

2,732,797

Filed May 12, 1951

3 Sheets-Sheet 1

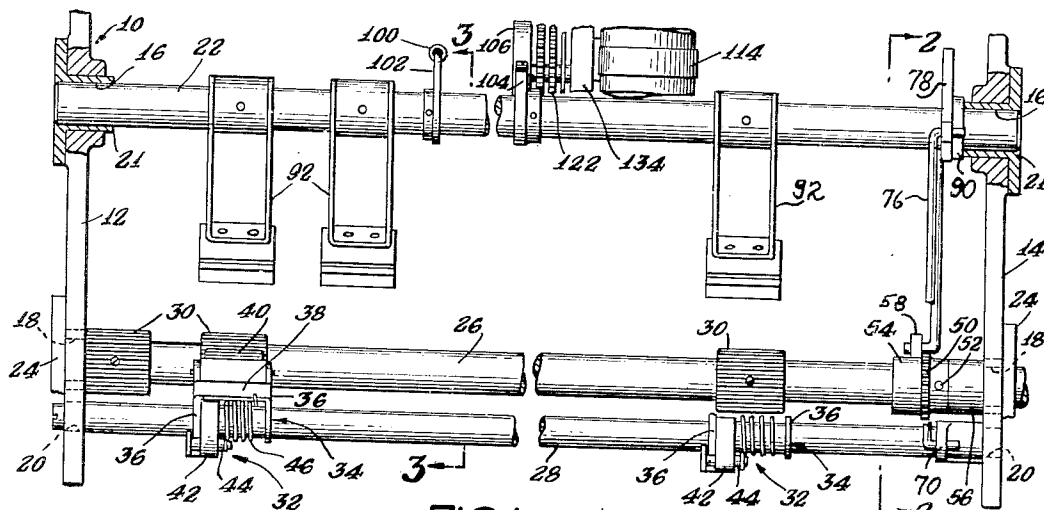


FIG. 1.

