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POSITIVE COUNT PINIONLESS ODOMETER AND RESET MEANS THEREFOR

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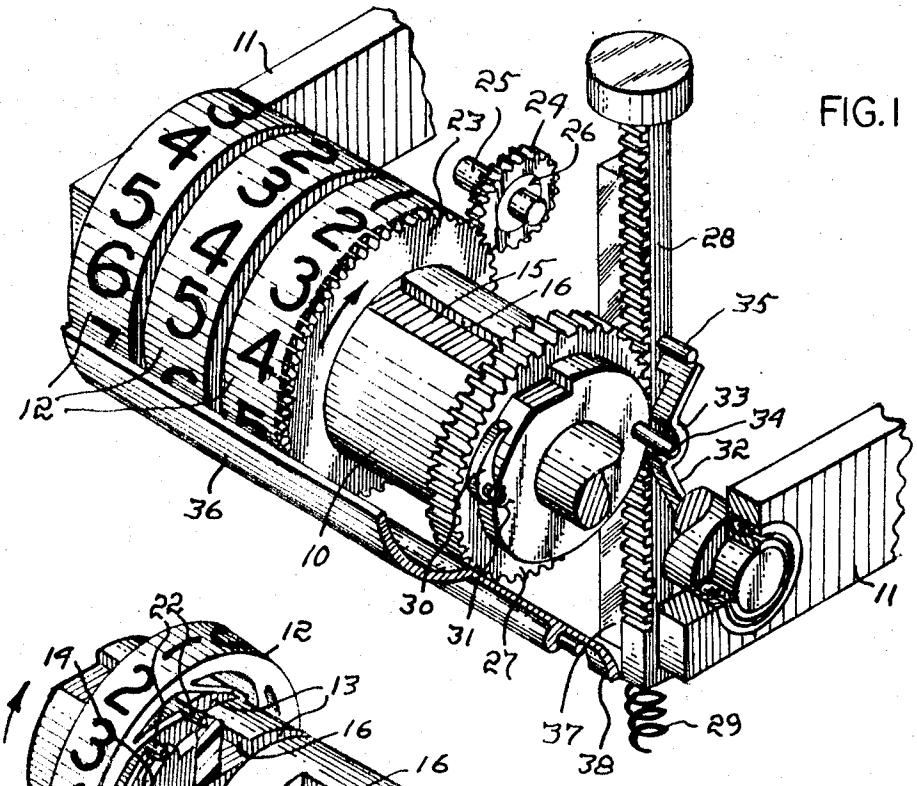


FIG. 1

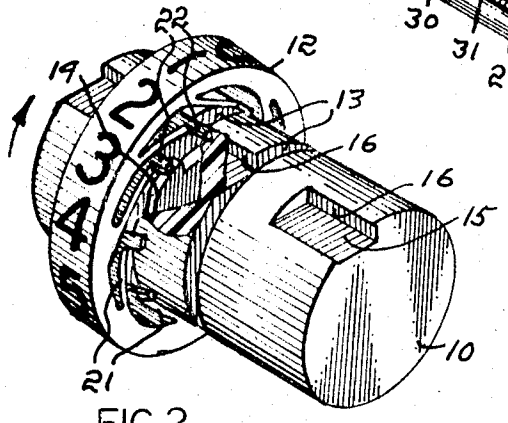


FIG. 2

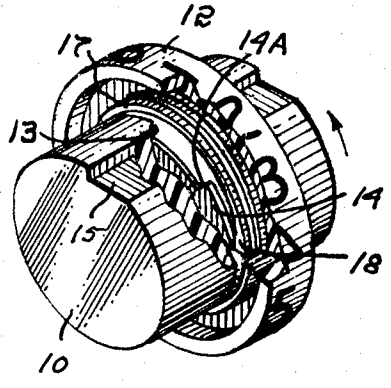


FIG. 3

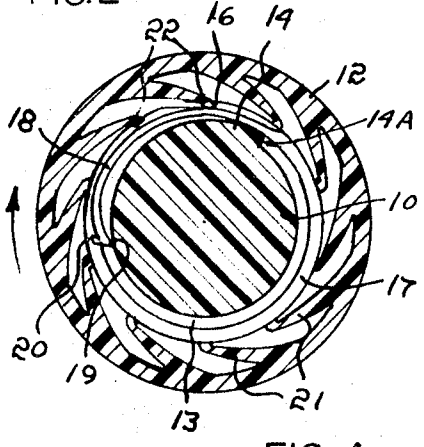


FIG. 4

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POSITIVE COUNT PINIONLESS ODOMETER AND RESET MEANS THEREFOR

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ABSTRACT OF THE DISCLOSURE

A positive count, pinionless odometer with the rotors mounted on a shaft for rotation independently thereof and of each other, the rotor of the lower order including a driving arm within a circumferential groove formed with a cam which forces the arm outwardly to disengage a drive arm of a rotor of a higher order from a stop on the shaft and drive the thus released arm a distance representing a count, the higher order rotor having an arm for each count, and reset means of the rack and pinion type and including a shaft lock and rotor steadying means operable during rotor resetting.

