

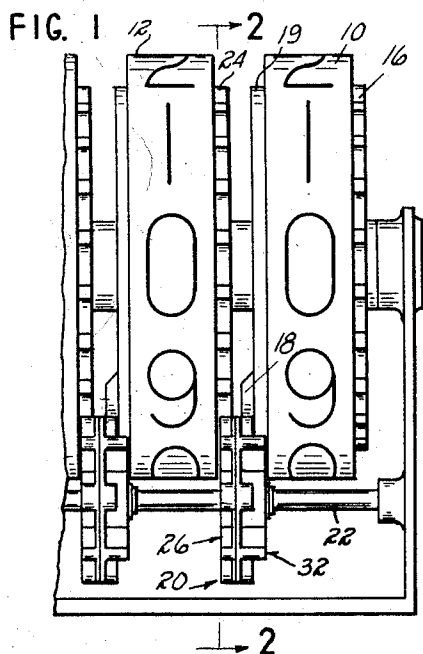
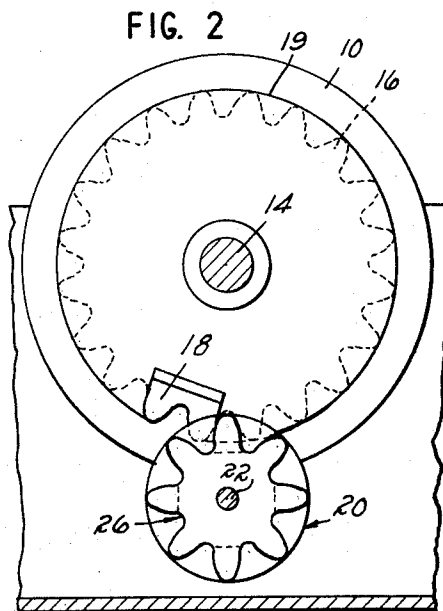
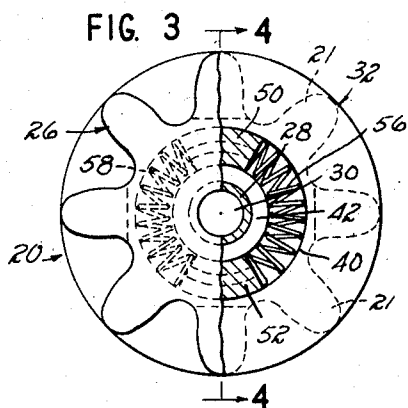
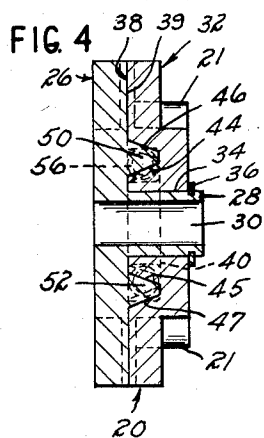
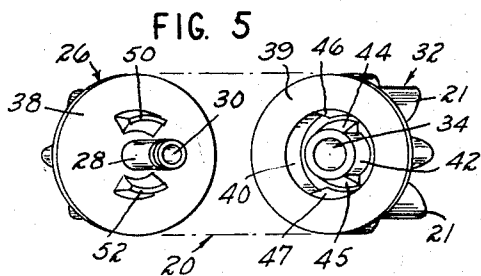
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TRANSFER PINION FOR COUNTERS

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TRANSFER PINION FOR COUNTERS

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6 Claims. (Cl. 74—411)

This invention relates to counters of the type utilizing an interrupted tooth transfer gearing mechanism and more particularly to a novel and improved transfer pinion for use in the transfer gearing mechanism of such a counter.

In counters of the type for which this invention is intended for use, each higher order number wheel is driven a predetermined angular distance by the respectively preceding lower order number wheel each time the lower order number wheel makes one complete revolution. This transfer or carryover from the lower order wheel is accomplished by means of a gear segment on the lower order number wheel which is engageable with a rotatable mutilated pinion having a full toothed portion engageable with a driven gear on the higher order wheel.

When the lower order wheel of such counter is operating at a relatively high rotative speed it can be appreciated that there will be considerable loading on the pinion and gears at each carryover of the count from the lower order wheel to the next higher order wheel. This loading comprises the first impact when the rapidly moving gear segment of the first number wheel meets the stationary transfer pinion which in turn is meshed with the stationary driven gear of the second number wheel and also comprises a second strain when thereafter, at the end of the transfer operation, the transfer pinion is suddenly halted by the locking ring and must resist the inertia of the now rapidly-moving second wheel. This loading may be serious enough to damage or fracture either the gears or the pinion, and certainly reduces the service life of the transfer gearing.

Accordingly it is an object of this invention to provide a novel and improved transfer pinion for use in a counter of the type described having means to overcome the shock loading imposed on the transfer pinion upon initiation of the transfer of the count from a lower order wheel to a next higher order wheel.

It is further the object of this invention to provide a pinion of the type described of rugged yet simple construction in order to minimize any increase in cost of the overall counter mechanism and to assure the pinion of a long and trouble-free service life.