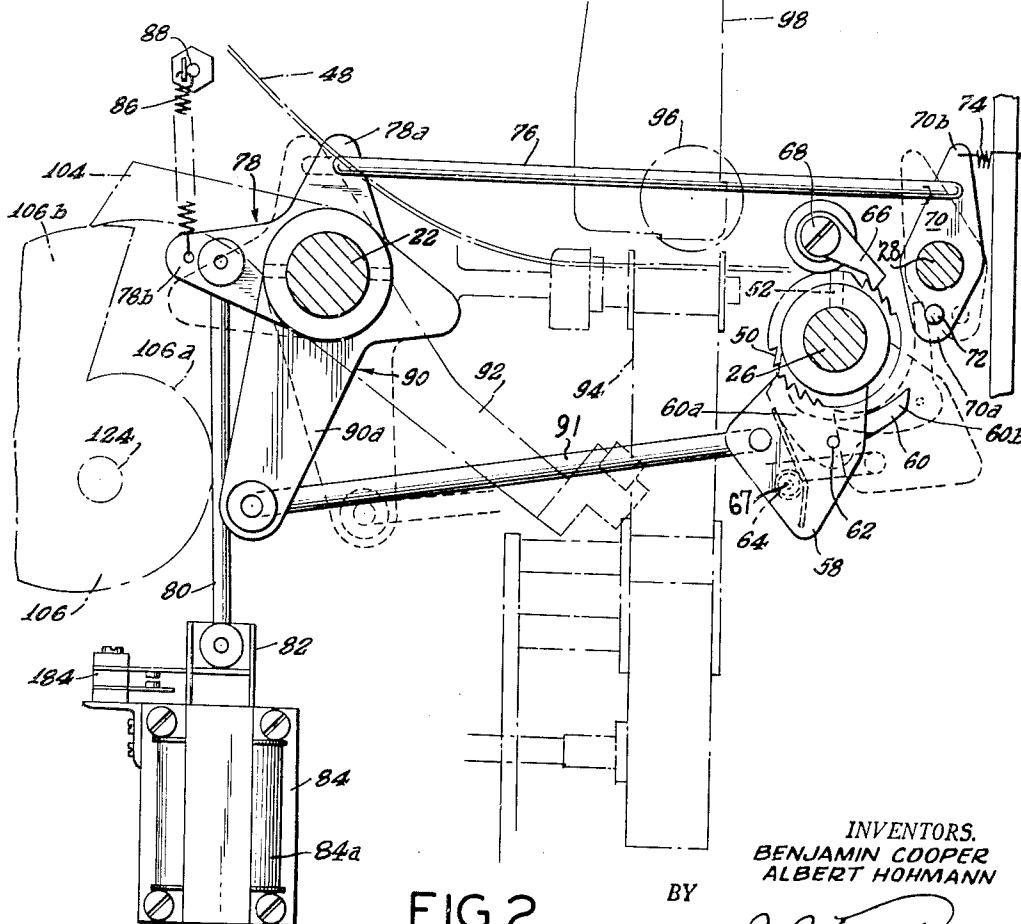


FIG. 2.

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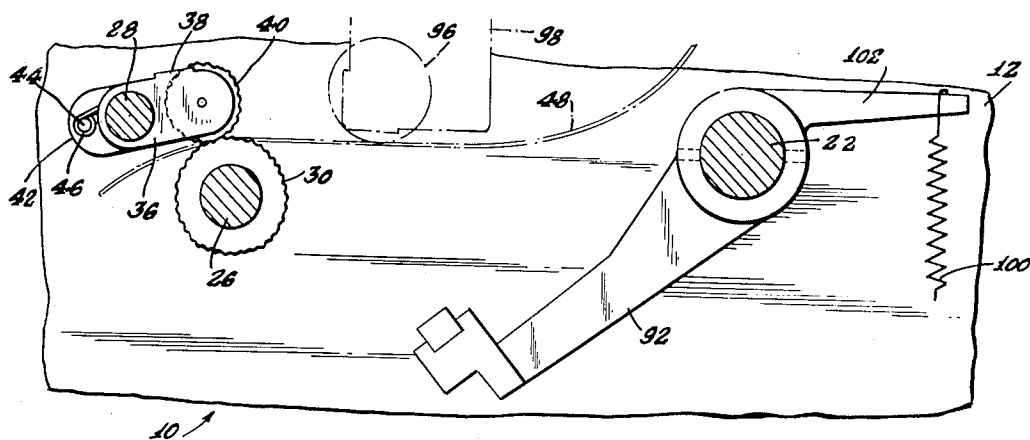


FIG. 3.

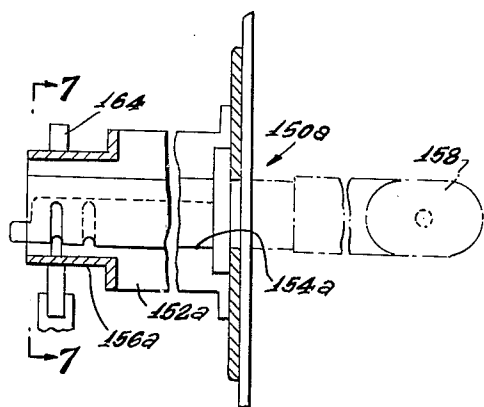


FIG. 6.

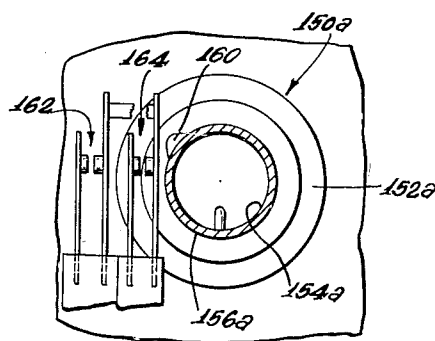


FIG.7.

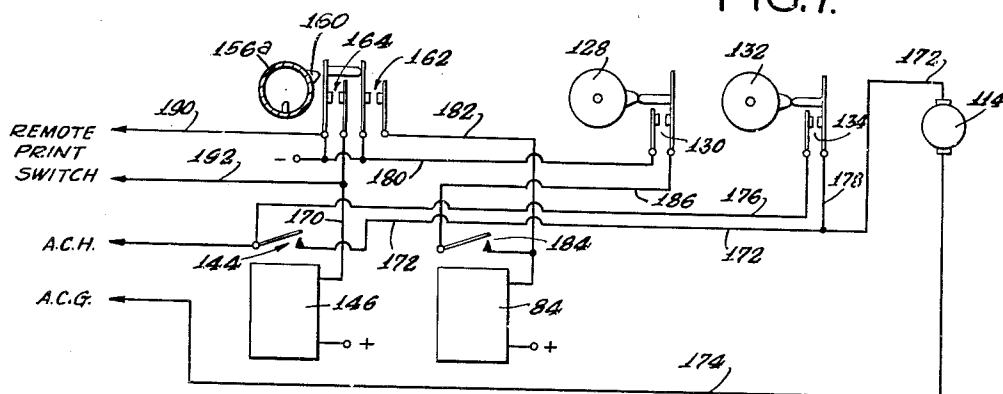


FIG. 8.

