

[54] **TICKET PRINTER**

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[51] Int. Cl..... B41I 47/46
[58] Field of Search..... 101/93 C, 93 R, 90,
101/92, 95, 99, 110, 97, 85, 75, 79, 83, 59,
106, 109

[56] **References Cited**

UNITED STATES PATENTS

2,111,121	3/1938	Mills	101/90 X
2,669,177	2/1954	Loudon.....	101/90
2,802,415	8/1957	Heinze et al.	101/93 R
2,986,993	6/1961	Gang.....	101/93 R
3,051,082	8/1962	Wagemann	101/93 R
3,296,959	1/1967	Sewell.....	101/90 X
3,385,213	5/1968	Stephan	101/110
3,453,952	7/1969	Huber.....	101/91
3,596,593	8/1971	Wada.....	101/93 C

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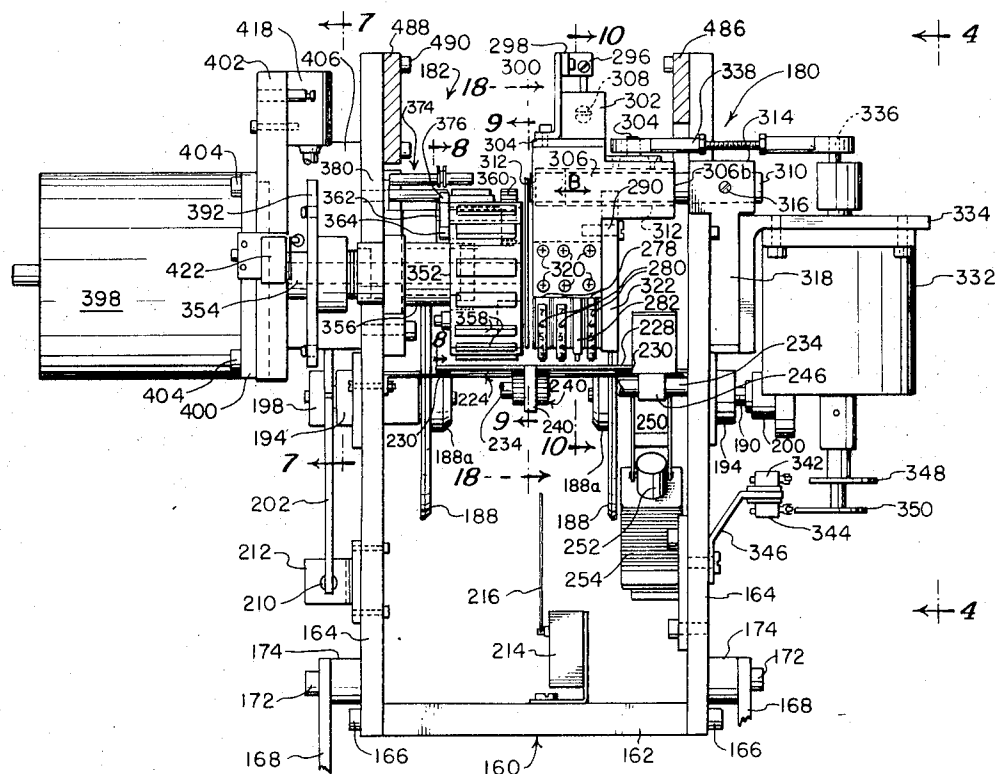
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[57] **ABSTRACT**

Apparatus for printing tickets on an elongated web or thin, flexible sheet material comprising means for controllably advancing said web across a printing station. A printing assembly is provided at said station comprising a primary drum mounted for rotation about an axis transversely of and spaced parallel to said web and a plurality of printing indicia are circumferentially spaced on at least a portion of the periphery of said drum. A secondary drum is mounted on the primary drum for rotation relative thereto about a secondary axis parallel and radially outwardly of the first mentioned axis, and a plurality of printing indicia are circumferentially spaced around at least a portion of the periphery of the secondary drum. Indexing means is provided for rotating the secondary drum relative to the primary drum to position a selected indicia on the former adjacent a selected indicia on the periphery of the latter. Primary indexing means is provided for rotating said printing drum to place any selected indicia on the drum into the printing position, and print hammer means, swingable about an axis parallel to the primary axis from a rest position to a printing position, is provided for urging the web into momentary printing contact against selected indicia on either drum.

9 Claims, 20 Drawing Figures



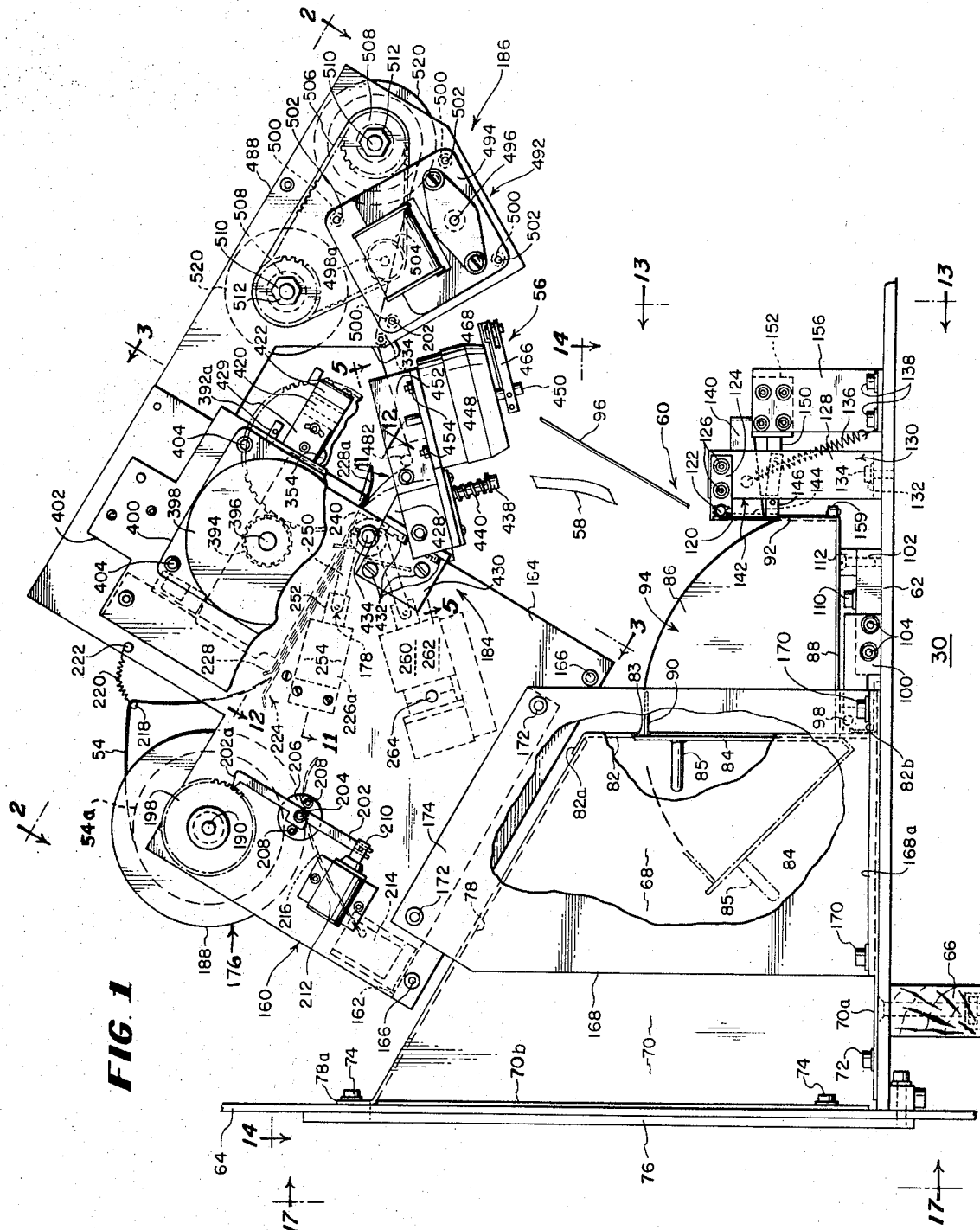


FIG. 1

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FIG 2

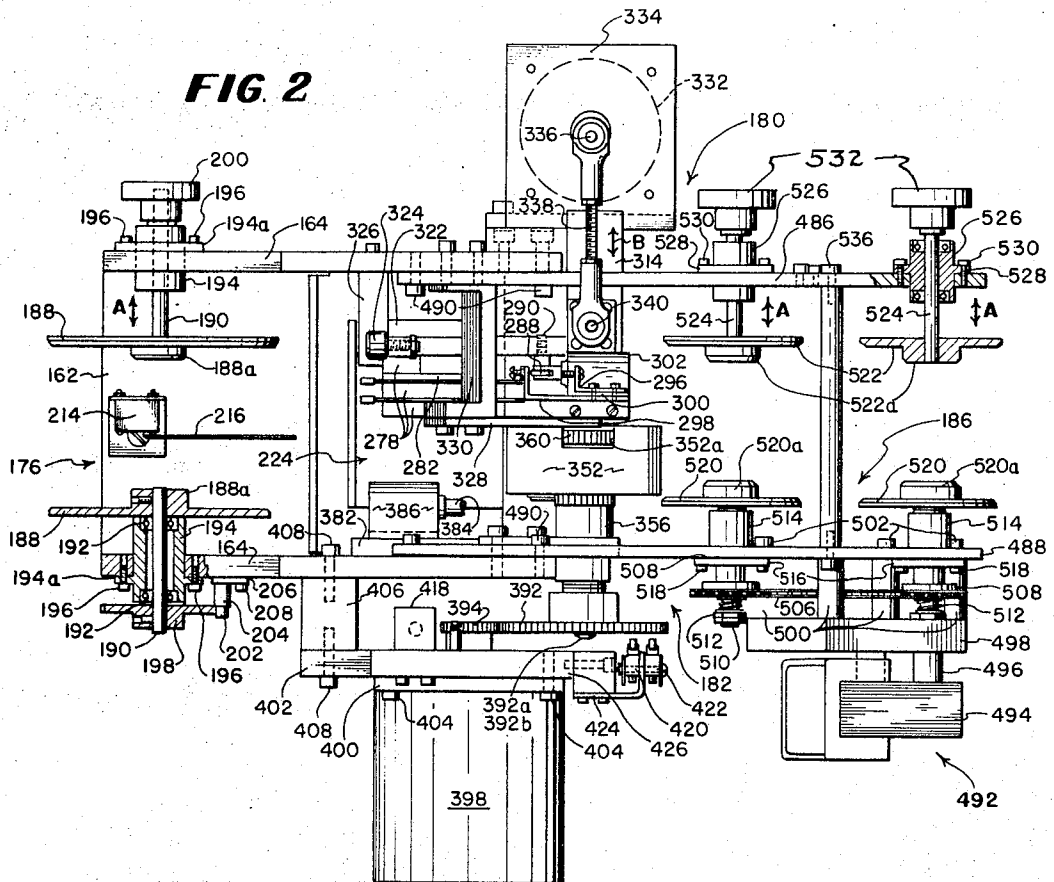
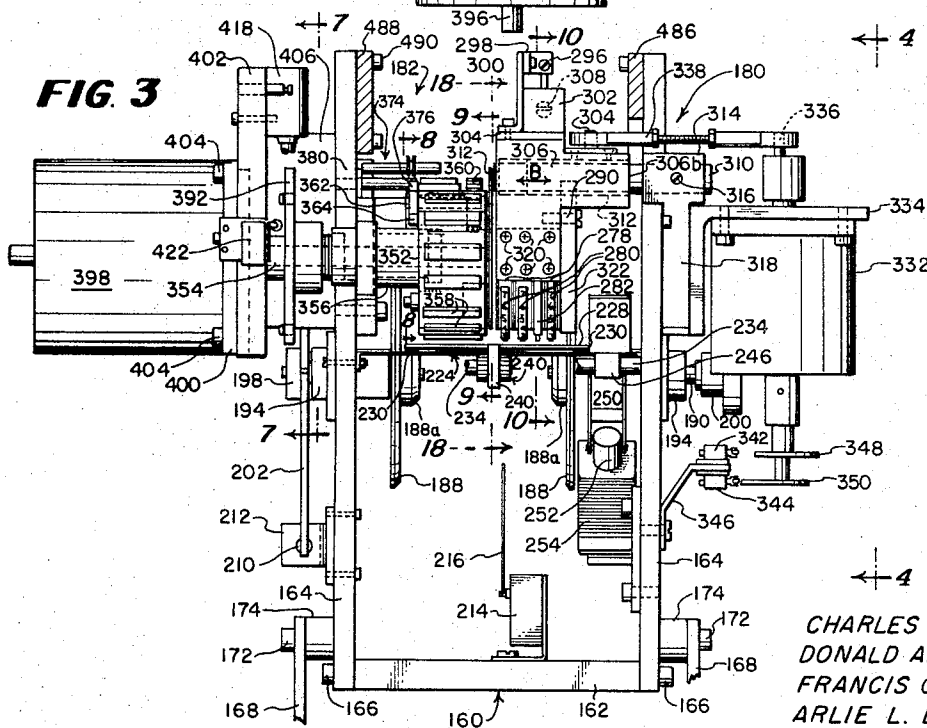


