

[54] **DUAL PRINTING APPARATUS WITH SELECTIVE HAMMER ARMING MEANS**

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 [51] **Int. Cl.**..... **B41j 45/00, G01d 9/00**
 [58] **Field of Search**..... **101/66, 69, 70, 72-75, 101/78-80, 90, 94, 95, 96, 99, 110; 346/43; 235/94 R; 222/30; 73/194 R, 194 E, 194 M, 272 R, 272 A; 340/239**

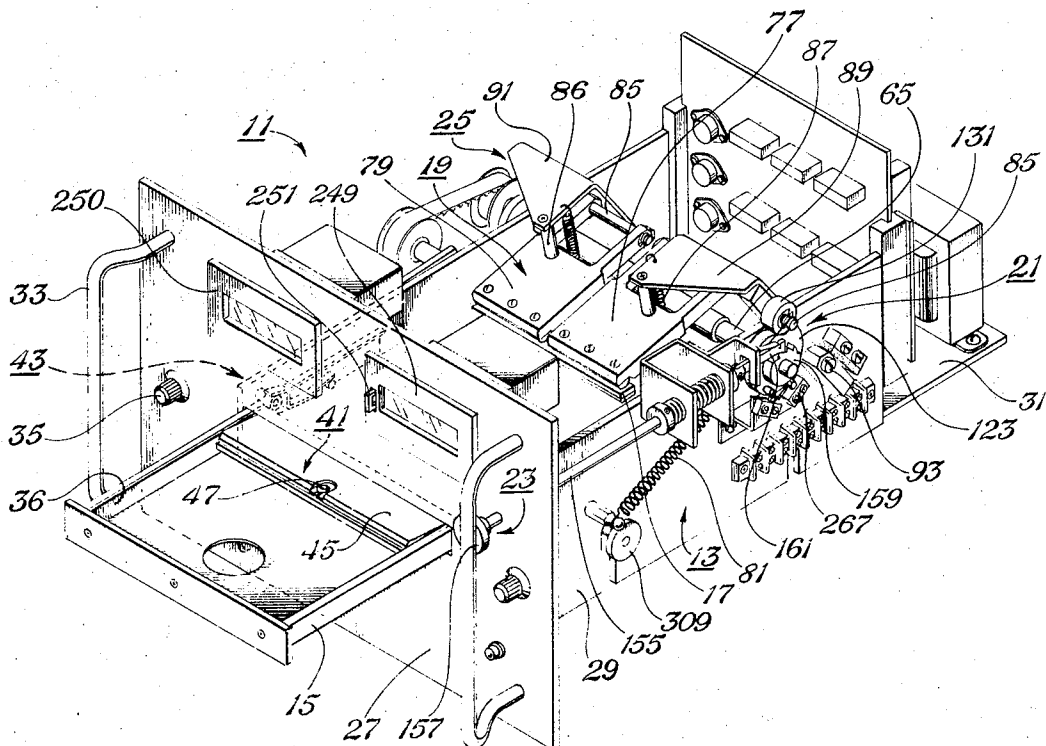
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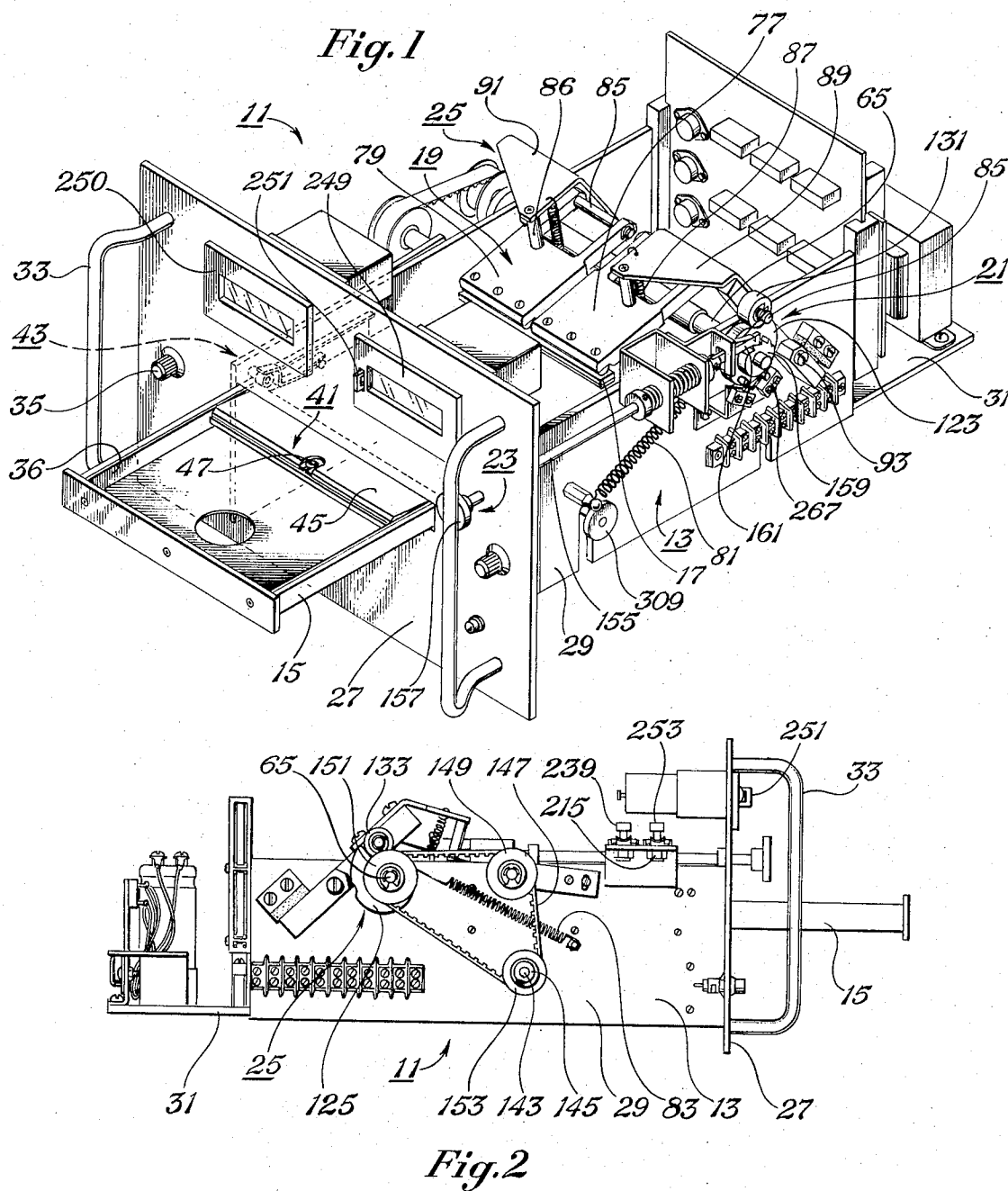
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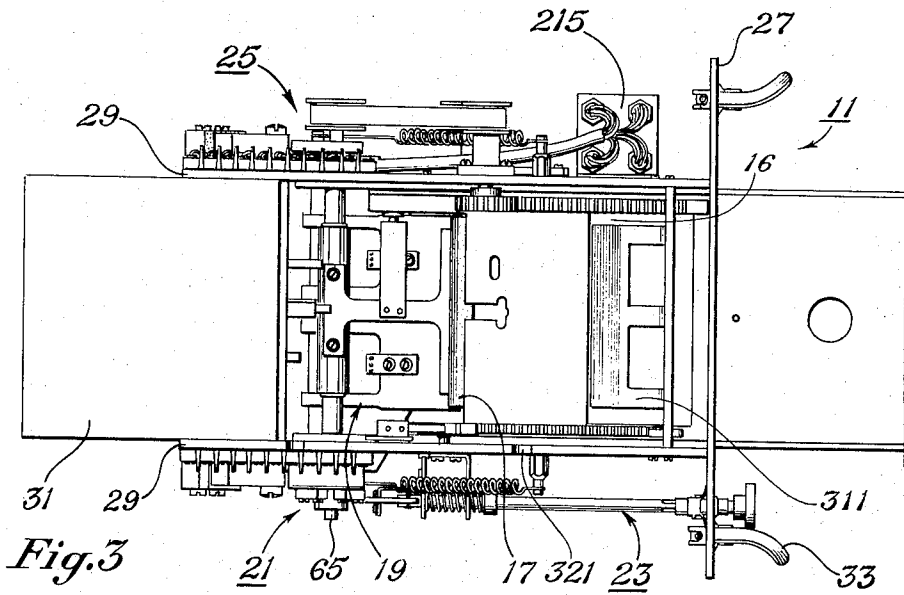
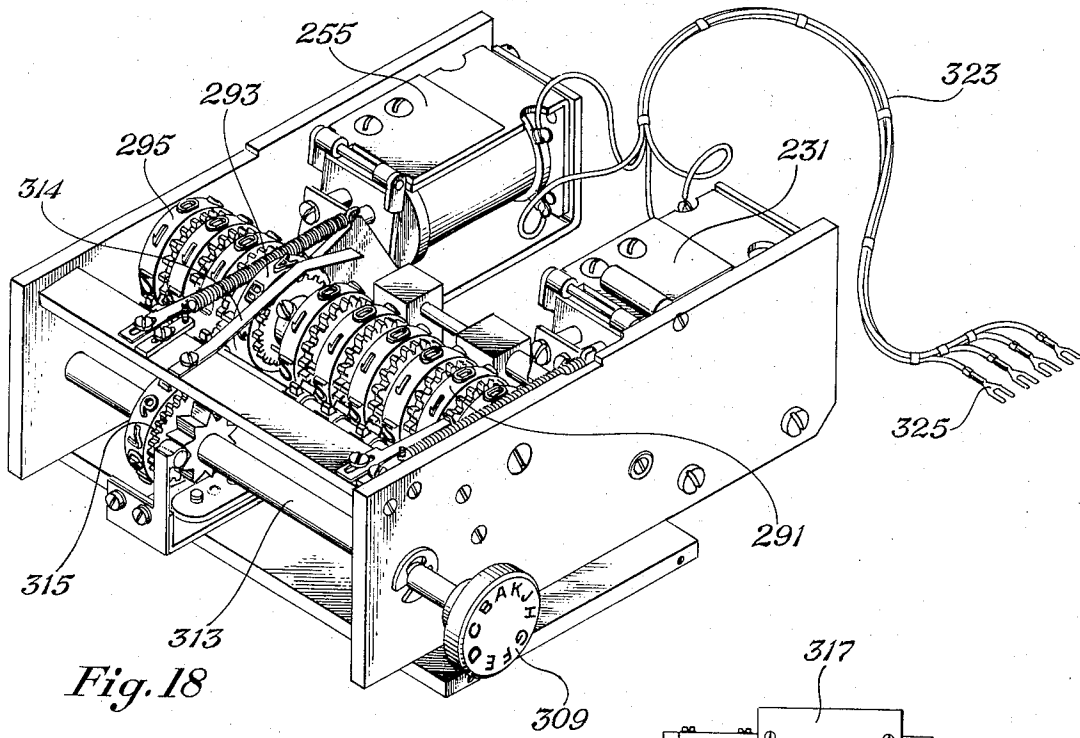
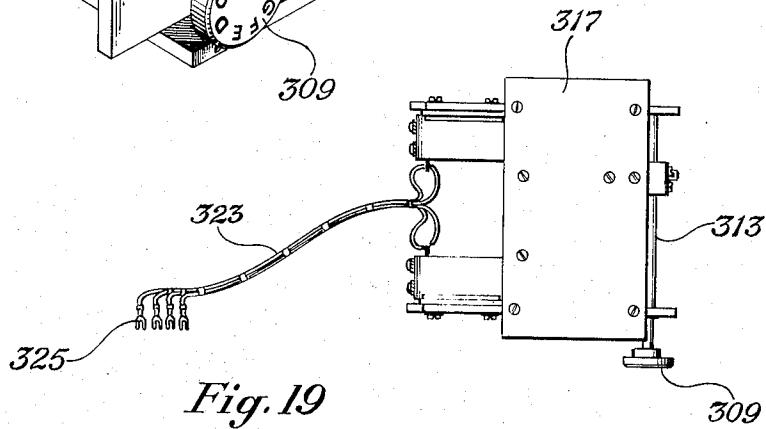
[57] **ABSTRACT**

