

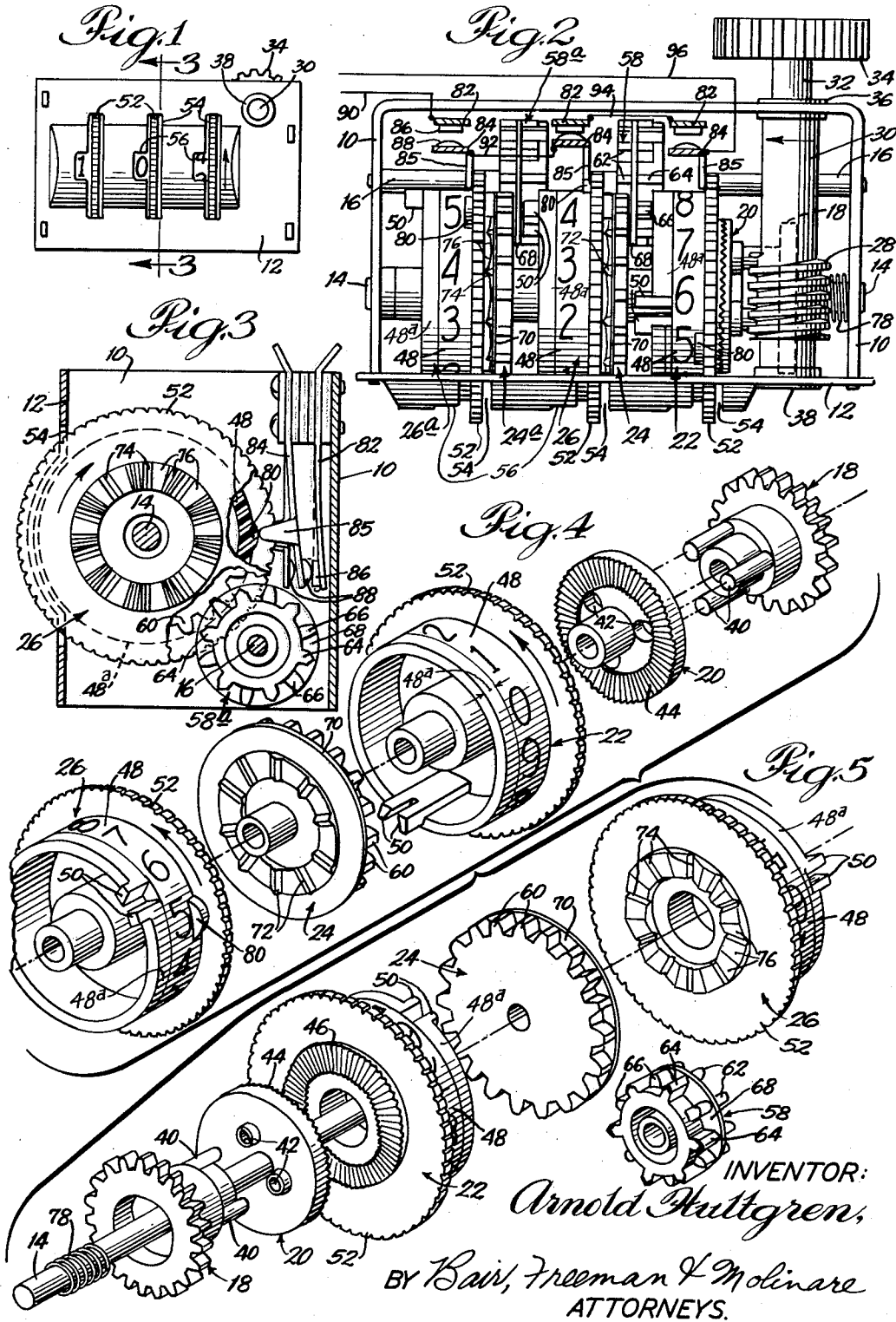
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MANUALLY PRESETTABLE COUNTING MEANS

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MANUALLY PRESETTABLE COUNTING MEANS
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This invention relates to counting means in the form of a unit of the multiple number wheel type.

One object of the invention is to provide a counting unit in which each number wheel is of two-piece type so that the wheels can be individually set to any number thereon desired whereby the counting means may be quickly set to a desired number of machine cycles, revolutions or the like to perform a control function when that number expires upon subsequent operation of the counting means.

Another object is to provide a counting unit which is composed of elements that can be very inexpensively formed from molded plastic material, and the parts of which require no subsequent machining before assembly thereof to form the completed counting unit, thus making my counting means very economical to produce.

Still another object is to provide a novel number wheel and number drive wheel arrangement wherein the two wheels face each other and coupling teeth of the two coact with each other to permit setting of the number wheel without rotation of the number drive wheel, thus enabling the individual setting of the number wheels as desired.

