **130** or the notched disc **184**, this being effectively prevented by the no-back pawl **204**. At the completion of the cocking movement of the parts just described, the no-back pawl **204** is cammed to a releasing position by the camming edge **183** which is adapted to engage a pin **201** on the pawl **204**, thus lifting the no-back pawl into the releasing position.

With the apparatus in the cocked position as just described, the operation may then reset the register simply by pivoting the drive pawl **186** so as to disengage its nose **187** from the shoulder **190** of the drive plate **180**. While the exact mechanism for pivoting the pawl **186** to disengaging position may be subject to considerable variation, there is shown for this purpose in the preferred embodiment a pivoted arm **230** which is pivotally mounted on the side plate of the frame and having a pawl **232** mounted for limiting pivoting movement at its outer end, the pawl **232** being biased in a counterclockwise direction by means of a light spring **234**. A coupling **236** secured to the arm **230** can be used to pivot the arm **230** in a clockwise direction to cause the pawl **232** to engage underneath the tail of the pawl **186** and thus disengage it from the driving plate **180** to cause resetting to take place.

Turning now to the resetting operation which takes place upon the disengagement of the pawl **186** from the driving plate **180**, it will be seen that immediately upon release of the pawl **186** the control plate **182** is free to rotate in a clockwise direction under the influence of the heavy spring **210** at a speed controlled by the dashpot **220**. Such clockwise rotation of the control plate **182** will cause a concurrent rotation of the notched disc **184** because of the driving action of the second drive pawl **200** which is in engagement with one of the notches **185** of the notched disc **184**. This concurrent movement of the notched disc **184** will not be prevented by the no-back pawl **204**, because, as previously mentioned, this pawl has been disengaged to releasing position by the cam shoulder **183** of the control plate **182**. Upon partial movement of the control plate **182** and the notched disc **184** therewith, the no-back pawl **204** is again free to lock the disc **184** against movement, which it does as soon as disc **184** has rotated far enough to bring the next notch **185** into registry therewith, which occurs at the completion of the necessary amount of turning to effect complete resetting.

Upon completion of the resetting operation, the latching pawl **192** is disengaged from the notch **194** of the drive plate **180** by reason of the camming edge **236** of the control plate **182** which engages against the pin **193** of the latching pawl **192** and thereby cams the pawl **192** in a clockwise direction to disengaging position. Since the latching pawl **192** is now disengaged from the driving plate **180**, the operator is then permitted to turn the coupling **154** and hence return the shaft **132** to original position shown in Figures 1 and 3. In this position the drive pawl **186** is re-engaged with the shoulder **190** of the driving plate **180** and the wheel supporting shafts are shifted to re-engage the number wheels with their driving gears, thus conditioning the apparatus for a counting operation.

It thus will be seen that there has been provided, in accordance with the invention, a counter or register of improved construction having many advantages from an operational standpoint, which is particularly adapted for commercial manufacture and use, and which will afford speed and simplicity of control compatible with accuracy and dependability.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim:

1. In a counter, a rotatable number wheel, a coaxially mounted rotatable resetting member having a series of circularly arranged elongated openings, a plunger on the number wheel for engaging in one of said openings, said openings being of greater length than the width of the plungers to permit relative movement thereof lengthwise of the opening, means for extending the plunger toward the resetting member during a resetting operation, and means for rotating the resetting member through one complete turn plus at least the distance between centers of said openings.

2. In a counter, a rotatable number wheel, a coaxially mounted rotatable resetting member having a series of circularly arranged elongated openings, a plunger on the number wheel for engaging in one of said openings, said openings being of greater length than the width of the plungers to permit relative movement thereof lengthwise of the opening, means for extending the plunger toward the resetting member during a resetting operation, a gear fixed to the rotatable resetting member having a predetermined number of teeth which is divisible by the number of said openings, and means for rotating the gear through one complete turn plus at least the number of teeth corresponding to the distance between centers of said openings.

3. In the mechanism set forth in claim 2, a gear fixed to the rotatable resetting member having the same number of teeth as the number of openings in the resetting member and means for rotating the gear through one complete turn plus at least the distance between adjacent teeth.

