Dec. 14, 1965

L. E. COULTER ETAL

3,223,316

COUNTER WHEEL ASSEMBLY

Filed May 5, 1964

3 Sheets-Sheet 1

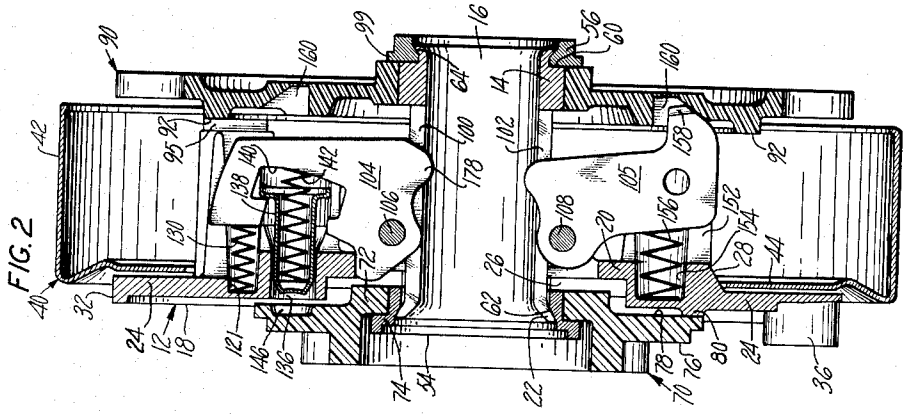

FIG. 2

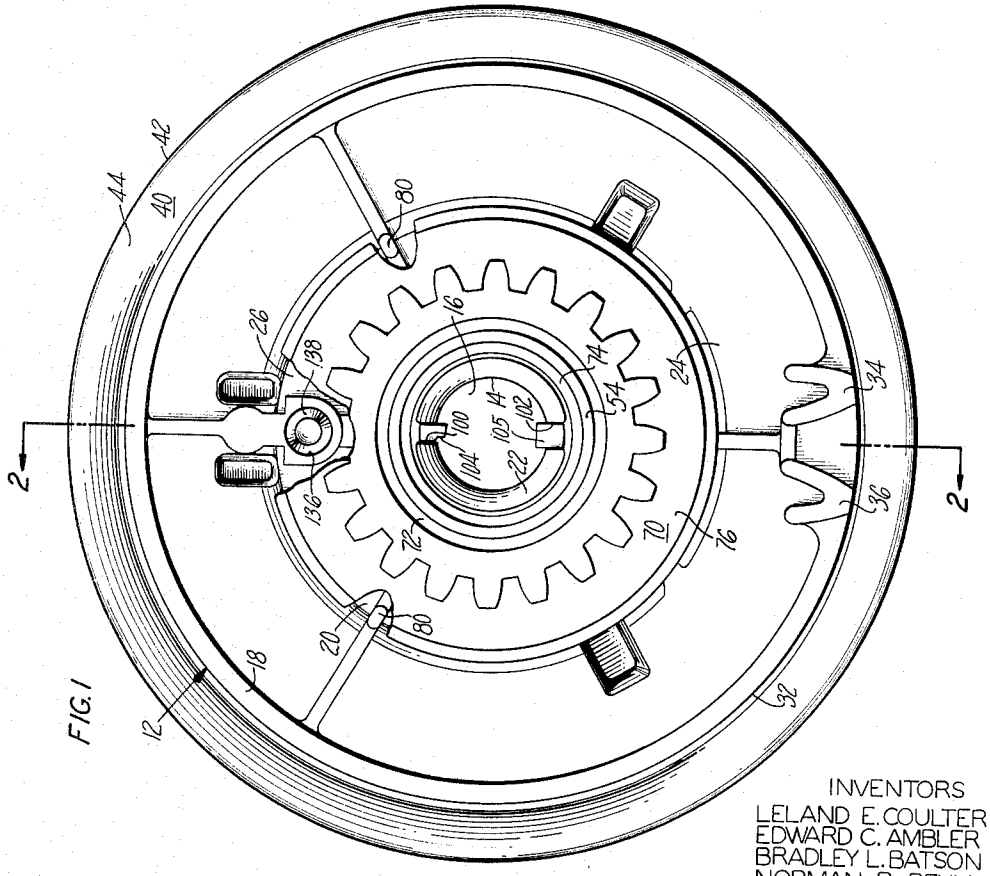

FIG. 1

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FIG. 4

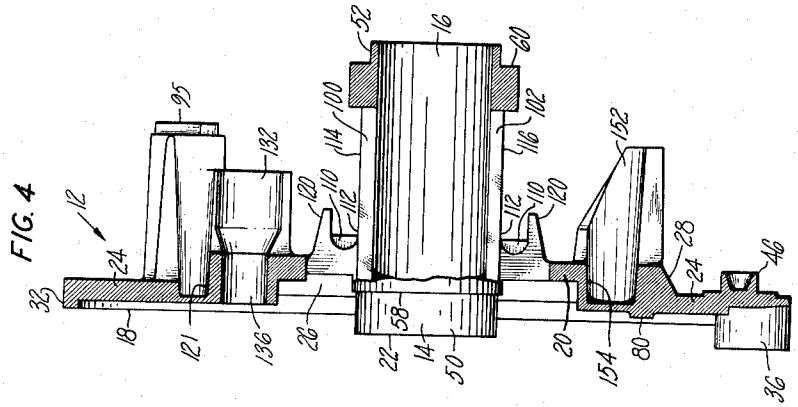

FIG. 3

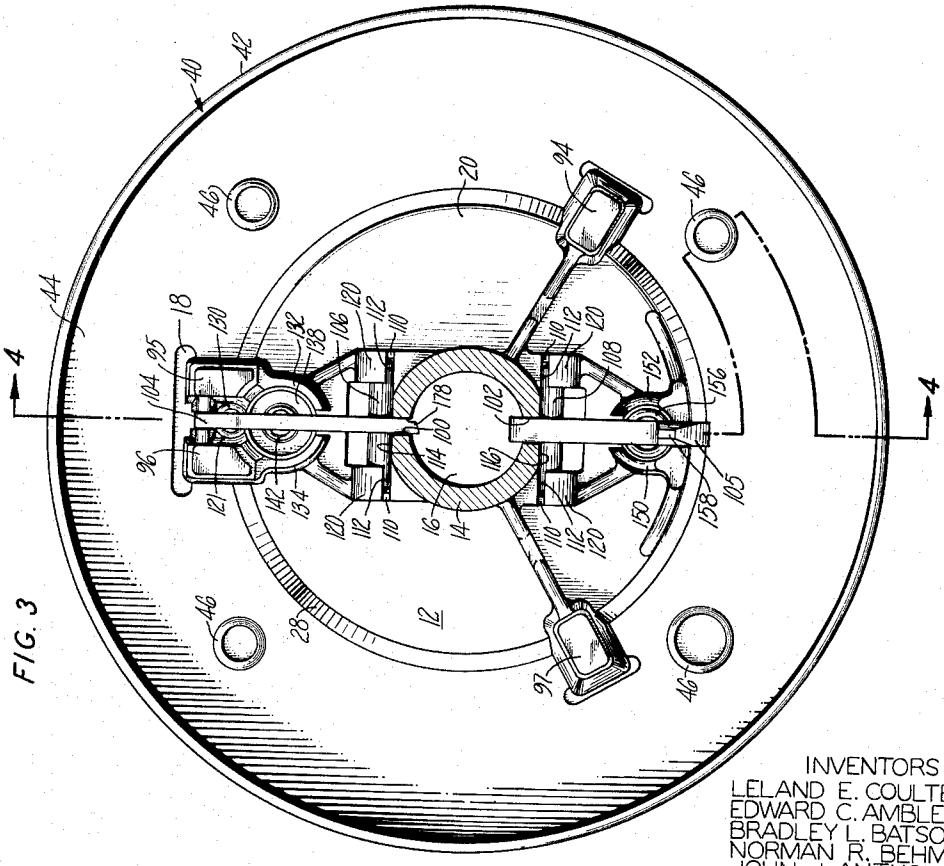

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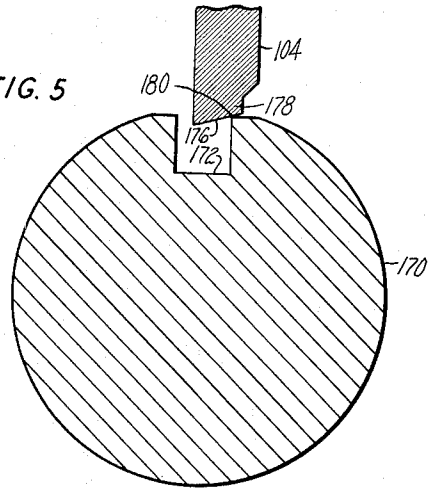
FIG. 5



PRIOR ART

FIG. 6

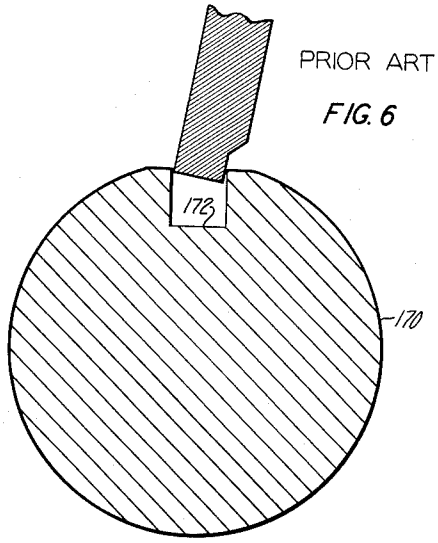
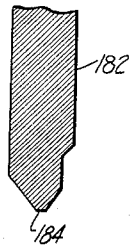


FIG. 7



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3,223,316

COUNTER WHEEL ASSEMBLY

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Filed May 5, 1964, Ser. No. 365,087
6 Claims. (Cl. 235—1)

The present invention relates generally to counter wheels and more particularly to a counter wheel assembly of the type illustrated in United States Patent No. 2,932,448 granted to Harvey N. Bliss April 12, 1960 on an invention entitled Resetting Mechanism for Counters and comprising an indicia wheel and independently rotatable drive and reset gears which may be selectively engaged for common rotation with the indicia wheel by axially shifting the indicia wheel supporting shaft.