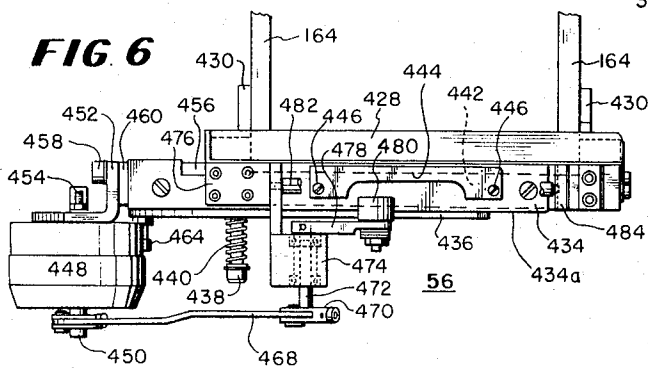
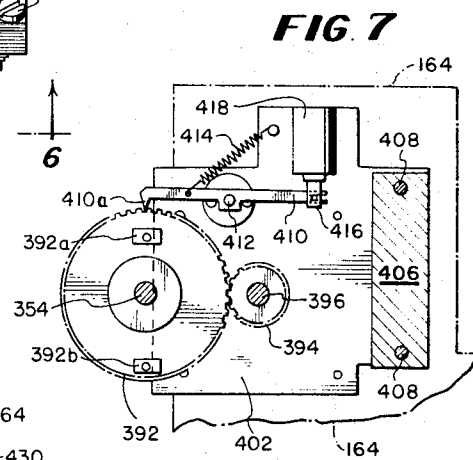
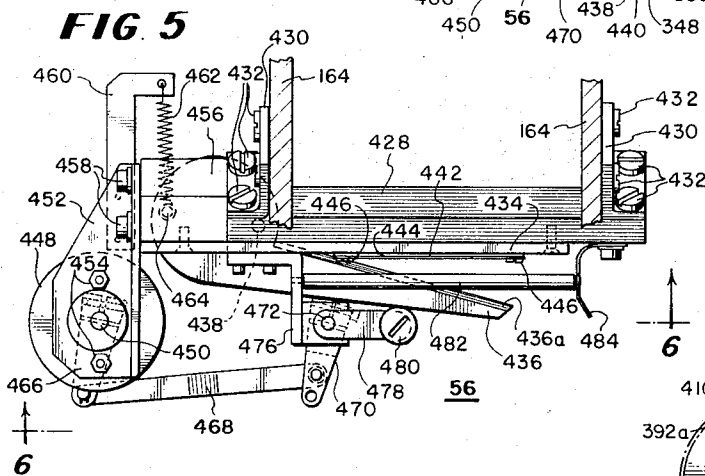
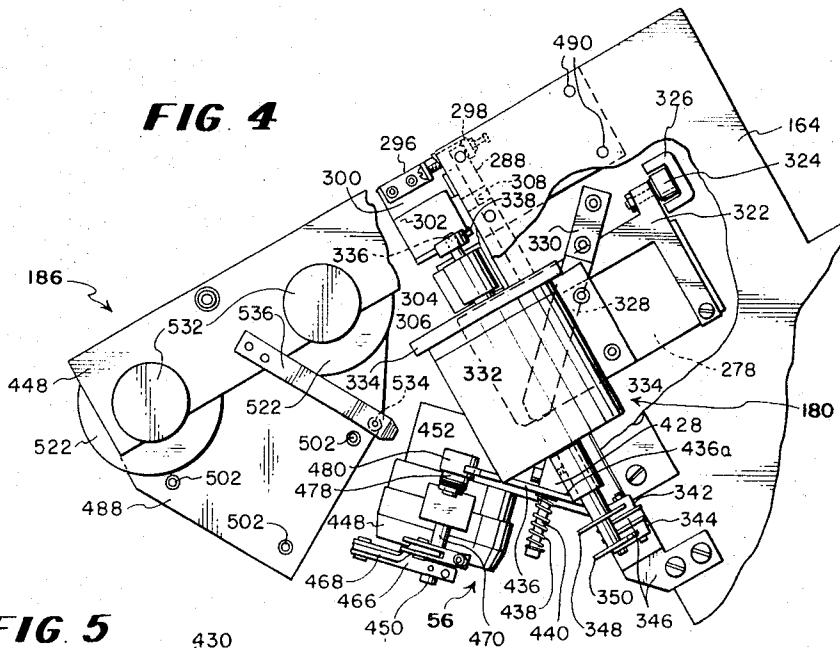
FIG 3



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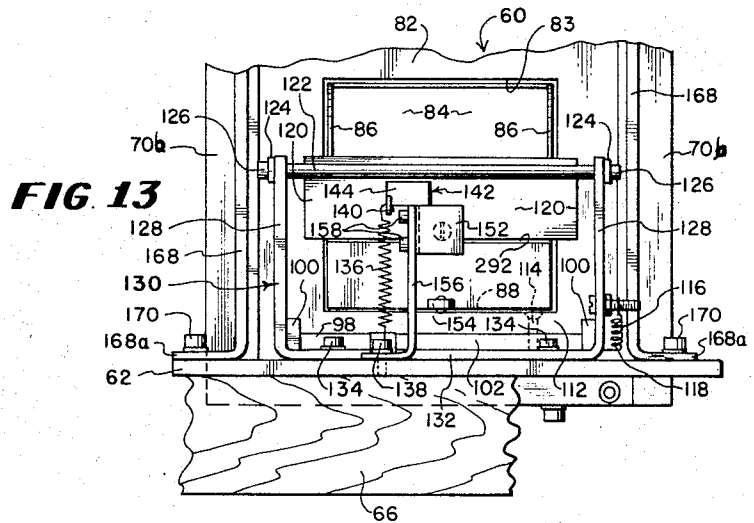
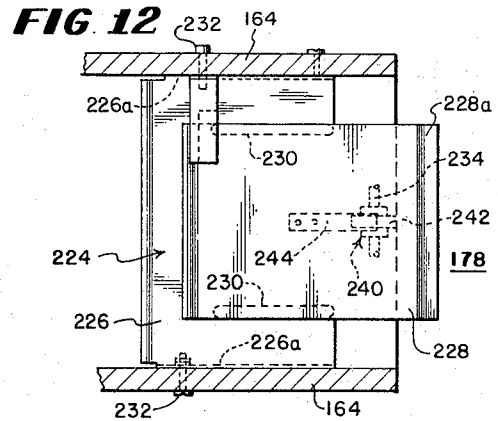
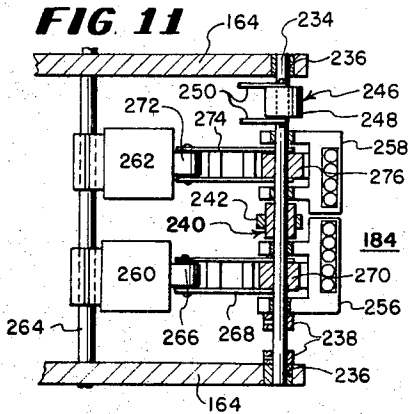
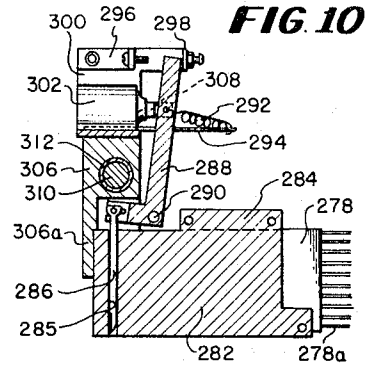
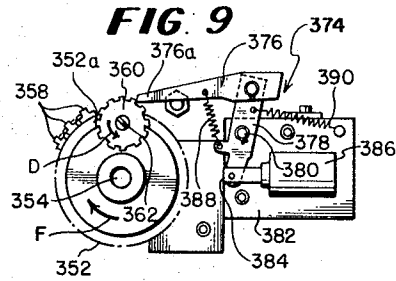
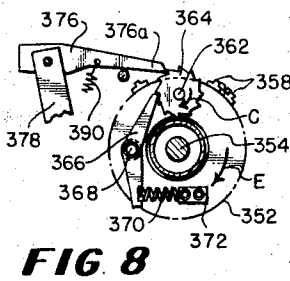
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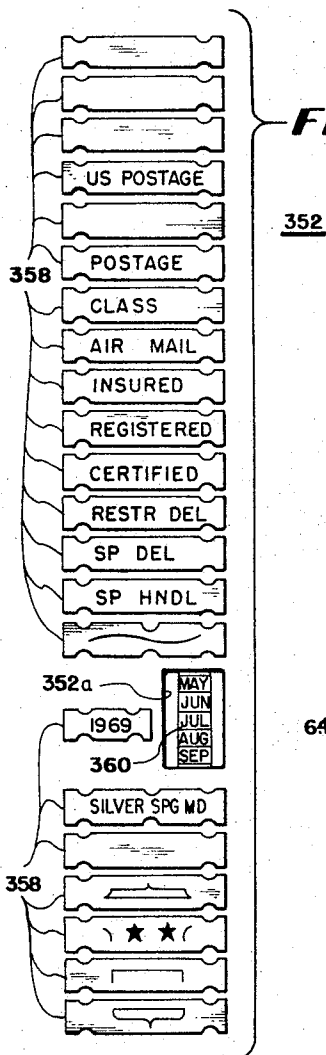
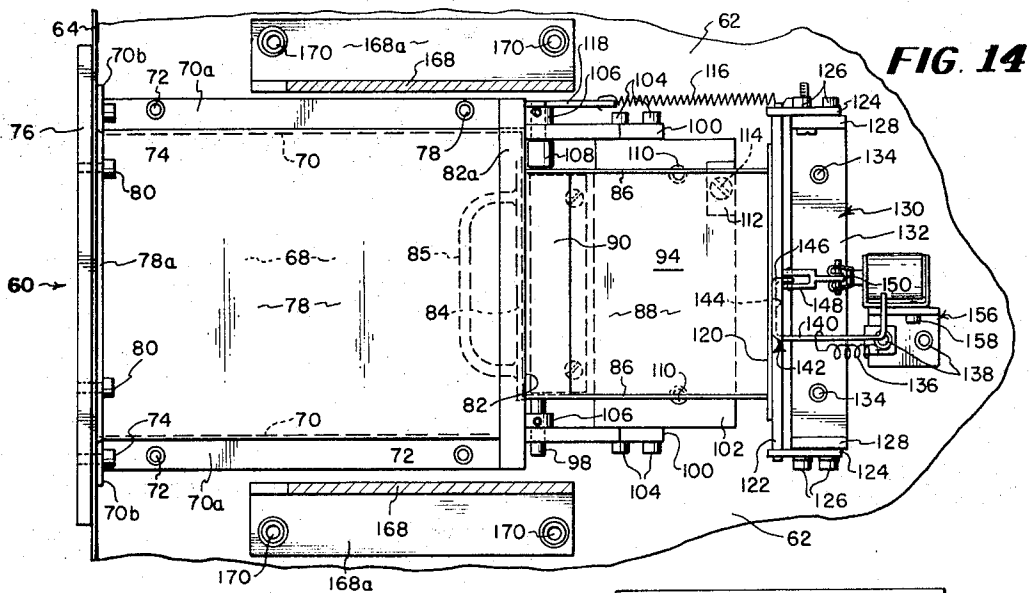
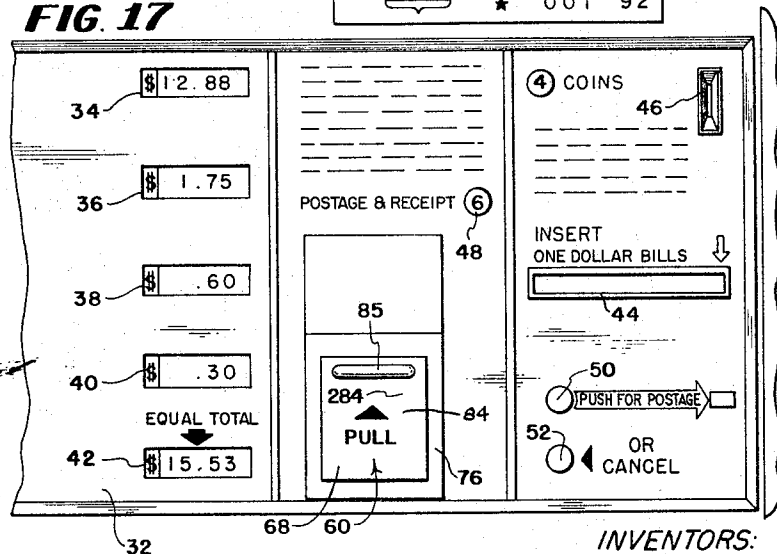


