

Aug. 31, 1954

B. COOPER ET AL
PRINTING COUNTER

2,687,937

Filed March 5, 1951

3 Sheets-Sheet 1

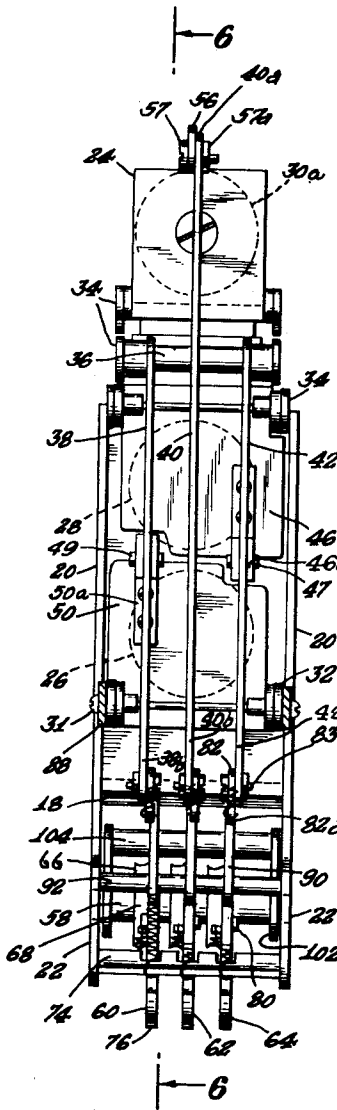


FIG. 2.

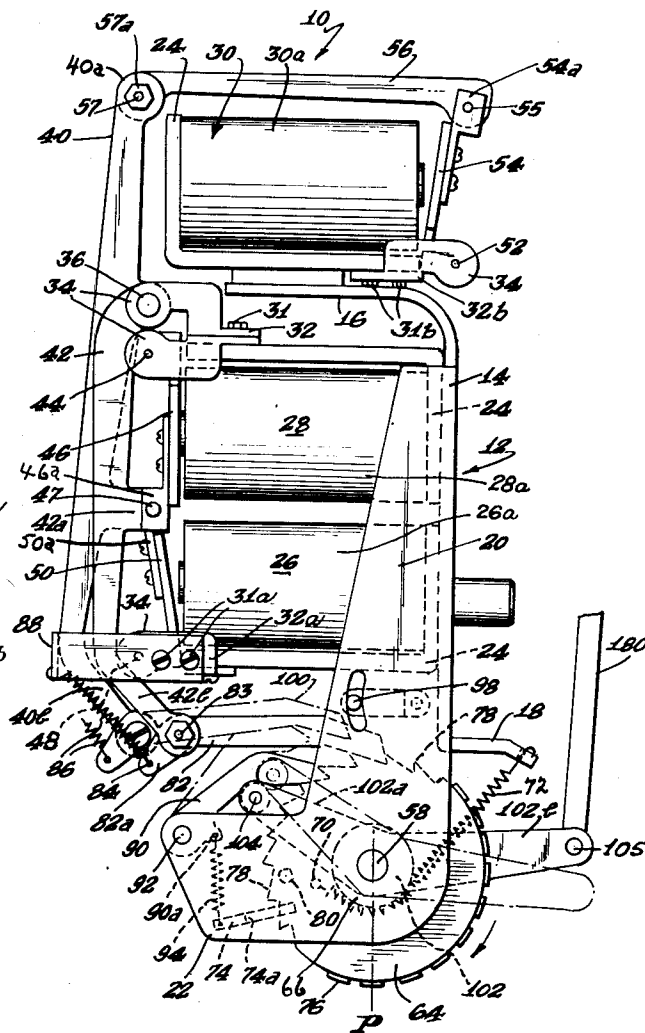


FIG. 1.

