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TRANSFER MECHANISM FOR COUNTERS

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Fig. 1

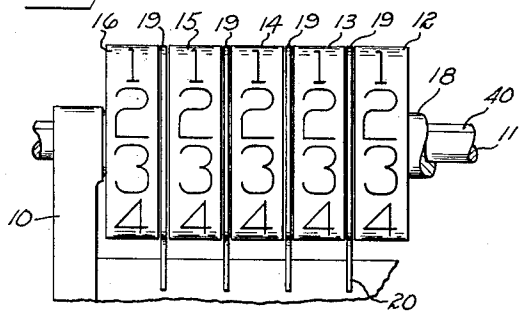


Fig. 2

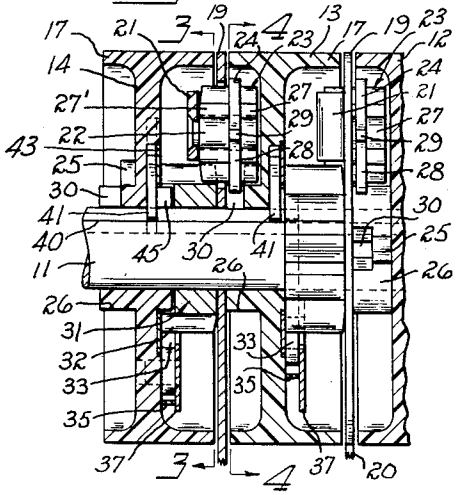


Fig. 3

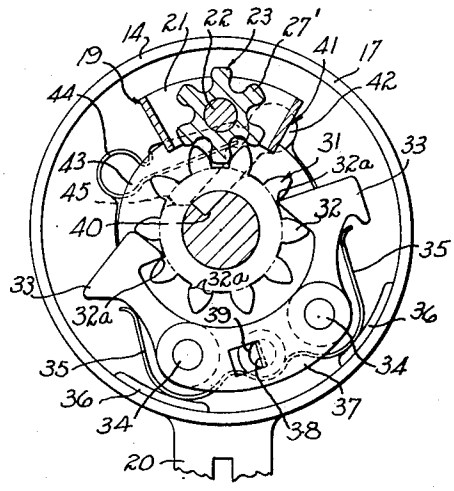
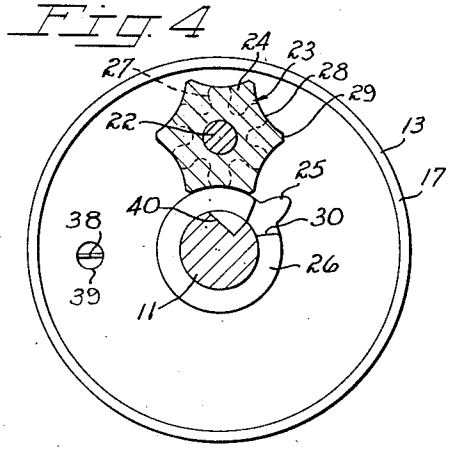


Fig. 4



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TRANSFER MECHANISM FOR COUNTERS

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6 Claims. (Cl. 235—139)

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This invention relates to counters and more specifically to an improved transfer mechanism for a counter of the type having a plurality of coaxially arranged wheels. In counters of this nature it is the function of the transfer mechanism to transfer the count of a numeral wheel of lower order to the wheel of next higher order at completion of a counting cycle for the lower order wheel.

It is the general aim of the invention to provide a counter with transfer mechanism of the internal type capable of smoothly and positively effecting transfer of count from one number wheel to another at normal operating speeds and which will, in addition to performing the transfer operation, function in an improved manner as a lock to prevent overthrow or other inadvertent movement of the driven number wheel.

A particular object of the invention is to provide a novel form of internal transfer mechanism having improved and simplified means for interengaging the driven elements with the wheel whereby a resettable number wheel of improved construction and manufacture is obtained.

It is a further important object of the invention to provide an improved and economical transfer mechanism which is characterized by its simplicity of construction and compact arrangement so that it may be incorporated in counters having little available space for such mechanism due to the required use of relatively heavy reset shafts and the like, and which may be fabricated and assembled in a simplified manner at a great saving in time and cost.

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 front elevational view of a counter embodying the present invention;

Fig. 2 is an enlarged scale vertical elevational view of a portion of the counter disclosed in Fig. 1 and showing parts of the mechanism in elevation;

Fig. 3 is a transverse sectional view taken as indicated by the line 3—3 of Fig. 2; and

Fig. 4 is a transverse sectional view taken as indicated by the line 4—4 of Fig. 2.

