United States Patent

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[54] **COUNTER**
9 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** ..... **235/132 R,** 235/144 HC
[51] **Int. Cl.** **G06f 15/18,** G06c 15/42
[50] **Field of Search** ..... 235/132 R, 144 HC, 117 R, 91 R

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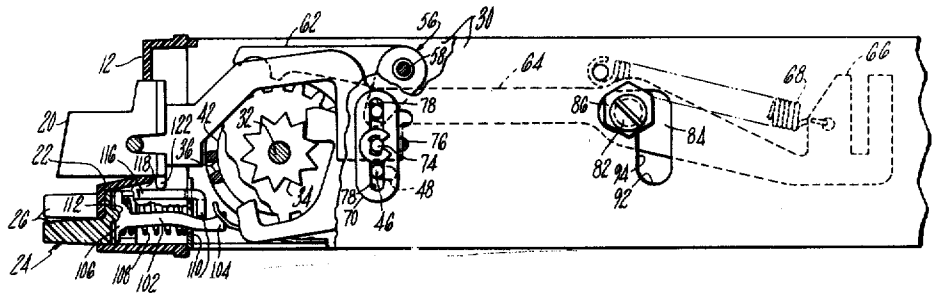
ABSTRACT: A resettable predetermining counter having a preset mechanism adapted for being moved into a preset-conditioning position in engagement with the counter wheels and a withdrawn preset-prohibiting position out of engagement with the counter wheels is provided with a dual-motion reset actuator having a primary actuating motion for resetting the counter and a secondary actuating motion for conditioning the counter for presetting. The reset actuator is provided with an interlock for locking the preset mechanism against presetting during the primary actuating motion of the reset actuator and for locking the reset mechanism in its reset condition while simultaneously releasing the preset mechanism and conditioning it for presetting the counter wheels during the secondary actuating motion of the reset actuator.