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3 Sheets-Sheet 2

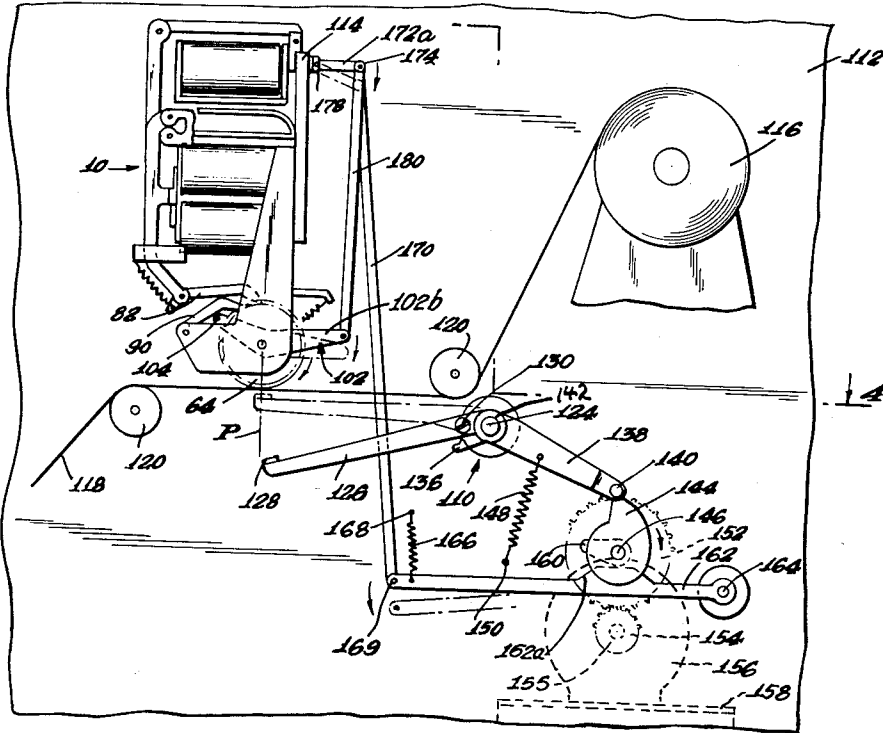


FIG. 3.

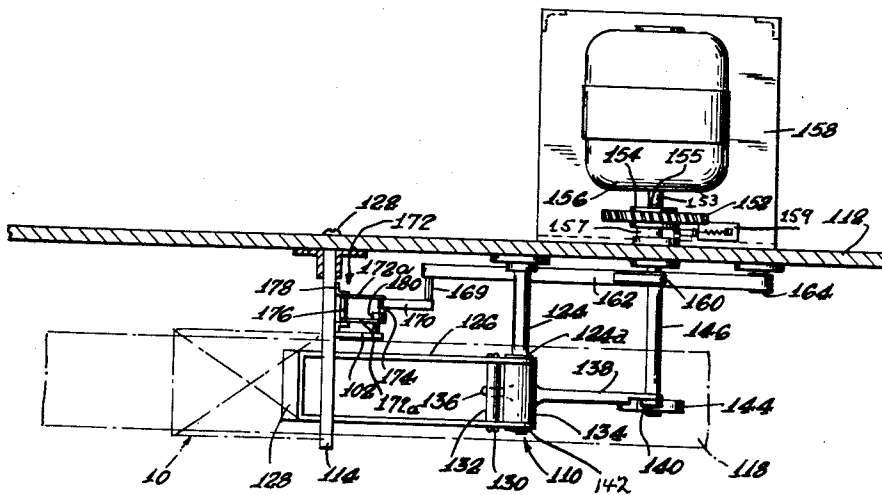


FIG. 4.

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3 Sheets-Sheet 3

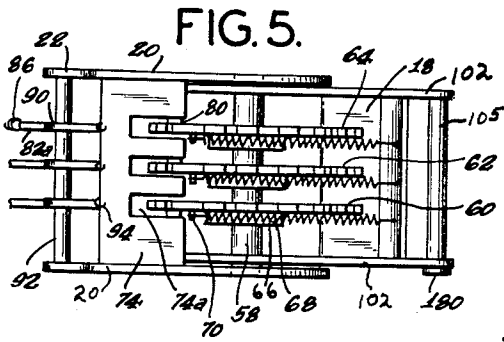


FIG. 6.