The principal aim of the present invention is to provide an improved counter wheel assembly of the type described having an economical assembly of parts which may be individually manufactured by mass production methods and readily combined into a compact and highly reliable and sturdy assembly.

Another aim of the present invention is to provide an improved counter wheel assembly having a minimum number of parts of lightweight construction.

A further aim of the present invention is to provide an improved counter wheel assembly having drive and reset gears which are freely rotatable independently of the indicia wheel in accurate coaxial relationship therewith, and which may be smoothly engaged for common rotation with the indicia wheel.

Another aim of the present invention is to provide an improved counter wheel assembly of the type described having a simple and economical arrangement for engaging the reset gear which provides for accurate and smooth resetting of the indicia wheel and for timely engagement and disengagement of the reset gear and locking of the indicia wheel as it is rotated to its reset or zero position.

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:

FIG. 1 is a view, partly broken away, of one end of an embodiment of a counter wheel assembly of the present invention;

FIG. 2 is an axial section view of the counter wheel assembly taken substantially along line 2—2 of FIG. 1;

FIG. 3 is a view, partly broken away and partly in section, of the other end of the counter wheel assembly;

FIG. 4 is an axial section view of a hub of the counter wheel assembly taken substantially along line 4—4 of FIG. 3, showing the hub in its manufactured form prior to assembly;

FIG. 5 is a fragmentary transverse section view showing a counter wheel supporting shaft in cooperative engagement with a reset gear operating pawl of the counter wheel assembly;

FIG. 6 is a fragmentary transverse section view similar to FIG. 5 showing a prior art reset gear operating pawl; and

FIG. 7 is a section view, partly broken away, of a modified reset gear operating pawl of the counter wheel assembly.