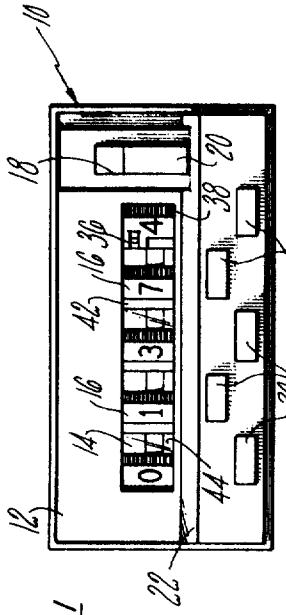


FIG. 1

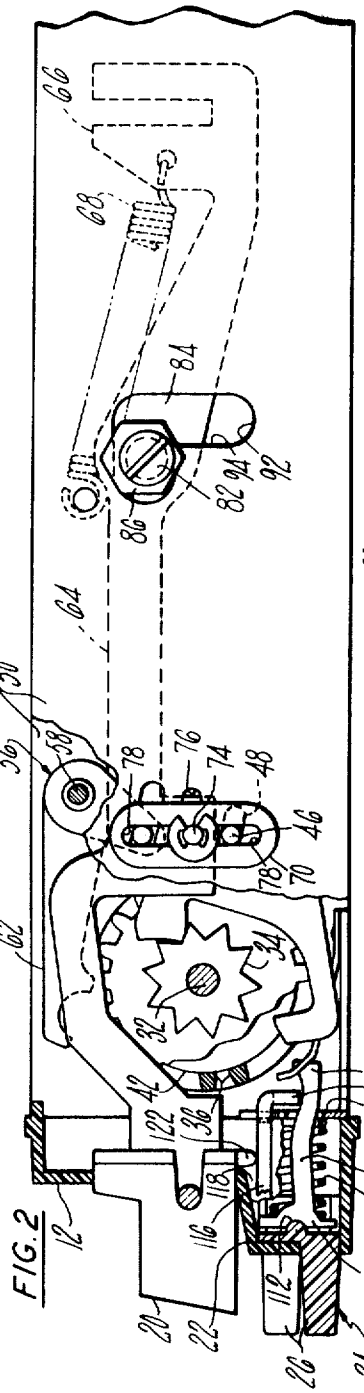


FIG. 2

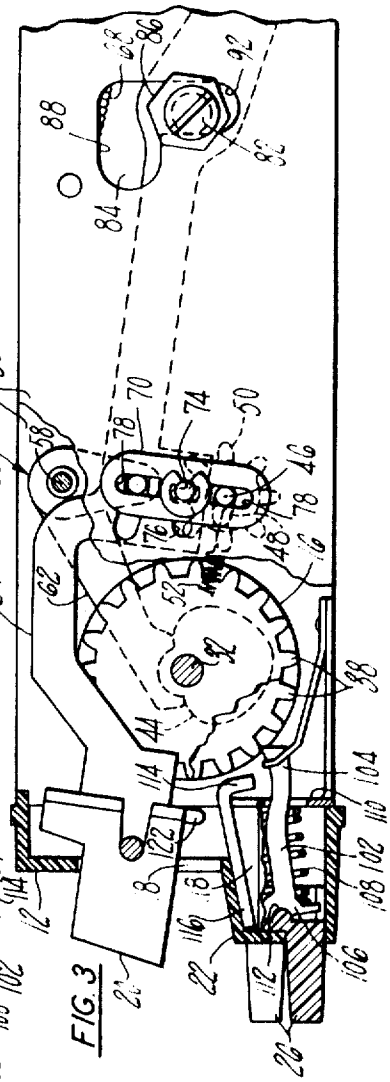


FIG. 3

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COUNTER

SUMMARY OF THE INVENTION

The present invention relates generally to counters and more particularly is concerned with a new and improved resettable counter of the predetermining type capable of being set at a preselected count and of being repeatedly reset to the same or a different preselected count.

It is a principal object of the present invention to provide a new and improved predetermining counter of the type described having a new and improved arrangement for locking the reset mechanism of the counter in its reset condition while at the same time conditioning the presetting mechanism for presetting the individual counter wheels to a preselected count.

Another object of the present invention is to provide a new and improved predetermining counter of the type described having a dual-motion reset actuator adapted for primary actuation to reset the counter and secondary actuation upon movement of the reset mechanism into its reset condition to lock the reset mechanism in that condition.

Still another object of the present invention is to provide a new and improved manually presettable counter adapted for being conditioned for presetting by the counter's reset actuator and for being readily reset to a different preselected count in a rapid and facile manner.

A further object of the present invention is to provide a new and improved interlock between the reset mechanism and preset mechanism of a predetermining counter so that upon locking the reset mechanism in its reset condition the preset mechanism is automatically conditioned for presetting the counter.

A still further object of the present invention is to provide a new and improved predetermining counter of the type described adapted for being manually set to a selected count and operatively indexed in a subtracting direction from the selected count to zero and subsequently reset to the preselected count by means of a durable, compact and economical assembly capable of high efficiency and accurate operation.

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

These and related objects of the present invention are effected by providing a new and improved resettable counter having a preset mechanism adapted for being moved into a preset-conditioning position in engagement with the counter wheels and a withdraw preset-prohibiting position out of engagement with the counter wheels of the counter, a dual-motion reset actuator having a primary actuating motion toward and away from a reset position for resetting the counter and a secondary actuation motion upon movement into its reset position, said actuator including an interlock controlling the movement of the preset mechanism to retain the preset mechanism in its withdraw preset-prohibiting position during primary actuating motion of the reset actuator and being operative during the secondary actuating motion of the reset actuator for locking the reset mechanism in its reset condition while simultaneously releasing the preset mechanism to permit conditioning thereof for presetting the counter wheels to a selected count.