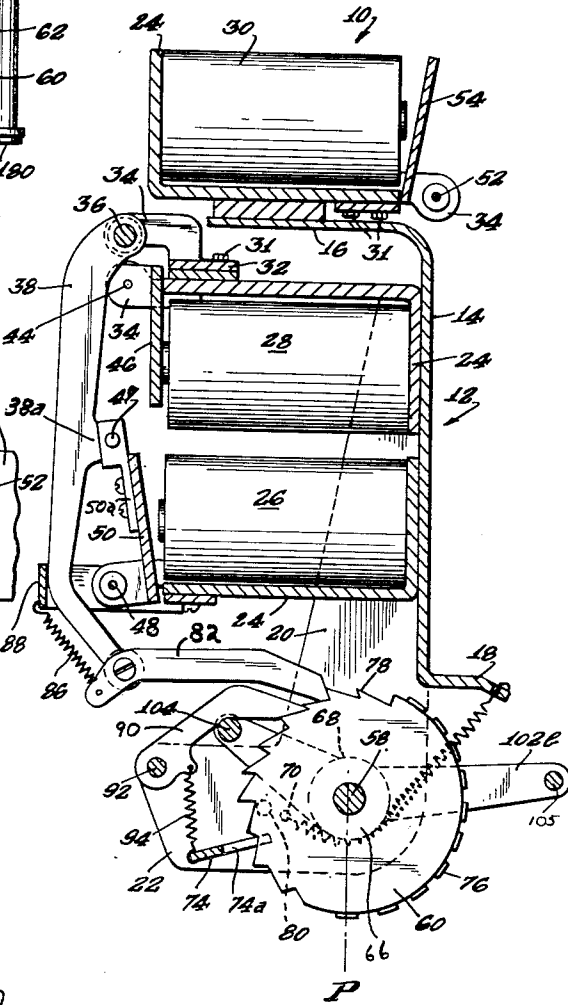


FIG. 7.

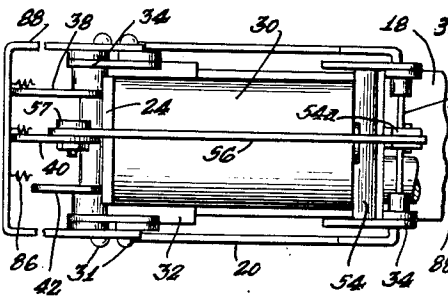
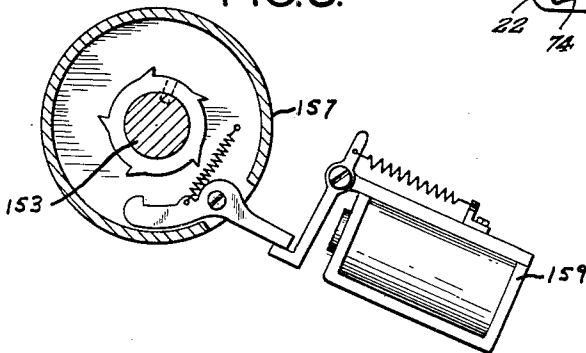


FIG. 8.



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2,687,937

PRINTING COUNTER

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Application March 5, 1951, Serial No. 213,940

2 Claims. (Cl. 346—141)

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This invention relates generally to printing counters and in particular, to an electro-magnetic printing counter having improved digit wheel zeroizing means.

Heretofore, printing counters of the class characterized by individually and independently actuable digit wheels, were restored or reset to their respective zero printing positions by means advancing said wheels through their highest order. Conventionally, printing counter digit wheels have peripherally embossed thereon, successive numerical designations representative of zero through nine. Therefore, with the printing of lower order numerals, subsequent restoration to zero printing position requires the successive advancement of each digit wheel through the higher numerals. Such a counter is disclosed in applicant's Patent 2,344,234 issued March 14, 1944.