Odometers of the positive count, pinionless type have many uses provided they can be manufactured at a reasonable price and provided that they are accurate and adapted for high speed counting uses.

The general objective of the present invention is to provide odometers that meet these requirements, an objective attained by providing a shaft on which a plurality of rotors are mounted for rotation independently thereof and of each other. The shaft has a series of axially spaced and aligned cams, one for each lower order rotor and axially spaced and aligned stops, one for each higher order rotor. Each lower order rotor has a resilient driving arm engageable with an appropriate one of the cams as it turns and provided with a shoulder that is then projected outwardly into an operative position. Each higher order rotor has resilient driven arms one for each count to be made by that rotor and projecting over the path of the driving arm of the rotor of the next lower order and including a shoulder engageable with the appropriate stop when its rotor is in a predetermined counting position. The cams and stops are so spaced that when a lower order rotor has been turned to a predetermined extent, the shoulder of its driving arm is cammed into its operative position thereby to engage and unseat a driven arm of the rotor of the next higher order from its stop with the drive and driven shoulder in driving engagement until the driving arm is released by its cam, another driven arm of the thus turned higher order rotor then being in engagement with the stop for that rotor.

In the accompanying drawings, there is shown an embodiment of the invention illustrative of these and other of its objectives, novel features and advantages.

In the drawings:

FIGURE 1 is a perspective view of an odometer in accordance with the invention as seen from the front,

FIGURE 2 is a fragmentary, perspective view showing the driven side of a rotor,

FIGURE 3 is a like view of the driving side thereof, and

FIGURE 4 is a cross section illustrating the driving connection between proximate rotor.

The odometer shown in the drawings has a shaft **10** rotatable in end supports **11** on which rotors **12** are mounted for rotation independently thereof and of each other. The rotors **12** are shown as identical and as having a series of numbers ranging from 0–9, on their peripheries, and hence function as counting wheels. The rotors **12** are of

successively higher orders, from right to left as viewed in FIGURE 1.

The shaft **10** has a series of circumferential grooves **13**, one for each rotor **12**, each having a cam **14** therein, the cams **14** being in alignment lengthwise of the shaft. The shaft **10** also has a lengthwise recess **15** interrupted by the grooves **13** and shaped and dimensioned to provide stops **16** in alignment lengthwise of the shaft, one stop **16** for each rotor **12** except, in the illustrative embodiment, in the case of the lowest order rotor which is located on a cylindrical shaft portion interrupting the stop-defining lengthwise recess, see FIGURE 2.

Each rotor **12** has a central hub **17** on its driving side formed with an arcuate, resilient arm **18** disposed within a groove **13** and extending in a trailing direction with reference to the arrows indicating the counting direction of the rotors **12**. Each arm **18**, see FIGURE 4, has a head at its trailing end including an inwardly disposed cam engaging part **19** and an outwardly disposed shoulder **20** normally below the periphery of the shaft and thus hold the rotors against axial movement.

Each rotor **12** has on its driven side a plurality of equally spaced, resilient arms **21**, each extending inwardly and forwardly with a shoulder **22** at its free end projecting to overlie the margin of the hub **17** of the adjacent lower order rotor. Each shoulder **22** engages the subjacent stop **16** when the rotor of which it is a part is turned into a predetermined counting position.

In order that the lowest order rotor **12** may be driven to initiate the counting action, an annular gear **23** is secured thereto with a driving gear **24** in mesh therewith and connected to its drive shaft **25** by a one-way clutch generally indicated at **26**.

By these or equivalent means, the rotor **12** of the lowest order is rotated while the other rotors **12** are held against advance by the stops **16** with the stop-forming recess **15** providing a detent action against retrograde movement and a positive stop against over travel.