A better understanding of the objects, advantages, features, properties and relationships of the invention will be obtained from the following detailed description and accompanying drawing which set forth an illustrative embodiment indicative of the way in which the principles of the invention are employed.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a front view of a counter incorporating the features of the present invention;

FIG. 2 is an enlarged side view, partly broken away and partly in section, of a portion of the counter of FIG. 1 showing the reset mechanism in its rest position prior to the resetting operation and the Greset mechanism restrainably held in its withdrawn position; and

FIG. 3 is an enlarged side view similar to FIG. 2 illustrating the reset mechanism locked in its reset position and the preset mechanism conditioned for presetting the counter wheels.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawing in greater detail wherein like reference numerals indicate like parts throughout the figures, an electromagnetic counter **10** of the predetermining type is shown comprising a generally rectangular front face plate **12** of low profile having a rectangular readout window **14** extending longitudinally across the face plate **12** for exposing certain indicia on the periphery of a plurality of counter wheels **16**. A transversely extending slot **18** in front plate **12** is spaced from one end of the window **14** for slidably receiving a thumb-operated reset button **20** for resetting the counter. The front plate **12** additionally includes a projecting deck portion **22** extending across the front of the counter below the readout window **14** and slot **18** for housing a plurality of preset mechanisms designated generally by the numeral **24**. A plurality of preset buttons **26** associated with the mechanisms **24** project from the deck portion **22** in a staggered arrangement below the window **14** to facilitate individual actuation.

A pair of rectangular sidewall frame plates **30** are secured to opposite ends of the front face **12** and extend rearwardly therefrom in spaced parallel relationship. The plates **30** support a counter wheel shaft **32** which, in turn, rotatably mounts a plurality of coaxially aligned counter wheels **16** of ascending order adjacent the readout window **14**. As shown in FIG. 2, the shaft **32** also rotatably supports a verge-driven star wheel **34** operatively connected to the counter wheels **16** for registering a count in response to electrical signals received by the counter. Each of the counter wheels **16** is provided with a conventional two-tooth drive gear segment **36** on one side thereof and a driven gear **38** on the opposite side thereof for effecting count transfer between lower and higher order number wheels of the counter. An integral locking ring **42** and heart cam **44** for each counter wheel **16** also is mounted on the wheel shaft **32**. Each locking ring and heart cam is operatively connected to its respective number wheel through a spring-loaded detent drive (not shown) for assuring rotation thereof with the wheel during normal counting and resetting operations. As is known in the art, the detent permits relative rotation between the heart cam **44** and its respective counter wheel during the presetting operation of the counter while providing secure engagement therebetween during normal operation for repeated and accurate resetting of the counter to the count selected during the presetting operation.

A transfer pinion shaft **46** extends transversely of the counter between the sideplates **30** in spaced parallel relationship to the wheel shaft **32**. The ends of shaft **46** are mounted within a pair of elongated slots **48** in the spaced sideplates **30**, which slots extend generally in a rearward radial direction from the wheel shaft **32**. A plurality of transfer pinions **50** are rotatably mounted on the pinion shaft **46** for engagement with the gear segment **36** and gear **38** of adjacent counter wheels for effecting count transfer between lower and higher order number wheels of the counter. A pinion shaft spring **52** secured to the pinion shaft **46** biases the shaft toward the counter wheels **16** and urges the transfer pinions into operative engagement with the gears on the counter wheels. As will be appreciated, the elongated slots **48** in the side plates **30** of the frame permit a shift of the transfer pinion shaft therealong against the bias of spring **52** to move the transfer pinions out of engagement with the counter wheels during the resetting operation.

The reset mechanism for resetting the counter includes a reset comb **56** pivotally mounted on a reset comb shaft **58** secured to the side plates **30** in spaced parallel relationship to both the transfer pinion shaft **46** and the counter wheel shaft

32. The reset comb includes a plurality of reset fingers 62 extending forwardly of the comb shaft 58 for pivotal movement about the shaft into resetting engagement with the heart cams 44 of the individual counter wheels for resetting the wheels to their preselected count. As shown in FIGS. 2 and 3, an elongated reset actuator or slide 64 extends longitudinally of the counter adjacent one sideplate 30 thereof. The forward end of the reset actuator projects through the slot 18 in front faceplate 12 of the counter and fixedly carries the thumb-operated reset button 20. The innermost or rearward end 66 of the reset actuator is connected to a return drive spring 68 adapted to be loaded as the actuator is pushed rearwardly during the resetting operation.