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3 Sheets-Sheet 3

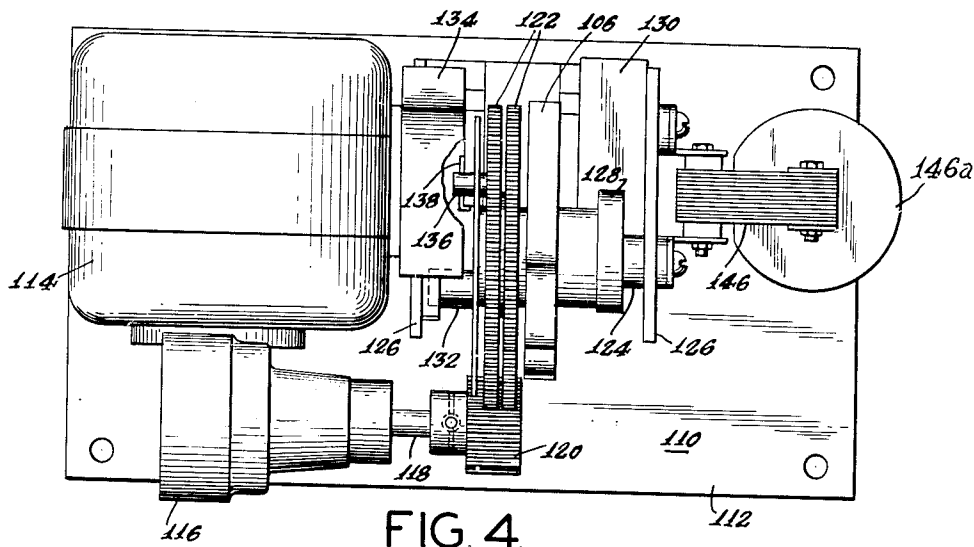


FIG. 4.

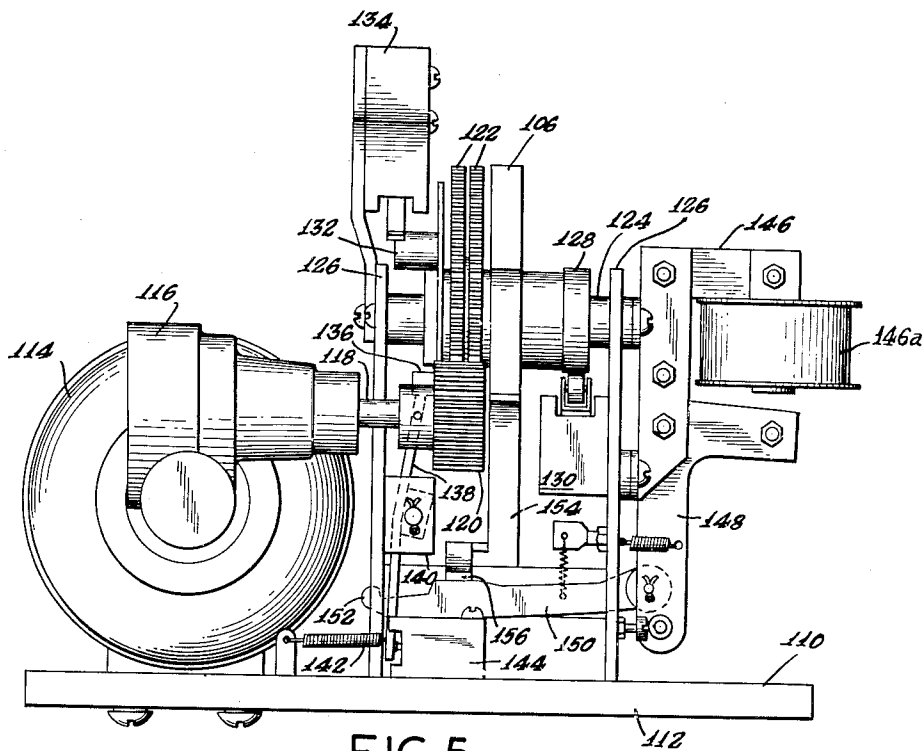


FIG. 5.