FIG. 15

US POSTAGE	★	\$ 21.68
POSTAGE	★	\$ 20.08
AIR MAIL	★	
INSURED	★	\$ 00.50
RESTR DEL	★	\$ 00.50
SP ¹ DEL	★	\$ 00.60
	★	
1970 JUL	★	22 P M D
SILVER SPG MD	★	000 00
	★	
	★	
	★	
	★	001 92

FIG. 17



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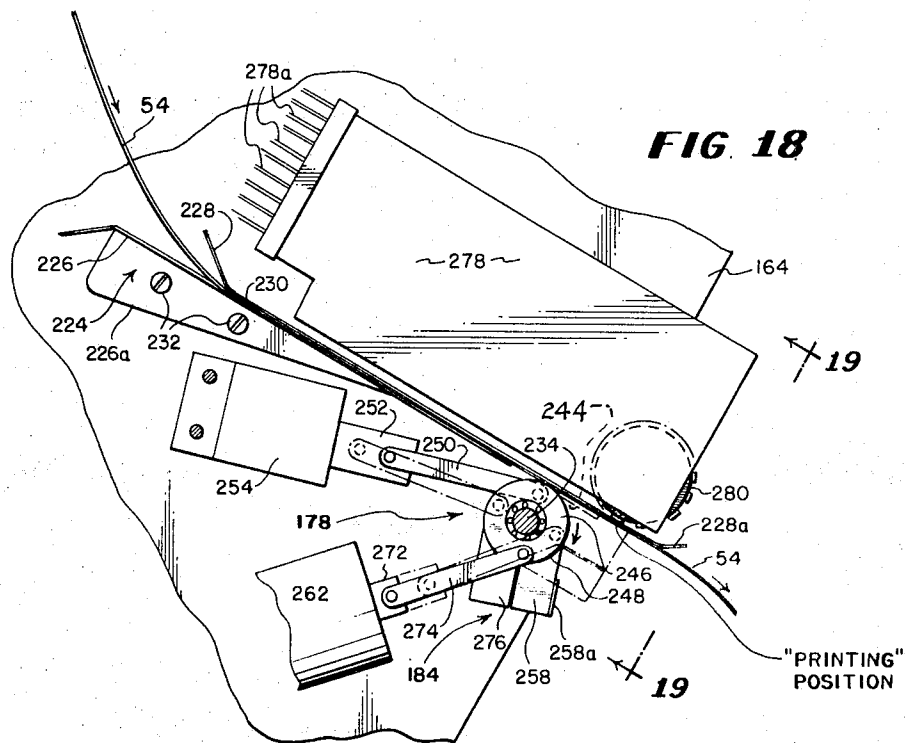


FIG 20

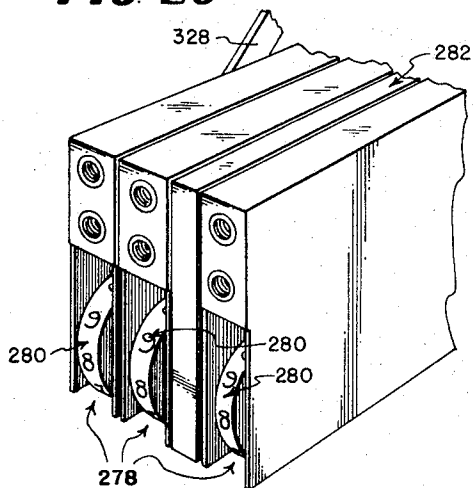
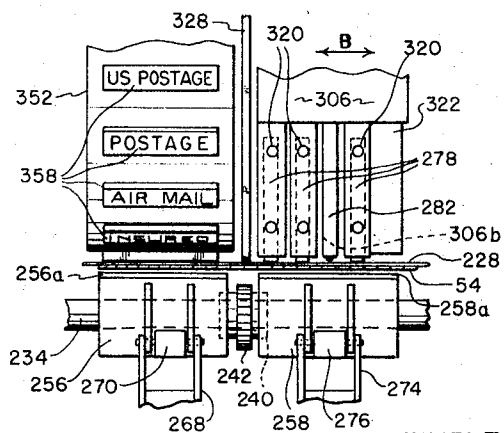


FIG 19



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TICKET PRINTER

The present invention relates to a new and improved ticket printer and, more particularly, to an automatically controlled printing device adapted to print postage information on tickets cut from a continuous web or sheet for use in connection with a self-service parcel post mailing facility. The automatic parcel post mailing facility referred to is a self-service, coin or dollar-bill operated vending device that automatically determines the postage to be charged for a letter or parcel based both on customer generated information and on predetermined rates, and then provides a calculated output in the form of a printed ticket form. The ticket is affixed to the letter or parcel and indicates the charges and amount of the postage that has been paid. The customer then places the ticketed letter or parcel in a depository box for mailing. The automatic parcel post facility includes a scale compartment upon which the customer places the parcel or letter for weighing and also includes a panel having a plurality of buttons therein wherein the customer can select the desired class of postage, insurance, and categories such as registration, special delivery, special handling, certified delivery or restricted delivery that may be desired for the particular mailing. The panel also includes a coin receiving slot and a dollar-bill changer with the customary coin return slot. After the customer generated input has been received by the device, the parcel post mailing facility calculates the postage due and flashes an indication thereof so that the customer may then place the required amount of money in the coin slot. When the proper coins have been received, the ticket printer is activated to print out a postage ticket showing thereon the specific and total charges involved. The customer picks up a double layer ticket in a depository box in the machine. One layer of the ticket is attached to the letter or package which is then placed in the mailing depository and the other layer of the ticket is retained as a receipt by the customer.

The ticket printer of the present invention is especially adapted for use in conjunction with the automatic, self-service parcel post mailing facility heretofore described; however, the printer is also useful in other applications wherein the printer may be activated by signals generated from a special or general purpose computer to perform selected printing tasks, as will be described hereinafter.

In copending U.S. Pat. application, Ser. No. 217,995, filed Dec. 30, 1971 and assigned to the same assignee as the present application, there is shown a control system for activating and operating the printing apparatus herein described, and attention should be directed to the aforementioned copending patent application which is incorporated herein by reference.

Command instructions to the printing apparatus are received from the associated electronic control system, and the instructions are generated by preselected rate information and customer generated information. The command signals are fed to the printing apparatus, causing the postage ticket to be printed and dispensed to the customer. A record of the transaction is maintained on a record roll of web material which is kept within the housing of the facility.

It is an object of the present invention to provide a new and improved ticket printing apparatus of the character described.

More particularly, it is an object of the present invention to provide a new and improved ticket printing apparatus which is adapted to receive and act upon operational command instructions received from an electronic control system.

It is another object of the present invention to provide a new and improved printing apparatus capable of printing lines of typed indicia on a continuous multi-layer web in response to command instructions received from an electronic controller and thereafter severing portions of selected layers of the web into tickets which are dispensed to a customer separately from the remaining portion of the continuous web which is retained within the device as a continuous record of the transactions.

An object of the present invention is to provide a new and improved printer of the character described having in combination, a printing drum for printing informational material on a ticket web together with a plurality of modular printers for printing selected numerical information on the same lines.

The foregoing and other objects of the present invention are accomplished in a new and improved ticket printing apparatus for use in printing tickets on a multi-layer, elongated web of thin, flexible sheet material. The apparatus comprises means for advancing the web across a printing station and a printing assembly is positioned at the print station which comprises a primary drum mounted for rotation about a first axis generally transverse and parallel to the path of travel of the web. A plurality of printing indicia are circumferentially spaced along the periphery of the drum and a secondary drum is mounted on the primary drum for rotation relative thereto about a secondary axis parallel of the first. A plurality of printing indicia are circumferentially spaced along the periphery of the secondary drum and indexing means is provided for rotating the secondary drum relative to the primary in order to position a selected indicia on the former alongside a line on the periphery of the primary drum for simultaneous printing.

Primary indexing means is provided for rotating the primary drum to place any selected indicia thereon into a printing position adjacent the web. Print hammer means is provided for swinging movement about an axis parallel of the first axis from a downward hanging, rest position to an upward, printing position wherein the hammer means urges said web into momentary contact against the selected line of type selected on the drum. After the printing of a number of lines on the web comprising a postage ticket, a prescribed length of several layers of the web containing the printed matter thereon is severed and the severed ticket is dropped into a dispensing assembly for pickup by the customer. When the customer opens a door in the dispenser and withdraws the ticket, the printer is set up for the next cycle of operation.