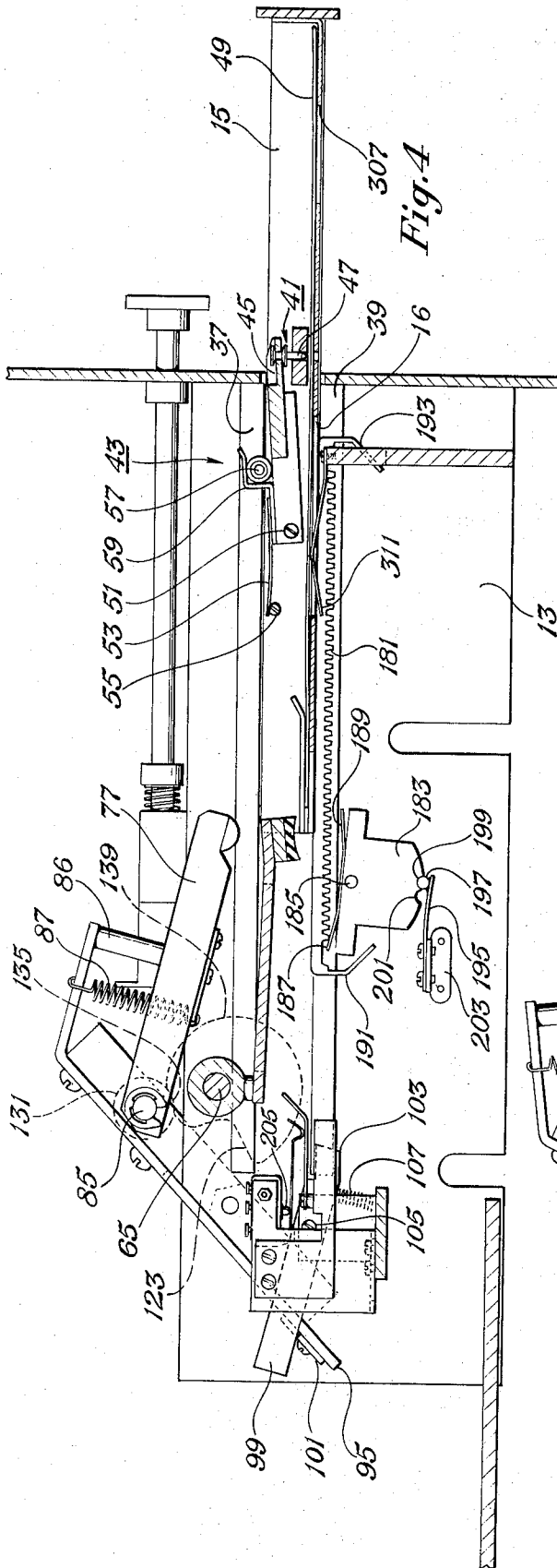
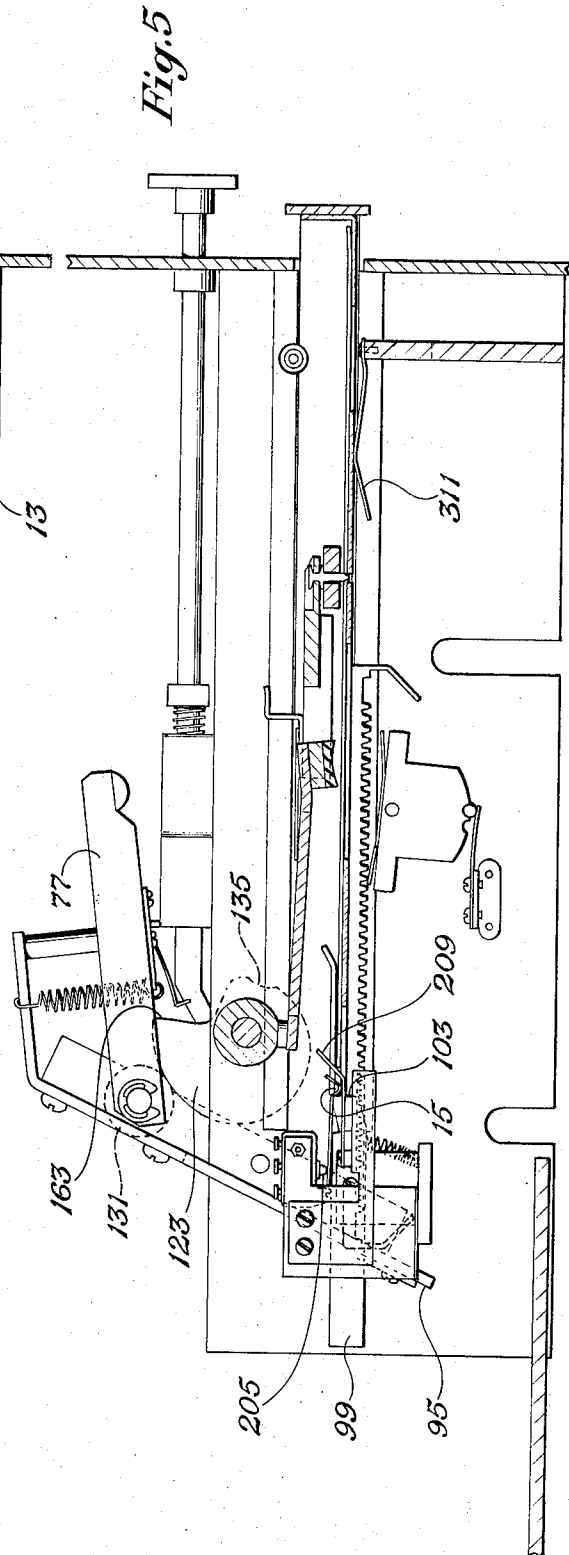
Apparatus for effecting two printing operations on a delivery ticket characterized by a dual printing mechanism having a ticket drawer into which the ticket is emplaced, the drawer being pushed inwardly into a plurality of positions. The inward movement of the drawer arms spring loaded print mechanism, including two print hammers, to deliver a striking force against the ticket to effect a printing from delivery data print wheels. The data print wheels contain product identification, transaction number, and number of units of quantity of product delivered. Also disclosed are specific embodiments enabling remote use of the dual printing mechanism, safety switches and specific structural features.