Counters of this class are generally, although not exclusively, associated with identification systems wherein watchmen, toll collectors, etc., are provided with individually differing keys operable to unlock related apparatus. Toll collection apparatus exemplifies the use of such keys. Each toll collector is issued a specific key that is insertable in the toll register or related equipment, to unlock, activate and prepare such apparatus for subsequent registration of collected tolls. Each key has specific formations thereon that differ from other toll collector's keys. The particular formations actuate a counter unit which prints a number corresponding to the formations and thus identifies the toll collector using said register. Analogously, a print is made when the key is removed and the collector responsible for said key is liable for tolls collected during the interval of register operation.

After the second print has been made, the counter digit wheels are restored to zero position in preparation for the identifying of a subsequently inserted key. Electro-magnetic stepping means rotate said digit wheels to zero printing position where the stepping means are deactivated.

The present invention appertains to an improved digit wheel resetting mechanism wherein the digit wheels are returned directly to zero pointing position without being advanced through their highest order. Accordingly, one of the principal objects of this invention resides in the provision of separate means operable to restore advanced digit wheels to their respective zero printing positions.

Another object is to provide means operable

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to return the digit wheels to zero printing position in a direction opposite to the direction of advancement.

And another object is to provide individual returning means for each digit wheel.

A further object is to provide limit means for accurately resetting said returning digit wheels on the respective zero printing positions.

Another object is to provide printing control means operable to effect the printing of a record of the digit wheels after the advancement thereof.

Still another object resides in the provision of means operable by said printing control means to release said digit wheels from their advanced positions for return to the zero printing positions, after the record has been printed.

A further object of the invention is to provide a highly improved and compact digit wheel resetting mechanism of the character described, which shall be easy to operate, positive in action, which shall have a large variety of applications, and yet be practical and efficient to a high degree in use.

Other ancillary objects will, in part, be obvious and in part hereinafter pointed out.

The invention accordingly consists in features of construction, combination of elements, and arrangement of parts which will be exemplified in construction hereinafter described, and of which the scope of application will be indicated in the appended claims.

In the drawings:

Figure 1 is a side elevation of a printing counter embodying the invention.

Figure 2 is a plan view illustrating in part, the digit wheel advancing means.

Figure 3 is a side elevation of the counter and printing means, illustrating the digit wheel resetting mechanism and controls therefor.

Figure 4 is a sectional view taken along line 4—4 of Figure 3.

Figure 5 is a bottom view detail of the counter unit.

Figure 6 is a cross-section taken along line 6—6 of Figure 2.

Figure 7 is a plan view of the counter unit.

Figure 8 is a cross-section of the one revolution clutch.

Referring now in detail to the drawings, 10 designates an electro-magnetic counter unit embodying the invention, and 12 designates a supporting frame therefor. Frame 12 comprises an elongated plate 14 disposed in a vertical plane and provided with oppositely extending arms 16

and 18. Integrally formed at right angles along the vertical margins of plate 14 are parallel side walls 20, having shoulders 22 at the base thereof. Secured to the inner face of plate 14, and horizontally disposed, are a pair of electro-magnets 26 and 28 with the respective coils 26a and 28a mounted on duplicate supporting frame pieces 24' and 24'' respectively. A third electro-magnet 30 has coil 30a thereof oppositely mounted on a similar supporting frame piece 24''' that is secured to arm 16 of plate 14. Therefore, electro-magnets 26, 28 and 30 are disposed in a substantially parallel stacked relation.