For a better understanding of the present invention, reference should be had to the following detailed description taken in conjunction with the drawings, in which:

FIG. 1 is a side elevational view of a new and improved ticket printing apparatus constructed in accordance with the features of the present invention;

FIG. 2 is a top elevational view of a printing apparatus looking in the direction of arrows 2—2 of FIG. 1;

FIG. 3 is a rear elevational view of the printing appa-

ratus taken substantially along the line 3—3 of FIG. 1;

FIG. 4 is a fragmentary, side elevational view of the printing apparatus looking in the direction of the arrows 4—4 of FIG. 3;

FIG. 5 is a top view of a ticket cut-off subassembly of the printing apparatus, taken substantially along line 5—5 of FIG. 1;

FIG. 6 is a rear elevational view of the cut-off subassembly taken substantially along line 6—6 of FIG. 5;

FIG. 7 is a fragmentary, vertical, sectional view of the printing apparatus taken substantially along line 7—7 of FIG. 3;

FIG. 8 is a fragmentary, sectional view of the apparatus taken substantially along line 8—8 of FIG. 3;

FIG. 9 is a fragmentary, sectional view of the apparatus taken substantially along line 9—9 of FIG. 3;

FIG. 10 is a fragmentary, sectional view of the apparatus taken substantially along line 10—10 of FIG. 3;

FIG. 11 is a fragmentary, plan, sectional view of the apparatus taken substantially along line 11—11 of FIG. 1 illustrating the print hammer control subassembly;

FIG. 12 is a fragmentary, sectional view of the apparatus taken substantially along line 12—12 of FIG. 1 illustrating the paper guide and advancing subassembly;

FIG. 13 is a fragmentary, rear, elevational view of the apparatus illustrating the ticket dispenser taken substantially along line 13—13 of FIG. 1;

FIG. 14 is a horizontal, sectional view of the apparatus taken substantially along line 14—14 of FIG. 1, illustrating the ticket dispenser;

FIG. 15 illustrates a typical postage ticket as printed with the apparatus of the present invention;

FIG. 16 is a schematic diagram illustrating the arrangement of printing bars on the primary print drum of the apparatus;

FIG. 17 is a fragmentary, front, elevational view of a typical, automatic, self-service type parcel post mailing facility equipped with the printing apparatus of the present invention taken substantially along lines 17—17 of FIG. 1;

FIG. 18 is an enlarged, fragmentary, vertical, sectional view of the printing apparatus taken substantially along line 18—18 of FIG. 3 showing a print module and the print hammers;

FIG. 19 is an enlarged, fragmentary, elevational view of the printing apparatus taken substantially along line 19—19 of FIG. 18; and

FIG. 20 is a fragmentary elevational view showing a ganged array of print modules and decimal point printer of the apparatus.

Referring now, more specifically, to the drawings, therein is illustrated a new and improved postage ticket printer referred to generally by the reference numeral 30 (FIG. 1) and constructed in accordance with the features of the present invention. The ticket printer 30 is especially adapted for use in an automatic, self-service, parcel post mailing facility, as described, and a portion of the front panel of a typical mailing facility is shown in FIG. 17 identified by the reference numeral 32.

A customer wishing to use the self-service parcel post mailing facility 32 places his package or letter on a scale means not shown, which delivers an input based on the weight of the package to an electronic control unit, as described in the aforementioned copending patent application. The package weight input informa-

tion, together with other customer generated information, as selected by pushing control buttons on the front panel (not shown), is integrated in the electronic control system which then activates the printer 30 to operate and print out a postage ticket. Information as to the destination, the class, whether airmail or not, the amount of insurance required, whether the package should be sent registered or certified, special delivery or special handling, is input through the pushing of selected buttons, and the control system then calculates the total mailing cost or postage due and registers the amounts on registers which are viewable by the customer through windows 34, 36, 38, and 40 (FIG. 17) on the front panel of the mailing facility. The sum total of all charges required is then registered in a lower window or total registering window 42. If the customer wishes to mail the package, the proper amount of coins is deposited in a coin slot 46 and a bill changer 44 is provided to furnish the needed coins. When the total amount deposited in the coin slot 46 is equal to the total postage in the window 42, a postage and receipt light, indicated as 48, is illuminated. The customer then pushes a button 50 labeled "Push for Postage," or he may cancel and obtain a refund by pushing a button 52, in which case his money will be returned in a coin return receptacle (not shown). Upon pushing the postage button 50, the printing apparatus 30 of the invention is activated to print a postage ticket on a multilayer continuous web of sheet material, indicated by the reference numeral 54. After the ticket printing operation is completed, a cut-off mechanism 56, best shown in FIGS. 4, 5, and 6, is activated to sever two layers of the web into a printed ticket (generally indicated as 58, in FIG. 1). One layer of the ticket has a gummed face for adhesive attachment to the package or letter, and the second layer of the ticket is retained by the customer as a receipt. The printer ticket, after cut-off from the main web, is dropped into a receptacle provided in a dispenser subassembly, generally indicated by the reference numeral 60 (FIG. 1). A general form of printed postage ticket and/or receipt produced by the printer 30 is shown in FIG. 58. The ticket contains mainly alphabetical printed matter on the left-hand side, and corresponding numerical cost amounts are provided on the right. The time and date of ticket printing are also indicated, as shown.

The ticket printer 30 is supported on a horizontal base plate or other suitable structure 62 (FIGS. 1, 13, and 14) which extends rearwardly of an outer front panel 64 (FIGS. 1 and 17) of the parcel post mailing facility 32. The base 62 may comprise a sheet of plywood or metal and may utilize structural members, such as 2 × 4's, 66 (FIGS. 1 and 13) for reinforcing the same.

In accordance with the present invention the ticket dispenser subassembly 60 includes an outer hand receptacle generally referred to as 68, defined by a pair of sidewalls 70, having base flanges 70a along the lower edge attached to the base 62 by cap screws 72, as best shown in FIG. 14. The sidewalls 70 include forward edge flanges 70b attached to the rear face of the mailing facility front panel 64 by means of cap screws 74, and these cap screws project outwardly through the panel to support a rectangular frame member of relatively thick plastic material, generally indicated as 76, which surrounds and defines an outer hand receiving opening of the outer ticket chamber 68. The outer

chamber includes a rearwardly and downwardly sloping integral top wall 78 having an upwardly extending flange 78a at the forward edge which is secured to the front panel 64 and the rectangular frame 76 by a pair of cap screws 80 (FIG. 14). The chamber also includes a rear partition wall 82 with an upward forwardly extending flange 82a secured to the top wall 78 along the rearward edge, as best shown in FIG. 1, to provide the needed security for the facility. The rear wall 82 defines therein a rectangular opening 83 which is in communication with a rearward portion of the dispenser subassembly.

The opening 83 is normally closed by a pivotally mounted door generally indicated as 84. The door 84 is slightly larger in dimension than the opening 83 to provide marginal edge cover or overlap around the periphery of the opening and a handle 85 is mounted on the front of the door so that a customer may open the door at the desired time to obtain a printed postage ticket 58.

As best shown in FIG. 1, the door is pivotally movable from a closed, vertical position (shown in solid lines) to an open position (shown in dotted lines), wherein the area behind the wall 82 is accessible through the opening 83. As shown in FIG. 17, the front face of the door is provided with printed indicia indicating the handle should be pulled when postage and receipt light 48 is illuminated.

The dispenser subassembly 60 includes a rear ticket receptacle formed by a pair of arcuate sidewalls extending rearwardly of the door 84 and a bottom wall 88 which normally rests in a horizontal position when the door is closed. In addition to the sidewalls 86 and the bottom wall 88, the rear ticket receptacle includes a narrow top wall 90 extending rearwardly of the door, adjacent the upper edge thereof, and a relatively short, vertical, back wall 92 extending at right angles upwardly from the bottom wall 88 at the rearward edge thereof. The door 84 and the walls 86, 88, 90, and 92 provide a secure and strong rear receptacle 94 for receiving tickets for dispensing to the customer through the opening 83 when the door is unlocked and opened. The printed tickets 58, after being cut off from the remainder of the continuous web 54 by a ticket cut-off subassembly 56 (as best shown in FIG. 1), drop into the rear receptacle 94. When the door is unlocked and then opened by the customer, the postage ticket may then be retrieved manually. A suitable baffle structure 96 (FIG. 1) may be provided to insure that the tickets 58 are directed downwardly into the receptacle 94. The door 84 is pivotal between the vertical, door-closed position and the open position, and the receptacle is supported on an axle 98 adjacent the forward edge of the bottom wall 88. The pivot axle is supported on a pair of upstanding bearing members 100 which are secured to a flat baseplate 102 by cap screws 104. In order to laterally center the receptacle 94 with the sidewalls 86 spaced relatively evenly between the side edges of the access opening 83, a pair of bearing collars 106 (FIG. 14) are secured on the shaft 98 and a spacer block 108 is provided between one of the bearing members 100 and an adjacent sidewall 86 of the ticket receptacle. The baseplate 102 is secured in place on the base 62 by cap screws 110 and a stop block 112 of "Nylon" or other suitable material is mounted on the base 102 by a cap screw 114, to normally maintain the level of the bottom wall 88 when the door 84 is in the vertical or

closed position as shown in FIG. 1. The access door 84 is moved to the open position by a customer's pulling forwardly on the handle 85, and as soon as the handle is released, the door is biased to pivot in a clockwise direction (FIG. 1) to the closed position by means of a spring 116 (FIG. 14). The forward end of the spring is connected to a lever arm 118 secured on the outer end of the pivot support shaft 98, and when the customer releases the handle 85 the spring 116 acts to close the door. In the closed position, the rear receptacle 94 is again ready to receive by gravity fall the next printed postage ticket 58 from the ticket cut-off subassembly 56.

In order to retain the door 84 and the receptacle 94 in the door-closed position and prevent unauthorized access to the interior of the facility, the dispenser subassembly 60 includes a latching mechanism comprising a latching bar or plate 120 supported in pendulum fashion on a horizontal pivot axle 122. The pivot axle 122 is journaled at opposite ends in a pair of bearing brackets 124 secured by cap screws 126 to the upper ends of a pair of upstanding legs 128 of a U-shaped mounting bracket generally indicated as 130 (FIG. 13). The U-shaped bracket 130 includes a lower, bight portion 132 secured to the base 62 by a pair of cap screws 134. The lower edge of the latch plate 120 normally engages the upper edge of the receptacle back wall 92 (as best shown in FIG. 1) and locks or prevents the door 84 from being opened or pivoted in a counterclockwise direction. Normally, the latch bar 120 is maintained in the engaged or latched position with the wall 92 by means of a latch spring 136 having its lower end secured by a cap screw 138 to the base and its upper end connected to a rearwardly extending bracket arm 140 of a U-shaped bracket member 142 having a bight portion 144 secured to the rear face of the latch plate 120 (FIG. 14).

In order to provide controlled unlatching of the door, a short rearwardly projecting arm 126 is provided on the U-shaped bracket 142, and this short arm is pivotally interconnected with a clevis 148 (FIG. 14) which in turn is pivotally connected to the armature 150 of a door latching and release solenoid 152. When the solenoid 152 is energized, the armature 150 is drawn rearwardly (to the right in FIGS. 1 and 4), and this pivots the latch bar in a counterclockwise direction (FIG. 1) out of latching engagement with the back wall 92 of the ticket receptacle 94. When this occurs, the customer can freely open the access door 84 and can readily retrieve the double layer printed postage ticket 58. The solenoid 152 is secured on the upstanding leg of an L-shaped bracket 156 by cap screws 158, and the bracket is secured onto the base 62 by cap screws 138 (FIGS. 1 and 13).