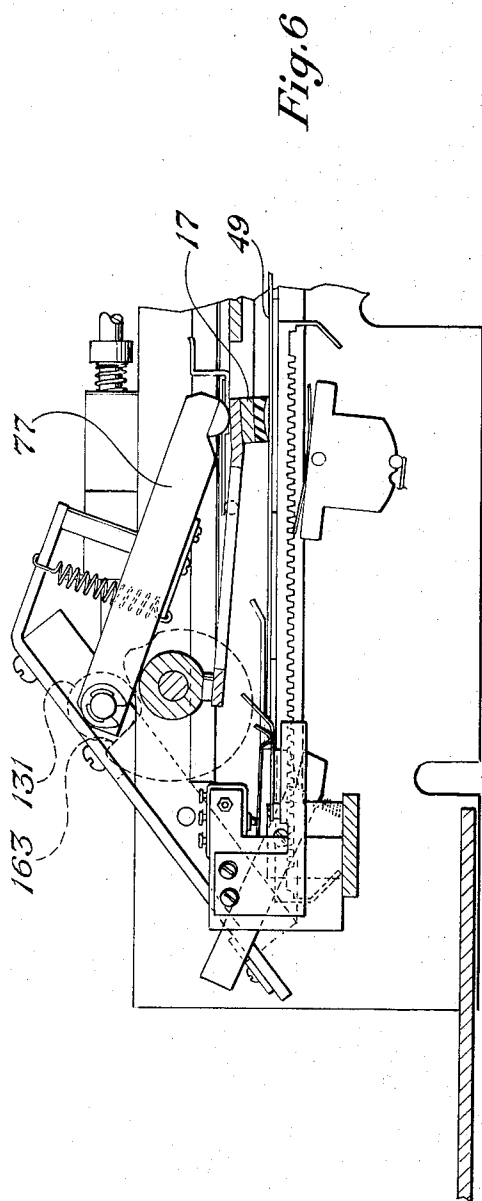
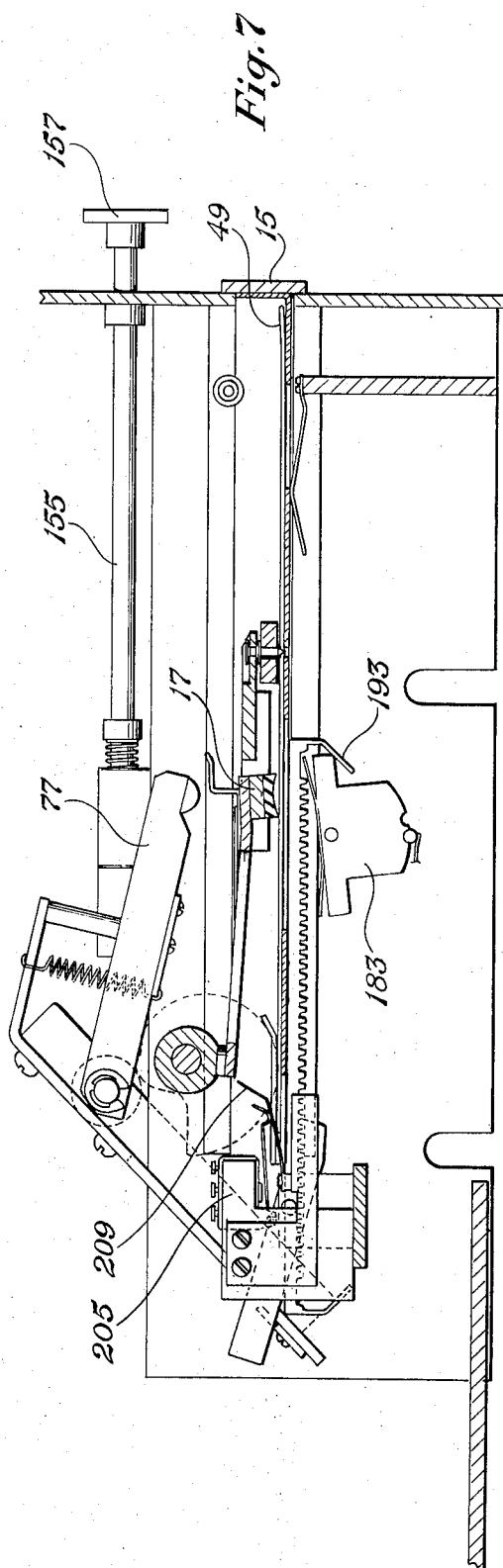
22 Claims, 20 Drawing Figures

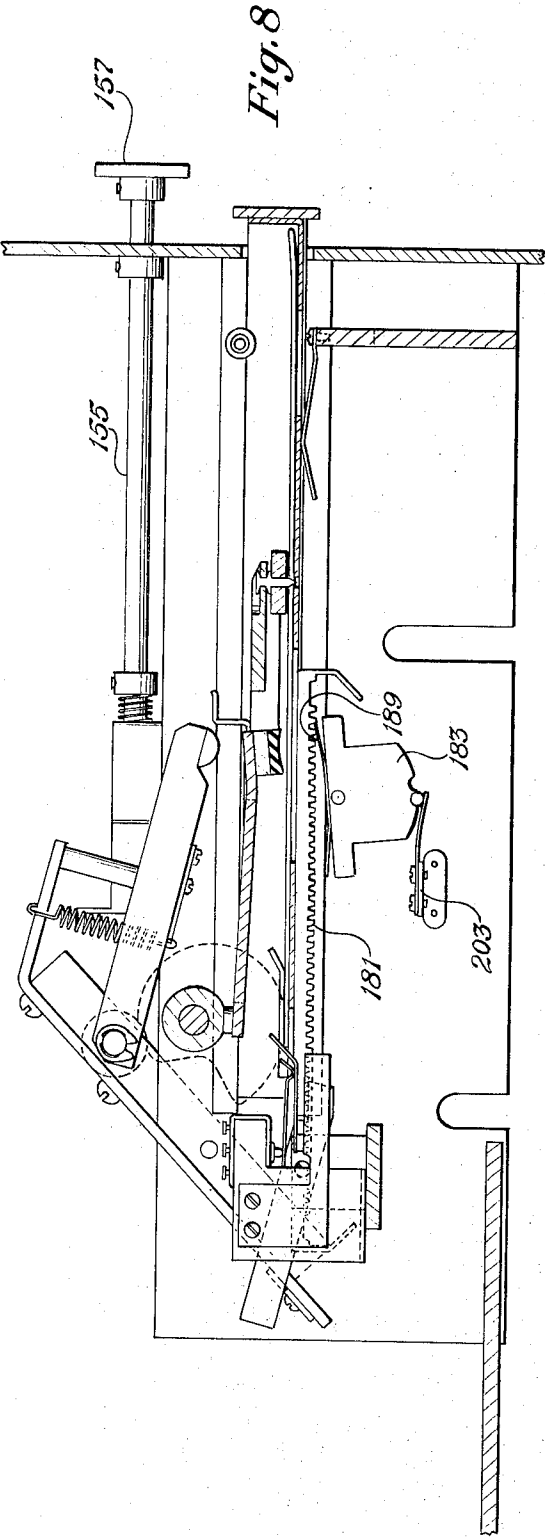
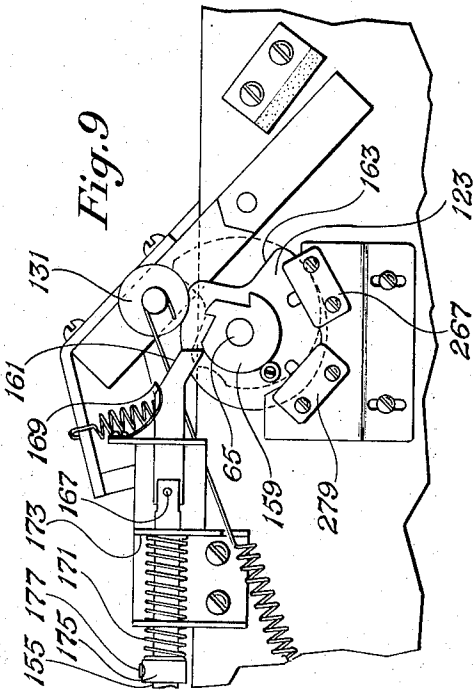
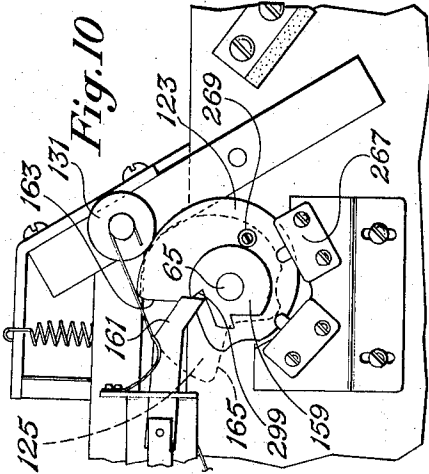
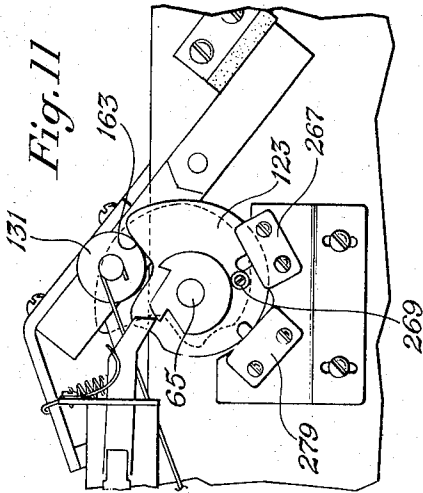