In the drawings there has been shown, for purposes of illustration, a counter which comprises generally a frame 10 journaling a shaft 11 on which are rotatably mounted a plurality of counter wheels 12, 13, 14, 15 and 16 of successively higher orders. Each of the counter wheels has a flanged peripheral portion 17 on the outer surface of which are consecutively arranged numerals running from "0" to "9." The number of counter wheels and the numerals arranged on the wheels may of course be varied in accordance with the requirements incident to the various uses to which the counter may be put.

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In the counting operation, the wheel of next higher order will be advanced a predetermined amount (in the present instance, one-tenth of a revolution) for each complete revolution of the adjacent wheel of lower order. It will thus be seen that, for consecutive counting, the number wheels 13 to 16 are advanced in stepwise fashion by the number wheel 12 of lowest order which is driven by the machine or device, the operations of which are to be counted. Driving engagement to the lowest order wheel 12 may be effected, for example, by means of a hub or sleeve 18 rotatably mounted on the shaft 11. The hub or sleeve 18 may be secured to or formed as a part of counter wheel 12 and may be driven by means (not shown) such as direct gearing, ratchet driven mechanism, solenoid operating means, or other means known in the art.

Inasmuch as the transfer mechanism interconnecting any pair of counter wheels of successive order is identical to that connecting any other pair, the transfer mechanism associated with number wheels 13 and 14 only (Fig. 2) will be described.

A vertically arranged support plate or disc 19 is disposed between the adjacent number wheels to loosely embrace the shaft 11. The disc 19 has a depending appendage 20 which may be nested or secured within the frame 10 to prevent shifting or turning of the plate 19 during operation of the counter. The plate 19 is formed of single thickness sheet material having a portion 21 struck therefrom to provide an offset support for a transfer pinion shaft 22, disposed parallel to and above the shaft 11.

In accordance with the present invention the pinion shaft 22 rotatably mounts a transfer pinion 23 and a locking disc 24 which may be formed integrally with the pinion 23 or which may comprise a separate disc coaxially secured between sections of the pinion.

The pinion 23 has a plurality of teeth 27 (six

in number in the present instance) to the right-hand side of locking disc 24 which are engageable by a single tooth 25 integrally formed on the lefthand hub 26 of the counter wheel of lower order. Thus, for each complete revolution of the counter wheel of lower order, the transfer pinion will be driven through one-sixth of a revolution when the single tooth 25 meshes with teeth 27 formed on the pinion at 23 to the right of the locking disc 24.

The locking disc 24 has a multi-sided outer periphery defined by circumferentially arranged arcuate surfaces 28. Each pair of adjacent arcuate surfaces 28 join to form a toothlike projection 29 on a radius intermediate adjacent pinion teeth 27. Each of the arcuate surfaces 28 is complementary to the outer periphery of the hub 26 and during the time that the pinion 23 is not engaged by the tooth 25, one such arcuate surface 28 will be disposed (as best shown in Fig. 4) at the outer periphery of the hub 26 to prevent rotation of the transfer pinion 23 and hence rotation of the wheel of higher order except during a transfer operation. An escapement for movement of the pinion 23 is provided in the hub 26 by a notch 30 radially aligned with the single tooth 25. When the counter wheel of lower order is rotated to a position to effect engagement of tooth 25 between two adjacent teeth 27, the locking disc projection 29 between said adjacent teeth may be received within the slot 30 so that the pinion 23 will be free to rotate one-sixth revolution. After such revolution of the transfer pinion 23, the next adjacent arcuate surface 28 will be brought into registry with the driving hub 26 to prevent further rotation of the transfer pinion.

The transfer pinion 23 has a second set of teeth 27' to the left of the locking disc 24 which mesh with a driven gear 31 rotatably mounted on the counter shaft 11. In the present instance, the driven gear 31 has ten teeth 32 to cause the gear 31 to be driven $\frac{1}{10}$ revolution for each $\frac{1}{6}$ turn of the pinion 23 which occurs upon each complete revolution of the number wheel 13.

The teeth 32 are made relatively wide and provided with a substantially radial undercut 32*a* on each side of each individual tooth for engagement in ratchet fashion by a pair of diametrically opposed pawls 33 pivoted on axially directed appendages 34 projecting from the right-hand side of the counter wheel of higher order. The pawls 33 are biased to engagement with the gear 31 by an irregularly shaped spring 35 which abuts a pair of bosses 36 formed on the inner periphery of the counter wheel flange 17, as shown in Fig. 3. An arcuately shaped retaining plate 37 having suitable apertures for securement about the pivot appendages 34 retains the pawls 33 and the spring 35 in their proper positions. The retaining plate is secured to the righthand side of the counter wheel by means of a struck portion 38 which is inserted within a cavity 39 in the counter wheel.