Secured by screws 31, to the horizontal portion of the frame piece 24', associated with electro-magnet 28, are a pair of brackets 32, formed to provide two pairs of parallel arms 34 which extend marginally of the coil 28a. Interposed between one pair of arms 34 is a shaft 36 on which levers 38, 40 and 42, are pivotally journaled thus providing a pivot point therefor. Secured between arms 34 of the adjacent bracket 32, is a shaft 44 on which armature 46 is pivotally journaled. Armature 48 has secured thereto a bifurcated member 46a adapted to receive a projection 42a dependent from lever 42. A pin 47 pivotally secures lever projection 42a to bifurcated armature member 46a.

A similarly disposed bracket 32A is secured by screws 31A to frame piece 24'' of electro-magnet 26 with the arms 32a thereof supporting a transverse shaft 48. Armature 50 of electro-magnet 26 is pivotally journaled on shaft 48 and is pivotally secured to lever 38 by means of dependent projection 38a, bifurcated member 50a and pin 49.

Electro-magnet 30 is disposed in reverse relation to electro-magnets 26 and 28, and has secured to the opposite margin thereof, as by screws 31, a bracket 32. Arms 34 of bracket 32b support a shaft 52 on which armature 54 of electro-magnet 30 is pivotally journaled. Secured to armature 54, and extending vertically thereof, is a bifurcated member 54a in which one terminal of a link 56 is pivotally secured by screw 55. The other terminal of link 56 is pivotally secured to terminal 40a of pivotal lever 40 by screw 57 and nut 57a.

Pivotal levers 38, 40 and 42, are formed with angular extensions 38b, 40b and 42b, respectively, for a purpose hereinafter appearing.

Secured in aligned apertures in sidewalls 20 of frame 12 is a transverse shaft 58, on which digit wheels 60, 62, and 64 are journaled. Co-axially secured to each digit wheel is a concentric flange 66 formed to provide an annular groove 68 in the periphery thereof. A pin 70 is affixed to each of the respective digit wheels and extends transversely of the flange 66. Coil springs 72 have one end thereof anchored on the pins 70 and are secured at the other end, under tension, to suitable apertures in horizontal arm 18 of frame 12.

Interposed between shoulders 22 of side walls 20, is a plate 74 having three transverse slots 74a open at one end thereof, in which digit wheels 60, 62, and 64 radially extend. Secured to one side of each of said digit wheels, is a limit stud 80 that is arranged to abut against a marginal edge of a respective slot 74a and thus limit counterclockwise digit wheel rotation under the tension of springs 72. Digit wheels 60, 62 and 64 are of analogous structure and are provided with raised numerical indicia 76. Said numerical indicia occupies a predetermined portion of the periphery of each wheel and is arranged in con-

secutive order of the numerals zero through nine. A proportional part of the periphery is provided with a like number of ratchet teeth 78.

Pivotally secured to the terminals of lever extensions 38b, 40b and 42b, as by screws and nuts 83, are pawl swings 82 having one end thereof adapted for engagement with teeth 78. Projecting arms 82a of pawl springs 82 have apertures 84 therein, which are arranged to secure one end of springs 86. The other end of each of said springs is secured in a suitable aperture provided in a transverse bridge member 88. Bridge member 88 is secured to frame piece 24' of electro-magnet 26, as by screws 31a and extends transversely over levers 38, 40 and 42. Thus, springs 86 normally urge levers 38, 40 and 42 into aligning engagement with the under-surface of bridge member 88. Accordingly, the armatures of the respective electro-magnets are normally held open. Springs 86 further function to urge pawl swings 82 into engagement with teeth 78 on the digit wheels.

Pawl swings 90 journaled on a transverse shaft 92 mounted in shoulders 22, are urged into engagement with the respective digit wheels by means of springs 94. An apertured projection 90a on each pawl swing 90 secures one end of spring 94 thereto. The other end of said spring is affixed to a suitable aperture in slotted plate 74. Therefore, pawl swings 90 are urged clockwise to engage teeth 78 of the digit wheels.