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Application May 12, 1951, Serial No. 226,048

9 Claims. (Cl. 101—283)

This invention relates generally to paper feeding devices and in particular to a paper feed device having a selectively variable line spacing mechanism.

The present invention appertains to an improved line space control mechanism wherein the advancement of a continuous paper strip is selectively varied to effect either a single line space or a multiple line space.

In paper feeds of this type, a feed shaft is provided with frictional feed rollers on which the paper strip is disposed. Pressure rollers are employed to press the said strip into frictional engagement with the feed rollers. Accordingly, rotation of said feed shaft through a predetermined angle under control of a printing mechanism, will advance the strip a predetermined lineal distance past said printing mechanism. This repetitious action, which may be time controlled to take place periodically, spaces the data printed on said strip substantially a single line space apart with each printing operation.

In toll collection systems, each toll register operator is conventionally issued a key to unlock and actuate toll registering apparatus at the initiation of a tour of duty. At the termination of the tour of duty the key is turned for removal and the apparatus is again locked and deactuated. During operation of the registers, periodic prints of the accumulated toll data is recorded on a paper strip to provide a permanent record thereof. Heretofore, with each printing operation, a paper feed mechanism advanced the strip a single line space. Consequently, in the analyzation of the printed record by supervisory or accounting personnel, difficulty was experienced in determining which toll transactions were chargeable to the respective operators. Toll collection apparatus embodying the present invention eliminates such difficulty, in that a differing space now exists to indicate the termination of a tour of duty by one operator and the start of a tour by the succeeding collector.

The present improved line space control mechanism provides an electrical means under control of an operator for varying the angle of rotation of the feed shaft whereby the said strip may be advanced a lineal distance greater than a single line space, means being provided to make a print on the paper and hence showing a line space between printing lines to indicate that the print preceding the line space was made under control of an operator instead of being a time controlled print.

Another object is to provide in a paper feed of the character described, means normally operable to limit feeding of a paper strip to a single line space.

A further object is to provide in a paper feed of the character described, means operable to deactuate said feed limiting means whereby said feed advances the paper strip a double line space.

A further object of the invention is to provide a paper feed device of the character described that is practical and efficient to a high degree in use.

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

In the drawings:

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Figure 1 is a plan view of a paper feed embodying the invention with the data accumulating means omitted for clarity.

Figure 2 is a cross-section taken along line 2—2 of Fig. 1.

Figure 3 is a cross-section taken along line 3—3 of Fig. 1.

Figure 4 is a plan view of the one-revolution print and paper feed drive assembly.

Figure 5 is a front elevation of the drive assembly.

Figure 6 is a section of an identifier key lock.

Figure 7 is an end view of the key lock.

Figure 8 is a schematic wiring diagram of the printing and double spacing control means.

Referring in detail to the drawings, 10 generally designates the frame of a toll register or the like, which supports paper feeding means hereinafter described. Frame 10 comprises a pair of spaced parallel vertical walls 12 and 14 that are provided with complemental coaligned pairs of through apertures 16, 18 and 20, respectively. Apertures 16 are adapted to have secured therein, complemental bearing inserts 21 in which transverse rotatable shaft 22 is journaled. Analogously apertures 18 are adapted to receive complemental bearing inserts 24 in which a parallel transverse rotatable shaft 26 is journaled. Apertures 20 are arranged to support a parallel fixed rod 28 in secured relation in walls 12 and 14.

Shaft 26 has secured circumjacent thereon in spaced relation, a plurality of feed rollers 30 having knurled peripheries. Adapted for cooperation with feed rollers 30 and disposed in spaced alignment therewith on fixed rod 28 are a plurality of pressure roller assemblies 32. Each assembly 32 comprises a yoke member 34 journaled on rod 28 and provided with two parallel arms 36 having a cross-piece 38 formed therebetween. A roller 40 is rotatably secured between the ends of arms 36. Affixed to rod 28 between arms 36, is a collar 42 having a pin 44 extending transversely therefrom. A torsion spring 46 circumjacently disposed on rod 28, has one end thereof secured to pin 44 and the other end affixed to cross-piece 38. Thus, springs 46 urge pressure rollers 40 into engagement with feed rollers 30.