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 drawing:

Fig. 1 is a fragmentary elevational view of a portion of a counter mechanism incorporating a pinion constructed in accordance with the invention;

Fig. 2 is a cross-sectional view along the line 2—2 of Fig. 1;

Fig. 3 is an end view of a pinion constructed in ac-

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cordance with the invention, with a portion of the pinion cut away;

Fig. 4 is a cross-sectional view of the pinion of Fig. 3 along the line 4—4 of Fig. 3; and

Fig. 5 is an exploded perspective view of two of the elements of a pinion constructed in accordance with the invention.

With reference to the drawing, and particularly Figs. 1 and 2, there is shown a counter mechanism of the type generally described above which comprises a lower order number wheel 10 and a higher order number wheel 12. Both number wheels are rotatably mounted on a shaft 14. The lower order wheel 10 is provided with a gear 16 mounted for rotation therewith and by means of which the wheel 10 and hence the counter may be driven by suitable external driving mechanism (not shown). As shown in Fig. 2 the lower order number wheel is provided with a two tooth gear 18 engageable with a pinion 20 having alternately wide and narrow teeth and rotatably mounted, intermediate the lower and higher order wheels, on a shaft 22. The left hand portion of the pinion 20 (as viewed in Fig. 1) is engaged with a driven gear 24 mounted for rotation with the higher order wheel. As should be apparent each time the lower order wheel makes one complete revolution the two tooth gear 18 will, through the pinion 20, rotate the driven gear 24 and the higher order number wheel an angular distance equivalent to the advance of one digit on the higher order wheel. Except during a transfer operation, the pinion 20 is locked against turning movement by the locking ring 19 which engages with the alternate wide teeth 21 of the pinion 20. In accordance with the invention, and as can be most clearly seen in Figs. 3—5, the pinion 20 is constructed in two sections; a male section 26 carries the unmodified gear teeth which are engageable with the driven gear 24 of the higher order number wheel and is provided with a hub 28 extending coaxially of the section 26. The hub 28 is provided with a through bore 30 for the rotatable mounting of the section on the shaft 22. The other pinion section 32 carries the mutilated toothed portion of the pinion engageable with the two-toothed gear 18 and locking ring 19 of the lower order wheel and is provided with a central aperture 34 extending coaxially therethrough by means of which the section 32 is rotatably mounted on the hub 28 of the pinion section 26. The hub 28 is provided at its outer end with an annular groove in which is receivable a snap-ring 36 to maintain the pinions 26 and 32 in axial assembly with their radially extending and axially facing surfaces 38 and 39, respectively, and their gear teeth in close contact.

In accordance with the invention, the radial surface 39 of the female pinion section 32 is provided with an annular recess 40 disposed coaxially of the axis of the pinion and forming a boss 42 extending coaxially of the section 32. The cross sectional area of the recess 40 is reduced at diametrically opposed points by means of a pair of radially outwardly inclined abutment members 44 and 45 extending axially of the boss 42 from the free end thereof, and a pair of radially inwardly inclined abutment members 46 and 47 extending axially of the section 32 from the surface 39. The abutment members 44—47 form a pair of V-shaped recesses facing axially of the pinion section 32 toward the section 26.

Further, in accordance with the invention the male section 26 is provided with a pair of projections 50, 52 having a V-shaped cross section generally complementary to the V-shaped recesses of the section 32. The projections 50, 52 extend axially of the section 26 for reception in the V-shaped recesses of the section 32 and are of a length corresponding to the length of the abutment members 44—47.

Also, in accordance with the invention a pair of coil

springs 56, 58 are oppositely disposed in the annular recess 40 of the pinion section 32 with the ends of the springs abutting the ends of the abutment members 44, 47. As it clearly apparent from Figs. 3-5, with the springs 56 and 58 so disposed and with the pinion sections assembled, the projections 50, 52 of the male section 26 will be resiliently maintained centered in the V-shaped recess of the female section 32 by the engagement of the ends of the springs 56, 58 with the shoulders formed by the ends of the projections 50, 52.

In the preferred embodiment the gear teeth of the pinion sections 26 and 32 are disposed relative to the projections 50, 52 of the section 26 and V-shaped recesses of the section 32 such that the gear teeth of the sections are aligned when the projections 50, 52 are centered in the V-shaped recesses as aforescribed. Further it is preferred that the springs 56, 58 be assembled in the pinion under compressive preload in order to resiliently maintain the alignment of the gear teeth when the pinion is not under load.