It will be noted that each of the digit wheels 60, 62 and 64 have a pawl swing 82 and a pawl swing 90 associated therewith. Pawl springs 90 are normally operative to prevent retrograde movement of the respective digit wheels. Pawl swings 82, the digit wheel advancing means, are arranged to reciprocate under the control of the related electro-magnets. Intermittent energization of an electro-magnet coil analogously attracts and releases the armature therefor. Through the associated pivotal lever, a pawl swing 82 is carried rightwardly, as shown in dotted line in Fig. 1, and the related digit wheel is rotated clockwise. Meanwhile, pawl swing 90 yields against the tension of spring 94, by the high dwell of a tooth passing thereunder. The driving stroke of pawl swing 82 rotates the engaged digit wheel sufficiently whereby the next adjacent tooth is engaged by pawl swing 90. The deenergization of the related coil permits spring 86 to restore pawl swing 82 to normal position and place said pawl swing in engagement with the tooth previously engaged by pawl swing 90.

An adjustable transverse bail 98 is provided to prevent pawl swings 82 from being cammed free by the high dwell of the adjacent tooth. The inclined edge 100 on pawl swing 82 cooperates with bail 98 to guide said pawl swing during the driving stroke. As shown in Fig. 1, digit wheel 64 has advanced one tenth of total movement and thus aligned the second raised indicium 76 with a printing line designated as P. A print taken by means hereinafter appearing, will indicate a "2" in the units column. It is apparent that any one of the digit wheels 60, 62 and 64 may be advanced in accordance with the supplied number of electrical impulses independent of advancement of the others.

Coil spring 72 now further tensioned by the advancement of wheel 64, is arranged to reside in annular groove 68 in the related flange 66.

Means is provided for the release of the advanced digit wheels and to this end there is provided a pair of bell-cranks 102 interposed between

the digit wheels and shoulders 22. Bell-cranks 102 are journaled on shaft 58 and have transverse bails 104 and 105 disposed between the arms 102a and 102b respectively. Bail 104 underlies pawl swings 90 which are vertically aligned with pawl swings 82. Therefore, clockwise rotation of bell-cranks 102 will, through bail 104, rotate pawl swings 90 counter-clockwise which in turn abut against and rotate pawl swings 82 in the same direction.

Pawl swings 82 and 90 are displaced against the tension of springs 86 and 94 respectively, and disengaged from teeth 78. Digit wheels 60, 62 and 64 may then return under the influence of springs 72 to zero position, i. e.; the position wherein stud 80 engages slotted plate 74 and the raised indicium 76 representative of "zero" is aligned with printing line P.

As shown in Figures 3 and 4, means is provided to reset or zeroize the said digit wheels after a print has been made. To this end, there is provided a printing mechanism generally designated as 110 and operable to print a record of the digit wheel indicia aligned with printing line P.

A vertical frame 112 is adapted to have mounted thereon, a horizontally extending bar 114, printing mechanism 110 and a suitable paper supply associated therewith. The paper supply is briefly illustrated in Figure 3, as supply roll 116, paper strip 118 and guide rollers 120. The said supply is conventional and may be of the type wherein the paper strip is advanced with each printing operation.

Horizontal bar 114 secured to vertical frame 112, as by screws 122, supports counter unit 10 in vertical relation whereby digit wheels 60, 62 and 64 are disposed adjacent to paper strip 118.

Printing mechanism 110, comprises a fixed shaft 124 secured at one end thereof to vertical frame plate 112. Shaft 124 is of reduced diameter at the other end to provide shoulder 124a. Journaled on the reduced diametrical portion of shaft 124 and disposed against shoulder 124a, is a printing hammer assembly. Said assembly comprises a U-shaped member 126, having affixed to the closed end thereof, a resilient hammer piece 128. Disposed between the arms of member 126 and secured by screws 130, is a spacer rod 132. There is further journaled on shaft 124 and disposed between the arms of U-shaped member 126, a bushing 134 provided with an underlip 136 adapted to engage spacer rod 132. Bushing 134 has oppositely extending therefrom, an arm 138 having a follower roller 140 journaled in the terminal thereof. A retaining ring 142 retains said rotatable assembly on shaft 124.