The counter wheel assembly of the present invention is shown comprising a wheel hub 12 which is cast, preferably of zinc, to provide a number of integrally formed parts including a central generally cylindrical boss or tubular portion 14 having an opening 16 for receiving a counter wheel reset shaft and an integral radial flange 18 having an inner portion 20 spaced axially inwardly from but adjacent to what will be termed for convenience as the higher order end 22 of the central tubular portion 14. The flange 18 has an outer portion 24 which is offset axially outwardly from the inner flange portion 20 and which thereby forms with the inner flange portion 20 and the tubular portion 14 a generally annular recess 26 and which additionally forms with the inner flange portion 20 on the opposite face of the flange an axially tapered generally frustoconical edge 28. The flange 18 is provided with a peripheral partially cylindrical shoulder 32 for engagement by the usual mutilated transfer pinion (not shown) for holding the transfer pinion against rotation and is additionally provided with a pair of teeth 34, 36 that are adapted to engage the mutilated transfer pinion for providing the transfer action to the next higher order wheel (not shown), it being understood that the counter wheel assembly of the present invention has particular utility in counters of the type having a plurality of coaxial counter wheel assemblies arranged in ascending order.

An indicia bearing rim 40 of the counter wheel assembly, preferably constructed of sheet metal aluminum, includes a generally cylindrical portion 42 that is suitably embellished with appropriate indicia, conventionally the numerals 0 through 9, and an inwardly extending radial flange portion 44 that is affixed to the flange 18 by a plurality of angularly spaced rivets 46 formed integrally with the hub flange for receipt within corresponding openings in the radial flange portion 44 and upset to rigidly secure the rim to the hub.

The central tubular portion 14 of the hub is provided with reduced ends 50, 52 for receiving and for axially locating a pair of sleeves or washers 54, 56, respectively. The sleeves 54, 56 are retained against shoulders 58, 60 formed by the reduced ends by flanging the edges of the tubular portion outwardly as by spinning, for which purpose the sleeves 54, 56 are outwardly tapered at 62, 64, respectively.

A molded plastic reset gear 70 is rotatably mounted at the higher order end of the counter wheel assembly on the sleeve 54 by an integrally formed axially offset radial flange 72 received in part within the annular recess 26 and retained against axial outward movement by a radial annular shoulder or flange 74 on the sleeve 54. The reset gear 70 further includes an integrally formed outwardly extending radial flange 76 with an inner annular face 78 that cooperates with a plurality of angularly spaced studs or bosses 80 formed on the flange 18 for supporting the reset gear 70 against inward axial movement.

A drive gear of molded plastic construction is rotatably mounted on the tubular portion 14 at the opposite or lower order end thereof and is provided with an inwardly facing annular bearing surface 92 having engagement with the coplanar end faces of the bosses or posts 94, 95, 96, 97 formed integrally with and axially extending from the flange 18 and which thereby provide for supporting the gear 90 against inward axial movement. A radial annular shoulder or flange 99 on the sleeve 56 provides a bearing for supporting the drive gear against outward axial movement. The sleeves 54, 56, which are preferably constructed of a good bearing material, therefore provide for restraining the gears against outward axial movement, and additionally are preferably positioned to provide end bearings for engagement with adjacent wheel assemblies.

The central tubular portion **14** of the hub **12** is provided with a pair of diametrically opposed slots **100, 102** extending from the higher order end **22** of the tubular portion to adjacent the drive gear **90**. A pair of diametrically opposed radially extending reset and drive gear pawls **104, 105**, preferably of sintered metal construction, are slideably mounted in the opposed slots **100, 102** for operation by the wheel reset shaft and are pivotally mounted on the hub about parallel transversely extending axes by pivot pins **106, 108**, respectively, for which purpose the hub is cast to provide a pair of transversely spaced pockets for each of the pivot pins **106, 108**.

As best seen in FIGS. 3 and 4, the pivot pin pockets are defined by shortened end walls **110**, by inner side walls **112** that are coplanar with axially extending diametrically opposed flats **114, 116** formed on the tubular portion **14**, and by tangs **120** which are cast to extend generally parallel to the side walls **112**. The pawls and pivot pins are therefore readily installed by positioning the pivot pins within the pockets and in engagement with the flats **114, 116** and by upsetting the tangs onto the pivot pins.