4. In a counter, a number wheel supporting shaft, a number wheel rotatably mounted on the shaft, a rotatable resetting member disposed coaxially with the number wheel and having a series of circularly arranged elongated openings, a plunger on the number wheel for engaging in one of said openings, a shiftable member in the number wheel for moving the plunger toward and away from the resetting member during a resetting operation, means on the shaft for actuating the shiftable member and to cause it to withdraw the plunger away from the resetting member when the number wheel is in zero position, means for rotating the resetting member through at least one turn during a resetting operation, and means for positioning the resetting member in a rotated position where the intermediate portion of an elongated opening of the resetting member is in alignment with the plunger of the number wheel when the number wheel is in zero position.

5. In a counter, a number wheel supporting shaft, a number wheel rotatably mounted on the shaft, a rotatable resetting member disposed coaxially with the number wheel and having a series of circularly arranged elongated openings, a projectable member on the number wheel for engaging in one of said openings, a shiftable member in the number wheel for moving the projectable member toward and away from the resetting member during a resetting operation, said supporting shaft having a notch located to receive the shiftable member and withdraw the projectable member away from the resetting member when the number wheel is at zero position, a gear fixed to the rotatable resetting member having a predetermined number of teeth which is divisible by the number of said openings, and means for driving the gear having an initial starting position such that the inter-

mediate portion of one of said openings is aligned with the projectable member when the wheel is in zero position and arranged to turn the gear through one complete turn plus the number of teeth corresponding to the distance between centers of at least two openings.

6. In a counter, a number wheel supporting shaft having a longitudinal notch, a number wheel rotatably mounted on the shaft, a rotatable resetting member mounted coaxially with the number wheel and having a series of circularly arranged elongated openings, a shiftable pawl in the number wheel adapted to engage in the notch of the supporting shaft when the wheel is in zero position, a plunger actuated by the pawl for engaging in one of the openings of the resetting member and arranged to be withdrawn away from the resetting member when the pawl engages in the notch of the supporting shaft, a gear fixed to the rotatable resetting member having the same number of teeth as the number of openings in the resetting member, said gear and resetting member being positioned so that an intermediate portion of one of said openings is aligned with the plunger when the wheel is in zero position, and means for rotating the gear through a multiple of the tooth distance of said gear greater than 360 degrees.

7. In a counter, a resetting actuator movable through a predetermined distance from an initial position, a number wheel supporting shaft, a number wheel rotatably mounted on the shaft, a rotatable resetting member disposed coaxially with the number wheel and having a series of circularly arranged elongated openings, a plunger on the number wheel for engaging in one of said openings, a shiftable member in the number wheel for moving the plunger toward and away from the resetting member, means on the shaft for actuating the shiftable member and to cause it to withdraw the plunger away from the resetting member when the number wheel is in zero position, and drive means between the actuator and the resetting member for positioning the resetting member with an intermediate portion of one of said openings in alignment with the plunger when the wheel is in zero position and for rotating the resetting member through a distance which is a multiple of the distance between centers of adjacent openings greater than 360 degrees.

8. In a counter, a resetting actuator movable predetermined distances in a continuous direction, a number wheel supporting shaft, a number wheel rotatably mounted on the shaft, a rotatable resetting member mounted coaxially with the number wheel and having a series of circularly arranged elongated openings, a shiftable member in the number wheel, a plunger actuated by the shiftable member for engaging in one of the openings of the resetting member, means to shift the shiftable member and withdraw the plunger when the wheel is in zero position including a notch in the supporting shaft, a gear fixed to the resetting member having a predetermined number of teeth which is divisible by the number of openings in the resetting member, and a gear train between the actuator and the last-named gear for rotating the gear through a distance of one turn plus the number of teeth corresponding to the distance between centers of at least two openings, said gear train being assembled to position the gear in a rotated position such that the intermediate portion of one of the openings is aligned with the plunger when the actuator is at rest and the number wheel is in zero position.

9. In a counter, a shaft mounted for axial movement into and out of non-resetting and resetting positions, a plurality of number wheels rotatably mounted on said shaft, a rotatable resetting member mounted coaxially with each of said number wheels and having a series of circularly arranged elongated openings, a plunger in each wheel for engaging in an opening of the associated resetting member, a pawl pivotally mounted in each wheel for actuating the plunger, said shaft having a shoulder for pivoting the pawl to a plunger extending position when the shaft is shifted to resetting position and a notch for retracting the pawl and plunger when the number wheel is in zero position, a gear fixed to each resetting member having a number of teeth which is divisible by the number of openings in the resetting member, and driving means for rotating said gears from an initial position through one complete turn plus the distance between centers of at least two openings, said initial position being a rotated position in which the intermediate portion of one of said openings is in alignment with the plunger when the wheel is in zero position.