When the latching solenoid 152 is de-energized, the latching spring 136 is then operable to pivot the latching plate 120 in a clockwise direction into the latched position. In order to reduce wear on the latching plate 120 as the ticket receptacle 94 is returned to the door-closed position under the influence of the spring 116, a "Nylon" bumper 154 is mounted on the lower rearward corner of the wall 92, and as the receptacle returns to the closed position, the bumper engages the latch plate 120 and momentarily moves the latching plate out of engagement with the edges of the returning wall 92 of the receptacle. After return of the ticket receptacle 94 to the door-closed position, the latch bar

120 again latches or engages the upper edge of the wall 92 of the receptacle, preventing the door from being opened. Because of the relatively large area of latching engagement between the plate 120 and wall 92, it is extremely difficult for a person to jimmy or open the door 84 with a screwdriver or other tool.

From the foregoing, it will be seen that ticket dispenser subassembly 60 includes an outer hand chamber or receptacle 68 framed by the member 76 on the front panel 64. The door 84 is opened after unlatching by manual forward pull on the handle 85 so that a printed postage ticket 58 in the rear receptacle 94 may be retrieved or withdrawn for use. When the door handle 85 is subsequently released, the door automatically returns to a door-closed position (as shown) and is held in this position by the latching plate 120 until the next cycle of operation of the printer is initiated and the solenoid 152 is again energized.

In accordance with the present invention, the printing apparatus 30 includes a generally U-shaped chassis structure 160 (FIGS. 1 and 3) which comprises a rectangular baseplate 162 of relatively thick material and a pair of upstanding parallel side plates 164 secured along the lower edges to opposite longitudinal side edges of the baseplate by a plurality of cap screws 166. The chassis structure 160 is supported on a pair of upstanding support brackets 168 having flanges 168a along the lower edge which are secured to the base 62 by cap screws 170. As best shown in FIGS. 1 and 14, the brackets 168 are disposed on opposite sides of vertical sidewalls 70 of the outer dispenser receptacle 68 of the dispenser subassembly 60, and the brackets support the U-shaped chassis structure of the printer with the base 162 spaced above and generally parallel to the upper or top wall 78 of the outer dispenser receptacle. As shown in FIG. 3, the upper edge portions of the support brackets 168 are secured to the adjacent side plates 164 of the printer chassis structure by a plurality of cap screws 172 and a pair of longitudinally extending spacer blocks 174. The upstanding parallel sides 164 of the printer chassis provide support for a number of subassemblies in the printing apparatus, and these subassemblies include the postage ticket cut-off subassembly 56 previously mentioned, a paper supply subassembly generally indicated as 176 adjacent the forward end of the chassis (FIGS. 1 and 2), a paper advance subassembly 178 (FIGS. 1, 12, and 18), a print module and stepping motor subassembly 180 (FIGS. 2 and 3), a drum and month advance subassembly 182 (FIGS. 2 and 3), a print hammer control subassembly 184 (FIGS. 1, 11, and 18), and a paper take-up subassembly 186 (FIGS. 1 and 2).

As best shown in FIG. 1, a roll 54a of paper webbing 54 having a total of four paper layers, three of which are self-carboning type, is supported by the paper supply system 176, and the continuous paper web is fed from the roll into the paper advance mechanism 178 and past the printing station. At the printing position, the print module and stepping subassembly 180, the drum and month advance subassembly 182, and the print hammer control subassembly 184 are activated to print the desired information on the multilayer self-carboning web. After the printing takes place, two plies of the web are passed through the ticket cut-off subassembly 56 wherein individual postage tickets of finite length are delivered into the rear receptacle 94 of the paper take-up subassembly 60. The remaining two plies

of the continuous web 54 are rolled up on a roll for storage in the paper take-up subassembly 186 at the rearward end of the printing apparatus.

The paper supply mechanism 176 includes a pair of flanged support wheels 188 for supporting the opposite ends of the roll 54a of the paper web. The paper roll is usually wound on a hollow core or spool, and the opposite ends of the roll core or spool are carried on cylindrical projections 188a which extend inwardly from the inner surfaces of the support wheels. The support wheels 188 are mounted on the inner ends of respective shafts 190 which, in turn, are journaled in pairs of spaced apart bearings 192 carried adjacent opposite ends of hollow support sleeves 194. The sleeves 194 project through suitable openings formed in the chassis side plates 164 and the sleeves include radial mounting flanges 194a which are secured to the side plates by cap screws 196. The shafts 190 are journaled for rotation in the bearings 192; however, one of the shafts 190 (the lower one in FIG. 2) can be selectively locked against rotation, when desired, to prevent unwinding of the paper web from the roll core supported by the wheels 188. For this purpose, a locking gear 198 is provided on the outer end of the shaft. The gear 198 prevents unwanted rotation of the paper roll 54a supported by the wheels 188 when the gear is engaged by a locking lever 202, having a gear tooth engaging tip 202a at the upper end (FIG. 1). The locking lever is pivotally mounted on a shaft 204 which is journaled in a flanged support bearing 206 secured to the chassis side plate 164 by cap screws 208. The lower end of the locking lever 202 is pivotally connected to the outer end of an armature 210 of a paper supply roll, locking solenoid generally indicated as 212. The solenoid 212 is mounted on the chassis side plate 164 by suitable fasteners and the armature is biased outwardly of the coil by spring means (not shown) so that the upper end 202a of the locking lever is normally engaged in a space between a pair of teeth on the locking gear 198 to prevent rotation thereof. When the solenoid 212 is energized, the armature 210 is retracted inwardly into the coil, and this pivots the locking lever 202 in a clockwise direction (FIG. 1) so that the upper tip 202a moves out of engagement with the teeth on the locking gear, and thus permits the roll of paper webbing 54 carried on the wheels 188 to be advanced for printing.

The opposite shaft 190 is provided with a control knob 200 on the outer end for use in longitudinally shifting the shaft inwardly and outwardly in the direction of the arrow "A" for loading or unloading of a roll of paper or a roll core onto the wheels 188. The inwardly projecting hub portions 188a of the wheels are press fitted into the internal bore of the roll core or spool and when a fresh roll of paper web is inserted into position, the roll core or spool interconnects the shafts 190 to rotate together.

In order that the printing apparatus is automatically shut down or disabled, when the supply of paper web 54 on the supply roll is at a selected low level, a paper-sensing limit switch, indicated by the numeral 214, is provided and is secured in place on the chassis base 162 by suitable fastening means. The paper-sensing limit switch is activated by an upstanding spring wire sensor 216 which is adapted to bear lightly against the paper contained on the roll supported in the wheels 188.

Referring to FIG. 1, as the paper supply on the roll is reduced by usage of the printer, the spring wire 216 pivots in a counterclockwise direction until finally, at a selected low paper level or a complete exhaustion of paper (if desired), the limit switch is actuated, causing the printing apparatus to be disabled and an appropriate alarm means is activated.

When the solenoid 212 is momentarily energized to retract the tip 202a of the locking lever from the locking gear 198, the four-ply paper web 54 may be withdrawn or unrolled from the roll 54a and is pulled up over a floating dancer roll bar indicated at 218. The roll bar is resiliently supported at opposite ends by a pair of coil springs 220 having their upper ends secured to the chassis side plates 164 by cap screws 222, and the roll bar maintains tension on the paper web. The paper web passes over the roll bar and is fed downwardly and rearwardly into the paper advance subassembly 178, which includes a paper guide assembly 224, best shown in FIGS. 12 and 18.

The guide assembly includes a lower baseplate 226 formed of thin sheet material and an upper guide plate 228 of similar material. Spacing is maintained between the guide plates by a pair of side spacers 230 and the spacers and plates form a paper receiving slot for the paper web 54, as best shown in FIGS. 3, 12, and 18. The baseplate 226 extends forwardly of the forward end of the upper plate 228 and is considerably wider in transverse dimension. The lower plate is mounted on down-turned, flangelike, side edge portions 226a which are secured to the inside surfaces of the side plates 164 by suitable fasteners 232 (FIG. 18). Forward and rearward ends of the spacers 230, which define the paper receiving slot, are rounded, as best shown in FIG. 12, to prevent paper jams or hangups, and the forward ends of the upper and lower sheets are bent upwardly and downwardly, respectively, as shown in FIG. 18, to facilitate feeding of the paper web into the paper receiving slot defined in the guide.

The upper plate 228 projects rearwardly beyond the rearward edge of the side frame members 164 and is bent upwardly in a narrow lip portion 228a (FIG. 18). As best shown in FIG. 18, after the paper web 54 passes rearwardly beyond the upturned lip at the rearward end of the paper sheet, it is passed on toward the cut-off subassembly 56 and the paper take-off subassembly 186.

In order to provide for incremental line-by-line advancing of the web 54, for printing one line at a time thereon by the print module and stepping subassembly 180, the drum and month advance subassembly 182 and the print hammer control subassembly 184, the printing apparatus 30 includes a transverse platen support rod 234 which extends transversely between the opposite side plates 164 of the chassis at a point slightly rearwardly of the rearward edge of the lower plate 226 of the guide 224. As best shown in FIG. 11, the platen support rod is mounted for rotation in bearing members 236 mounted in suitable recesses in the chassis side plates 164. A blocking collar 238 is provided to prevent longitudinal shifting of the platen support rod as it is rotated in its support bearings.

A paper drive wheel 240 is mounted at the center of the platen support rod 234, and the drive wheel is provided with an outer traction tire 242 for driving engagement with the underside of the paper web 54. The paper web is biased downwardly against the traction

tire by means of a leaf spring 244 (FIG. 12) in order to insure that the web is advanced a line each time the support rod 244 is rotated. Rotation of the rod is in increments by an amount as required to provide the desired spacing between lines of printing on the postage ticket.

The platen support rod 234 is rotated only in a clockwise direction (FIG. 18) in precise angular amounts through a one-way clutch assembly 246 (best shown in FIGS. 11 and 18), which includes an outer race 248 pivotally connected to the outer end of an actuating arm 250. The opposite end of the arm is connected to an armature 252 of a push-type spring returned solenoid 254. The solenoid 254 is mounted on a side plate 164 of the chassis with suitable fastening means. When the solenoid is energized, the armature 252 is projected rearwardly so that the linking arm 250 drives the outer race 248 of the one-way clutch mechanism 246 to rotate the platen support rod in a clockwise direction by a desired amount. Each increment of shaft rotation advances the paper web 54 to the next line of printing. When the solenoid 254 is de-energized, the armature 252 is spring retracted and the one-way clutch assembly 246 permits relative rotation between the outer race 248 (counterclockwise FIG. 18) and the platen support rod 234. It will thus be seen that each time the solenoid 254 is energized, the platen support rod 234 is driven to advance the paper web 54 an incremental amount equal to the spacing desired between lines of printing on the web. When the solenoid armature 252 is retracted, the paper web 54 is pinched between the traction tire 242 and the bias spring 244 and movement of the paper web in a reverse direction is prevented.

Printing information on the four-ply, self-carboning, multilayer web 54 is accomplished at the printing position or station (FIG. 18) which is located slightly to the rear (or right) of the platen support rod 234. The print hammer control subassembly 184, in combination with the print module and stepping subassembly 180 and the print drum and month advance subassembly 182 are effective to print selected numerical data on the left- and right-hand side of a postage ticket 58, as shown in FIG. 15.