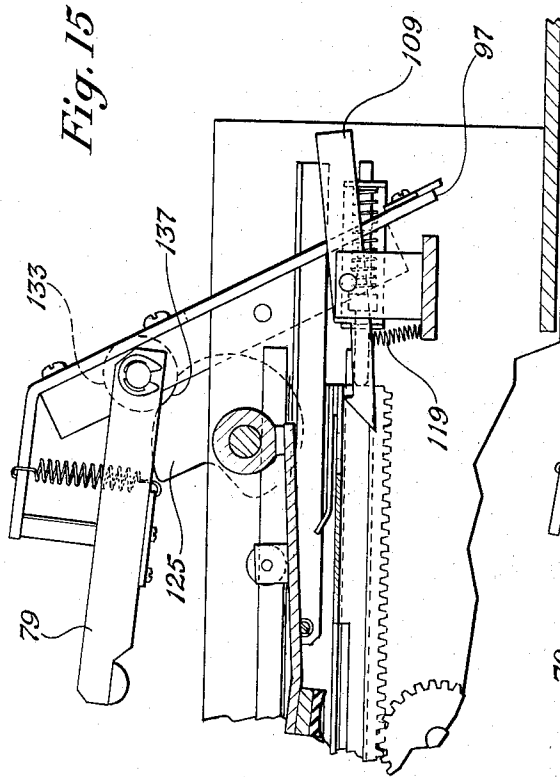
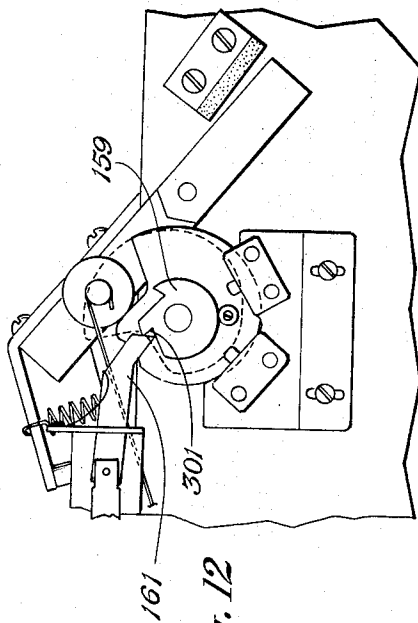
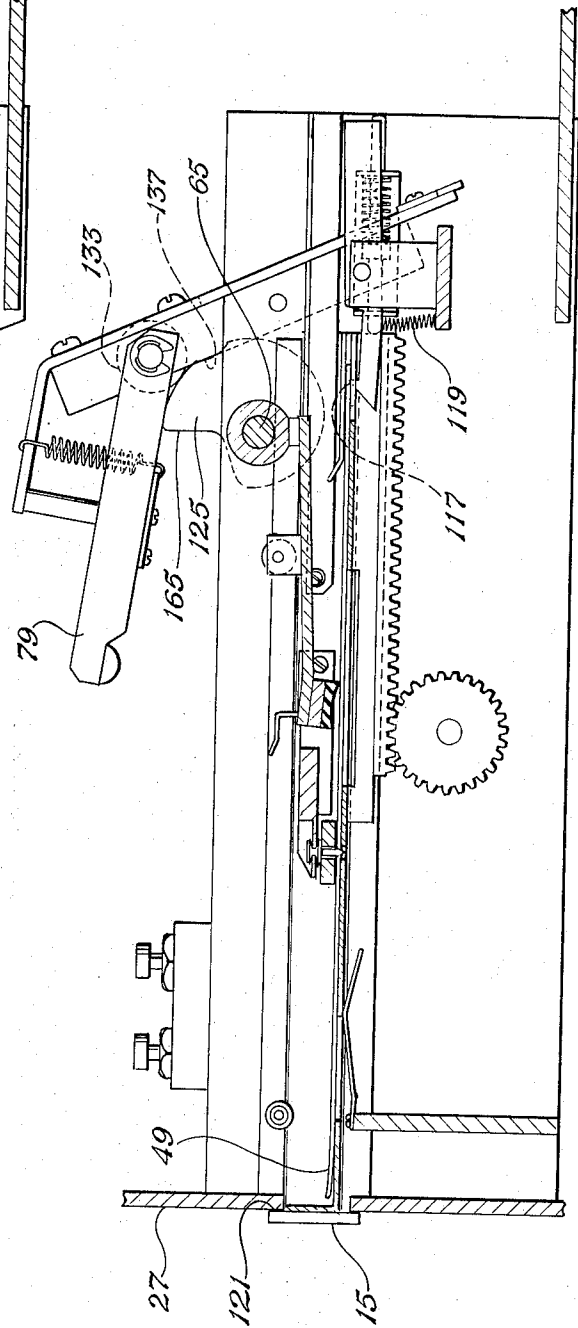


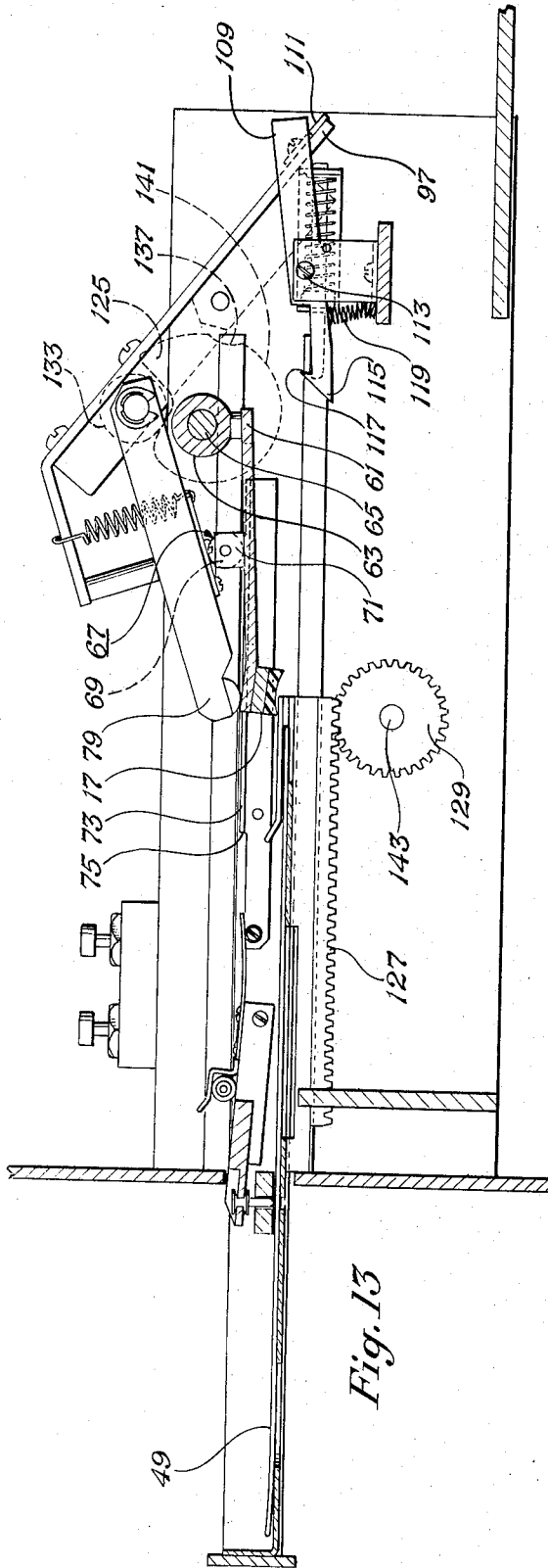
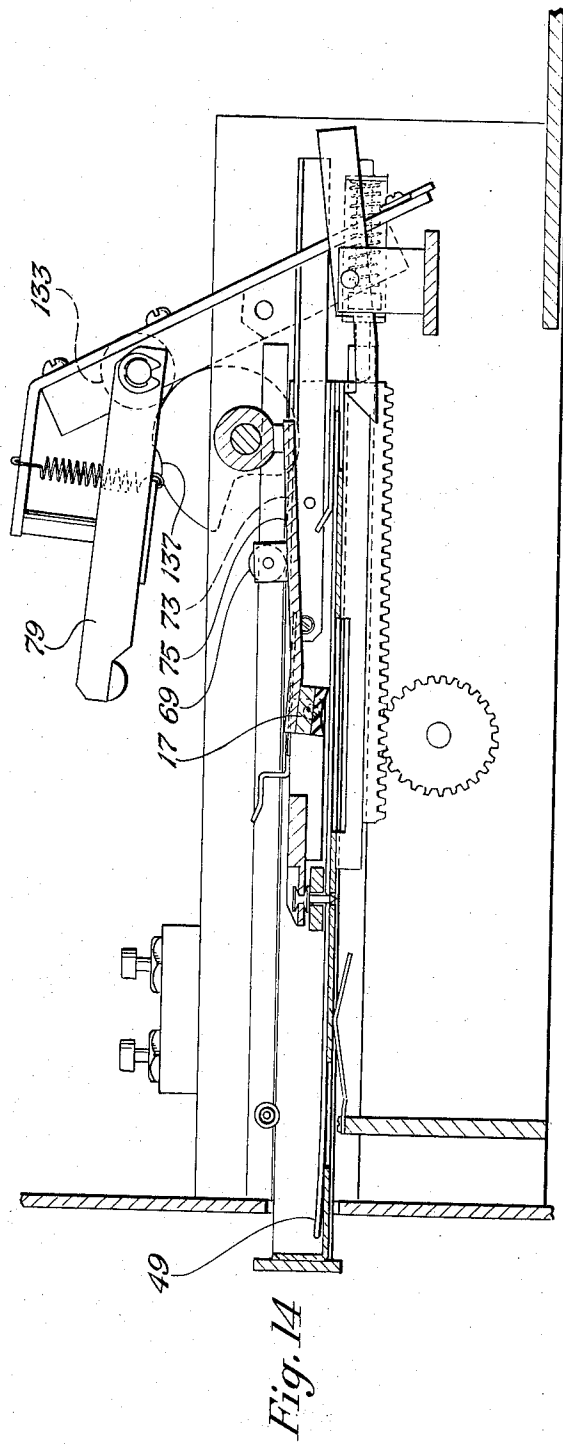


