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COUNTER

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The present invention relates to counters and more particularly is directed to a new and improved low cost counter having a design and construction which permit the use of high volume automated assembling techniques.

A principal object of the present invention is to provide a new and improved counter of simplified design which employs a minimum number of standardized low cost parts adapted for rapid and facile assembly with a minimum of skill yet providing precise and accurate operation coupled with durable and sturdy construction.

An additional object of the present invention is to provide a counter of the type described which is capable of rapid, accurate and aligned assembly while permitting easy access to the components thereof through an improved and simplified disassembly feature which obviates the requirement of specialized tools.

A further object of the present invention is to provide a counter of improved construction and arrangement which enables the use of low cost readily moldable materials such as plastics and the like in parts which are standardized to permit the complete interchangeability thereof.

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 which will be indicated in the appended claims.

In the drawing:

FIG. 1 is an exploded perspective view, partially broken away, illustrating an embodiment of the counter of the present invention;

FIG. 2 is a perspective view of a pinion aligning template used during the assembly of the counter of FIG. 1; and

FIG. 3 is an enlarged perspective view, partially broken away and partially in section, illustrating the utilization of the template of FIG. 2 during the assembly of the counter.

Referring now to the drawing in greater detail wherein like referenced characters indicate like parts throughout the several figures there is shown in FIG. 1 a counter comprising a generally U-shaped frame member 10 adapted to supportingly receive a bank of count transfer pinions 12 and a zeroized wheel subassembly 14. The frame 10 comprises a generally rectangular base portion 16 and a pair of longitudinally opposed integral end wall portions 18 upstanding therefrom and provided with the reinforcing abutments 20 adjacent the edges thereof at their points of interconnection. As illustrated, the frame 10 may be provided with suited means for mounting the counter, such as the slotted mounting lugs 22 which extend outwardly from the base and wall portions. As will be appreciated the lugs 22 conveniently provide for the mounting of the counter in a variety of positions thereby broadening its adaptability to greater and varied uses.

The base portion 16 of the frame is provided with a plurality of longitudinally spaced transversely extending apertures 24 of generally rectangular configuration. The apertures 24 are centrally positioned in the base portion 16 so as to extend an equal distance on each side of the longitudinal median of the base portion and are equal in

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number to the transfer pinions within the bank 12. Intermediate the apertures 24 located between the opposed end walls 18 are a plurality of vertically upstanding generally rectangular journal boxes 26 integral with the base portion 16. As shown, the boxes 26 have longitudinally aligned open half bearings 28 for coaxially receiving the bank of pinions 12, as will be described in greater detail hereinafter.

The end wall portions 18 of the frame are provided with opposed shaft receiving apertures 30 positioned slightly above the wall midpoints. The wall portions 18 are further provided with interior and exterior raised segments 32, 34, respectively, adjacent the entire periphery of the apertures 30, which segments provide greater support and bearing surface area for the wheel subassembly 14 mounted therein. Bisecting the aperture 30 in each wall portion is a generally vertical passage 36 extending from the top edge 38 of the wall through the aperture 30 to an enlarged terminal slot 40 located immediately below the raised exterior segment 34. The bisecting passage 36 is of a width greater than the diameter of the aperture 30 at the top edge 38 of the wall but tapers inwardly so that at the inlet 42 to the aperture 30 it has converged to a width slightly smaller than the diameter of the aperture 30. However, between the aperture 30 and the enlarged terminal slot 40 the passage 36 is quite narrow to permit as much bearing surface 44 as possible within the aperture 30 for supporting the wheel subassembly 14 while at the same time enhancing the ability of the wall portions adjacent the passage 36 to resiliently yield during the mounting of the subassembly 14.

The bank of transfer pinions 12 which nests on the journal boxes 26 comprises a plurality of individual transfer pinions 46, each comprising a central pinion body portion 48 and a pair of opposed axially aligned cylindrical trunnions 50 of slightly greater length than about one half the thickness of the journal boxes 26. The pinion body portions 48, as shown in FIG. 3, are narrower than the apertures 24 and carry a plurality of alternating full and mutilated teeth 52, 54, respectively, for providing the appropriate count transfer within the subassembly 14. The opposed trunnions 50 of each pinion 46 rest on the arcuate bearings 28 of the adjacent journal boxes 26 thereby suspending the pinion body portion 48 above and partially within the apertures 24 and intermediate the wheels of the subassembly 14.

