Fuel delivery apparatus having a resettable register and a delivery register reset mechanism manually operable after the completion of each fuel delivery for deactivating the apparatus and loading a reset spring and manually operable at the beginning of each fuel delivery for resetting the delivery register with the reset spring and, upon completion of the reset phase, reactivating the delivery apparatus for delivering fuel.
FUEI PUMP REGISTER RESET MECHANISM

BRIEF SUMMARY OF THE INVENTION

The present invention relates generally to fuel delivery pumps and more particularly to a new and improved register reset mechanism for resetting a mechanical register conventionally employed in such pumps.

It is a principal aim of the present invention to provide a new and improved register reset mechanism for a fuel delivery pump which provides for resetting the fuel pump register prior to the commencement of each fuel delivery and for activating the pump for delivering fuel after the register is fully reset.

It is another aim of the present invention to provide a new and improved register reset mechanism which may be either handle operated or automatically operated upon the removal and replacement of the usual fuel pump delivery nozzle in its storage receptacle.

It is a further aim of the present invention to provide a new and improved register reset mechanism for a fuel delivery pump of the type which employs a register reset spring which is connected to be loaded in conjunction with deactivating the pump and to be released for resetting the fuel pump register in conjunction with reactivating the pump for delivering fuel.

In accordance with the present invention the reset spring is operable to rotate a reset shaft an exact predetermined amount to provide for completely resetting the fuel pump register and such that the reset shaft is started and stopped without undue mechanical shock.

It is another aim of the present invention to provide a new and improved modular register reset mechanism which may be mounted on either end of the conventional fuel pump register.

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

A better understanding of the invention will be obtained from the following detailed description and the accompanying drawings of illustrative applications of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a generally schematic representation, partly broken away, of a gasoline dispensing system incorporating an embodiment of a register reset mechanism of the present invention;

FIG. 2 is an enlarged side elevation view, partly broken away and partly in section, of the register reset mechanism;

FIG. 3 is an enlarged plan view, partly broken away and partly in section, showing a flywheel damping device of the register reset mechanism;

FIG. 4 is an enlarged side elevation view, partly broken away and partly in section, showing a portion of a cam and follower device of the register reset mechanism;

FIG. 5 is a view, partly broken away and partly in section, showing another embodiment of a flywheel damping device; and

FIG. 6 is a section view, partly broken away, taken generally along line 6—6 of FIG. 5.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail wherein like numerals represent like parts, a gasoline dispensing system incorporating an embodiment of a register reset mechanism 10 of the present invention is shown comprising a gasoline delivery pump generally designated 12 having a conventional resettable mechanical register 14 (for example, of the type disclosed in U.S. Pat. No. 3,216,659 of Edward C. Ambler et al. dated Nov. 9, 1965 and entitled "Resetting Control Mechanism For Counting Device"). The register 14 includes a volume counter 15 for registering the volume amount of fuel delivered and a cost counter 16 for registering the cost of fuel delivered (e.g., to the nearest cent). A reset shaft 17 is provided which is adapted to be rotated one revolution for resetting the volume and cost counters 15. 16 to zero between fuel deliveries.

The gasoline delivery pump comprises in a conventional manner a pump 22 driven by an electric motor 24 for delivering gasoline from a suitable source and via a fluid meter 25 to a dispensing nozzle 26. The output or volume shaft 30 of the meter 25 is connected for driving a suitable variator 32 (for example, a variator of the type disclosed and described in U.S. Pat. No. 3,413,867 of Richard B. Hamlin dated Dec. 3, 1968 and entitled "Variator") and for driving the volume counter 15 for registering the volume amount of gasoline dispensed. The output (not shown) of the variator 32 is connected in a well known manner for driving the cost counter 16 to register the cost amount of gasoline dispensed in accordance with the volume amount dispensed and a unit volume price within a three place price range established by the variator setting. The variator 32 shown has price wheels 40—42 for selecting the unit volume price established by the variator setting.

The register reset mechanism 10 is made as a separate module and such that it may be mounted at either end of the register 14 so that its output shaft 50 can be coupled to the register reset shaft 17 to rotate the reset shaft 17 one revolution (in counterclockwise direction as viewed from the right side of the register as shown in FIG. 1). The reset mechanism 10 comprises a pair of end plates 60, 61 and a reset drive and interlock mechanism 62 mounted between the end plates 60, 61. The output shaft 50 of the register reset mechanism 10 and its input or control shaft 64 and its switch operating shaft 66 extend between and are rotatably mounted in generally parallel relation to one another on the end plates 60, 61. The control shaft 64 may, as shown in FIG. 1, be coupled directly to an operating handle 72.