Follower roller 140 is adapted to ride on the periphery of a cam 144 fixed on a shaft 146 journaled in a suitable aperture in vertical frame plate 112 and horizontally extending therefrom. A coil spring 148 is secured at one end to arm 138 and at the other end to a pin 150 fixed to frame plate 112. Spring 148 thereby urges follower roller 140 on arm 138 into peripheral engagement with cam 144.

Cam shaft 146 extends through vertical frame plate 112 and has a gear 152 secured thereon. Gear 152 meshes with a pinion 154 secured to a sleeve 155 journaled on the shaft 153 of an electric motor 156. Motor 156 is mounted on a horizontal base plate 158 permanently secured to vertical frame plate 112 by welding or other means. By means of the aforesaid reduction gearing, and clutch 157, motor 156 is adapted to cyclicly rotate shaft 146 one revolution for each printing operation under control of a solenoid 159. The

control means for solenoid 159 is not shown, but is, however, well known to anyone skilled in the art.

Cam 144 is of eccentric form with an abrupt change from the maximum high dwell radius to the minimum low dwell radius. The position of cam 144 shown in the drawings is normal or non-printing and arm 138 is disposed in its maximum counter-clockwise position. Accordingly, spring 148 is fully tensioned. Under-lip 136 or bushing 134 is analogously disposed in its maximum counter-clockwise position. Spacer rod 132 gravitationally rests on under-lip 136 thereby positioning U-shaped hammer member 126 away from paper strip 118.

Clockwise rotation of cam 144 permits spring 148 to rotate arm 138 clockwise as follower roller 140 rides off the high dwell of the cam. Under-lip 136 correspondingly rotates clockwise and hammer piece 128 is carried upwardly into striking engagement with paper strip 118. An inked ribbon, not shown, is disposed between the digit wheels and paper strip 118, therefore, the hammer striking the paper produces a print of the digit wheel settings. It will be noted that the low dwell of cam 144 is of such radius to permit limited counter-clockwise rotation of arm 138 and consequently, under-lip 136. The limited rotation of under-lip 136 carries hammer piece 128 to a point below the point of contact with paper strip 118 and inertia further carries said hammer into momentary striking engagement with paper strip 118. The hammer piece then gravitationally returns to engage under-lip 136. This momentary contact permits a paper feeding mechanism, not shown, to advance paper strip 118 during the return of the hammer assembly to normal non-printing position.

Means are provided to actuate bail 104 and release pawl swings 82 and 90 during the remainder of the cycle of rotation of cam 144. For this purpose there is provided a second eccentric cam 160 secured to shaft 146 and disposed adjacent to frame plate 112. Cooperable with cam 160 is a lever 162 pivotally mounted at one end on a stud 164 secured to vertical frame plate 112. Adjacent the other end of lever 162 and secured thereto, is a spring 166, which is also secured to a pin 168 mounted on frame plate 112. Spring 166 urges lever 162 clockwise about pivot stud 164 and presents a raised protrusion 162a in bearing engagement with the periphery of cam 160. Lever 162 is pivotally secured to link 170 by means of pin 169 thereby inter-connecting lever 162 with pivotal bracket 172. Bracket 172 comprises a pair of parallel arms 172a having pins 174, 176, disposed parallel there-between at the respective terminals thereof. Pin 176 is pivotally secured to horizontal bar 114 by means of a mounting hinge 178. Link 170 is pivotally secured to pin 174. Also pivotally secured to pin 174 is one end of a link 180. The other end thereof is pivotally secured to an arm 102b of bell-crank 102.

Thus, rotation of cam 160 on shaft 146, will pivot lever 162 counter-clockwise about stud 164 and pull link 170 downwardly. Downward movement of link 170 pivots bracket arms 172a clockwise to move link 180 downwardly. Link 180 rotates bell-cranks 102 clockwise and bail 104 thereon releases pawl swings 82, 90 from engagement with ratchet teeth 78 on the respective digit wheels. Springs 72 thereupon return the said digit wheels to their respective zero printing positions.