The posts **95, 96** are circumferentially spaced to define a radial slot for receiving the reset gear pawl **104** and are suitably contoured to define with a cylindrical recess **121** in the flange **18** a chamber for mounting a compression spring **130** that is operative to engage the reset gear pawl **104** to pivotally urge the pawl in the clockwise direction, as seen in FIG. 2. A pair of partially circular webs **132, 134** are cast radially inwardly of the posts **95, 96**, respectively, and with an axially extending opening **136** in the flange **18** provide a generally cylindrical recess for a sheet metal locking plunger **138**. As best seen in FIG. 2, the plunger **138** is provided with a radial flange at its inner end which is received within a generally T-shaped slot **140** in the reset gear pawl **104**. Accordingly, with the pawl **104** in its normal position, shown in FIG. 2, maintained by the compression spring **130**, the plunger **138** is retracted and upon pivotal actuation of the reset gear pawl **104**, in the counterclockwise direction as seen in FIG. 2, the plunger **138** is urged axially under the force of a compression spring **142** into engagement with the reset gear **70**. For receiving the plunger **138** the reset gear is provided with a plurality of angularly spaced cylindrical recesses **146** that are adapted to receive the tapered end of the plunger **138** for securely connecting the reset gear with the indicia wheel.

A pair of partially cylindrical webs **150, 152** are contoured to provide in conjunction with a generally cylindrical recess **154** in the flange **18** an axially extending chamber for a compression coil spring **156** adapted to urge the drive gear pawl **105**, in the counterclockwise direction as seen in FIG. 2, into engagement with the drive gear **90**. For securely connecting the indicia wheel for common rotation with the drive gear, the pawl **105** is provided with an outer tapered nose **158** that is adapted for receipt within radially extending slots **160** angularly spaced about the inner face of the drive gear **90**.

In a well-known manner, the supporting shaft for the counter wheel assembly functions as a reset shaft for disengaging the drive gear and for engaging the reset gear for resetting. This is accomplished by axially shifting the reset shaft for pivotally displacing the reset and drive gear pawls outwardly from the reset shaft. As seen in FIG. 5 the reset shaft **170** is conventionally provided with an axially extending slot **172** for receiving the reset gear pawl **104** when the indicia wheel is located in its fully reset or zero position, whereupon the reset gear is disengaged and the indicia wheel is locked to the reset shaft. If the indicia wheel is located in its zero position when the reset shaft is axially shifted, the slot **172** receives the pawl **104** and the reset gear is never engaged. However, if the indicia wheel is angularly

offset from its zero position by a few degrees when the reset shaft is axially shifted, it has been found that the reset gear pawl may become lodged within the slot **172**, for example, as emphasized in FIG. 6. This may result in simultaneous locking of the indicia wheel to the reset shaft and engagement of the reset gear. For this reason counter wheel assemblies in the past have incorporated a friction clutch in the reset gear drive as shown in the above referenced Patent No. 2,932,448. With the counter wheel assembly of the present invention, however, the reset gear pawl **104** is contoured to provide a tapered edge **176** on the inner projection **178** of the pawl to prevent simultaneous engagement of the reset gear and locking of the indicia wheel. The tapered edge **176** provides a circumferentially facing camming edge adapted for engagement with the edge **180** of the reset shaft (FIG. 5) to either move the pawl **104** out of the slot **172** when the indicia wheel and therefore the pawl **104** is being rotated by the reset gear, in the clockwise direction as seen in FIG. 5, or to move the indicia wheel in the counterclockwise direction, under the force of the compression springs **130, 142** to its zero position whereupon the inner projection of the pawl **104** is fully received within the slot **172**.

Where resetting of the indicia wheel is accomplished in the opposite angular direction, the reset gear pawl **104** would be formed with a cam circumferentially facing in the opposite angular direction. Alternatively as seen in FIG. 7, a pawl **182** having a V-shaped projection **184** with tapered edges facing in both circumferential directions could be employed as a universal pawl for use with resetting in either rotational direction.