10. In a counter, a shaft mounted for axial movement into and out of non-resetting and resetting positions, a plurality of number wheels rotatably mounted on said shaft, a rotatable resetting member mounted coaxially with each of said number wheels and having a series of circularly arranged elongated openings, a plunger in each wheel for engaging in an opening of the associated resetting member, a pawl pivotally mounted in each wheel for actuating the plunger, a plurality of shoulders on the shaft for pivoting the pawls to plunger extending position when the shaft is shifted to resetting position, said shoulders being provided with a notch to retract the pawl and plunger when the wheel is in zero position, means for shifting the shaft to resetting position and thereafter partially retracting the shaft to relieve excessive side thrust on the wheel, and means for rotating the resetting member through one complete turn plus the distance between centers of at least two of the openings therein.

11. In a counter, a shaft mounted for axial movement into and out of non-resetting and resetting positions, a plurality of side-by-side number wheels rotatably supported on the shaft, pawl means in the number wheels for actuation by the shaft when the shaft is shifted to resetting position, and means for sequentially shifting the shaft to resetting position and thereafter partially retracting the shaft while the shaft is in resetting position to relieve excessive side thrust on the wheels.

12. In a counter, a shaft mounted for axial movement into and out of non-resetting and resetting positions, a plurality of side-by-side number wheels rotatably supported on the shaft, pawl means pivotally mounted in each of the number wheels engaging with the shaft, a plurality of shoulders on the shaft for cooperation respectively with the pawl means in the number wheels to pivot the pawl means when the shaft is shifted to resetting position, and means for shifting the shaft to resetting position and thereafter retracting the shaft a small predetermined amount to relieve excessive side thrust on the wheels.

13. In a counter, a shaft mounted for axial movement into and out of non-resetting and resetting positions, a plurality of side-by-side number wheels rotatably supported on the shaft, pawl means in the number wheels for actuation by the shaft when the shaft is shifted to resetting position, and means for shifting the shaft to resetting position including a cam, said cam having a surface for causing a slight retrogression of the shaft following movement thereof to resetting position.

14. In a counter, a shaft mounted for axial movement into and out of non-resetting and resetting positions, a plurality of side-by-side number wheels rotatably supported on the shaft, means for restraining outward axial movement of the end number wheels, pawl means in the number wheels for actuation by the shaft when the shaft is shifted to resetting position, a cam follower operably connected to the shaft, a rotatable cam associated with the follower having surfaces for moving the shaft to non-resetting and resetting positions, and an additional surface on the cam for causing a slight retrogression of the shaft following movement thereof to resetting position to relieve pressure on the number wheels.

15. In a counter, a rotatable number wheel, a co-

axially mounted rotatable resetting member, means for selectively interengaging the number wheel and resetting member, means for rotating the resetting member, and clutch means forming a frictional engagement between the last named means and the resetting member.

16. In a counter, a rotatable number wheel, a coaxially mounted rotatable resetting member having a series of circularly arranged openings, a plunger on the number wheel for engaging in one of said openings, and means for frictionally driving the resetting member.

17. In a counter, a rotatable number wheel, a coaxially mounted rotatable resetting member having a series of circularly arranged openings, a plunger on the number wheel for engaging in one of said openings, a gear in side-by-side relationship with the resetting member, and means forming a frictional engagement between the gear and resetting member.

18. In a counter, a rotatable number wheel, a coaxially mounted resetting gear, a wheel pick-up member

frictionally mounted on the resetting gear, and means for selectively engaging the number wheel with the wheel pick-up member.

19. In a counter, a rotatable number wheel, a coaxially mounted resetting gear, an annular pick-up member having a series of circularly arranged openings mounted for rotation on the resetting gear, a plunger on the number wheel for engaging in one of said openings, and spring means maintaining the pick-up member in frictional engagement with the gear to prevent slippage therebetween except when movement of the number wheel is prevented.

References Cited in the file of this patent

UNITED STATES PATENTS

1,764,959	Johnston et al.	June 17, 1930
2,161,919	Fraser	June 13, 1939
2,568,709	Bliss	Sept. 25, 1951