With a lower order rotor **12** turning (either continuously or step-by-step) the cam **19** of its arm **18** is carried outwardly, as the last count is approached with its shoulder **20** engaging and raising the shoulder **22** of that arm **21** of the rotor of the next higher order that has its shoulder **22** then in engagement with a stop **16** thus to disengage that shoulder therefrom for driven engagement with the shoulder **20** of the lower order rotor, the shoulder-to-shoulder engagement continuing until the cam **14** permits the arm **18** to return to lie wholly within the channel **13**. The cams **14** and stops **16** are so spaced that such engagement turns the driven rotor **12** accurately for one count with the shoulder of another arm **21** then becoming engaged with the appropriate stop **16**.

In order that the odometer may be reset, a pinion gear **27** is fixed on the shaft **10** to be driven by the reset rack **28** which is yieldably held in its raised position by the spring **29**. The pinion gear **27** is provided with a pawl **30** yieldably urged inwardly by the spring **31**. The shaft **10** is normally held against turning by a resilient latch **32** attached to the rack **28** and provided with a U-shaped bend **33** receiving and holding the pin **34** on one end of the shaft **10**. The latch **32** is swung outwardly by a pin **35** on the rack **28** to release the shaft as the rack **28** starts its downward stroke but before the pawl **30** engages the shaft stop **16** and starts to turn the shaft **10** in the reset direction which is the same as the counting direction.

While the shaft **10** is turning in response to the downward thrust of the rack **28**, the shoulders **14A** of the cams **14** pick up, sooner or later, depending on the position into which each rotor **12** was turned in the final count, the heads at the trailing end of the driving arms **18** and turn the rotors forwardly into their zero positions. During such

reset movement, the one-way clutch **27** releases the rotor of the lowest order.

In order to prevent the friction between the shaft and the rotors from being the cause of rotor rotation, a brake member **36** is pivoted to the supports **11** to swing into and out of a position in which it engages and steadies the rotors, such swinging movement resulting from the engagement of an actuator **37** with an arm **38** with which the member **36** is provided.

From the foregoing, it will be apparent that odometers in accordance with the invention are well adapted to meet the various requirements both of production and of use.

I claim:

1. In a positive count, pinionless odometer, a plurality of rotors of successively higher orders, a shaft on which said rotors are mounted for rotation independently thereof and of each other, said shaft having axially spaced alined cams, one cam for each lower order rotor, and having axially spaced, alined stops, one stop for each higher order rotor, and each rotor including a resilient driving arm engageable with the appropriate one of said cams as that rotor turns and provided with a shoulder that is then projected outwardly into an operative position, and each rotor including resilient driven arms, one for each count to be made by that rotor, each driven arm of a higher order rotor projecting over the path of the driving arm of the next lower order rotor and including a shoulder engageable with the appropriate stop when the higher order rotor has been turned into a predetermined count position, and said cams and stops being so angularly spaced that when a lower order rotor has been turned to a predetermined extent, the shoulder of its driving arm is cammed into its operative position thereby to unseat a driven arm of the next higher order rotor from its stop and engage the shoulder of the unseated driven arm with the drive and driven shoulders in driving engagement until the driving arm of the lower order is released by its cam with another driven arm of the thus-turned higher order rotor then being in engagement with its stop.

2. The odometer of claim **1** in which the shaft has a lengthwise channel underlying the higher order rotors with one edge thereof providing the stops therefor.

3. The odometer of claim **1** in which the shaft has a series of annular grooves, one for each rotor, each cam being within a groove and the driving arm of each rotor travelling within the appropriate groove.

4. The odometer of claim **3** in which each rotor includes a shaft-receiving hub on its driving end and the driven arm of each rotor is part of its hub and extends inwardly and provides a gap in the hub, and the shoulders of the driven arms ride on the hub of the next lower order rotor and on the shaft between the ends of the gap.

5. The odometer of claim **4** in which each higher order rotor includes an annular flange on its driven end and the driven arms extending inwardly from the flange in the leading direction.

6. The odometer of claim **1**, means to hold the shaft against rotation, and reset means including means to release the shaft holding means and then to turn the shaft in a counting direction.

7. The odometer of claim **6** and means to restrain the rotors while they are being reset.

8. The odometer of claim **6** in which the reset means includes a rack, a pinion driven by the rack and carried by the shaft for rotation independently thereof, a pawl attached to the pinion and spring pressed into engagement with the periphery of the shaft, the shaft having a stop engageable by the pawl when the pinion is rotated in the counting direction.

9. The odometer of claim **8** in which the shaft holding means includes a resilient latch and a member on the rack to release the latch before the pawl engages its stop.

10. The odometer of claim **8** in which the rotor restraining means includes a member pivoted to swing into and out of engagement with the rotors and a member carried by the rack to swing the member into engagement with the rotors.

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