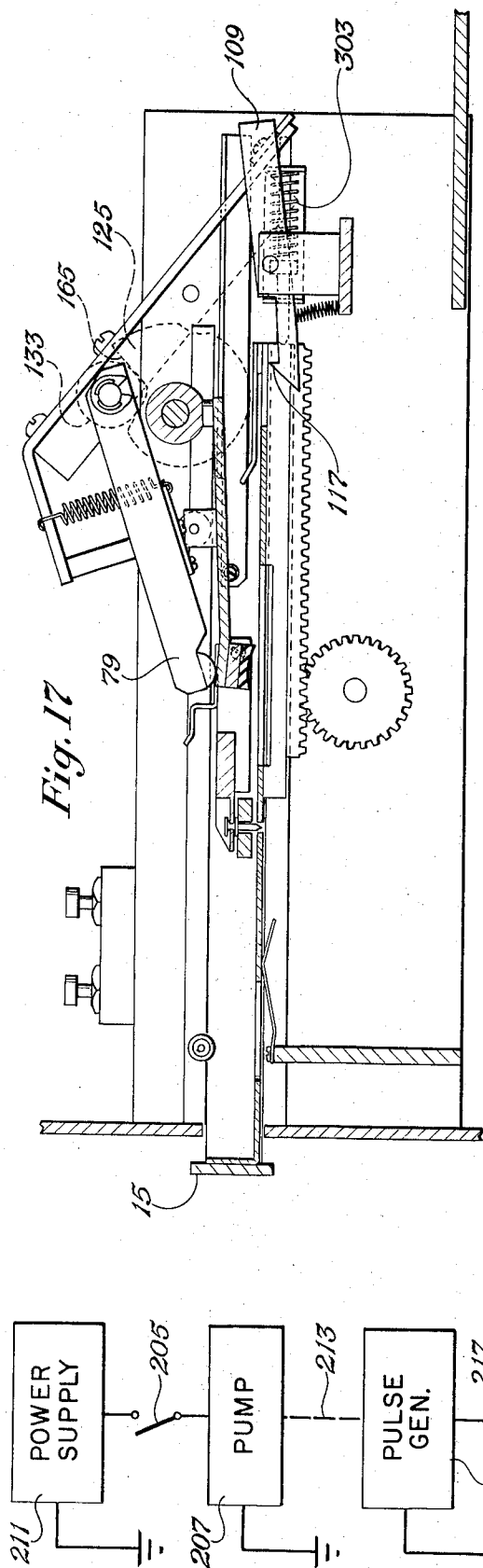
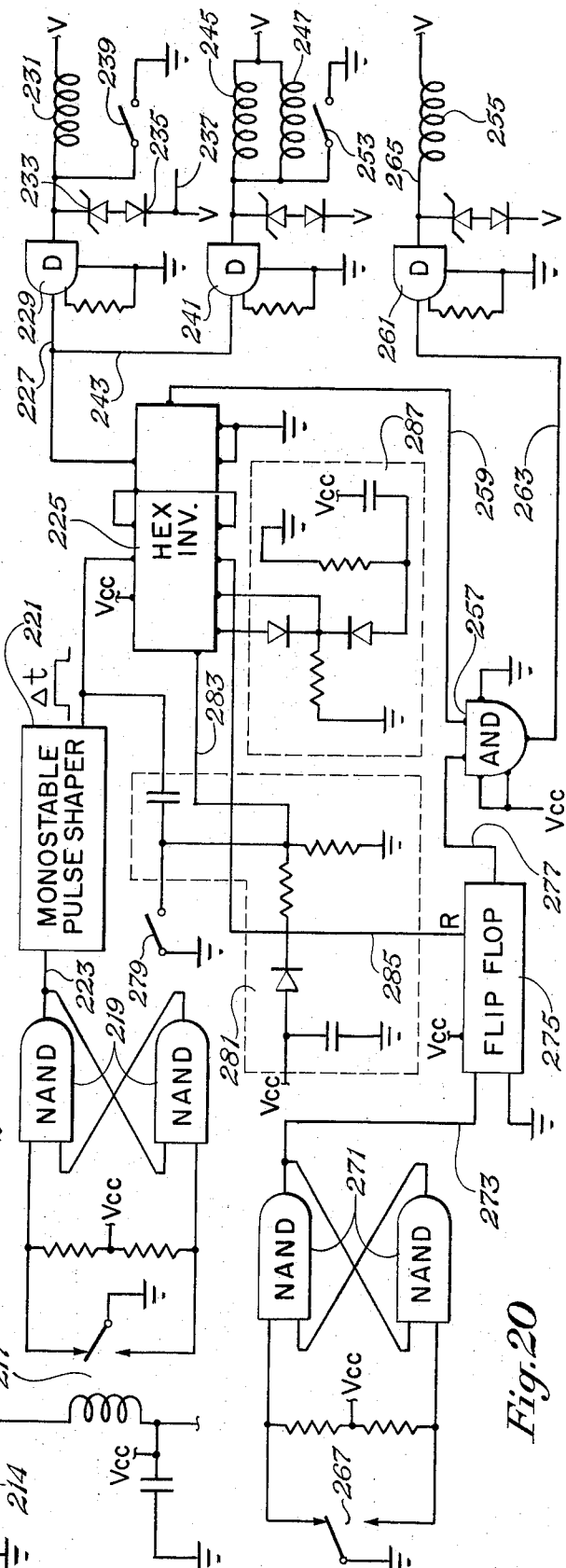












DUAL PRINTING APPARATUS WITH SELECTIVE HAMMER ARMING MEANS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to apparatus for printing tickets; and, more particularly, to apparatus of the so-called "dual printing" type wherein two printing operations are performed on a single ticket to show the quantity of material delivered at the beginning and the end of the delivery operation.

2. Description of the Prior Art

A wide variety of methods and apparatus have been employed for recording the quantity of goods delivered; just as the goods themselves have varied widely from individual units like apples; through solid measures of quantity, like bushels of wheat; to measurement of flow of fluids through meters, like gallons or cubic feet. For example, early flow measurements were made by gaugers dropping a plumb bob and tape into a storage tank to take beginning and ending readings of level of the liquid and converting this to volume from calibration charts. More recently, various types of meters have been employed to indicate in appropriate units the cumulative quantity of the material passed therethrough.

One of the most widely used and best known products employs a dual printing mechanism that is mechanically driven in response to connection with a meter. Since they are frequently similarly used in the field, the terms "pump" or "delivery mechanism" are employed herein as generic terms to include an appropriate metering device. This widely used product employs a ticket printer that is cocked by rotating a crank a plurality of times with a mechanism for shifting the ticket from one position to another. It is primarily mechanical and has a plurality of different boxes that have to be employed and interconnected so its installation was cumbersome and not readily amenable to use at a location remote from the delivery mechanism, or meter. It came into prominence, however, when accounting departments, and product control agencies, and the like found it advisable to provide delivery information that could not be altered by subjective means, as by a gauger putting down the wrong delivery information. This decreased the errors, both intentional and accidental. This type of device, however, was cumbersome and required operation of a plurality of manually operable means, the omission of any one of which could foul up the printing operation. Moreover, the plurality of different pieces of apparatus enabled inexperienced helpers to connect the apparatus incorrectly and, in any event, was cumbersome to install and employ.

Thus, it can be seen that the prior art has not produced a wholly satisfactory dual printing apparatus.

Accordingly, it is an object of this invention to provide a dual printing apparatus that can be employed at a location remote from a delivery mechanism; such as, a pump including a meter.

It is also an object of this invention to provide a dual printing mechanism in which the ticket printer is incorporated into a single unit and in which the various operations are carried out semi-automatically responsive to simple, fool-proof manual operation performed at the front of the ticket printer.

These and other objects will become apparent from the descriptive matter hereinafter, particularly when taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of a ticket printer in accordance with one embodiment of this invention, the ticket printer being in its "step 1" position for receiving a ticket.

FIG. 2 is a side elevational view of the left side of the ticket printer of FIG. 1.

FIG. 3 is a bottom plan view, with the delivery data print wheel assembly removed, of the ticket printer of FIG. 1.

FIG. 4 is a partial cross sectional view of the longitudinal center section looking toward the right side of the ticket printer of FIG. 1 with the ticket printer in its "step 1" position.

FIG. 5 is a partial cross sectional view of the longitudinal center section looking toward the right side with the ticket printer in its "step 2" position.