In accordance with the present invention, the print hammer control subassembly 184 includes a pair of printing platens 256 and 258 mounted for free swinging action on the platen support rod 234, as best shown in FIGS. 11, 18, and 19. The rearward or printing face of the platens include replaceable pressure pads 256a and 258a, respectively, which pads are designed to urge the paper web 54 upwardly into printing contact with type indicia carried by the drum and month subassembly and the print module and stepping subassembly. As best shown in FIG. 11, each printing platen includes a pair of supporting hanger arms journaled on the platen support rods 234 to permit free swinging action of the printing platens. As shown in FIG. 18, when in the rest position, the printing platens 256 and 258 hang vertically downwardly, and when the printing hammer control subassembly is actuated, the platens swing upwardly in a counterclockwise direction until the pressure pads strike to effect printing of the paper web 54. The swinging action of one or both of the printing platens 256 or 258 is initiated by energizing one or both of a pair of push-type, spring-return solenoids 260 and 262, respectively. The solenoids 260 and 262 are con-

nected at the forward end to a solenoid support rod 264 extending between the chassis side plates 164.

The printing solenoid 260 controlling the printing platen 256 includes a spring-retracted armature 266 which is thrust outwardly (rearwardly) when the solenoid is energized. The armature 266 is pivotally connected to a linkage member 268 which, in turn, is pivotally connected to an actuating lever 270 journaled for free swinging movement on the platen support rod 234, as best shown in FIGS. 11 and 19. Similarly, solenoid 262 is provided with a spring retracted armature 272 pivotally connected to a linking member 274, which in turn is pivotally connected to an actuating lever 276 journaled in free-swinging action on the platen support rod 234 for activating the print platen 258 when the solenoid is energized.

From the foregoing, it will be seen that when the printing solenoids 260 and 262 are energized, the printing platens 256 and 258, respectively, are actuated upwardly in a clockwise direction (as viewed in FIG. 18) to effect printing on the paper web 54 at the printing station. The solenoids 260 and 262 may be energized independently of one another or may be energized simultaneously if printed material is to appear on both the left-hand and right-hand sides of a postage ticket in a particular line thereon.

In accordance with the present invention, the print module and stepping subassembly 180 cooperates with the print hammer and control subassembly 184 to print selected indicia on the right-hand half of a postage ticket 58. For this purpose, the print module and stepping subassembly includes three decade-type, electronically controlled printing modules which are arranged in a side-by-side, ganged or stacked configuration, as best shown in FIGS. 19 and 20. Suitable print modules are available from International Telephone and Telegraph Corporation, such as their Model CP-Decade Printer. Each printing module includes a rotatable print wheel 280 having a plurality of spaced apart type characters around the circumference or periphery. The type characters include the digits 0 through 9, the letters A, M, and P, and a dollar sign.

As best shown in FIG. 20, between the outside print module and the center module in the gang, there is provided a decimal point printing system indicated by the number 282. As shown in FIG. 15, the printed material on the right-hand side of the ticket 58 is printed in six figure columns, and the ganged print modules are operable to print columns 1, 3, and 5 (from right to left) at one time. The gang of modules is then stepped to the left (as viewed in FIG. 15) and columns 2, 4, and 6 are printed on the same line on the postage ticket. The decade type print modules will not be described herein in detail, it being sufficient to say that the print wheel of each module is stepped electrically by pulses to rotate the wheels into the desired position to effect printing of a particular symbol. Electric pulse are fed to the modules from the rear through multiconnector terminal assemblies 278a (FIG. 18). By the proper electrical signals, each print wheel 280 is rotated to position the desired type character on the circumference of the wheel in a position directly above the pressure pad on the upswinging print hammer 258 to effect printing of the character on the multilayer web 54. After the stepping motor in each module is pulsed to electrically rotate the print wheel 280 to the desired type character, the

solenoid 262 is activated to swing the print platen 258 upwardly to effect the printing action on the web.

The ganged array of print modules 278 and the decimal point printer 282 sandwiched between the outer and center module are stepped together as a unit laterally across the web of paper 54 after printing columns 1, 3, and 5, and the print wheels are again stepped electrically to position selected type characters into printing position for columns 2, 4, and 6. The print hammer control solenoid 262 is again activated to swing the printing platen 258 into printing position. From the foregoing, it will be seen that printing of the numerical data on the ticket is accomplished in two different steps for each line of printing, both steps being accomplished by a single printing platen 258 actuated by the solenoid 252 and striking the same ganged array of modules (FIG. 20) which has been shifted or stepped laterally by a one column spacing.

As best shown in FIG. 10, the decimal point printer 282 includes a flat body plate 284 which is somewhat thinner in thickness than the thickness of a printing module 278. This plate is sandwiched in between the outer and center print module, as best shown in FIGS. 19 and 20, and includes an elongated bore 285 having an open lower end in line with the printing position of the adjacent printing modules. A decimal point printing die 286 is disposed for sliding movement in the bore 285 to effect printing of a decimal point between columns 2 and 3 on the postage ticket. The upper end of the decimal point die 286 is pivotally connected to an L-shaped lever 288 which is mounted on a pivot screw 290. The actuating lever 288 is illustrated in a rest or nonprinting position, and when it is desired to effect the printing of a decimal point the lever is pivoted in a counterclockwise direction about the pin 290. The lever 288 is maintained in a nonprinting position by means of a bias spring 292 having one end connected to the lever adjacent the upper end thereof and the other end connected to a spring bracket 294. Travel limits for the upper end of the activating lever 288 are set up by means of a pair of L-shaped stop brackets 296 and 298, respectively (FIG. 2), each having an adjustable stop screw therein, as shown in FIGS. 2 and 10. The stop brackets 296 and 298 and the respective stop screws are supported on the upper end of an upstanding L-shaped support bracket 300 and this bracket, along with an activating solenoid 302, is mounted on a support plate 304 which is in turn carried on the upper surface of a print module, gang support carriage 306.

The decimal print solenoid includes an armature 308 which is pivotally connected to the upper end of the activating lever 288, and the spring 292 normally retracts the armature 208 from the coil to the outer position when the solenoid is not energized. When the decimal point, print solenoid 302 is energized, the armature is pulled inwardly into the coil, causing the lever 288 to pivot in a counterclockwise direction. This moves the lower end of the die 286 downwardly in the bore to effect printing on the paper web. When solenoid 302 is de-energized, the spring 292 retracts the armature outwardly of the solenoid coil, and the lever pivots in a clockwise position (FIG. 10) to retract the die to the nonprinting position as shown.

As best shown in FIGS. 3 and 10, the print module gang supporting carriage 306 comprises a body having an L-shaped cross section (FIG. 10) with a thickened upper portion which is slidably mounted on a rod 310

extended perpendicular to and supported from the chassis side plate 154, as shown in FIG. 3. Suitable bearings 312 (FIG. 10) are provided at opposite ends of the carriage body to provide for free sliding movement of the body for stepping in a lateral direction longitudinally of the rod. The outer end of the rod 310 is mounted in the bore of a sleeve 314 and is secured therein by means of a setscrew 360. When the setscrew 316 is loosened, the rod 310 can be completely withdrawn from the sleeve so that the module carriage 306 can be detached and removed from the printer. The sleeve 314 is integrally formed at the upper end of a bracket 318 secured to the outside surface of the chassis side plate 164. The ganged print modules 278 are secured in place on the carriage body 306 by a plurality of screws 320 (FIG. 3) which pass through a lower depending flange 306a of the (FIG. 10) carriage body, and the carriage includes a side plate 322 (FIG. 3) for supporting the decimal lever pivot screw 290. The side plate 322 also provides an abutting support surface for the outer print module 278 of the ganged array, as shown in FIG. 20.

As best shown in FIGS. 4 and 2, in order to prevent rotation of the carriage body 306 on its carriage rod 310, a guide roller 234 is mounted on the side plate 322 and is adapted to roll within a channel-shaped guide 326 affixed to extend inwardly of the side plate 164. As the print module assembly is stepped laterally back and forth longitudinally of the rod 310, the guide roll 324 moves within the channel 326 and prevents rotation of the carriage body 306 on the rod.

In order to print a row of stars or asterisks down the center or middle of the postage tickets 58 (as shown in FIG. 15), the printing module and stepping subassembly 180 includes a star print die bar 328 (FIGS. 2, 3, and 4). The die bar includes a star or asterick die character formed on the lower edge thereof in a printing position adjacent the selected type on the print wheels 280 of the print modules. As best shown in FIGS. 2 and 4, the star print die bar is secured in place on a U-shaped bracket 230 and the print die bar is thus fixed in position spaced apart from the chassis side plates 164 approximately midway therebetween. The star print die bar acts as a stop to prevent overtravel of the ganged print modules during lateral shifting of the same back and forth to print alternate columns.

As previously described, columns 1, 3, and 5 are printed first, and later on, columns 2, 4, and 6 are printed by laterally stepping the module supporting carriage 306 on the support rod 310. For the purpose of moving the carriage body and the ganged array of print modules 278 and decimal point printer 282 carried thereby between alternate columnar printing positions on the carriage rod 310, the print module control and stepping subassembly 180 includes a stepping motor 332 having an elongated rotor shaft extending in a generally vertical direction. The shaft projects outwardly from both ends of the motor body which is supported on an L-shaped mounting bracket 334 (FIG. 3) having a vertical leg portion secured to the bracket 318 on the sleeve 314. The upper end of the motor shaft 332 is provided with an eccentric drive pin assembly 336 which is interconnected via an adjustable-length connecting rod 338 to an upstanding pin 340 on the print module carriage body 306. The stepping motor 332 is energized by electrical pulses to rotate the shaft thereof in increments of 180 degrees on each pulse cy-

cle, and when this occurs, the eccentric pin assembly 336 causes the print module carriage 306 to shift laterally a full columnar space so that the print modules 278 shift from even numbered to odd numbered columns and vice versa as shown by the arrows "B." The lateral stepping motor 332 is thus rotated in only one direction rather than requiring reversal and the gang of modules are shifted back and forth in opposite directions. In order to insure that precisely 180° rotation occurs during each stepping cycle, a pair of limit switches 342 and 344 are mounted on a bracket 346 positioned below the stepping motor. The respective limit switches 342 and 344 are adapted to engage respective cam arms 348 and 350 mounted on the lower end portion of the motor shaft, and when these switches are alternately actuated by the respective cam arms, the stepping pulses supplied to the stepping motor 332 are discontinued after 180° of shaft rotation is achieved during a stepping cycle.

From the foregoing description, it will be seen that the print module and stepping subassembly 180 and the print hammer control subassembly 184 cooperate to print matter on the right-hand side of the postage tickets and the line of stars or asterisks in the center column of the tickets.