Positioned directly above the bank of transfer pinions 12 in operative relationship therewith is the number wheel subassembly 14 which includes a plurality of number wheels consisting of a lowest order number wheel 56 and a plurality of consecutively higher order number wheels 58. The number wheels of the subassembly are coaxially aligned in side-by-side relationship and mounted for rotational movement on the wheel supporting shaft 60. As illustrated, each of the wheels are identical, being molded as single units, and comprise a wheel body portion 62 having suitable read-out indicia 64, such as the consecutive numerals from 0 to 9, on its arcuate peripheral surface 66. On one side of each body portion 62 is an integrally formed radially recessed locking ring 68 which carries a two tooth driving gear 70 while on the opposite side thereof is an integrally formed radially recessed driven gear 72. The wheels are spaced along the shaft 60 by a distance approximately equal to the width of their hubs 73.

Aligned assembly of the counter mechanism is facilitated by the use of an aligning template 74 depicted in FIG. 2. The template 74 comprises a flat generally rectangular base portion 76 approximately equal in size to the base portion 16 of the frame 10. Upstanding from the base 76 are a plurality of transversely extending generally rectangular pinion supports 78 having exterior

dimensions substantially equal to but slightly less than the dimensions of the apertures 24. The pinion supports 78 are arranged so as to register with the apertures 24 and nest intermediate the journal boxes 26 of the frame 10 (FIG. 3) during the pinion aligning assembly operation. The pinion supports 78 are all substantially identical and each contains a top recess 80 extending transversely to the base 76 and of sufficient width to receive only the mutilated teeth 54 of the pinions 46. The recess 80 is bound by a slightly raised side rail 82 and an opposed substantially higher side rail 84 inwardly displaced from the longitudinal edge 86 of the support 78 by a distance approximately equal to the thickness of side rail 82. The rail 84 is designed so as to approximately equal in thickness the difference in length between the full pinion teeth 52 and the mutilated teeth 54. Each support 78 is further provided with a medial groove 88 bisecting only the recess 80 and its opposed rails 82, 84.

As mentioned hereinbefore the counter may be quickly assembled in fully aligned condition with a minimum of skill and is particularly adapted for high volume automated assembly. This may be effectuated by positioning the frame 10 on the template 74 so that the pinion supports 78 protrude through the apertures 24 of the frame. The individual pinions 46 may then be quickly and accurately mounted on the journal boxes 26 with their opposed trunnions 50 resting within the open, arcuate half bearings 28, as shown in FIG. 3. In order to properly effectuate this positioning it is necessary that the pinions 46 be oriented so that a full pinion tooth 52 is disposed within the medial groove 88 of the support 78 while a pair of mutilated teeth 54 rest within the recess 80 thereof. The pinion body 48, being narrower than the space between the journal boxes 26, is properly spaced therefrom on one side by the rail 82 and on the other side by the distance between the edge 86 of the support 78 and the taller side rail 84. If the pinion is not properly oriented the full teeth 52 will contact the high side rail 84 of the support 78, preventing the trunnions from moving into the bearing 28 and causing the pinion to noticeably tilt. Such misalignment can then be easily observed by the assemblies or detected by an appropriate sensing device and quickly corrected. As can be appreciated the pinion mounting operation may be easily accomplished manually or by means of automated assembling equipment.

The wheel subassembly 14 is formed by fixedly securing the lowest order number wheel 56 on the input or drive shaft 60 while rotatably mounting the remaining wheels 58 thereon. The wheels of the subassembly are then zeroized by passing an aligning pin 90 through the apertures 92 located on the wheels diametrically opposite the two tooth drive gear 70. The zeroized wheel subassembly 14 may then be lowered into the frame with the wheels passing between the wall portions 18 and the ends of the wheel supporting shaft 60 freely passing into the bifurcating passage 36 until reaching the narrow entrance 42 of the shaft receiving aperture 30. The number wheel body portions 62 are positioned above the journal boxes 26 and oriented so that the two tooth drive gear 70 is in registry with the uppermost full tooth 52 of each of the pinions 46. The shaft 60 may then be snapped into the apertures 30 by applying a slight downward pressure thereon, the end walls 18 yielding slightly to permit the passage of the shaft through the aperture inlets 42 and onto the bearing surfaces 44 of the apertures 30. The zeroizing aligning pin 90 may then be removed from the wheel subassembly and the counter lifted from the template 74 in a fully assembled and aligned condition.