Thus it can be seen that the parts of the counter wheel assembly of the present invention are capable of being manufactured by economical mass production methods and can be readily assembled into accurate association to provide a compact and highly reliable assembly. Additionally, the counter wheel assembly provides an economical arrangement for engaging and disengaging the reset gear which precludes the necessity of having, for example, a friction clutch in the reset gear drive and which nevertheless provides smooth resetting and prevents simultaneous locking of the indicia wheel and engagement of the reset gear. Further, the counter wheel assembly of the present invention is of lightweight construction with a minimum number of parts arranged for reliable operation over a long service life.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

We claim:

1. A counter wheel assembly comprising a cast hub having a central axially extending tubular portion adapted for receiving a counter reset shaft and a radial flange portion spaced axially inwardly of but adjacent to one axial end of the tubular portion, a sheet metal rim secured to the flange portion having a generally cylindrical indicia bearing surface, the tubular portion of the hub having reduced axial ends, a pair of sleeves mounted on the reduced axial ends of the tubular portion, said sleeves being retained on the hub by outwardly flanged edges of the tubular portion, a reset gear rotatably mounted at said one axial end of the tubular portion, a drive gear rotatably mounted at the other axial end of the tubular portion, said flange portion having a plurality of angularly spaced axially projecting bosses and said gears having axially facing annular bearing surfaces engageable by the bosses for supporting the gears against inward axial movement, said sleeves having radial shoulders for supporting the gears against outward axial movement, and means mounted on the hub operable by the reset shaft for selectively locking the hub with the drive and reset gears.

2. A counter wheel assembly comprising a cast hub having a central axially extending tubular portion adapted for receiving a counter reset shaft and a radial flange with an inner annular portion axially spaced inwardly of but adjacent to one axial end of the tubular portion and an outer annular portion offset axially outwardly thereof to define an annulus with said one axial end of the tubular portion, a sheet metal ring having a generally cylindrical indicia bearing portion and an inward radial flange portion secured to the outer annular portion of the flange, a reset gear rotatably mounted at said one axial end of the tubular portion and in part within said annulus, a drive gear rotatably mounted at the other axial end of the tubular portion, a pair of sleeves mounted on the axial ends of the tubular portion retaining the gears against outward axial movement, said flange having a plurality of angularly spaced axially projecting bosses and said gears having axially facing annular bearing surfaces engageable by the bosses for supporting the gears against inward axial movement, and means mounted on the hub operable by the reset shaft for selectively locking the hub with the reset and drive gears.

3. A counter wheel assembly comprising a cast hub having a generally cylindrical axially extending tubular portion adapted for receiving a counter reset shaft and a radial flange portion spaced axially inwardly of but adjacent to one axial end of the tubular portion, a sheet metal indicia bearing rim secured to the radial flange portion, a first sleeve mounted on said one axial end of the tubular portion, a second sleeve mounted on the other axial end of the tubular portion, said sleeves being retained on the hub by outwardly flanged edges of the tubular portion, a pair of molded plastic gears rotatably mounted at the opposite ends of the tubular portion, said flange having a plurality of angularly spaced axially projecting bosses and said gears having axially facing annular bearing surfaces engageable by the bosses for supporting the gears against inward axial movement, said sleeves having radial shoulders for supporting the gears against outward axial movement, said tubular portion having a pair of opposed slots, a pair of pawls slideably received in the slots for actuation by the reset shaft for selective engagement of the reset and drive gears respectively, and a pair of pins pivotally mounting the pawls about transverse axes, said tubular portion having a pair of axially extending opposed flats engageable by the pins for rigid support thereof, and said hub having integral tangs for retaining the pins against the flats.