In a conventional manner the operating handle 72 has to be turned to its vertical or "Off" position shown in FIG. 1 to replace the nozzle 26 in its receptacle 73, and the nozzle 26 has to be removed from the storage receptacle 73 to permit turning the operating handle 72 to its horizontal or "On" position.

As hereinafter more fully described, when the operating handle 72 is turned to its horizontal or "On" position, the input or control shaft 64 is rotated in a counterclockwise direction as viewed in FIG. 2 to reset the register 14. Upon completion of the reset cycle, the pump motor 24 is turned on with the motor switch operating shaft 66 to condition the pump 12 for delivering gasoline. Upon returning the operating handle 72 to its vertical or "Off" position, the motor switch operating shaft 66 is rotated to turn off the pump motor 24 and to deactivate the pump 12. In FIG. 1, a suitable gear reduction unit 54 is preferably shown drivingly connect-
the operating handle 72 and control shaft 64 whereby 90° rotation of handle 72 effects rotation of the control shaft 64 to an angular rotation of a preselected displacement less than 90°. If desired, the operating handle 72 may be replaced by a nozzle operated drive element, not shown, directly coupled to an outer end of the control shaft 64, e.g., effecting the above described rotational movements of the control shaft 64 simply upon removing the nozzle 26 from and replacing it in its storage receptacle 73.

Referring particularly to FIG. 2, a cam 74 is fixed to the input or control shaft 64 and a gear sector 78 is rotatably mounted on the shaft 64 for approximately 30° displacement in the clockwise direction as viewed in FIG. 2 when the operating handle 72 is turned from its "On" to its "Off" positions. For this purpose a pawl 80 is pivotally mounted on the gear sector 78, and a torsion spring 82 biases a radial shoulder 84 of the pawl 80 toward engagement with a cooperating shoulder on the cam 74 to provide a drive connection for rotating the gear sector 78 with the cam 74.

Such clockwise movement of the gear sector 78 loads a reset tension spring 86, having opposite ends connected to frame 20 and a movable lever 90, via gear 87 in mesh with gear sector 78 and meshing gears 88 and 89. The lever 90 is integrally formed on gear sector 89 and is shown rotatably mounted on shaft 67. The gears 87 and 88 are formed integrally with a ratchet wheel 92 and mounted in coaxial relation on a support shaft 68.

To hold the reset spring 86 in loaded position, a ratchet pawl 93 is rotatably mounted on shaft 67 and is shown biased into engagement with ratchet wheel 92 by spring 94. The pawl 93 and ratchet wheel 92 also provide for holding the spring 86 in a partially loaded position should the operating handle 72 be released or returned to its "On" position before having been pivoted a full 90° to fully load the reset spring 86.

A drive wheel or gear 100 is also supported on shaft 68 to be rotated 180° in the clockwise direction, as viewed in FIG. 2 when the reset spring 86 is released and pawl 93 is disengaged from its ratchet wheel 92. For this purpose, a one-way drive comprising a ratchet wheel 95 and a pair of diametrically spaced paws 102 are mounted in diametrically spaced relation on the wheel 100 for rotating wheel 100 in the clockwise direction. The wheel 100 is in mesh with a gear 103 fixed to an output or drive shaft 50 such that the shaft 50 is rotated 360° in the counterclockwise direction, as viewed in FIG. 2, for resetting register 14 when reset spring 86 is released. To prevent reverse rotation of shaft 50, in the clockwise direction as viewed in FIG. 2, after shaft 50 has been rotated a full 360° for resetting the register 14, a cam 106 is formed integrally with the gear 103, and a non-back pawl 108 is pivotally mounted for engagement with the cam 106. Wheel 100 has an external control cam surface 110 with a pair of diametrically opposed notches 112. A pawl trip 114 is pivotally mounted on the frame 20 by pin 116 and is biased in a counterclockwise direction as seen in FIG. 2 by tension spring 117 such that shoulder 118 of the trip pawl 114 rides on the external cam surface 110 and is received in one of the notches 112 upon completion of 180° rotation of wheel 100 (and thus completion of 360° rotation of drive shaft 50). To limit the clockwise rotations of the drive wheel 100 by the reset spring 86, wheel 100 is provided an internal cam surface 120 with a pair of diametrically opposed shoulders 122, and the sector gear 78 has a depending stop pin 124 engageable with the cam shoulders 122.