As previously mentioned, the pawls 33 engage opposite sides of the driven gear 31 between pairs of teeth 32. The construction and arrangement of the nose portions of the pawls 33 engaging the teeth 32 at the undercut 32*a* in ratchet fashion is such as to prevent relative rotation of the driven gear 31 in a clockwise direction, as viewed in Fig. 3. Hence, when the driven gear 31 is rotated in the driving direction of the number wheel of lower order, the pawls 33 remain in engagement therewith and carry the number wheel of higher order in the same direction (clockwise in Fig. 3) to advance the count of the number wheel of higher order. In the counting operation, the transfer pinion 23 will be advanced one-sixth revolution for one complete revolution of the counter wheel of lower order and it will in turn advance the driven gear 31 through one-tenth revolution which advances the wheel of higher order the same amount corresponding to a number advance of one digit.

It should be understood that in the counting operation the number wheels 12 to 16 rotate about the shaft 11, which remains stationary, the count being transferred from one wheel to another in the aforedescribed manner. The number wheels are reset in a conventional manner by rotating the shaft 11 relative to the frame 10. To effect resetting the counter shaft 11 is provided with a reset groove 40 which will engage the tail of a reset pawl 41 pivotally supported in each number wheel when the shaft 11 is rotated in a clockwise direction, as viewed in Fig. 3. When the number wheels are advanced relative to the shaft in a clockwise direction, as viewed in Fig. 3, during a counting operation, the tail of the pawl merely rides around on the periphery of the shaft.

The reset pawls 41 have a disc-like head portion 42 disposed in a suitable cavity in the right-hand face of each counter wheel and retained therein by means of a retaining ring 43 disposed in an annular groove in the righthand face of the counter wheel. A spring element 44 is retained within a suitable recess in the righthand face of the counter wheel and urges the tail of the reset pawl toward the axis of the shaft 11. The tail of the reset pawl 41 is directed through a slot 45 in the righthand hub 46 of the counter wheel. When the shaft 11 is rotated to cause the reset groove 40 to engage all of the pawls 41, the counter wheels 12 and 16 are numerically aligned so that the counter mechanism can be reset to zero.

In the resetting operation the counter wheels are rotated independently of their associated driven gears 31, this being permitted by the configuration of the nose portions of the pawls 33 which causes the pawls to be cammed out of engagement with the gear teeth as the number wheel is advanced relative to gear 31 in a clockwise direction, as viewed in Fig. 3.

From the foregoing description of the transfer mechanism of this invention, it will be noted that the transfer pinion may be disposed at or adjacent to the periphery of the number wheels, thus providing greater free area at the center of the wheel permitting the use of a reset shaft of greater diameter. This is a distinct advantage in multiple counter installations or in counters wherein a relatively great number of counter wheels are utilized and which require a relatively long reset shaft, which would be likely to snap if small in diameter. It also will be noted that the wheel is formed of a minimum of parts which can be easily fabricated and assembled and at the same time is of sufficiently rugged construction so that it will function satisfactorily over long periods of time without breakdown.

As many changes could be made in the above construction and many apparently widely different embodiments of this inventions could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying

drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In a resettable counter having a reset shaft, a plurality of number wheels rotatably mounted on the shaft in side by side relationship, and interengaging means on the wheels and shaft to zeroize the wheels when the shaft is rotated in a registering direction, the combination of transfer means disposed between number wheels of lower and higher order comprising a wide center pinion mounted on the shaft between said wheels, a holding pawl on the wheel of higher order engaging the pinion in a plane immediately adjacent the wheel of higher order, said holding pawl being constructed and arranged to turn the wheel with the center pinion during a counting operation but permitting the wheel to be advanced independently of the pinion during resetting, a stationary support disposed between said wheels, a transfer pinion rotatably mounted on the support and meshing with said center pinion in a second plane spaced from the wheel of higher order, driving means on the wheel of lower order intermittently engageable with said transfer pinion in a third plane adjacent the number wheel of lower order, and locking means for preventing rotation of the transfer pinion except during a transfer operation.