As previously described, the numerical values of the postage costs in each line are printed as well as other information, such as the time of printing in two different steps or stages on each line. The matter in columns, 1, 3, and 5 is printed with the print module carriage body 306 in a right-hand printing position wherein an outer end surface 306b (FIG. 3) of the body is abutting the inside end surface of the rod support sleeve 314. After printing columns 1, 3, and 5, the stepping motor 332 is energized and the eccentric pin 336 rotates 180 degrees to shift the print module carriage body to an inward position (as shown in FIG. 3) wherein the outer end face 306b of the carriage is spaced a column width away from the inside end face of the sleeve 314. The printing platen 258 is then actuated to effect printing by the solenoid 252, and this results in the printing of the figures in columns 2, 4, and 6 on the postage ticket. After one line has been printed in the manner aforesaid, the paper advance subassembly 178 is activated in the manner previously described, and the paper is advanced until the next line on the web 54 moves into a printing position. Electrical signals or stepping pulses are supplied to the respective print modules 278 and to the decimal printing solenoid 302 to effect selective positioning of the print wheels 280 so that the desired type characters are moved into the printing position as described. The electric stepping signals for the printing wheels 280 of the respective print control modules are supplied from an electronic control system, preferably of the type disclosed in the aforementioned copending U.S. Pat. application Ser. No. 213,995. Other printer control commands and signals for activating components, such as the lateral stepping motor 332, are supplied in controlled sequence and signals from the limit switches 342 and 344 are integrated into the control system.

In accordance with the present invention, the printed matter appearing on the left-hand side of the postage tickets is applied by the print drum and month advance subassembly in combination with the print hammer control subassembly 184 and the paper advance subassembly 178.

The print drum and month advance subassembly 182 includes a generally cylindrical, relatively large, rotatable printing drum 352, which is supported on a drive axle 354 journaled in a flange bearing assembly 356 secured to an opposite side plate 164 of the printer chassis (as best shown in FIG. 3). A plurality of circumferentially spaced, character bars 358 having printing indicia thereon (as indicated in FIG. 16) are detachably mounted on the outer periphery of the drum. The drum is rotated by turning the axle so that selected character bars will be aligned in the printing position above the swinging pressure pad of the platen or print hammer 256. As will be noted from FIGS. 15 and 16, each character bar is formed with printing type of an alphabetical nature thereon to print the desired informational material in conjunction with the related numerical cost data on the right-hand side of the postage tickets. Character bars may be added to or taken from the drum, as required, and several of the character bars are used to print the United States Post-office seal, as shown on the lower left-hand corner of the printed postage ticket 58 in FIG. 15. A short character bar is provided for printing the year and date, and this bar is positioned adjacent an opening or window 352a in the outer surface of the drum. The window permits exposure of a peripheral segment of a smaller, rotatable, generally cylindrical month wheel 360 (best shown in FIG. 9). The month wheel is provided with a plurality of 12 circumferentially spaced, month designating character bars around the periphery, and is supported for independent rotation relative to the larger printing drum 352 on a stepping shaft 362 (FIGS. 8 and 9). When this year, month, day and time line is printed on a postage ticket 58 (FIG. 15), the drum 352 is stepped to a position where the year date is in the printing station and the month wheel 360 is stepped until the proper month appears adjacent the year date on the drum. The wheels 280 in the respective print modules 278 are likewise stepped to provide the date and time of issuance or printing of the ticket and the print platen control solenoids 260 and 262 are activated to effect printing of the date and time line on the postage ticket. After printing of this line has occurred, the month wheel 360 is stepped until it is returned to an original rest or starting position awaiting the next cycle of stepping signals. A line corresponding to each character bar on the drum is not always printed, depending on the customer generated information supplied to the control system, and in this case the drum 352 may be stepped a number of increments to omit printing of certain character bars which are not required. After all of the required lines have been printed on a postage ticket 58 by the print drum 52, the drum is rotated by means of the shaft 354 to a rest position ready for commencement of the next ticket printing cycle. The month wheel 360 is likewise returned to a rest position after printing to await the next printing cycle. On the next cycle, the month wheel is then stepped from the rest position to the selected month while the drum remains in the rest position, and then the drum is stepped to commence printing the desired lines on the postage ticket.

Referring to FIGS. 8 and 9, when a stepping signal or command is initiated, the month wheel 360 is stepped rotationally by a selected number of increments of about 30° each until the desired month is in position in the window on the drum adjacent the year indicating character bar. As shown in FIG. 8, on one end of the

month wheel support shaft 362 there is provided a ratchet wheel 364 having 12 ratchet teeth thereon, one for each month. Cooperating with the ratchet wheel is a pawl lever 366 supported intermediate its ends on a pivot pin 368 secured to the print drum 352. The pawl lever 366 is biased in a clockwise direction about the pin 368 (viewed in FIG. 8) by means of a compression bias spring 370 having one end engaging the lower end of the pawl lever and an opposite end secured to the side of the print drum as at 372. Engagement between the upper end of the pawl lever and the teeth of the ratchet wheel 364 prevents rotation of the month wheel shaft 362 in a counterclockwise direction (FIG. 8) but permits rotation in the opposite direction, as shown by the arrow "C." Engagement between the upper end of the pawl lever 366 and the teeth of the ratchet wheel 364 provides indexing action for insuring that a selected character bar for a month is accurately aligned on the circumference of the printing drum 352 adjacent the year-date character bar.

In order to rotate or step the month wheel 360 a desired number of increments to arrive at a particular month (for example, the month of March), three stepping increments of 30 degrees rotation each are required. A month wheel stepping subassembly 374 is mounted on the inside surface of a printer chassis side plate 164, as viewed in FIG. 3, and includes an operating pawl 376 having an outer end 376a adapted to engage the teeth of the ratchet wheel 364 for stepping the month wheel in an increment of about 30 degrees. The operator pawl 376 is pivotally mounted on the upper end of an actuating lever 378 which is journaled intermediate its ends on a pivot support pin 380 carried on a mounting base 382 of the stepping subassembly. The lower end of the actuating lever 378 is pivotally interconnected to the armature 384 of a month wheel stepping solenoid 386 which is also fixedly mounted on the base plate 382. When the solenoid 386 is energized, the armature 384 is retracted causing the lever 378 to pivot in a counterclockwise direction (FIG. 9) about the support pin 380. This action causes the operating pawl 376 to move to the left and step the ratchet wheel 364 to rotate approximately 30° in a counterclockwise direction, as indicated by the arrow "D." The operating pawl 376 is biased in a counterclockwise direction on its mounting pin at the upper end of the lever 378 by a spring 388 in order to insure that contact between the tip 376a of the pawl and the ratchet wheel 364 is maintained. When the solenoid 386 is de-energized a biasing spring 390 tends to pivot the lever 378 in a clockwise direction (FIG. 9) to a return or rest position and this causes the operating pawl 376 to move toward the right and engage the next tooth in the ratchet wheel. As this occurs, the armature 384 of the stepping solenoid is withdrawn outwardly to the rest position by the spring force awaiting the next stepping pulse to be supplied to the solenoid 386. Operation of the stepping system 374 is accomplished by sending a selected number of successive energizing pulses to the stepping solenoid 386 to effect incremental rotation of the month wheel 360 to the desired month. After the month wheel has been stepped to the proper month for printing, the print drum 352 is rotated or stepped in a clockwise direction (FIG. 8), as indicated by the arrow "E," until the first character bar 358 is in a position in readiness for printing.

As this action occurs, the month wheel ratchet 364 moves out of engagement with the tip 376a of the stepping pawl 376 and remains so until the print drum is returned to the rest position at the end of a ticket printing cycle. During the printing cycle, the month wheel remains in the previously stepped position because of the holding force of the locking pawl 366 which was engaged with a selected tooth. After a printing cycle is completed and the drum 352 is rotated back to its original or rest position, the month wheel stepping solenoid is energized by a selected number of pulses until a starting month (as for example, the month of January) is adjacent the top of the drum. When subsequent stepping instructions are received in the next printing cycle, the month wheel is resteped on the drum 352 until the desired month appears opposite the year date print bar on the drum.

In order to rotatably index the print drum 352 so that any selected character bar 358 may be positioned in the printing position, the shaft or axle 354 is rotated in selected increments of angular rotation by means of a drive sprocket 392, best shown in FIG. 7. The sprocket has a plurality of teeth around the periphery—selected teeth corresponding to particular character bars on the print drum 352. The sprocket 392 is driven by a pinion gear 394 attached to the rotor shaft 396 of a print drum stepping motor 398. The stepping motor includes a flange mounting plate 400 which is secured to a subchassis 402 with suitable fasteners 404. The subchassis 402 is spaced outwardly of a parallel to the adjacent side plate 164, as shown in FIG. 3. Spacing between the adjacent side plate 164 and the subchassis 402 is provided by a spacer block 406 (best shown in FIGS. 2 and 7), which spacer is secured in place by suitable fasteners 408. In order to hold the print drum 352 in a selected rotational position, there is provided a locking lever 410 (FIG. 7) pivotally mounted intermediate its ends on a bearing mount 412 having a flanged base secured to the subchassis 402. The locking lever 410 includes a tooth engaging outer end 410a adapted to engage teeth on the drum driving gear 392 for locking and holding an indexed position of the drum. The locking lever 410 is spring biased in a counterclockwise direction into locking engagement with the gear wheel 392 by means of a compression spring 414, and the opposite end of the locking lever is connected to the armature 416 of a push-type, drum locking solenoid 418, mounted on the subchassis 402. When it is desired to index or rotate the drum, the solenoid 418 is energized and the armature 416 is pushed downwardly to move the locking pawl 410 out of engagement with the gear wheel 392. When this occurs, the gear wheel can be rotated by the stepping motor drive which is electrically pulsed with a selected number of electrical pulses to produce a responsive number of degrees of angular rotation desired. On de-energizing of the solenoid 418, the armature 416 is retracted by the compression spring 414 and the lever moves to the locking position wherein the outer end 410a is engaged with the gear wheel 392 to prevent inadvertent rotational indexing of the drum.

In order to control the operation of the stepping motor 398 and to return the print drum 352 to the neutral or rest position after the completion of a ticket printing cycle, a pair of limit switches 420 and 422 (FIG. 2) are provided on a bracket 424 mounted on the subchassis 402. The inner limit switch 420 is adapted

to cooperate with a cam lug 392a (FIG. 7) formed on the gear wheel 392 in order to provide drum position follow-up information for the electronic control system for the stepping motor. Another cam lug 392b is spaced radially outwardly of the cam lug 392a and is 180° out of phase therewith for activation of the outer limit switch 422. The lug 392b and switch 422 prevent a 180° ambiguity from developing in regard to the position of the drum, which ambiguity might otherwise occur if only a single limit switch was provided. At the start of each printing cycle, the print drum 352 and month wheel 360 are in the rest or zero position as previously described. While the drum is retained in the rest position, the month wheel 360 is indexed until the desired month appears in the window 352a adjacent the year date printing bar on the drum. The print drum is then rotated or indexed until the first character bar 358 to be printed is in the printing position. The numerical information corresponding to the first character bar is also fed into the print module and stepping system 180, as previously described. After printing of a line has been effected, the print drum is then indexed a desired angular amount of energizing the stepping motor 398 with a desired number of pulses to produce the selected angular degree of rotation so that a selected character bar 358 is moved into printing position. The process is repeated by successive energization of the stepping motor 398 and locking and unlocking of the solenoid 418 until printing of the lines of a postage ticket has been completed. At the completion of the printing cycle, one of the cams 392a or 392b is effective with its limit switch 422 or 420 in order to provide control information as to drum position, so that the stepping motor 398 may be actuated to return the drum to the zero index position ready for the next printing cycle.

After a selected number of lines are printed in a printing cycle, the paper advancing subassembly 186 is activated to advance the web 54 a prescribed distance so that a completed postage ticket is in position for cut-off by the subassembly 56. After cut-off, the paper web is advanced again and other lines of printing are completed to end a print cycle. As previously indicated, the paper web is a four-ply structure having self-carboning backing on the first three plies. Two plies of the web are directed downwardly into the ticket cut-off assembly 56, wherein the printed tickets 58 are severed from the remaining web. The severed tickets fall into the rear receptacle 94 of the ticket dispenser subassembly 60, as previously described, for retrieval by the customer.