The reset mechanism further includes a whippletree linking member 70 connecting the reset actuator 64 to both the transfer pinion shaft 46 and the reset comb 56. The operation of the linking member 70 is more fully described in the copending U.S. Pat. application of Ludwick Szeluga, Ser. No. 57,177, filed July 22, 1970, entitled "Resettable Counter." The link 70 is a flat elongated member mounted on the exterior of the sideplate 30 and is pivotally connected at approximately its midpoint to the reset actuator 64 by a connecting pin 74 movable along an elongated slot 76 in the sideplate 30 of the counter frame. Each end of whippletree linking member 70 has an elongated slot 78 providing a pivotal connection between the linking member and both the transfer pinion shaft and the reset comb. Upon primary actuation of the reset actuator 64, that is, linear rearward movement of the actuator longitudinally of the wall 30 against the bias of its return drive spring 68, the whippletree linking member 70 sequentially alternates its pivot point between the transfer pinion shaft 46 and its connection with the reset comb. This action provides initial engagement between the reset fingers 62 and heart cams 44 of the counter, shift of the transfer pinions 50 out of engagement with the counter wheels and resetting of the counter wheels by the action of the reset fingers against the heart cams.

As mentioned, the reset actuator 64 is mounted for slidable longitudinal travel adjacent one sidewall 30 of the counter and carries a thumb-operated reset button 20 projecting through the slot 18 in the front face plate 12 of the counter. The reset actuator 64 additionally is provided with a rotatably adjustable eccentric plug 82 located rearwardly of the linking member 70 but forwardly of the connection with drive spring 68. The plug 82 extends through a generally L-shaped aperture 84 in the adjacent sideplate 30 and carries a retaining washer 86 contacting the exterior of the sideplate. The L-shaped aperture 84 includes a base portion 88 extending longitudinally of the sideplate permitting free travel of the plug therealong as the reset actuator slides rearwardly during its linear primary actuating motion for resetting the number wheels of the counter. The aperture 84 also includes a slightly narrower leg portion 92 disposed at a right angle to base portion 88 and extending downwardly therefrom.

It is an advantageous feature of the present invention that the reset actuator 64 is capable of dual motion and may undergo not only primary actuating motion for resetting the counter but also secondary actuating motion for locking the counter in a reset position while conditioning it for presetting. Thus as the reset actuator 64 reaches the reset position the pinion shaft 46 reaches the ends of its supporting slots 48 and the eccentric plug 82 has moved along the base portion 88 of the L-shaped aperture 84 into registry with the leg portion 92 thereof. Therefore, the reset actuator is now free to pivot about its connecting pin 74 causing the eccentric plug 82 to move along the depending leg portion 92 of the L-shaped aperture 84. Due to the eccentricity of the plug 82 the exact location of the reset actuator can be adjusted so that a firm abutting and locking engagement is effected between the plug 82 and the front edge 94 of the slot's depending leg portion 92.

As mentioned, the front face plate 12 of the counter is provided with an outwardly projecting deck portion 22 for housing individual preset mechanisms 24 for each number wheel of the counter. Each preset mechanism is housed within a separate compartment in the deck and includes an elongated drive pawl 102 having a head portion 104 on one end thereof for engaging the driven gear 38 of a number wheel and a foot portion 106 extending from the opposite end thereof. A coil spring 108 retained within each compartment by a slotted closure plate 110 through which the pawls extend circumscribes the pawl 102 and bears against the foot portion 106 to bias the pawl counterclockwise as viewed in FIGS. 2 and 3, and urge the head portion 104 thereof into engagement with the driven gear 38 of its associated number wheel 16. The manually operated buttons 26 extending outwardly through the deck 22 are each provided with an arcuate projection 112 engaging the foot portion 106 of the respective pawl for moving the pawls inwardly against the bias of springs 108 to advance the wheels to a selected count.