Upon clockwise rotation of the input or control shaft 64 to its "Off" position for loading the reset spring 86, pin 124 is moved out of engagement with the adjacent shoulder 122, and, into a non-interfering position (shown at 124A) relative to the internal cam surface 120 just before the reset spring 86 is fully loaded, and the reset spring 86 will rotate the drive wheel 100 a slight angular amount in a clockwise direction as viewed in FIG. 2 until any slack is taken up by the pawl 114. At this point the last tooth 92A of ratchet 92 is spaced apart slightly from the operative end of the ratchet pawl 93 to facilitate withdrawing the ratchet pawl 93 from ratchet wheel 92 upon subsequent operation of the drive wheel 100. Thus, after reset spring 86 has been fully loaded, trip pawl 114 provides the only restraining force for holding drive wheel 100 against rotation by the reset spring 86.

When the control shaft 64 is then rotated counterclockwise from "Off" position to "On" position shown in FIG. 2, a release lever 134, pivotally mounted on cam 74 and biased by a tension spring 136 toward engagement with a pin 138 carried by the pawl 114, engages the pin 138 with shoulder 140 of the lever 134 to pivot pawl 114 outwardly out of engagement with the drive wheel 100 against the bias of its tension spring 117 to thereby release the wheel 100 to reset the register 14.

A pawl control link 150 is pivotally mounted on the pawl 114 by a pin 151 and has an elongated slot 152 formed in an opposite end of the link 150 and receiving an upstanding pin 153 on a free end of the pawl 80. Slot 152 is formed such that the link 150 maintains pawl 80 in disengaged relation to the cam 74 against the bias of torsion spring 82 when the pawl 114 is withdrawn out of the notch 112 in drive wheel 100 during resetting of the register 14. Such construction insures that the reset operation is not terminated prior to completion by rotation of the input or control shaft 64 in a clockwise direction as viewed in FIG. 2 from its "On" to its "Off" position during the reset operation. The elongated configuration of the slot 152 permits the pawl trip 114 to drop within the next succeeding slot 112 at the end of the reset cycle, irrespective of the angular position of the control shaft 64 and cam 74.

A generally U-shaped leaf spring 160 having one end connected to the ratchet pawl 93 and having an opposite U-shaped end receiving a pin 162 on the pawl control link 150 provides for withdrawing the ratchet pawl 93 when the trip pawl 114 is withdrawn to release the drive wheel 100. Spring 160 is made sufficiently flexible so that if the reset spring 86 is not fully loaded and the operative end of the ratchet pawl 93 engages a shoulder of the ratchet wheel 92, pawl 93 will not be withdrawn from the ratchet wheel 92 if the trip pawl 114 is withdrawn, thereby assuring that if the reset spring 86 is only partially loaded, the pawl 93 will remain in positive engagement with the ratchet 92 to despairably prevent any partial reset.

Once the trip pawl 114 has been released to permit rotary movement of the drive wheel 100 and the ratchet pawl 93 is withdrawn, the gear sector 78 will return toward its illustrated position in FIG. 2 whereupon a pin 168 carried by gear sector 78 will engage lever 134 to return it to its position shown in FIG. 2 out from under pin 138 of the trip pawl 114 which will ride on
the cam surface 110 to ensure that the pawl 80 is maintained in disengaged relation to the cam 74 during the reset operation.

To prevent undue mechanical shock at the end of the reset cycle upon engagement of the cam shoulder 122 with the stop pin 124, a flywheel 170 is shown connected to be driven with drive wheel 100 to provide for the slow rate of rotation of the drive wheel 100. The flywheel 170 is connected to the drive wheel 100 via a compound gear 172, 174 and a gear 176 rotateably mounted on a stub shaft 178 coaxially aligned with a flywheel hub 180. A spring clutch 182 is mounted on the stub shaft 178 and flywheel hub 180 and has one end secured relative to the gear 176 to provide a one-way drive between the gear 176 and flywheel 170, it being understood that the spring clutch 182 slips during the loading cycle and permits the flywheel to remain stationary. Consequently, the flywheel 170 is driven in the clockwise direction as viewed in FIG. 2, by the reset spring 86 during the reset cycle to prevent undue acceleration of the drive wheel 100, and at the end of the reset cycle the flywheel 170 is free to decelerate gradually to minimize any mechanical loading due to flywheel deceleration.