A further object is to provide a novel transfer drive wheel and number wheel combination wherein transfer teeth of a first number wheel at one position thereon coact with certain mutilated pinion teeth of the transfer drive wheel to transfer the motion of the first number wheel to a second number wheel once each revolution of the first number wheel, and these mutilated pinion teeth thereafter coact with a drum portion of the first number wheel to lock the transfer drive wheel against undesirable rotation until the first number wheel has made another full revolution.

Still a further object is to provide a drive wheel for a unit number wheel with coupling teeth so divided that the unit number wheel can be fine-adjusted to some fraction of a unit and the 10-unit and 100-unit (as well as further number wheels if desired) and likewise their facing number drive wheels are provided with coarser coupling teeth so as to insure their adjustment to whole numbers rather than fractions.

An additional object is to provide each transfer drive wheel with a web between a full set of pinion teeth thereon and its set of mutilated pinion teeth to limit movement axially of the transfer drive wheel on a shaft on which it is rotatably mounted without the necessity of having to provide shoulders or collars on the shaft for this purpose.

Another additional object is to provide the number wheels, number drive wheels and a drive gear therefor rotatable on a shaft, and to provide such cooperation between the number drive wheels and their corresponding number wheels that a single spring on this shaft tends to normally hold all of the coupling teeth thereof in engagement with each other.

A further additional object is to provide counting means which includes a plurality of number wheels, each having cam means coacting with a switch and the switches being connected in series to perform a control function only when all three switches are either closed or open at a time when all of the number wheels are at their zero positions, thereby enabling the setting of the counting means to any desired number and at the expiration

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of that number, due to operation of the counting means, the closing or opening of a circuit as the case may be will perform a control function such as stopping the operation of a machine or energizing a pilot light or other electrical device.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my counting means, whereby the objects above contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in detail on the accompanying drawing, wherein:

FIG. 1 is a front elevation of counting means embodying my present invention;

FIG. 2 is an enlarged plan view thereof showing a series of switch blades in cross section and a series control circuit through them;

FIG. 3 is an enlarged vertical sectional view on the line 3-3 of FIG. 1 illustrating details;

FIG. 4 is an exploded perspective view of number wheels, number drive wheels and a drive gear of my counting means; and

FIG. 5 is a similar exploded perspective view in the reverse direction and includes also a transfer drive wheel.

On the accompanying drawing I have used the reference numeral 10 to indicate a three-walled sheet metal frame and 12 a frame plate which may be riveted or otherwise secured thereto to form a complete frame for the mechanism of my counting means. A number wheel shaft 14 and a transfer drive wheel shaft 16 are supported in the frame 10.

Rotatably mounted on the number wheel shaft 14 as shown in FIG. 5 are (from left to right) a drive gear 18, a unit number drive wheel 20, a unit number wheel 22, a 10-unit number drive wheel 24 and a 10-unit number wheel 26. These are shown in the reverse order in FIGS. 2 and 4, and in addition to the elements just enumerated, FIG. 2 illustrates a 100-unit number drive wheel 24a and a 100-unit number wheel 26a. The counting means illustrated accordingly has a capacity of 999 units and obviously can be made for 9,999 units by an additional 1000-unit number drive wheel which would be a duplicate of the wheels 24 and 24a, and a 1000-unit number wheel that would be a duplicate of the wheels 26 and 26a.

To drive my counting means, I illustrate a worm 28 meshing with the drive gear 18 and this worm also may be molded of plastic integral with a worm shaft 30 having a worm shaft extension 32. The worm gear shaft 30 may be journaled in suitable bearings 36 and 38 mounted in the frame 10 and the frame plate 12 respectively. An actuating gear 34 is shown on the extension 32 and may be driven by meshing with a gear of a machine or the like or any other suitable means may be substituted for the elements 18, 28, 30, 32 and 34 to drive the unit number drive wheel 20 and through it the counting means as will hereinafter appear. By way of example, a ratchet wheel may be substituted and mechanically driven one step at a time by a cyclically operable pawl, or an electrically energized solenoid or electro magnet may be used to actuate the pawl in response to electrical impulses.

The unit number drive wheel 20 is operatively connected with the drive gear 18 for being driven thereby and the means for connection comprises drive pins 40 (see FIG. 4) extending from the drive gear 18 into drive sockets 42 of the unit number drive wheel 20.