From the above description it should be clearly evident with a transfer pinion constructed in accordance with the invention, incorporated within a counter such as aforescribed, each time the two-toothed gear 18 of the lower order number wheel engages the mutilated portion of the pinion, the pinion section 32 can rotate relative to the pinion section 26 an amount sufficient to absorb or damp the impact load on the pinion. Then at the completion of the transfer operation, when the pinion section 32 is suddenly halted by the locking ring 19, the pinion section 26 can continue to rotate a slight amount relative to section 32 while decelerating and halting the wheel of higher order. The springs 56, 58 absorb and dampen the force of the impact and release and finally return the sections 26 and 32 to their original aligned positions upon removal of the strain on the pinion. This latter movement is important in a counter mechanism, of course, to maintain the registry of the number wheels. During a high speed counting operation, this relative rotation of the sections of the pinion, first in one direction and then in the other, will of course occur so rapidly that there will be no visible indication of the slight lag in the transfer of the count occasioned thereby.

From the above it can be seen that there has been provided a shock absorbing transfer pinion for a counter of the type described having a novel and improved sectional construction whereby the strain on the pinion due to the shock loading thereof during a transfer operation at high speed will be materially reduced if not substantially eliminated, thus minimizing the possibility of damage to the counter during the transfer operation and materially increasing the service life of the counter. The structure is simple to fabricate and assemble and provides trouble-free operation for long periods of time.

We claim:

1. In a counter, a number wheel of lower order having a driving gear segment and a locking ring, a number wheel of higher order having a driven gear, and a transfer pinion comprising a driven gear section alternately engaging the driving gear segment and locking ring, a coaxial driving gear section meshing with the driven gear on the higher order number wheel, and a resilient driving connection between the gear sections resisting rotation of the driving gear section relative to the driven gear section in both directions.

2. In a counter, a number wheel of lower order having a driving gear segment and locking ring mounted thereon, a number wheel of higher order having a driven gear mounted thereon, and a transfer pinion resiliently interconnecting said driving gear and said driven gear, said transfer pinion comprising a pair of coaxially assembled relatively rotatable pinion sections each carrying a plurality of gear teeth, one of said pinion sections alternately engaging the driving gear segment and locking ring and

the other of said pinion sections meshing with the driven gear on the higher order number wheel, and means forming a resilient driving connection between the pinion sections, said resilient driving connection comprising a spring carried by one of the pinion sections and a shoulder on the other pinion section, said shoulder being abuttingly engageable with said spring to establish a position of equilibrium between the pinion sections, said spring being compressed by relative rotation of the sections out of the position of equilibrium.

3. In a counter, a number wheel of lower order having a driving gear segment and locking ring mounted thereon, a number wheel of higher order having a driven gear mounted thereon and a transfer pinion resiliently interconnecting said driving and driven gears, said transfer pinion comprising a pair of coaxial sections mounted for rotation relative to each other in either direction, one of said coaxial sections alternately engaging the driving gear segment and locking ring and the other of said coaxial sections meshing with the driven gear on the higher order number wheel, and opposed spring means biasing the sections to a predetermined relatively rotated position and resisting rotation of each section relative to the other section in both directions out of said predetermined relatively rotated position.

4. In a counter, a number wheel of lower order having a driving gear segment and locking ring mounted thereon, a number wheel of higher order having a driven gear mounted thereon and a transfer pinion resiliently interconnecting said driving gear and said driven gear, said transfer pinion comprising a pair of coaxial pinion sections mounted for rotation relative to each other in either direction, one of said pinion sections alternately engaging the driving gear segment and locking ring and the other of said sections meshing with the driven gear on the higher order number wheel, a pair of springs disposed between the sections and each abuttingly engaged at both ends by one of said sections, and means for loading at least one of said springs when the sections are moved in opposite directions including a shoulder on the other of the sections alternately abuttingly engageable with adjacent ends of the springs.

5. In a counter, a number wheel of lower order having a driving gear segment and locking ring mounted thereon, a number wheel of higher order having a driven gear mounted thereon and a transfer pinion resiliently interconnecting said driving gear and said driven gear comprising a pair of relatively rotatable pinion sections each carrying a plurality of gear teeth, the teeth on one of said pinion sections alternately engaging the driving gear segment and locking ring and the teeth on the other of said segments meshing with the driven gear on the higher order number wheel, means to coaxially assemble said pinion sections, means providing an annular recess in one of said sections facing axially thereof toward the other section, diametrically opposed abutment means on said one section extending radially thereof into said annular recess, a pair of oppositely disposed coil springs received in said annular recess with each spring in abutting engagement at both ends with said abutment means, and a pair of diametrically opposed projections on the other section received in said annular recess in abutting engagement with the adjacent ends of said coil springs.

6. In a counter, a number wheel of lower order having a driving gear segment and locking ring mounted thereon, a number wheel of higher order having a driven gear mounted thereon and a transfer pinion resiliently interconnecting the driving and driven gears, said transfer pinion comprising a pair of relatively rotatable coaxially disposed sections, one of the sections having alternately wide and narrow teeth, said wide teeth alternately engaging said driving gear segment and said locking ring, the other of the sections having teeth of equal width alignable respectively with the teeth of said one section and meshing with the driven gear on the higher order

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number wheel, and a resilient driving connection between the sections including spring means bracing the sections to a predetermined relative rotated position wherein the teeth of the sections are aligned and resisting movement of each section relative to the other in both directions.

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