When the high dwell of cam 160 has been ro-

tated out of engagement with lever 162, spring 166 restores lever 162, links 170, 180, intermediate bracket 172 and bellcranks 102 to their respective normal positions in preparation for subsequent operations.

It will thus be seen that there is provided a device in which the several objects of the invention are achieved and which is well adapted to meet the conditions of practical use.

As various possible embodiment might be made of the above invention, and as various changes might be made in the embodiment set forth, it is to be understood that all matters herein set forth or shown in the accompanying drawings are to be interpreted as illustrative and not in a limiting sense.

The invention claimed is:

1. In an electro-magnetic unit, in combination, a frame having a pair of side walls extending from the margins thereof, a plurality of electro-magnets secured to said frame and disposed between said walls, an angular frame extension, an electro-magnet secured to said angular frame extension, a shaft journaled in said frame side walls, a plurality of independently rotatable digit wheels journaled on said shaft, a collar affixed to each of said digit wheels having a grooved periphery, plural resilient means each being affixed at one end to a respective digit wheel and at the other end to said frame, and adapted to reside in the grooved periphery of a respective collar, a second shaft disposed between said walls in spaced parallel relation to said first shaft, a plurality of latching pawls, resilient means normally urging said latching pawls into engagement with said digit wheels, whereby said digit wheels may rotate in one direction and being locked by said pawls against rotation in the opposite direction, a plurality of levers, armature means associated with each electro-magnet for actuating a respective lever when the associated electro-magnet is energized, a plurality of advancing pawls, each being pivotally secured to a respective lever and each being adapted to engage a respective digit wheel, resilient means normally urging said advancing pawls into engagement with said digit wheels, guide retaining means for maintaining said advancing pawls in engagement with the digit wheels during rotation of said digit wheels by said advancing pawls, and means to disengage said latching pawls and said advancing pawls from said digit wheels whereby said first resilient means restores the rotated digit wheels to their respective initial positions, said digit wheel restoring means affixed respectively to the digit wheels and the frame comprising a bail adapted to engage said latching pawls to urge said latching pawls out of engagement with said digit wheels and into engagement with said advancing pawls, and to further disengage said advancing pawls from said digit wheels.

2. In an electro-magnetic unit, in combination, a frame having a pair of side walls extending from the margins thereof, a plurality of electro-magnets secured to said frame and disposed between said walls, an angular frame extension, an

electro-magnet secured to said angular frame extension, a shaft journaled in said frame side walls, a plurality of independently rotatable digit wheels journaled on said shaft, a collar affixed to each of said digit wheels having a grooved periphery, plural resilient means each being affixed at one end to a respective digit wheel and at the other end to said frame, and adapted to reside in the grooved periphery of a respective collar, a second shaft disposed between said walls in spaced parallel relation to said first shaft, a plurality of latching pawls, resilient means normally urging said latching pawls into engagement with said digit wheels, whereby said digit wheels may rotate in one direction and being locked by said pawls against rotation in the opposite direction, a plurality of levers, armature means associated with each electro-magnet for actuating a respective lever when the associated electro-magnet is energized, a plurality of advancing pawls, each being pivotally secured to a respective lever and each being adapted to engage a respective digit wheel, resilient means normally urging said advancing pawls into engagement with said digit wheels, guide retaining means for maintaining said advancing pawls in engagement with the digit wheels during rotation of said digit wheels by said advancing pawls, and means to disengage said latching pawls and said advancing pawls from said digit wheels whereby said first resilient means restores the rotated digit wheels to their respective initial positions, said digit wheel restoring means affixed respectively to the digit wheels and the frame comprising a bail adapted to engage said latching pawls to urge said latching pawls out of engagement with said digit wheels and into engagement with said advancing pawls, and to further disengage said advancing pawls from said digit wheels.

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