A paper strip 48 is fed between feed rollers 30 and pressure rollers 40 from a suitable supply source, not shown, and is advanced in accordance with the angle of rotation of shaft 26.

Means are provided to rotate shaft 26 in one direction. To this end there is provided on said shaft adjacent one end thereof, a ratchet wheel 50 affixed, as by set screw 52, to said shaft. Journaled on shaft 26 adjacent to ratchet wheel 50, is a sleeve 54 and securing said sleeve against lateral movement is a fixed collar 56. Depending from sleeve 54 is an arm 58 on which pawl swing 60 is pivotally mounted. Pawl swing 60 is of substantially arcuate shape and is centrally pivoted on pin 62. Further, pawl swing 60 is disposed in radial alignment with ratchet wheel 50 and is spring-urged into peripheral engagement therewith. A torsion spring 64 is circumjacently disposed on stud 67 fixed to arm 58 and has one end thereof secured to said arm. The other end of spring 64 is disposed in tensioned relation to engage arm 60a of pawl swing 60 and, therefore, normally urges arm 60a into engagement with said ratchet wheel. A second pawl swing 66 is diametrically disposed relative to pawl swing 60 and is resiliently mounted on stud 68 secured to frame wall 14. Spring means, not shown, urges pawl swing 66 into peripheral engagement with ratchet wheel 50 to prevent retrograde movement thereof.

Arm 58 and sleeve 54 are arranged to oscillate through a predetermined angle and accordingly, effect rotation of shaft 26. Arm 58, when rotated counter-clockwise, as viewed in Figure 2, advances pawl swing 60 over a

plurality of teeth on ratchet wheel 50 while pawl swing 66 prevents counter-clockwise movement of said ratchet wheel. Upon rotating arm 58 in a clockwise direction, pawl swing 60 rotates ratchet wheel 50 therewith. Means hereinafter described, is provided to oscillate arm 58.

Means is provided to selectively vary the angle of rotation of ratchet wheel 50, and accordingly, selectively vary the lineal advancement of paper strip 48. Such means comprises a lever 70 pivotally journalled on fixed rod 28 and offset relative to ratchet wheel 50. On lower arm 70a of lever 70 is a stud 72 that extends transversely into the path of travel of pawl swing 60. When lever 70 is rotated, as by spring 74, to a maximum clockwise position, Figure 2, arm 60b of pawl swing 60 cams against stud 72 during counter-clockwise rotation of arm 58 and said pawl swing is disengaged from ratchet wheel 50. Thus, for substantially one half of the counter-clockwise stroke of arm 58, pawl swing 60 is disengaged from ratchet wheel 50. Accordingly, pawl swing 60 remains disengaged from ratchet wheel 50 for one half of the return or clockwise stroke of arm 58 and shaft 26 rotates through a proportionately decreased angle. Correspondingly, paper strip 48 advances a proportionate lineal distance.

Lever 70 is adapted to be pivoted counter-clockwise to displace stud 72 out of the path of travel of pawl swing 60. Pivotally secured to arm 70b of lever 70 is one end of a link 76, the other end of which is pivotally secured to upwardly extending arm 78a of bell-crank 78. Bell-crank 78 is journalled on print shaft 22 and has pivotally connected to rearwardly extending arm 78b, a link 80. Link 80 is in turn pivotally secured to plunger 82 of solenoid 84. When energized solenoid 84 draws plunger 82 and link 80 downward, thus rotating bell-crank 78 counter-clockwise, Figure 2. Link 76 analogously rotates lever 70 counter-clockwise to render stud 72 ineffective. When solenoid 84 is deenergized, spring 86 secured to bell-crank 78 and to a fixed pin 88, cooperates with spring 74 to restore the interconnecting elements and stud 72 to its effective position.

Arm 58 is pivotally connected by means of link 91 to arm 90a of bell-crank 90 affixed to shaft 22. The rotation of shaft 22 through a predetermined angle and counter rotation to its initial position oscillates bell-crank 90 and consequently oscillates arm 58 to advance the paper strip. On the initial rotation of shaft 22, a plurality of printing hammers 92 affixed thereto are arranged to press paper strip 48 against ink ribbon 94, shown in dotted line in Figure 2, and printing wheels 96 of counters 98, thus transcribing the particular setting of said wheels on to strip 48. On the return stroke of hammers 92, strip 48 is advanced past printing wheels 96 by the hereinbefore described feeding means.