The unit number drive wheel 20 is provided with fine coupling teeth 44 which are normally engaged with cooperating fine coupling teeth 46 of the unit number wheel

22 (see FIGS. 4 and 5 respectively). Each of the number wheels 22, 26 and 26a is provided with a number drum 48 with suitable numbers thereon such as 0 to 9 as illustrated. Each number drum is also provided with a pair of transfer teeth 50 and a reset flange 52. The frame plate 12 is provided with openings 54 (see FIGS. 1, 2 and 3) through which the reset flanges 52 project for manual engagement. FIG. 1 illustrates just to the left of each opening 54 a sight opening 56 through which the numbers of the number drums 48 may be observed at any time.

Transfer drive wheels 58 and 58a are rotatably mounted on the transfer drive wheel shaft 16 shown in FIG. 2. The number drive wheels 24 and 24a have gear teeth 60 and the transfer drive wheels 58 and 58a have cooperating pinion teeth 62. The transfer drive wheels 58 and 58a also have pinion teeth 64 which are mutilated to the extent that they are only about two-thirds as high as the teeth 50, 60 and 62. They also have alternating with the teeth 64, other mutilated teeth 66 which are characterized by being only half as wide as the teeth 64 though the same height as the teeth 50, 60 and 62. The teeth 64 are adapted to coast with the transfer teeth 50 of the number wheels 22 and 26 and also with drum portions 48a of the number drums 48 thereof to the left of the numbers in FIG. 2 as will hereinafter be described. The transfer drive wheels 58, 58a are restricted against axial movement to the right (FIG. 2) relative to the adjacent number wheels 22, 26 by the ends of teeth 66 which are adjacent to the left ends of drum portions 48a of the number wheels, and by the ends of transfer teeth 50 on the number wheels which are adjacent the right side of webs 68 on the transfer drive wheels during the transfer interval, which occurs when the transfer teeth 50 mesh with pinion teeth 66, 64. The transfer drive wheels 58, 58a are also restricted against axial movement to the left (FIG. 2) relative to the adjacent number drive wheels 24, 24a by the left side of webs 68 on the transfer drive wheels which are adjacent the ends of teeth 60 on the number drive wheels and by the ends of teeth 62 on the transfer drive wheels which are adjacent the right side of webs 70 provided on the number drive wheels. This arrangement thus prevents undesirable endwise movement of the transfer drive wheels on their shaft 16 which would interfere with the smooth operation of the counting means during counting operation, and maintains the transfer drive wheels in operative engagement with their respective number wheels and number drive wheels when the assembly is shifted axially to the right during manual setting of the number wheels. In FIG. 2 it will be noted that the web 68 is located between one number wheel and the next number drive wheel whereas the web 70 is located in each case to the left of the transfer drive wheel so there is no possibility of the meshing teeth of the wheels shifting out of proper alignment. These webs 68 and 70 are advantageously located at the parting line between the molds in which the parts are molded, and the molds are gated to the webs so that the subsequent removal of the gate is accomplished without any finishing operations required for the teeth of the parts. Thus they are ready for assembly when removed from the mold.

The 10-unit number drive wheel 24 is provided with coarse coupling teeth 72 to cooperate with similarly coarse coupling grooves 74 of the 10-unit number wheel 26. The wheels 24a and 26a are similarly provided with coarse coupling teeth 72 and coarse coupling grooves 74 respectively as shown in FIGS. 2, 4 and 5. Inclined shoulders 76 adjacent the grooves 74 lead into the grooves so that in adjusting the number wheels 26 and 26a, assurance is had that they will seek the proper relationship to each other so that in all instances the numerals will be centered in their sight openings 56 of the frame plate 12. On the other hand, the teeth 44 and 46 are such that the unit number wheel 22 may be adjusted $\frac{1}{4}$ of a nu-

meral where a partial revolution of a machine element such as a coil winding machine might be critical.

A spring 78 is located on the number wheel shaft 14 between the drive gear 18 and the frame 10 as shown in FIG. 2, thus tending to keep the coupling teeth 44 engaged with the coupling teeth 46 and the coupling teeth 72 engaged in the coupling grooves 74 at all times, yet allow the necessary end movement for permitting adjustment from tooth to tooth of each number wheel in an obvious manner.