FIG. 6 is a partial cross sectional view of the longitudinal center section looking toward the right side with the ticket printer in its "step 3" position, and not duplicating the portion that was unchanged from FIG. 5.

FIG. 7 is a partial cross sectional view of the longitudinal center section looking toward the right side with the ticket printer in its "step 4" position.

FIG. 8 is a partial cross sectional view of the longitudinal center section looking toward the right side with the ticket printer in its "step 5" position.

FIG. 9 is a partial right side elevational detail view showing the ratchet, cam and hammer of the ticket printer in its "step 1" position.

FIG. 10 is a partial right side elevational detail view showing the ratchet, cam and hammer with the ticket printer in its "step 2" position.

FIG. 11 is a partial right side elevational detail view showing the ratchet, cam and hammer with the ticket printer in its "step 3" position.

FIG. 12 is a partial right side elevational detail view showing ratchet, cam and hammer with the ticket printer in its "step 4" position.

FIG. 13 is a partial cross sectional view of the longitudinal center section looking toward the left side of the ticket printer of FIG. 1 with the ticket printer in its "step 1" position.

FIG. 14 is a partial cross sectional view of the longitudinal center section looking toward the left side with the ticket printer in its "step 2" position.

FIG. 15 is a partial cross sectional view of the longitudinal center section looking toward the left side with the ticket printer in its "step 3" position and not duplicating the portion that was unchanged from FIG. 14.

FIG. 16 is a partial cross sectional view of the longitudinal center section looking toward the left side with the ticket printer in its "step 4" position.

FIG. 17 is a partial cross sectional view of the longitudinal center section looking toward the left side with the ticket printer in its "step 5" position.

FIG. 18 is an isometric view of a delivery data print wheel assembly for use in the ticket printer of FIG. 1.

FIG. 19 is a bottom plan view of the delivery data print wheel assembly of FIG. 18.

FIG. 20 is a schematic view of one embodiment of this invention employed for delivering a liquid, such as a hydrocarbon.

DESCRIPTION OF PREFERRED EMBODIMENTS

The apparatus of this invention may be employed for dual printing of tickets showing units of quantity of a material delivered by way of a delivery device for any material. For purposes of illustrating the construction and automation, however, it will be employed in conjunction with a pump as the delivery device for delivering a liquid material by way of a meter or the like that effects pulses when a predetermined quantity of material has been delivered. These pulses may be effected by the closure of contacts on a meter or the like, serving as a pulse generator. The specific system will be understood more thoroughly from the descriptive matter with respect to the schematic view of FIG. 20, described later hereinafter. It is sufficient at this point to note that the pulse generator is connected with a delivery data advancing means, such as solenoids 231 and 255, FIGS. 18 and 20, for advancing a delivery data printing means, such as the print wheels 291 and 295, responsive to the signals from the delivery device; for example, pulses from the pulse generator that is connected with the pump. The delivery data advancing means and the delivery data printing means may be incorporated directly into a suitable volumetric space within the frame of a ticket printer 11, FIG. 1, if desired. Such a construction facilitates emplacement, or positioning, of a ticket adjacent the delivery data printing means for printing the beginning and ending delivery data. The respective delivery data advancing means and delivery data printing means will be understood more thoroughly from the descriptive matter given with respect to FIGS. 18 and 19, later hereinafter.

The heart of this invention is a ticket printer 11, FIG. 1. The ticket printer 11 comprises the major assemblies or sub-assemblies of frame 13, FIGS. 1 and 2; a drawer means, such as drawer 15, for receiving a ticket; a print bar 17; a print means 19 for moving the print bar so as to effect printing of the ticket with information from the delivery data printing means; a first arming means 21 for arming the print means 19 when the drawer 15 is moved inwardly to a first location; actuator means 23 for actuating the print means 19; and a second arming means 25 for arming the print means 19 when the drawer 15 is moved inwardly to a second location.

The frame 13 comprises suitable structural and skeletal framework for supporting the respective elements. As illustrated, it comprises a front panel 27, side panels 29 and bottom rear shelf extension 31. Suitable handles 33 are provided to facilitate pulling the ticket printer 11 out of its cabinet or the like in which it has been installed, as by suitable fittings indicated by the knurled knobs 35. Suitable fittings may comprise any of the conventional fittings for inserting into an aperture or the like within a portion of the cabinet and fastening the ticket printer in place, as by rotation of the fitting. As illustrated, the frame 13 is metallic, although any other material that has adequate structural strength may be employed. The elements of the frame may be joined to each other, as well as to the other components by any suitable means, as by metal screws penetrating through apertures and engaging threaded receptacles.

The drawer 15 is slidable longitudinally of the frame 13. The drawer 15 has a means, such as a tray 36, for receiving a ticket therein. A cut-out 16, FIGS. 3 and 4, is provided in drawer 15 to allow a ticket therein to be depressed downwardly onto the delivery data printing

means. As illustrated, the drawer 15 is slidable between top and bottom rails 37 and 39, FIG. 4, that are attached to each of the side panels 29, as by metal screws (not shown). The drawer 15 includes a ticket fixing means for trapping a ticket in place in the drawer responsive to inward movement of the drawer. The ticket fixing means includes a cross bar piercing mechanism 41, FIGS. 1 and 4, and a cross bar positioning means 43 for forcing the cross bar piercing mechanism 41 downwardly to trap an inserted ticket when the drawer 15 is moved inwardly. As illustrated, the cross bar piercing mechanism 41 comprises a cross bar 45 traversing laterally of the drawer 15 and a pin 47 that is movable downwardly to penetrate a ticket 49 emplaced in the drawer. The cross bar piercing mechanism 41 is pivotally mounted via fulcrum shaft bolt 51 on each side of the drawer 15.

The cross bar positioning means 43 has a leaf spring extension 53 that engages a stop 55 and is connected with the cross bar piercing mechanism 41 for biasing the cross bar piercing mechanism 41 to trap an inserted ticket 49 and retain the pin 47 through the ticket. The cross bar positioning means 43 also includes a roller 57 mounted on each side of the frame 13 for forcing the cross bar piercing mechanism downwardly to insert the pin 47 through the ticket 49 when the drawer 15 is pushed inwardly. The cross bar positioning means 43 also includes a camming means such as the upwardly disposed L-bracket, or L-shaped member 59, for engaging the roller 57 and forcing the cross bar piercing mechanism 41 upwardly to release the inserted ticket 49 when the drawer 15 is moved outwardly to its release position. In this way the drawer 15 may be pushed inwardly to its first and second locations for emplacing a ticket between the delivery data printing means and the print bar 17 for printing the respective quantities of delivered material at the beginning and end of a particular delivery.

The print bar 17 is mounted adjacent the delivery data printing means with space therebetween for receiving ticket 49 when the drawer 15 is pushed inwardly. As illustrated, the print bar 17 extends laterally across the major portion of the width of the ticket printer 11 and extends across the top surface of the print wheels employed in the delivery data printing means; including the transaction wheels 295 and the product identification wheel 293, FIG. 18, in order that complete identification of the printing is afforded on the face of the ticket when the print bar 17 is moved downwardly to effect the printing. The illustrated print bar 17 is T-shaped and has the base of the T 61, FIG. 13, connected with a tubular shaft 63 that is freely rotatable about the shaft 65, the latter being discussed in more detail hereinafter with respect to the arming means 21 and 25.

A print bar positioning means 67 is connected with the print bar 17 for moving the print bar 17 toward the delivery data print means before the drawer means is moved inwardly to its first location and for moving the print bar 17 away from the delivery data printing means after the drawer 15 has been moved to its second location and the print means has been actuated to print the beginning and ending delivery data from the delivery data printing means. In this way, the print bar is adjacent the ticket for effecting better printing, and is moved away from the ticket during the time of greatest movement of the ticket so that smudging of the ticket

is prevented. Also, the print bar 17 is raised to allow the drawer 15 to be moved outwardly. As illustrated, the print bar positioning means 67 comprises a roller 69 that is attached to the print bar by way of a laterally extending bracket 71, and a ledge 73 that is mounted on and traverses longitudinally of the drawer 15 to a first predetermined position 75. Thus, as can be seen in FIG. 14, when the first predetermined position 75, marking the cessation of the ledge, moves past the roller 69; the roller and, consequently, the print bar 17, is free to move downwardly as the drawer is pushed further inwardly, thereby allowing the print bar 17 to drop more closely adjacent the ticket 49 and the delivery data printing means (not shown in FIGS. 13 and 14). Conversely, when the drawer 15 is moved outwardly, the ledge 73 will engage the roller 69 and lift the print bar 17 upwardly for the reasons given hereinbefore. Expressed otherwise, the roller 69 changes the position of the print bar 17 each time the first predetermined position 75 passes the roller; lowering the print bar when the drawer is pushed inwardly and raising the print bar when the drawer is pulled outwardly. This effects a cleaner ticket, yet better printing when the print bar is depressed by actuation of the print means 19.