Therefore, the motive means for actuating printing hammers 92 motivates the paper feed mechanism. Said motive means comprises a spring 100 affixed at one end to arm 102 secured to shaft 22 and extending transversely therefrom. The other end of spring 100 is secured to suitable anchoring means, not shown, that tensions said spring to urge shaft 22 counter-clockwise, as viewed in Figure 2. A second transversely extending arm 104 is affixed to shaft 22 and is adapted to coact with a print control cam 106. Cam 106 is eccentrically formed to provide a logarithmic curve extending from minimum radius low dwell 106a to maximum radius high dwell 106b. High dwell 106b normally is disposed under arm 104 and retains said arm in its uppermost position. Counter-clockwise rotation of cam 106 moves high dwell 106b out from engagement with arm 104 and accordingly, spring 100 rotates arm 102, shaft 22 and arm 104 counter-clockwise until arm 104 engages low dwell 106a of cam 106. Continued counter-clockwise rotation of cam 106 restores arm 104, shaft 22 and shaft 102 in a clockwise direction to their original positions wherein arm 104 rests on the high dwell of said cam.

Means are provided to control the rotation of cam 106 to limit each operation thereof to single revolution. To this end there is provided a drive assembly 110 comprising a base 112 having electric motor 114 mounted thereon. Mounted on motor 114 and extending transversely therefrom, is a reduction gear box 116 having shaft 118 extending therefrom with pinion 120 fixed thereto. Pinion 120 is disposed in engagement with a pair of parallel gears 122 disposed side-by-side and secured to shaft 124 journalled in a pair of spaced up-standing frame plates 126. Cam 106 is also secured to shaft 124 and rotatable therewith. A second cam designated as 128 is also secured to shaft 124 and controls micro-switch 130 during the rotation thereof. A third cam designated as 132 is mounted on shaft 124 and controls a micro-switch 134. Secured to the face of gear 122 is a pin 136 arranged to be engaged by lever 138 pivotally mounted on ear 140 formed from one of the frame plates 126. Lever 138 is urged clockwise, as viewed in Figure 5, by spring 142 to engage pin 136 and open micro-switch 144.

Solenoid 146 mounted on the right hand frame plate 126 is adapted to pivot lever 138 counter-clockwise when energized, as viewed in Figure 5. Armature 148 of solenoid 146 is attracted thereto and latch arm 150 is moved rightwardly. Hooked portion 152 of latch arm 150 engages lever 138 and pivots said lever counter-clockwise. Micro-switch 144 is actuated to a closed circuit condition by lever 138 to energize motor 114. Lever 138 is further disposed in a non-latching position relative to gear pin 136. Thus, pinion 120 rotates gears 122 and cam 106. A follower finger 154 peripherally engaging cam 106, is pivotally mounted between plates 126, and has forwardly extending therefrom a second finger 156. Finger 156 is disposed in engagement with latch arm 150 and accordingly, when finger 154 is engaged by the high dwell of cam 106, finger 156 depresses latch arm 150 to release lever 138. Spring 142 restores lever 138 to pin engaging position wherein micro-switch 144 is opened, however, motor 114 does not de-energize at this time. Microswitch 134 provides a parallel circuit with microswitch 144 and continues to supply a source of potential to the motor 114. Micro-switch 134 is now closed by reason of cam 132 having moved out of engagement with said microswitch. Immediately prior to the engagement of pin 136 with lever 138, cam 132 engages and opens microswitch 134, and motor 114 de-energizes. Microswitch 144 is open in the "At rest" position of cam 132. Thus, the motor 114 remains energized after lever 138 and its associated microswitch 144 have returned to normal until shaft 124 has substantially completed one revolution and microswitch 134 is opened by cam 132. Follower finger 154 is provided to prevent continuous printing in the event that solenoid 146 is held energized. Cam 106 will depress latch arm 150 and thus release lever 138 prior to the completion of a cycle of rotation.