Another embodiment of a damping device for the register reset mechanism 10 is shown in FIG. 5 which is particularly suited to enable the flywheel to be driven by a differential 171 during the reset cycle such that any high torque resistance which may be encountered during reset will be overcome by the inertia of the rotating flywheel. The flywheel 170A is rotatably mounted on a shaft 180A suitably mounted for rotation and having a gear 181 shown in mesh with the compound gear 172, 174. The flywheel 170A is directly coupled to a pair of planetary gears 183, 183 rotatably about a pinion 185 fixed to the rotary shaft 180A with the gears 183, 183 being in mesh with a ring gear 187 rotatably supported on the shaft 180A. The trip pawl 114A is shown having an integral arm 114B engageable with the ring gear 187 during the reset cycle with the trip pawl 114A being cammed outwardly by the cam surface 110A thereby to hold the ring gear 187 stationary during reset while flywheel 170A is driven by the differential 171. Upon completion of the reset cycle, the trip pawl 114A drops inwardly of the drive wheel 110A into a notch 112A and arm 114B is withdrawn to release the ring gear 187 which permits energy dissipation as the differential is free to rotate responsive to the flywheel 170A coasting to a stop after the gear sector stop pin engages the cam shoulder of the drive wheel stationary.

The motor switch operating shaft 66 is biased by a tension spring 190 to its "On" position shown in FIG. 2. Shaft 66 is operated by a bellcrank 192 pivotally mounted on a pin 194 and connected to a shaft actuating lever 196 by a link 198. Pivoting the bellcrank 192 in the counterclockwise direction as viewed in FIG. 2 provides for pivoting the operating shaft 66 in the same angular direction for deactivating the pump 12 by turning off its motor. A two-section follower 200 is mounted on the bellcrank 192 and has a circular follower section 201 engageable with the cam 74 and a square follower section 202 engageable with a secondary cam 206 (FIG. 4) rotatably supported on the input or control shaft 64 and connected to the gear sector 78. When the operating cam 74 and the gear sector 78 are in their "On" or fully withdrawn position shown in FIG. 2, the follower 200 is free to move inwardly to permit the motor switch operating shaft 66 to be rotated to its "On" position by the tension spring 190. The cam 206 is spring biased by a tension spring 210 in the clockwise direction as viewed in FIGS. 2 and 4 toward engagement with an adjustable eccentric or stop 212. The head of the stop 212 is provided a screwdriver slot for rotating the stop and thereby to provide fine adjustment of the angular position of the cam 206.

When control shaft 64 rotates from its "On" to its "Off" angular positions, the cam 74 engages the circular follower section 201 to actuate the follower outwardly and thereby rotate the motor switch operating shaft 66 to its open or "off" position. During the initial few degrees of rotation of the control shaft 64 from its "On" position shown in FIG. 2, cam 206 is rotated by the square follower section 202 relative to the gear sector 78 against the bias of the tension spring 210. The circular follower section 201 is riding on the outside circular edge 214 of the cam 74, the secondary cam 206 is free to snap back under the bias of its tension spring 210 to hold the square follower section 202 in its outer position to maintain the pump deactivated even if the input shaft 64 is thereupon returned to its "On" position (it being understood that the gear sector 78 and cam 206 are held in their advanced angular position by the no-back pawl 93 or the trip pawl 114).

Thereafter, the motor switch operating shaft 66 is held in its "Off" position until gear sector 78 is returned to its withdrawn position shown in FIG. 2, that is, after the register 14 has been reset. Assuming the control shaft 64 is in its "On" position shown in FIG. 2, the square follower section 202 will drop off the end of the secondary cam 206 just as the gear sector 78 reaches its fully withdrawn position and as adjusted by the eccentric 212.

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of the present invention.

I claim:
1. For use in fluid delivery apparatus having control means operable for deactivating the fluid delivery apparatus between fluid deliveries and for reactivating the fluid delivery apparatus for making a fluid delivery and a resettable delivery register with a reset shaft rotatable for resetting the register prior to the commencement of each fluid delivery, a register reset mechanism comprising a rotary output adapted to be coupled to the register reset shaft for resetting the register, a reset spring, a rotary output and a control lever to the control lever operatively engaged through the rotary output in one angular direction for resetting the register and having a rotary drive connected to the reset spring for rotation in one angular direction from a first position thereof for loading the reset spring and for rotation by the reset spring in the opposite angular direction to its said first position for said rotation of the rotary output in one angular direction for resetting the register, releasable means for retaining the rotary output against rotation in said one angular direction thereof by the reset spring, a rotary input rotatable in one angular direction from a first angular position thereof for rotating the rotary drive in its said one angular direction from its said first position for loading the reset spring and rotatable in the opposite angular direction to its said first angular position for operating the releasable means for releasing the loaded
reset spring, a rotary controller rotatable in one angular direction for reactivating the fluid delivery apparatus, and cam and follower means operatively connecting the rotary controller with the rotary input and rotary drive and operable for preventing rotation of the rotary controller in said one angular direction thereof for activating the fluid delivery apparatus unless the rotary input and the rotary drive are in their respective first angular positions, the rotary input and rotary drive being coaxial and the cam and follower means comprising first and second coaxial cams connected to the rotary input and rotary drive respectively and follower means connected to the rotary controller and engageable with the first and second cams, the second cam being rotatably mounted coaxially with the rotary drive, a cam stop on the rotary drive engageable by the second cam and spring means angularly biasing the second cam in said first angular direction of the rotary drive into engagement with the cam stop.