The print means 19 are employed for moving the print bar 17 so as to effect printing of the ticket with information from the delivery data printing means. As illustrated, the print means 19 comprises first and second print hammers 77 and 79, FIG. 1. The first print hammer 77 is connected with the first arming means 21 so as to be armed when the drawer 15 is moved inwardly to its first location. The second print hammer 79 is connected with the second arming means 25 so as to be armed when the drawer 15 is moved inwardly to its second location. Each of the print hammers 77 and 79 are movable toward and away from the print bar so as to be able to strike the print bar when suitably armed and subsequently actuated. As will become apparent from the descriptive matter hereinafter, the print hammers are pivotally mounted and, ultimately, are biased toward the print bar 17 by respective first and second springs 81 and 83, FIGS. 1 and 2, for striking the print bar 17 and forcing it downwardly to force engagement of an inserted ticket with the delivery data printing means therebeneath. Specifically, each of the print hammers; such as, print hammer 77, FIGS. 1 and 4; is freely pivotally mounted on respective cam follower shafts 85 that are connected with the respective first and second cam followers, which are described in more detail with respect to the first and second arming means later hereinafter. The print hammers are locally biased toward stops 86 into a position farthest away from the delivery data printing means and the print bar 17, as by springs 87. Since the print hammers are freely pivotally mounted, however, they are free to overtravel because of inertia beyond the position of the cam follower shaft when the cam follower shaft moves downwardly with its respective cam followers radially interiorly down the respective drop-offs of the cam surfaces, also described in more detail with respect to the arming means hereinafter. As illustrated, the respective first and second print hammers 77 and 79 are carried by first and second print hammer carriages 89 and 91 that are in turn pivotally mounted on the frame 13 by respective fulcrum shaft bolts 93. The springs 81 and 83 are connected to the first and second print hammer carriages 89 and 91.

Each of the first and second hammer carriages 89 and 91 have respective first and second extensions, such as first extension 95, FIG. 4, and second extension 97, FIG. 13. The first extension 95 is employed in conjunction with a first stop arm 99 that is pivotally mounted on the frame 13. The first stop arm 99 engages the first extension 95 so as to move into position to stop inward movement of the drawer 15 at its first location as the first print hammer 77 is armed by inward movement of the drawer 15. Conversely, the first stop arm 99 engages the first extension 95 so as to be moved out of its stop position when the first print hammer 77 is actuated. Specifically, the first extension 95 has a laterally extending member 101 that engages the rear end of the first stop arm 99 to move the rear end upwardly and downwardly as the laterally extending member 101 is moved upwardly and downwardly. Responsive to the upward and downward movement of the rear end of the first stop arm 99, the front end 103 of the first stop arm 99 is moved oppositely upwardly and downwardly to move into and out of its stop position for stopping inward movement of the drawer 15. The first stop arm 99 is pivotally mounted by way of fulcrum shaft bolt 105. Thus, as the first print hammer 77 is moved upwardly into its armed position, the first extension 95 is moved downwardly, allowing the rear end of the first stop arm 99 to move downwardly responsive to upward biasing by the spring 107 under compression. Consequently, the front end 103 moves upwardly into the line of travel to stop inward and rearward movement of the drawer 15 at its first location to properly emplace adjacent the delivery data printing means a delivery ticket space for the beginning delivery information, frequently referred to as READING START, as shown in FIG. 5. Conversely, when the first print hammer 77 has been actuated to move downwardly, the first extension 95 moves upwardly, moving the rear end of the first stop arm 99 upwardly. This lowers the front end 103 downwardly into its position, shown in FIG. 6, freeing the drawer 15 for further inward movement to its second location, FIG. 7.

A second stop arm 109, FIG. 13, engages the second extension 97 so as to move into its holding position to releasably retain the drawer 15 at its second location as the second print hammer 79 is armed by inward movement of the drawer 15 toward its second location. Conversely, the second stop arm 109 is moved out of its holding position to release the drawer 15 when the second print hammer 79 is actuated. Specifically, the second extension 97 has a laterally extending member 111 emplaced beneath the rear end of the second stop arm 109. The second stop arm 109 is pivotally mounted to the frame 13 by way of fulcrum shaft bolt 113. The forward end 115 of the second stop arm 109 has an upwardly extending finger 117 for engaging a slot in the drawer 15 to retain it at its second location until the second print hammer 79 has been actuated to effect printing of the final delivery data, frequently referred to as the READING FINISH. Specifically, the laterally extending member 111 rests beneath the rearward end of the pivotally mounted second stop arm 109 to retain the forward end 115 depressed as long as the second print hammer 79 is not armed. This keeps the finger 117 out of engagement of the slot in the drawer 15. When the second print hammer 79 is armed, however, the second extension 97 is moved downwardly, FIGS. 14 and 15, leaving the rear end of the second stop arm

109 free to move downwardly under the force of the upward biasing of the forward end 115 by the compressed spring 119 as soon as the drawer is moved inwardly to its second location, FIG. 16. As can be seen in FIG. 16, the upwardly extending finger 117 engages a slot (not shown) in the drawer 15 to retain the drawer in its second location. Simultaneously, the front flange 121 of the drawer 15 will have engaged the front panel 27 to prevent rearward movement and the drawer is thus immobilized until after the final delivery information has been printed, as by actuation of the second print hammer 79. Conversely, when the second print hammer 79 has been actuated, the second extension 97 is moved upwardly, to move the rear end of the second stop arm 109 upwardly. This moves the front end 115 downwardly and disengages the finger 117 from the slot in the drawer 15, allowing the drawer 15 to be moved outwardly, as shown in FIG. 17. Subsequently, drawer 15 can be pulled outwardly into its release position for removal of the ticket and insertion of another ticket.

As indicated hereinbefore, a first arming means 21 is connected with the drawer 15 and the print means, such as first print hammer 77, so as to arm the print means 19 when the drawer 15 is moved inwardly to its first location. Similarly, a second arming means 25 is connected with the drawer 15 and with the print means 19, such as second print hammer 79, so as to arm the print means when the drawer 15 is moved inwardly to its second location. The first and second arming means 21 and 25 include respective first and second moving means for moving respective first and second print hammers 77 and 79 away from the print bar 17 and the delivery data printing means and against the biasing means, such as the springs 81 and 83, to an armed position responsive to inward movement of the drawer 15. Specifically, the respective first and second moving means include first and second cams 123 and 125; FIGS. 1 and 4, and FIGS. 2 and 13, respectively; mounted on a rotatable shaft 65 so as to rotate in unison therewith; rack 127 and pinion 129, FIG. 13, for translating the inward motion of the drawer 15 into rotational motion that is transmitted to the shaft 65; and first and second cam followers 131 and 133.

The first and second cams 123 and 125 may be mounted on the rotatable shaft 65 so as to rotate in unison therewith by any conventional means, such as splines, set screws, or the like. As illustrated, the cams are of thermosetting plastic but have a cylindrical metallic hub that is connected with the shaft 65 by way of a set screw. The cams 123 and 125 have peripheral surfaces 139 and 141 that rise radially outwardly, or exteriorly, as the shaft 65 is rotated. Any other suitable construction could be employed as long as the exterior surface of the cam rises radially exteriorly from the shaft 65 so as to raise the respective cam followers 131 and 133. The cam followers, in turn, raise their cam follower shafts 85; and, thereby arm the respective print hammers 77 and 79 by raising them away from the print bar and against their biasing means. The peripheral surfaces 139 and 141 of the respective first and second cams 123 and 125 have respective first and second dwell notches 135 and 137. The first cam 123 has its first dwell notch 135 positioned so as to prevent overrunning of the first cam 123 when the second cam 125 is rotated by having its biased cam follower 133 travel rapidly radially inwardly when rolled off its drop-

off, described hereinafter. Similarly, the second cam 125 has its second dwell notch 137 positioned so as to prevent overrunning of the second cam 125 when the first cam 123 is rotated when its respective cam follower 131 moves rapidly radially inwardly when its drop-off is rotated therebeneath, also explained later hereinafter with respect to the release means of the actuator means 23.

To translate the inward motion of the drawer 15 into rotational motion of the shaft 65, the rack 127 is fixed to and extends longitudinally of the drawer 15 and engages the pinion 129. The pinion 129 is drivingly connected with the shaft 143, FIG. 13. The shaft 143 is drivingly connected with a sprocket pulley 145, FIG. 2. The sprocket pulley 145 serves as a part of the transmission means drivingly connecting the pinion 129 with the shaft 65. The transmission means includes notched belt 147, idler pulley 149 and driven notched pulley 151 that is connected with the shaft 65. The transmission means includes a one-way clutch that is employed to drivingly connect the drive pinion 129 with the shaft 65 so as to rotate the shaft 65 when the drawer 15 is moved inwardly and not to rotate the shaft 65 when the drawer 15 is moved outwardly. As illustrated, the one-way clutch is interposed intermediate the sprocket pulley 145 and the peripheral driving portion 153. The one-way clutch comprises conventional diminishing passageways with roller bearings that engage the parts and cause them to rotate in unison in one direction of rotation but roll between the diverging passageway walls to disengage and allow free movement in the opposite direction of relative rotation. The one-way clutch may be employed in driven pulley 151, instead of the sprocket pulley 145, if desired. It is imperative, however, that the one-way clutch principle be employed to prevent unwanted rotation of the shaft 65 when the drawer 15 is moved outwardly. Thus, it can be seen that the drive pinion 129 is drivingly connected with the shaft 65 so as to effect rotation of the shaft 65 when the drive pinion 129 is rotated in a first direction, and the drive pinion 129 engages the rack 127 so as to rotate in a first direction when the drawer 15 is moved longitudinally inwardly of the frame 13 of the ticket printer 11. On the other hand, even though the drive pinion 129 is rotated when the drawer 15 is moved outwardly, the one-way clutch prevents rotation of the shaft 65 in the opposite direction. As the shaft 65 rotates, the cams 123 and 125 rotate, initially forcing the first and second cam followers 131 and 133 radially outwardly away from the shaft 65.