Referring to Figures 6 and 7, 150a designates an identifier key lock. Said key lock comprises a fixed cylinder 152a having a key receiving bore 154a therein. Sleeve 156a journalled on the periphery of cylinder 152a, is adapted for rotation by the rotating of key 158. Protrusion 160 affixed to sleeve 156a engages normally open switches 162, 164 and during the rotating of said sleeve momentarily close-circuits said switches. Key 158 and sleeve 156a are arranged to rotate 90 degrees thus actuating switches 162, 164 upon the initial turning of said key and also upon the counter turning for the removal of said key. Protrusion 160 is adapted to effect momentary closure of switches 162 and 164 during the ninety degree rotation thereof; i. e., switches 162 and 164 will close and re-open by the passage of the protrusion 160 in its arcuate path. Identifier keys may be briefly described as being individually differing keys that are issued to specific personnel and record of such issuance maintained by supervisory personnel. Said keys are utilized to unlock

and actuate apparatus to permit subsequent operation thereof. Further, the individually differing keys are adapted to produce a record of their individual designations, thus, a record is established of the users of the apparatus.

Such keys are exemplified in toll collection systems wherein each toll collector is issued an identification key which is used to actuate the toll register apparatus for subsequent recording of collected tolls. Upon going on duty, the collector rotates key 158 to unlock and actuate the toll register and on going off duty, the key is counter rotated to lock and deactivate the register, after which the key is removed. Such an apparatus is disclosed in the patents to Cooper No. 2,196,194 issued April 9, 1940; No. 2,344,234 issued March 14, 1944; and Patent No. 2,351,405 issued June 13, 1944, and forms no part of the present invention, and accordingly is not shown.

Correspondingly, solenoids 84 and 146 are concurrently energized at the start of a tour of duty and at the termination thereof to make a print and advance the printed record a double line space after said print is made. Analyzing of the toll collection records by accounting personnel is facilitated by the readily identifiable double line spaces. The circuits controlled by the actuation of key 158 to effect the double line space are as follows:

The closed-circuiting of switch 164, Figure 8, completes a circuit from negative source of potential through closed switch 164, over conductor 170 to one terminal of coil 146a of solenoid 146. The other terminal of coil 146a is connected to the source of positive potential, therefore, solenoid 146 energizes. With the actuation of armature 148 of solenoid 146, micro-switch 144 is closed-circuited to complete a circuit to electric motor 114 from ACH, through closed switch 144, over conductor 172 to the winding of said motor, through said winding to conductor 174 to ACG. Accordingly, motor 114 rotates shaft 124 and cams 128, 132 thereon. Cam 132 immediately actuates micro-switch 134 to a closed-circuit condition to complete a holding circuit for motor 114 as follows. The circuit exists from ACH over conductor 176, closed switch 134, conductors 178, 172 to motor 114, and from said motor, over conductor 174 to ACG. Upon cam 132 reaching its initial position, switch 134 opens and motor 114 deenergizes.

Concurrently with the momentary closing of switch 164 by a key 158, switch 162 is closed to complete a circuit for energizing solenoid 84. The circuit is from a source of negative potential, through conductor 180, closed switch 162, conductor 182 to coil 84a of solenoid 84. The other end of said coil is connected to the source of positive potential, therefore, solenoid 84 energizes. A holding circuit is established by the energizing of solenoid 84. Plunger 82, when actuated close-circuits normally open switch 184 to complete a circuit from the source of negative potential, over conductor 180, through microswitch 130, conductor 186, closed switch 184, conductor 182 to coil 84a of solenoid 84. Normally open switch 130, however, is closed immediately upon rotation of cam 128. Therefore, switch 130 is closed before switch 162 is opened. At the completion of one cycle of rotation of cam 128, switch 130 opens and solenoid 84 deenergizes.

A remote switch, not shown, may be connected in series with conductors 190, 192 to parallel switch 164 and thus effect a normal printing operation. However, when actuated by remote means, double space solenoid 84 is not energized and, accordingly, the paper strip is advanced but a single line space.

While the present embodiment of the invention appertains to a double line space, it is to be understood that other quantities of differentiating space could readily be employed without departing from the principles hereinbefore set forth.

It will thus be evident 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.

The invention claimed is:

1. In combination, rotary paper feed means, means to rotate said feed means, a control means to predetermine the angle of rotation of said paper feed means upon actuating the rotating means for said feed means, electrical means to control the control means for varying the angle of rotation of the paper feed means by said rotating means and actuating the rotating means, and means for independently actuating said rotating means.