2. A register reset mechanism according to claim 1 wherein the follower means comprises a single follower with first and second follower sections engageable with the first and second cams respectively.

3. A reset mechanism according to claim 2 further comprising controller spring means biasing the rotary controller in said one angular direction thereof for reactivating the fluid delivery apparatus and wherein the first cam on the rotary input is operable through the follower means to rotate the rotary controller in its opposite angular direction against the bias of the controller spring means as the rotary input is rotated in said angular direction thereof from its said first angular position.

4. For use in fluid delivery apparatus having control means operable for deactivating the fluid delivery apparatus between fluid deliveries and for reactivating the fluid delivery apparatus for making a fluid delivery and a resettable delivery register with a reset shaft rotatable for resetting the register prior to the commencement of each fluid delivery, a register reset mechanism comprising a rotary output adapted to be coupled to the register reset shaft for resetting the register, a reset spring, a one-way rotary drive mechanism having a rotary drive connected to the reset spring for rotation in one angular direction from a first position thereof for loading the reset spring and for rotation by the reset spring in the opposite angular direction to its said first position for rotating the rotary output a predetermined angular amount in one angular direction for resetting the register, a flywheel having a hub, means interconnecting the rotary output and the flywheel including a drive shaft coaxially aligned with the flywheel hub and a one-way spring clutch mounted on the flywheel hub and the drive shaft interconnecting the flywheel and rotary output to drive the flywheel during the rotation of the rotary output in said one angular direction thereof.

5. A register reset mechanism according to claim 4 further including releasable means for retaining the rotary output against rotation in said one angular direction thereof by the reset spring, a rotary input rotatable in one angular direction from a first angular position thereof for rotating the rotary drive in its said one angular direction from its said first position for loading the reset spring and rotatable in the opposite angular direction to its said first angular position for operating the releasable means for releasing the loaded reset spring.

6. A register reset mechanism according to claim 5 wherein the disengangeable positive drive mechanism includes an input shaft drivingly connected to the rotary output, differential drive means rotatably mounted on the input shaft and drivingly connected to the flywheel, and disengangeable latch means operated by the releasable means for engaging the differential drive means for driving the flywheel upon release of the loaded reset spring and for disengaging the differential drive means upon rotation of the rotary output said predetermined angular amount.

7. For use in fluid delivery apparatus having control means operable for deactivating the fluid delivery apparatus between fluid deliveries and for reactivating the fluid delivery apparatus for making a fluid delivery and a resettable delivery register with a reset shaft rotatable for resetting the register prior to the commencement of each fluid delivery, a register reset mechanism comprising a rotary output adapted to be coupled to the register reset shaft for resetting the register, a reset spring, a one-way rotary drive mechanism having a rotary drive connected to the reset spring for rotation in one angular direction from a first position thereof for loading the reset spring and for rotation by the reset spring in the opposite angular direction to its said first position for rotating the rotary output a predetermined angular amount in one angular direction for resetting the register, a flywheel having a hub, means interconnecting the rotary output and the flywheel including a drive shaft coaxially aligned with the flywheel hub and a one-way spring clutch mounted on the flywheel hub and the drive shaft interconnecting the flywheel and rotary output to drive the flywheel during the rotation of the rotary output in said one angular direction thereof.

8. For use in fluid delivery apparatus having a resettable delivery register with a reset shaft rotatable for resetting the register prior to the commencement of each fluid delivery, a register reset mechanism comprising a rotary output adapted to be coupled to the register reset shaft for resetting the register, a reset spring, a one-way rotary drive mechanism having a rotary drive connected to the reset spring for rotation in the opposite angular direction to its said first position for rotating the rotary output in one angular direction substantially one revolution for resetting the register, a single stop cam mounted on the rotary output, a no-back pawl engageable with the single stop cam for preventing rotation of the rotary output in its opposite angular direction after said one revolution thereof, releasable means for retaining the rotary output against rotation in said one angular direction thereof by the reset spring, and a rotary input rotatable in one angular direction from a first angular position thereof for rotating the rotary drive in its said one angular direction from its said first position for loading the reset spring and rotatable in the opposite angular direction to its said first angular position for operating the releasable means for releasing the loaded reset spring.