As best shown in FIGS. 4, 5, and 6, the ticket cut-off subassembly 56 includes a base 428 secured to the rearward edges of the chassis side plates 164. The base extends transverse between the side plates and is secured thereto by a pair of angle brackets 430 and suitable fasteners 432. As best shown in FIGS. 5 and 6, the base 428 is of relatively thick, hard material in order to provide a solid cut-off base structure. A fixed cutter blade 434 having a lower cutting edge 434a (FIG. 6) is mounted on the base and is adapted to cooperate with a movable cutter 436 (FIG. 5) having a cutting edge 436a. The cutter 436 is mounted for rotation on a cutter support pin 438 which is outboard of the side plate 164, as shown in FIG. 6. The cutter is biased upwardly against the lower surface of the fixed blade by means of a compression spring 440 (FIG. 6) disposed between the head of the cutter support pin 438 and the under-

side of the movable cutter 436. Two plies of the four-ply paper web 54 are passed downwardly over the rear face of the fixed cutter blade 434 ready for shearing action by the movable cutter 436.

In order to maintain the paper closely against the surface of the fixed blade, a paper guide slot 442 (FIGS. 5 and 6) is provided, and the guide slot is formed by a guide member 444 attached to the fixed cutter by suitable fasteners 446. In order to activate the movable cutter 436 to shear the paper web into a ticket 58 of discrete length, the cutter is pivoted in a counterclockwise direction from the rest position (shown in FIG. 5), and for this purpose includes a rotary action solenoid 448 having an armature shaft 450 which is rotatively driven when the solenoid is energized. The solenoid is mounted on an angle bracket 452 by suitable fasteners 454 and the bracket in turn is secured to a base extension block 456 carried adjacent the outer end (left hand, FIGS. 5 and 6) of the fixed cutter blade 434. The bracket 452 is secured to the mounting block extension 456 by suitable cap screw type fasteners 458 which also secure the inner end portion of an L-shaped spring support bracket 460 of the block extension. A short outer end leg of the bracket 460 is connected to the outer end of a coil spring 462 having its inner end connected to a pin 464 on the rounded end of the movable cutter 436 outboard of its pivot pin 438. When the solenoid 448 is energized, the shaft 450 is rotated in a counterclockwise direction (FIG. 5) which causes the movable cutter 436 to shear off the paper web. After the cut-off is completed, the return spring 462, acting on the outer end portion of the cutter, returns the movable cutter to the rest position. In order to provide a mechanical linkage between the shaft 450 and the movable cutter 436, a lever 466 is affixed onto the lower end of the armature shaft and the lever is pivotally secured at its outer end to a link 468. The link is pivotally connected to the outer end portion of a lever 470 which in turn is carried on the lower end of a shaft 472 journaled in a bearing block 474. The bearing block is mounted on an L-shaped bracket 476 attached to the fixed cutter 434. An activator 478 is secured to the upper end of the shaft 472 (as best shown in FIG. 6), and a push roller 480 is journaled at the outer end of the lever for pushing engagement with the rearward edge of the movable cutter 436. When the armature shaft 450 is rotated in a counterclockwise direction (FIG. 5) by energizing the solenoid 448, the cutting edge 436a of the movable cutter moves progressively outwardly along the fixed cutter blade shearing off the web of paper 54 in the paper feed slot 442 into a postage ticket 58 of discrete length. When the postage ticket is completely cut off, the solenoid 448 is de-energized and the return spring 462 causes the cutter 436 to return to the rest position shown in FIG. 5 in readiness for the next electrical pulse or cutoff signal to be supplied to the solenoid 448.

In order to guide the remaining two layers of the paper web 54 after two layers have been separated and cut off into discrete postage tickets 58, the cut-off subassembly includes a web guide roll 482, having one end supported by the mounting bracket 476 and an opposite end supported by an L-shaped bracket 484 (FIG. 5). As best shown in FIG. 1, the guide roll 482 aids in directing the continuous remaining two layers of the paper web 54 toward the paper take-up subassembly 186.

In accordance with the present invention, the paper take-up subassembly 186 is mounted adjacent the upper and rearward end of the printer chassis 160 for the purpose of permanently retaining for record purposes a two-layer roll of the paper web. The take-up subassembly includes a pair of parallel frame members 486 and 488, respectively, which are secured to the inside surfaces of the main chassis side plates 164 by suitable fasteners 490. As viewed from the rear of the printing apparatus, the left-hand side frame 488 of the take-up assembly includes a downwardly depending, enlarged section in order to support a slow speed gear motor generally indicated as 492. The gear motor includes an electric motor 494 having an armature shaft 496 connected to drive a gear reduction gear train contained in a housing or base unit 498 (FIG. 2). The inside face of the housing 498 is secured in spaced parallel relation to the outside surface of the side plates 488 by a plurality of spacer sleeves 500 which are held in place by suitable fasteners 502.

As best shown in FIG. 1, when the electric motor 494 is energized, a low speed rotary output, in the range of approximately 50 rpm, is obtained from an output shaft 498a of the gearbox, and this rotational energy is coupled through a sprocket 504 and chain 506 to a pair of drive sprockets 508 which are coupled to drive shafts 510 through slip clutch mechanisms 512, as best shown in FIG. 2. The shafts 510 are journaled for rotation in sleeve bearing units 514 having mounted flanges 516 secured to the side plates 488 by suitable fasteners 518, as best shown in FIG. 2. When the gear train output shaft 498a is rotated in a counterclockwise direction, the chain 506 is driven in a similar direction, trained around the sprockets 508, and the shaft 510 are thus turned in a counterclockwise direction through the respective slip clutches 512, which permit continued rotation of the sprockets and chain even though the shafts may be restrained against rotation.

On the inner end portions of the shafts 510, which project inwardly of the bearing sleeves 514, there are provided flanged take-up rolls or wheels 520, which are similar to the paper supply wheels 188, previously described. Each take-up wheel includes an inwardly projecting hub portion 520a for receiving the end of a roll core or spool. The take-up motor 494 is normally energized during the printing cycle to exert tension on the web paper 54, and thus prevent wrinkles or folds from building up as the paper advance mechanism is actuated. The slip clutches 512 permit continuous energization of the motor 494 during the entire printing cycle, although movement of the paper web 54 is intermittent between line printing operations and is restrained by the latching lever 202, as previously described, during the printing of a line. After a printing cycle has been completed, the web 54 is advanced by one ticket length by the paper take-up assembly 186 so that a discrete two-layer postage ticket may be sheared off the cut-off assembly 56 for the customer, as previously described, and the remaining two layers are rolled up on the roll core or spool in the take-up subassembly 186.

In conjunction with each of the take-up drive wheels 520, there is provided an opposite idler wheel 522 journaled on the inner end of an idler shaft 524 which is slidable axially in the direction of the arrows "A," as shown in FIG. 2. The idler shafts 524 are carried by sleeve bearing units 526 having flanges 528 secured to the outside surface of the side plate 486 with suitable

fasteners 530. Control knobs 532 are provided on the outer end of the idler shaft 524, and when it is desired to remove a roll and replace it with an empty roll core, the knob 532 is grasped and pulled outwardly so that the wheel projections 522a are disengaged from the roll core or spool. The record roll of web can then be removed and a new roll core or spool positioned in place ready to receive the web. When the rearwardmost pair of wheels 520 and 522 are used with a roll core or spool, the paper web 54 is mounted, as shown by dotted lines in FIG. 1, and passes over an independent idler roll 534 having one end supported by the side plate member 488 and an opposite end supported by a downwardly projecting finger 536 (FIG. 4) having an upper end secured to the guide plate 486. When the forward pair of wheels 520 and 522 are being used, the web 54 is trained underneath rather than on top of the floating roll bar 534. With dual pairs of take-up wheels, as shown, two plies of the web 54 may be separated and wound separately on each pair of wheels, if required.

From the foregoing, it will be seen that the printer apparatus 30, in accordance with the present invention, provides means for printing and dispensing postage tickets for a completely automated, self-service parcel post mailing facility. In addition, the device provides means for maintaining a record of all the transactions of the facility.

While there has been illustrated and described a single embodiment of the present invention, it will be appreciated that numerous changes and modifications will occur to those skilled in the art, and it is intended in the appended claims to cover all those changes and modifications which fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. Apparatus for printing on an elongated web of thin, flexible sheet material comprising means for advancing said web along a path across a transverse print line at a printing station, a printing assembly at said station comprising a drum mounted for rotation about a first axis transversely of and spaced parallel to said path of said web and said print line, a plurality of type symbols circumferentially spaced around at least a portion of the periphery of said drum, a secondary wheel mounted on said drum for rotation relative thereto about a second movable axis eccentric and outwardly parallel of said first axis, a plurality of type symbols circumferentially spaced around at least a portion of the periphery of said wheel, secondary indexing means for rotating said wheel relative to said drum to position a selected type symbol on the wheel adjacent a selected position on the periphery of the drum, primary indexing means operatively associated with said drum for rotating said drum to place any selected type symbol thereon into said printing position, print hammer means swingable about an axis parallel of said other axes from a rest position to a printing position urging said web into momentary printing contact against one or more selected type symbols on said drum and wheel aligned along said print line, frame means for supporting said drum for rotation, said secondary indexing means supported from said frame means including

means for indexing said wheel relative to said drum only when said drum is in a selected rotational position relative to said frame means, one or more tertiary print wheels independent of said drum supported from said frame means and having a plurality of printing type spaced on a peripheral surface thereof, tertiary wheel indexing means operatively associated with said tertiary wheels for rotationally indexing said tertiary wheels to position a particular type thereon in alignment with a particular type in printing position on said drum along said print line, stepping means operatively associated with said tertiary wheels for shifting said tertiary wheels laterally toward and away from said drum between spaced apart row positions along said print line, and second print hammer means swingable from a rest position to a print position urging said web at said printing station toward printing contact with said particular type on said tertiary wheels in said spaced apart row positions with respect to type on said drum.

2. Printing apparatus in accordance with claim 1 including holding means mounted on said drum for maintaining an indexed position of said wheel relative thereto when said drum is rotated out of said selected rotational position away from said secondary indexing means.

3. Printing apparatus in accordance with claim 1, wherein said primary indexing means includes means for indexing said drum into selected rotative positions relative to said frame means.

4. The apparatus of claim 1 including means mounted on said frame means for transversely severing said web along a cut line spaced from said print line into printed tickets of discrete length after printing is provided thereon at said printing station.

5. The apparatus of claim 1 including a plurality of said tertiary print wheels supported in side-by-side coaxial ganged array for simultaneously printing characters at spaced apart row positions along said print line on said web.

6. The apparatus of claim 5 wherein said stepping means is operable to shift said ganged array of tertiary print wheels laterally of said web along said print line for successive printing in a first group of row positions and a second group of alternate row positions.

7. The apparatus of claim 6 including individual index means operatively associated with each of said tertiary print wheels in said ganged array for indexing the same.

8. The apparatus of claim 5 including retractable type means for printing a decimal point disposed between a pair of tertiary print wheels in said ganged array, said second print hammer means operable to urge said web into printing contact with said decimal point type means in an extended position for printing on said print line.

9. The apparatus of claim 8 including means for activating said retractable type decimal point printing means to move between an extended printing position for engaging said web and a retracted nonprinting position out of engagement with said web when said web is urged toward the same by said second print hammer means.

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