2. In combination, rotary paper feed means, means to rotate said feed means, a control means to predetermine the angle of rotation of said paper feed means upon actuating the rotating means for said feed means, electrical means to control the control means for varying the angle of rotation of the paper feed means by said rotating means and actuating the rotating means, key actuated means to control said electrical means, and means for independently actuating said rotating means.

3. In combination, rotary paper feed means, means to rotate said feed means, a control means to predetermine the angle of rotation of said paper feed means upon actuating the rotating means for said feed means, electrical means to control the control means for varying the angle of rotation of the paper feed means by said rotating means and actuating the rotating means, means to print on the paper, said printing means being connected for operation with the rotating means and means for independently actuating said paper feed rotating means.

4. In combination, rotary paper feed means, means to rotate said feed means, a control means to predetermine the angle of rotation of said paper feed means upon actuating the rotating means for said feed means, electrical means to control the control means for varying the angle of rotation of the paper feed means by said rotating means and actuating the rotating means, key actuated means to control said electrical means, means to print on the paper each time the rotating means is actuated and means for independently actuating said rotating means.

5. In combination, rotary paper feed means, means to rotate said feed means, a control means to predetermine the angle of rotation of said paper feed means upon actuating the rotating means for said feed means, electrical means to control the control means for varying the angle of rotation of the paper feed means by said rotating means, electrical means to actuate said rotating means, means to concurrently actuate said control means and said electrical actuating means, and means for independently actuating said rotating means.

6. In combination, rotary paper feed means, means to rotate said feed means, a control means to predetermine the angle of rotation of said paper feed means upon actuating the rotating means for said feed means, and electrical means to control the control means for varying the angle of rotation of the paper feed means by said rotating means, electrical means to actuate said rotating means, means to concurrently actuate said control means and said electrical actuating means, timing means to retain said control means in actuated condition during the rotation of said rotating means, and means for independently actuating the rotating means.

7. In combination, printing means, means to cyclicly actuate said printing means in opposite arcuate directions through a predetermined angle, rotary paper feed means, means to rotate said rotary paper feed means in one direction upon actuating said printing means, control means to predetermine the angle of rotation of said rotary paper feed means in said direction, electrical means to control the control means for varying the angle of rotation of said rotary feed means, means to independently actuate said means for actuating said printing means, and means to concurrently actuate said means for actuating said printing means and said electrical means.

8. In a paper feed, in combination, a shaft, a feed roller thereon, a pressure roller associated with said feed roller whereby a recording strip may be interposed between said feed roller and said pressure roller, a second shaft, means to rotate said second shaft in opposite directions, pawl supporting means journaled on said first shaft, means actuatable by said second shaft to rotate said pawl supporting means through a predetermined angle in opposite directions, a ratchet affixed to the first shaft, a pawl on said pawl supporting means engaging said ratchet to rotate said first shaft in one direction, a lever to disengage said pawl from said ratchet for a portion of the predetermined angle of rotation whereby said first shaft is rotated through a predetermined angle of lesser degree than said first predetermined angle, electrically controlled means operable to render said lever inoperative whereby said first shaft is rotated through said first predetermined angle, key-operative means to concurrently actuate said second shaft rotating means and said electrically controlled means, and means to independently actuate said second shaft rotating means.

9. In a paper feed, in combination, a shaft, a feed roller thereon, a pressure roller associated with said feed roller whereby a recording strip may be interposed between said feed roller and said pressure roller, a second shaft, printing means actuatable by said second shaft, means to rotate said second shaft in opposite directions to actuate said printing means, pawl supporting means journaled on

said first shaft, means actuatable by said second shaft to rotate said pawl supporting means through a predetermined angle in opposite directions, a ratchet affixed to the first shaft, a pawl on said pawl supporting means engaging said ratchet to rotate said first shaft in one direction, a lever normally operative to disengage said pawl from said ratchet for a portion of the predetermined angle of rotation whereby said first shaft is rotated through a predetermined angle of lesser degree than said first predetermined angle, electrically controlled means operable to render said lever inoperative whereby said first shaft is rotated through said first predetermined angle, key-operative means to concurrently actuate said second shaft rotating means and said electrically controlled means, and means for independently actuating said second shaft rotating means.

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