A single, generally U-shaped pawl-restraining bar 114 extends transversely across the counter adjacent the closure plate 110 and above the preset drive pawls 102 for engagement therewith. The bar 114 is provided with a pair of angularly disposed base portions 116 on opposite ends thereof supportably mounted within flared retaining cavities 118 in the deck 22 for limited oscillatory movement toward and away from the pawls 102. Thus, movement of the bar 114 from the position shown in FIG. 3 to the position shown in FIG. 2 causes pivotal movement of the pawls 102 about the projections 112 against the bias of their coil springs 108 and prevents or restrains engagement of the pawls with the driven gears 38 of the number wheels.

Movement of the arm 114 into and out of its pawl-restraining position is controlled by the reset actuator 64 and, more specifically, by the interengagement between a lug 122 on the thumb-actuated reset button 20 and one base portion 116 of the restraining arm 114. As shown in FIG. 2, when the reset actuator is in its rest position prior to a resetting operation, the lug 122 holds the bar 114 in restraining engagement with the pawls 102. Similarly, as the reset actuator 64 is moved inwardly along its substantially straight path for resetting the counter, the lug 122 continues to maintain the restraining arm in firm restraining engagement with the preset drive pawls to hold the pawls in their withdrawn position out of engagement with the counter wheels. However, when the reset actuator is moved into its reset condition and pivoted to bring the eccentric plug 82 into engagement with the cooperating front edge 94 of the L-shaped slot 84, the lug 122 will be withdrawn from the restraining arm, permitting the preset drive pawls 102 to pivot counterclockwise from the position illustrated in FIG. 2 to the position shown in FIG. 3 under the driving force of their preset conditioning springs 108 to condition the counter for presetting. The restraining arm 114 will be effective to release all the preset actuating mechanisms simultaneously and permit manual setting of the individual counter wheels to a new selected count.

As will be appreciated, locking of the reset actuator in a reset condition will lock the reset finger 62 in firm engagement with the heart cams 44. Consequently, as the individual pawls 102 ratchet their respective number wheels to any preselected count, the spring-loaded detent connection between each heart cam 44 and its associated number wheel 16 will permit rotation of the number wheel relative to the heart cam while the heart cam is maintained in its reset position. Thus, the primary linear actuating motion of the reset actuator is effective to reset the counter and the secondary pivotal actuating motion of the reset actuator is effective to lock the reset mechanism in its reset condition while simultaneously releasing the restraining arm and conditioning the preset mechanism for presetting the counter to a selected count designation. When the preselected count has been reached, the reset actuator is pivoted to disengage the eccentric locking plug 82 from the edge 94 and depress the restraining arm 114 thereby moving the pawls 102 clockwise as viewed in FIG. 3 against the bias of springs 108 causing disen-

gagement of the pawls from the number wheels. Thereafter the reset actuator **64** is permitted to return to its rest position under the driving force of its return drive spring **68**.

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.

We claim:

1. In a resettable counter having a plurality of resettable counter wheels, preset selector means movable into a condition for presetting the counter wheels to a selected count, reset members for resetting the counter wheels to said selected count and a reset actuator operable for moving the reset members to a reset condition for resetting the counter wheels, the improvement wherein the reset actuator has a primary actuating motion for resetting the counter wheels and a secondary actuating motion operative upon resetting the counter wheels to the selected count, and the counter includes interlock means operative during the primary actuating motion of the reset actuator for restraining movement of the preset selector means into a condition for presetting the counter and during the secondary actuating motion of the reset actuator for locking the reset members in a reset position and conditioning the preset selector means for presetting the counter wheels to a selected count.