The counter operates in a conventional manner with the count being transferred from the lowest order number wheel to the remaining higher order number wheels through the independently rotatable transfer pinions 46. A suitable input causes the wheel supporting shaft 60 to

rotatably drive the fixedly mounted lowest order number wheel 56 and its associated two tooth driving gear 70 a fixed increment. The rotation causes the pinion 46 to be held by the locking ring 68 with a mutilated tooth 54 facing the wheel 56 until the wheel has made a complete revolution and the two tooth gear 70 is brought into cooperative engagement with a succeeding full tooth 52 to automatically advance by one count the next succeeding number wheel 58.

As will be appreciated from the foregoing detailed description, the frame, pinions and number wheels of the counter as well as the aligning template of the present invention all may be advantageously formed from readily moldable, low cost materials such as plastics and the like. Additionally, the pinions 46 which are all identical in size and configuration, as are the number wheels and associated gears, permit the use of a single, standardized mold or die design for similar parts thereby effectuating economies in manufacture. The utilization of pinions having opposed trunnions further obviates the need for a pinion mounting shaft thus adding flexibility in both counter size and design. Of additional significance is the fact that only a single connection, that is, a "snap-in" connection between the wheel support shaft and the frame, is necessary to maintain the operating relationship of the various components of the counter. This feature enables not only rapid assembly with a minimum of skill but also provides ease of disassembly for maintenance purposes while eliminating the necessity for specialized tools.

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.

I claim:

1. A counter comprising a frame having a plurality of spaced aligned journal boxes with arcuate bearing surfaces, a wheel subassembly having a wheel shaft supported by the frame and a bank of coaxial rotatable counter wheels of increasing order mounted on the shaft, and transfer means engageable with the counter wheels to provide transfers therebetween, said transfer means comprising individual transfer pinions between the spaced journal boxes having opposed trunnions rotatably mounted on the bearing surfaces of immediately adjacent journal boxes.

2. The counter of claim 1 wherein the frame includes a pair of opposed end wall portions having shaft receiving means and bifurcating slots communicating with the shaft receiving means permitting resilient flexure of the wall portions for mounting the wheel subassembly by passage of its shaft through said slots into said shaft receiving means.

3. The counter of claim 1 wherein the frame is provided with access openings intermediate the aligned journal boxes, and wherein the counter wheels have holes therein to receive an alignment pin for maintaining alignment of the wheels while they are assembled on the frame and while the pinions are held in proper position by a pinion aligning fixture positioned within the access openings intermediate the journal boxes.

4. In a counter having a plurality of coaxial counter wheels of increasing order and transfer means providing transfers between adjacent lower and higher order counter wheels, the improvement wherein the transfer means comprises a plurality of transfer pinions having individual supporting trunnions for mounting the pinions in spaced relationship with the counter wheels.

5. The counter of claim 4 further comprising a plurality of spaced aligned journal boxes having open sided bearings wherein each of the transfer pinions comprises a pinion body and a pair of oppositely extending integral trunnions, wherein the pinion bodies are coaxially disposed intermediate the journal boxes and the trunnions

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rest on and are supported by the open sided bearings of the adjacent journal boxes.

6. The counter of claim 1 wherein the journal boxes have open sided bearings which open toward the wheel subassembly and wherein the engagement of the pinions with the wheel subassembly prevents the lateral withdrawal of the pinions from the open sides of the bearings of the journal boxes.

7. A method of assembling a counter having a plurality of coaxial counter wheels and a plurality of coaxial mutilated transfer pinions for providing transfers therebetween comprising the steps of providing a frame having a plurality of spaced aligned journal boxes having open sided bearings and access openings therebetween, positioning pinion locating elements within the access openings of the frame, providing mutilated transfer pinions having oppositely extending supporting trunnions, mounting said transfer pinions on the frame with the mutilated transfer pinions in engagement with the locating elements and the

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trunnions received in the open sided bearings, and mounting a counter wheel subassembly having a plurality of coaxial counter wheels on the frame above the journal boxes and in operative relationship with the pinions.

8. The method of claim 7 wherein the locating elements include recesses for supporting the mutilated teeth of the pinions, and the counter wheel subassembly is mounted by snapping a wheel supporting shaft thereof onto the frame.

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