2. In a resettable counter having a reset shaft, a plurality of number wheels rotatably mounted on the shaft in side by side relationship, and interengaging means on the wheels and shaft to zeroize the wheels when the shaft is rotated in a registering direction, the combination of transfer means disposed between number wheels of lower and higher order comprising a wide center pinion mounted on the shaft between said wheels, a holding pawl on the wheel of higher order engaging the pinion in a plane immediately adjacent the wheel of higher order, said holding pawl being constructed and arranged to turn the wheel with the center pinion during a counting operation but permitting the wheel to be advanced independently of the pinion during resetting, a stationary support disposed between said wheels, a transfer pinion rotatably mounted on the support and meshing with said center pinion in a second plane spaced from the wheel of higher order, a single tooth driving element on the wheel of lower order intermittently engageable with said transfer pinion in a third plane adjacent the number wheel of lower order, a locking ring on the wheel of lower order having a notch registering with said single tooth, and a locking disc fixed to the transfer pinion having arcuate shoulders successively engaging the ring to prevent turning of the transfer pinion except during a transfer operation.

3. In a resettable counter having a reset shaft, a plurality of number wheels rotatably mounted on the shaft in side by side relationship, and interengaging means on the wheels and shaft to zeroize the wheels when the shaft is rotated in a registering direction, the combination of transfer means disposed between number wheels of lower and higher order comprising a wide center pinion mounted on the shaft between said wheels, holding means on the wheel of higher order comprising a pair of pivotally mounted pawls biased into engagement with opposite sides of the center pinion in a plane immediately adjacent the wheel of higher order, said pawls being constructed and arranged to turn the wheel with the center pinion during a counting operation but permitting the wheel to be advanced independently of the pinion during resetting, a stationary support disposed between said wheels, a transfer pinion rotatably mounted on the support and meshing with said center pinion in a second plane spaced from the wheel of higher order, driving means on the wheel of lower order intermittently engageable with said transfer pinion in a third plane adjacent the number wheel of lower order, and locking means for preventing rotation of the transfer pinion except during a transfer operation.

4. In a resettable counter having a reset shaft, a plurality of number wheels rotatably mounted on the shaft in side by side relationship, and interengaging means on the wheels and shaft to zeroize the wheels when the shaft is rotated in a registering direction, the combination of transfer means disposed between number wheels of lower and higher order comprising a wide center pinion mounted on the shaft between said wheels, holding means on the wheel of higher order comprising a pair of diverging pawls pivotally mounted on the wheel of higher order and a spring extending about the pivots biasing the pawls into engagement with opposite sides of the center pinion in a plane immediately adjacent the wheel of higher order, said pawls being constructed and arranged to turn the wheel with the center pinion during a counting operation but permitting the wheel to be advanced independently of the pinion during resetting, a stationary support disposed between said wheels, a transfer pinion rotatably mounted on the support and meshing with said center pinion in a second plane spaced from the wheel of higher order, driving means on the wheel of lower order intermittently engageable with said transfer pinion in a third plane adjacent the number wheel of lower order, and locking means for preventing rotation of the transfer pinion except during a transfer operation.

5. In a resettable counter, a reset shaft, a plurality of number wheels of lower and higher order rotatably mounted on the shaft in close side by side relationship, each number wheel comprising an outer drum, a hub and a supporting web between the hub and drum recessed inwardly from the side edges of the drum; a wide center pinion mounted on the shaft between said wheels, a holding pawl on the wheel of higher order engaging the pinion in a plane immediately adjacent the web of the wheel of higher order, said holding pawl being constructed and arranged to turn the wheel with the center pinion during a counting operation but permitting the wheel to be advanced independently of the pinion during resetting, a stationary plate extending between said wheels, a transfer pinion rotatably mounted on the plate within the peripheries of the wheels and meshing with the center pinion in a second plane spaced from the web of the wheel of higher order, a driving element on the hub of the wheel of lower order intermittently engageable with said transfer pinion in a third plane adjacent the web of the number wheel of lower order, and locking means for preventing rotation of the transfer pinion except during a transfer operation.

6. In a resettable counter, a reset shaft, a plurality of number wheels of lower and higher order rotatably mounted on the shaft in close side by side relationship, each number wheel comprising an outer drum, a hub and a supporting web between the hub and drum recessed in-

wardly from the side edges of the drum; a wide center pinion mounted on the shaft between said wheels, a holding pawl on the wheel of higher order engaging the pinion in a plane immediately adjacent the web of the wheel of higher order, said holding pawl being constructed and arranged to turn the wheel with the center pinion during a counting operation but permitting the wheel to be advanced independently of the pinion during resetting, a stationary plate extending between said wheels, a transfer pinion rotatably mounted on the plate within the peripheries of the wheels and meshing with the center pinion in a second plane spaced from the web of the wheel of higher order, a single tooth driving element on the hub of the wheel of lower order intermittently engageable with said transfer pinion in a third plane adjacent the web of the number wheel of lower order, and a locking

disc fixed to the transfer pinion having arcuate shoulders successively engaging the hub of the wheel of lower order, said hub having a notch registering with said driving element for permitting turning of the locking disc during a transfer operation.

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