Counting means of the kind disclosed is particularly adaptable for coil winding and similar machines where it is desirable for the machine to cycle a certain number of times or rotate a certain number of revolutions and automatically stop at the end thereof, or in dispensing machines and the like where it is desirable that a certain number of dispensations takes place and the machine then rendered inoperative and/or the counting means being thereupon operable to light an indicator light as for indicating to the service man that a dispensing magazine is empty or has only a certain number of units to be dispensed left therein. For this purpose my counting means may be provided with a cam lobe 80 on each of the number wheels 22, 26 and 26a to coast with movable switch blades 84. Fixed switch blades 82 are illustrated and carry switch contacts 86 for coaction with switch contacts 88 of the switch blades 84. The blades 84 are provided with actuating extensions 85 to coast with the cam lobes 80 and close the switches which are normally open as shown for the right hand and left hand switches in FIG. 2. Thus a control circuit can be closed when all three switches are closed as shown for the center switch and a control function thereby performed. Wires 90, 92, 94 and 96 are shown in FIG. 2 connecting the switch blades together in series so that a control circuit connected with the wires 90 and 96 will be closed only when all three number wheels are at their zero positions. Thus the wheels may be set for instance for $103\frac{1}{2}$ revolutions of the drive gear 18 as shown in FIG. 1 and subsequently the gear rotated for running the numbers backward so that at the end of $103\frac{1}{2}$ revolutions all three of the number wheels are at zero and all three of the cam lobes 80 have closed their respective switches for establishing the control circuit. On the other hand the switches may be normally closed so that at the zero position a circuit such as one that energizes a coil winding machine may be opened. By connecting the switches in series the positioning of any one of them in the zero position does not establish or break the control circuit in the one case or the other, but it does so only when all three are in the zero position so that the control function is performed.

Referring to FIG. 3, it will be noted that the portion 48a of the number drum 48 (shown in dotted lines adjacent the transfer drive wheel 58) just clears the mutilated pinion teeth 64. Thus the surface of the drum portion 48a and the ends of the teeth 64 cooperate to lock or prevent undesirable rotation of the transfer drive wheel 58 or 58a but effect such rotation when the two teeth 50 cooperate with the teeth 66, 64 adjacent and to the left (FIG. 2) of the number drums as the drum rotates clockwise in FIG. 3. This, of course, rotates the transfer wheel counter clockwise each revolution of the number wheel and the motion is transmitted through the teeth 62 to the teeth 60 of the next number drive wheel in order to rotate it clockwise two teeth, and since there are 20 teeth it is rotated $\frac{1}{10}$ of a revolution and is thus rotated one numerical unit.

From the foregoing description it will be obvious that I have provided a counting means capable of accomplishing the objects set forth in my specification. The parts thereof can be readily molded from plastic material and are thus inexpensive so that the counting unit can be manufactured at very little cost. The arrangement of the parts is such that any desired number can be

set up on the counting means and at the expiration of the proper number of revolutions to bring the counting numbers all to zero, a control function can be performed thus providing a means to automatically set a machine and stop the operation thereof or perform any other desired control function at the termination of the cycles or revolutions to which my counting means is set.

Some changes may be made in the construction and arrangement of the parts of my counting means without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may reasonably be included within their scope.

I claim as my invention:

1. In counting means of the character disclosed, a shaft, a drive element rotatable and free to slide axially thereon, a plurality of number drive wheels having each a full complement of teeth and number wheels having transfer teeth also rotatable and free to slide axially on said shaft, said number wheels having drum portions provided with peripherally spaced digits, there being a number wheel for each denominational order including the units order and a number drive wheel for each order other than the units order, each of said number wheels having a reset flange thereon provided with peripheral serrations to facilitate manual resetting thereof, said drive element and said units order number wheel having fine serrations constituting coupling teeth on their confronting adjacent faces and axially engageable with each other for driving said units order wheel from said drive element, all of said number drive wheels and all of said number wheels except said units order number wheel having cooperating unit coupling elements on their confronting adjacent faces and axially engageable with each other, said unit coupling elements being angularly spaced apart corresponding to the digit spacing on said number wheels and said fine serrations being angularly spaced apart corresponding to a fraction of said digit spacing, said unit coupling elements being disposed in complementary sets on said number wheels and on said number drive wheels, one of which has radially extending circumferentially spaced teeth, and the other of which has radially extending cir-

cumferentially spaced grooves to receive said teeth and has inclined shoulders leading to said grooves, a single spring on said shaft tending to move said coupling teeth and said coupling elements respectively axially into engagement with each other, a second shaft, and transfer drive wheels having transfer teeth rotatable and freely slidable axially thereon and each operated by the transfer teeth of a number wheel of lower order to operate the number drive wheel of higher order through the medium of its teeth, said transfer drive wheels being each confined between a number wheel of lower order and a number drive wheel of next higher order whereby said transfer drive wheels are axially constrained by the latter to remain operatively engaged therewith during manual setting of the number wheels.

2. Counting means of the character defined in claim 1 wherein said transfer drive wheels are confined by means including a flange around each of said transfer drive wheels adjacent the center thereof, said flanges being located adjacent the ends of the teeth of said number drive wheels of higher order, and a flange around each of said number drive wheels and located adjacent the ends of the teeth of said transfer drive wheels of lower order, said transfer teeth on said transfer drive wheels being located adjacent the ends of said drum of said number wheels of lower order.

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