4. A counter wheel assembly comprising a cast hub having a central axially extending tubular portion adapted for receiving a counter reset shaft and a radial flange portion spaced axially inwardly of but adjacent to one axial end of the tubular portion, a sheet metal indicia bearing rim secured to the radial flange portion, the tubular portion of the hub having reduced ends, a pair of sleeves mounted on the reduced ends of the tubular portion, said sleeves being retained on the tubular portion by outwardly flanged edges thereof, a reset gear rotatably mounted at said one axial end of the tubular portion, a drive gear rotatably mounted at the other axial end of the tubular portion, said flange having a plurality of angularly spaced axially projecting bosses and said gears having axially facing annular bearing surfaces engageable by the bosses for supporting the gears against inward axial movement, said sleeves having radial shoulders for supporting the gears against outward axial movement, said tubular portion having a pair of diametrically opposed slots axially extending from said one axial end thereof to adjacent the drive gear, a pair of diametrically opposed pawls slideably received in the slots for actuation by the reset shaft, a pair of pins pivotally mounting the pawls about parallel transverse axes, said hub defining sockets for receiving the ends of the pivot pins and having integral tangs for retaining the pins within the sockets, said hub defining a pair of diametrically opposed axially extending chambers and radial slots inwardly thereof receiving the pawls, compression springs within the chambers engageable with the pawls for pivotal actuation thereof, and a plunger axially reciprocable on the flange operable by one of the locking pawls for engagement with the reset gear, the other of the locking pawls being adapted for engagement with the drive gear, said one locking pawl having an inner projection adapted for receipt within an axial slot in the reset shaft and tapered in a circumferential direction to provide a camming edge engageable with the reset shaft.

5. For use with an axially shiftable counter reset shaft, a counter wheel assembly comprising an indicia wheel having a cast hub with a generally cylindrical axially extending tubular portion adapted for receiving the counter reset shaft and a radial flange portion spaced axially inwardly of but adjacent to one axial end of the tubular portion, and an indicia bearing rim fixed to the flange portion, the tubular portion having reduced ends providing shoulders at the inner edges thereof, a pair of sleeves mounted on the reduced ends of the tubular portion in engagement with the shoulders, said sleeves being retained on the tubular portion by outwardly flanged edges thereof, molded plastic reset and drive gears rotatably mounted at the ends of the tubular portion respectively, said flange portion having a plurality of angularly spaced axially projecting bosses and said gears having axially facing annular bearing surfaces engageable by the bosses for supporting the gears against inward axial movement, said sleeves having radial shoulders for supporting the gears against outward axial movement, said tubular portion having a pair of diametrically opposed slots, a pair of pivotally mounted pawls slidably received in the slots, said pawls having inwardly extending projections engageable by the reset shaft for selective engagement of the reset and drive gears respectively, the reset shaft having an axial slot for receiving and locking the reset gear pawl when the indicia wheel has been fully reset, compression springs pivotally urging the pawls into engagement with the reset shaft, and a plunger axially reciprocable on the hub for operation by the reset gear pawl for locking the reset gear, said reset gear pawl having its inwardly extending projection tapered to provide a circumferentially facing camming edge engageable with the reset shaft to prevent simultaneous locking of the indicia wheel and engagement of the reset gear.

6. A counter wheel and counter shaft assembly comprising a counter shaft, and a counter wheel having a cast hub with a central axially extending tubular portion receiving the counter shaft and rotatably supporting the counter wheel thereon and a radial flange portion spaced axially inwardly of but adjacent to an axial end of the tubular portion, a rim on the flange portion having a generally cylindrical indicia bearing surface, the tubular portion of the hub having reduced axial ends, a pair of sleeves mounted on and affixed to the reduced axial ends of the tubular portion, an integrally formed reset gear rotatably mounted at one axial end of the tubular portion, a drive gear rotatably mounted at the other axial end of the tubular portion, said flange portion having a plurality of angularly spaced axially projecting bosses and said gears having axially facing annular bearing surfaces engageable by the bosses for supporting the gears against inward axial movement, said sleeves having radial shoulders for supporting the gears against outward axial movement, said tubular portion having a pair of angularly spaced axially extending slots, a pair of pawls slideably received in the slots having inwardly extending projections engageable by the counter shaft for selective engagement of the reset and drive gears respectively, means pivotally mounting the pawls on the hub for pivotal movement about transverse axes, compression springs pivotally urging the pawls into engagement with the counter shaft, the counter shaft having an axially extending slot

for receiving the reset gear pawl when the counter wheel has been fully reset with the reset gear for thereby locking the counter wheel to the counter shaft and for disengaging the reset gear, and means operative during wheel reset to cam the inwardly extending projection of the reset gear pawl radially outwardly of the axial slot in the counter shaft when the inward projection of the reset gear pawl is only partially received therein and for thereby preventing simultaneous locking of the counter wheel and engagement of the reset gear.

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