2. The counter of claim 1 wherein the interlock means includes a restraining member engaging the preset selector means and movable between a restraining position for restraining movement of the preset selector means into a condition for presetting the counter wheels and a release position permitting conditioning of the preset selector means for presetting the counter wheels, said reset actuator controlling movement of the restraining member toward its release position upon secondary actuating motion of the reset actuator.

3. The counter of claim 1 wherein the preset selector means includes a manually actuated selector drive member movable between an operative position in operative engagement with a counter wheel for presetting the wheel to a selected count and a restrained position operatively disengaged from the counter wheel and biasing means urging the selector drive member toward its operative position, and the interlock means includes a restraining member engageable with the selector drive member for moving the drive member into its restrained position against the bias of the biasing means and operative upon secondary actuating motion of the reset actuator for releasing the selector drive member and permitting movement thereof into its operative position.

4. The counter of claim 1 wherein the preset selector means includes wheel drive means movable between an operative position in engagement with the counter wheels for presetting the wheels to a selected count and a retracted position disengaged from the counter wheels and biasing means urging the drive means toward an operative position, the interlock means including a locking member carried by the reset actuator for locking the reset members in their reset positions upon secondary actuating motion of the actuator and a control member on the actuator operative during the primary actuating motion of the reset actuator for preventing movement of the drive means out of a retracted position and adapted to release the drive means during the secondary actuating motion of the reset actuator to permit movement of the drive means toward an operative position by the biasing means.

5. The counter of claim 1 wherein the interlock means includes a first interlock member operative for locking the reset actuator against primary actuating motion and a second interlock member controlling movement of the preset selector means into a condition for presetting the counter.

6. The counter of claim 1 wherein the reset members for resetting the counter wheels include reset cams mounted for rotation with the counter wheels and adapted to permit rotation relative to the counter wheels and reset fingers movable into engagement with the reset cams for resetting the counter wheels, the reset actuator being operable upon primary actuating motion for moving the reset fingers into engagement with the reset cams to reset the counter wheels, the interlock means being operative upon secondary actuating motion of the reset actuator for holding the reset cams in their reset condition to prevent rotation thereof with the counter wheels during presetting of the wheels to a selected count by the preset selector means.

7. The counter of claim 1 wherein the reset actuator is movable between a rest position and a reset position during primary actuating motion and the counter includes return drive spring means loaded during movement of the actuator toward the reset position for driving the actuator out of the reset position after resetting of the counter and wherein the interlock means includes a locking member movable with the actuator and operable upon secondary actuating motion of the actuator for holding the actuator against movement out of the reset position by the return drive spring.

8. The counter of claim 1 wherein the interlock means includes an adjustable eccentric member carried by the reset actuator and the counter includes a locking shoulder engageable by the eccentric member upon secondary actuating motion of the reset actuator.

9. The counter of claim 1 wherein the reset members include reset cams mounted for coaxial rotation with the counter wheels and adapted for rotation relative to the counter wheels and a reset comb having reset fingers pivotable into engagement with the reset cams for resetting the counter wheels, the reset actuator being operatively connected to the reset comb and operable upon actuation for pivoting the reset fingers into engagement with the reset cams to reset the counter wheels and hold the reset cams against rotation, the preset selector means including a plurality of present pawls movable between an operative position in engagement with the individual counter wheels for presetting the wheels to a selected count and a retracted position disengaged from the counter wheels and biasing means urging the drive pawls toward their operative position, the interlock means including a restraining bar in engagement with the drive pawls and movable between a restraining position for restraining movement of the drive pawls into an operative position and a withdrawn position permitting movement of the drive pawls into an operative position, an adjustable eccentric carried by the reset actuator for locking the cams in their reset positions upon secondary actuating motion of the actuator and a control member on the actuator engageable with the restraining bar during the primary actuating motion of the reset actuator for preventing movement of the restraining bar out of a restraining position and releasable from the restraining bar during the secondary actuating motion of the reset actuator to permit movement of the drive pawls into an operative position.

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