The first and second cam followers 131 and 133 are connected with the respective cam follower shafts 85 that carry the print hammers, as described hereinbefore. They are also, in turn, carried by the first and second print hammer carriages 89 and 91 such that, as the cam followers 131 and 133 are moved radially outwardly, they cause upward pivoting of the top portions of the respective print hammer carriages 89 and 91 to arm the respective print hammers 77 and 79. The print hammers 77 and 79 are retained in the armed position by the engagement of the respective cam followers 131 and 133 with the peripheral surfaces 139 and 141 of the respective first and second cams 123 and 125 until the print hammers are actuated by manual inward pushing of the actuator means 23.

As implied hereinbefore, the actuator means 23 is employed for actuating the print means 19. The actua-

tor means 23, FIG. 1, includes a manually operable member, such as push rod 155 having an external knob 157; and a release means for releasing the respective print hammers 77 and 79 after they have been moved into their armed position. The knob 157 is accessible at the front panel 27.

The release means is connected with the manually operable member, or push rod 155, at its inward end; and is connected with the first and second moving means for effecting respective releases of the armed first and second print hammers 77 and 79 responsive to manual operation of the manually operable member. Specifically, the release means includes a ratchet means comprising a ratchet wheel 159 and a ratchet tooth 161. The release means also includes respective precipitous drop-offs 163 and 165 of the respective exterior cam surfaces 139 and 141 of the respective first and second cams 123 and 125 for allowing the respective cam followers 131 and 133 to move rapidly radially inwardly toward shaft 65 when the respective cams are rotated to emplace the drop-offs 163 and 165 beneath the cam followers 131 and 133. Expressed Otherwise, the ratchet tooth 161 is connected with the push rod 155 so as to engage mating ratchet teeth on the ratchet wheel 159 for effecting timely further rotation of the shaft 65 and the respective cams responsive to inward pushing of the push rod 155. By "timely" is meant after the ratchet wheel 159 has been rotated into position such that the ratchet tooth 161 can engage a respective ratchet tooth on the ratchet wheel 159. The ratchet wheel 159 has two ratchet teeth disposed at its peripheral portion, the first of the ratchet teeth being positioned so as to be engaged by the ratchet tooth 161 when the first print hammer 77 is armed. Subsequent movement of the knob 157 inwardly will effect sufficient additional rotation of the first cam 123 to allow the first cam follower 131 to fall off the drop-off 163, to the position illustrated in FIG. 6. The approach of the drop-off 163 to the first cam follower can be seen in FIG. 5. Similarly, the approach of the second drop-off 165 on the second cam 125 and the fall of the second cam follower 133 can be seen in FIGS. 16 and 17. The ratchet tooth 161 is pivotally mounted at fulcrum pin 167, FIG. 9, and is biased downwardly by suitable biasing means, such as leaf spring 169, to engage the peripheral portion of the ratchet wheel 159. The push rod 155 is biased outwardly by coil spring 171 engaging bracket 173 and collar 175 that is fixedly connected with the push rod 155 by way of set screw 177. The ratchet wheel 159 has a cylindrical portion that is rigidly connected with the shaft 65 by way of a set screw (not shown).

A leaf spring 311, FIG. 5, traverses longitudinally of the ticket printer 11 immediately above the delivery data printing means. The leaf spring 311 guides the ticket 49 past the cut-out 16, FIGS. 3 and 4, in the drawer 15. A leaf spring 314, FIG. 18, serves to keep the ticket 49 and print bar 17 from dragging on the delivery data printing means.

It is important that synchronization be maintained in operation of the ticket printer 11 for correct operation. To ensure that synchronization is maintained, a mechanism is provided that allows operation of the drawer 15 only inwardly or only outwardly, once that direction of movement is started, until the complete trajectory of the drawer 15 has been traversed. Specifically, the drawer 15 has a rack 181, FIG. 4, fixed to and extend-

ing longitudinally thereof. As illustrated, the rack 181 is a separate rack that is mounted on the opposite side of the drawer from the rack 127 that drivingly engages the pinion 129. A toggle mechanism 183 is pivotally mounted on the frame 13 about fulcrum shaft bolt 185. The toggle mechanism 183 is movable into two angular positions, referred to hereinafter as a first angle and a second angle. The toggle mechanism 183 has two oppositely disposed arms 187 and 189 such that one and only one arm engages the rack 181 when the toggle mechanism is at a first angle and the other arm engages the rack 181 when the toggle mechanism 183 is at the second angle. Specifically, the inward arm 187 engages the rack 181 to allow inward movement of the drawer when the toggle mechanism is at the first angle. Conversely, the outward arm 189 engages the rack 181 when the toggle mechanism 183 is at the other angle. The inward arm 187 prevents outward movement of the drawer 15 because it engages the teeth of the rack 181 so the drawer 15 must be pushed completely inwardly before its direction can be reversed. Conversely, the outward arm 189, once it has been moved into engagement with the teeth of rack 181, permits movement of the drawer only outwardly. Toggle actuators 191 and 193 are provided at each end of the rack 181 for moving the toggle mechanism 183 to its proper angle, ordinarily to its other angle from whatever angle it is reposing in. This allows reversal of the direction of movement of the drawer 15. The toggle mechanism 183 is biased so as to retain its set angle by suitable biasing means. As illustrated, the biasing means comprises a leaf spring 195 that biases a cylindrical insert 197 into notches 199 and 201 of the toggle mechanism 183. The leaf spring is mounted to a bracket 203 that is connected with the frame 13.

The delivery data printing means comprises three sets of print wheels, the delivery data print wheels 291, FIG. 18, the product identification print wheels 293, and the transaction print wheels 295. As illustrated, there are six delivery data print wheels 291 in a single assembly in which the respective wheels advance in accordance with the conventional Arabic number system, the unit wheels rotating ten units to advance the tens wheel one unit, the tens wheel rotating ten units to advance the hundreds wheel one unit and so forth. Similarly, the transaction print wheels 295 comprise three wheels whose respective wheels advance the succeeding wheel in accordance with the Arabic number system; the three wheels being joined together in a single conventional unit. The product identification wheel 293 may be employed with either numbers or letters to identify the product, as indicated hereinbefore. As illustrated, letters are employed. The product identification wheel is journaled for rotation about its shaft and is connected via a gear train, including gear 315, and shaft 313 with the hand knob 309. The product identification wheel 293 is changed only by rotation of the hand knob 309. Contrariwise, electrically operated solenoids 231 and 255 are connected so as to advance, respectively, the delivery data print wheels 291 and the transaction print wheels 295 upon receipt of the respective operative pulses, or signals, as delineated with respect to FIG. 20 hereinafter. The printing assembly comprises conventional units that are arranged in a subframe 317 that can be readily inserted into the bottom of the ticket printer 11.

In fact, FIG. 19 illustrates the bottom of the subframe 317 that is ready for insertion into the bottom of the ticket printer 11 illustrated in FIG. 3. The hand knob 309 has its shaft 313 inserted in the recess 321 of FIG. 3. The electrical conductors 323 terminate in respective Y-connectors 325 to facilitate connecting with the respective electrical terminals for effecting the electrical connections being shown in FIG. 20. Since the operation of the respective counting wheels by way of electrically conventional, solenoids are conventional, it is not believed necessary to further encumber this already lengthy specification by delineating in detail the interconnections therefor. Also, the respective mounting bolts for the shaft of the respective print wheels and for the respective solenoids are clearly shown in FIG. 18.

In addition to the mechanical arrangement of the ticket printer 11, there are significant electrical interconnection aspects that are best illustrated schematically with reference to the appropriate mechanical structure and figures where appropriate. Referring to FIGS. 4 and 20, a ticket sensing switch 205 is connected with the delivery device, such as pump 207, so as to inhibit operation thereof until a ticket 49 is inserted into the ticket printer 11 and moved inwardly by moving the drawer 15 to its second location, as illustrated in FIG. 7. As can be seen in FIG. 7, the switch actuator arms 209 are raised upwardly to close the switch 205 when the ticket 49 is in the drawer 15 and the drawer 15 is pushed inwardly to its second location. At other locations; as illustrated in FIG. 5, for example; the arms 209 are lowered, opening the switch 205. As illustrated in FIG. 20, the ticket sensing switch 205 is serially connected intermediate a power supply 211 and pump 207, although any other interconnection that would inhibit operation of the pump could be employed. The pump 207 is connected with a pulse generator 214, as illustrated by dashed lines 213. Ordinarily, a liquid meter, that may be included in the housing referred to generically as the pump, can serve as the pulse generator 214, since it will have contacts that are closed after a predetermined quantity of fluid has been delivered to generate the pulses. This is conventional equipment and need not be described in detail. On the other hand, if desired, other types of pulse generators may be employed to make use of electromagnetic or magnetic coupling, or the like for safety features.

Electrical interconnection plugs employing conventional quick disconnect receptacles are affixed near the front of the ticket printer 11, illustrated as 215, FIGS. 2 and 3. By this means, the pulse generator 214 is connected with a relay 217, such as a Grigsby-Barton GB 821 C-1. The relay 217 has its latch 219 comprising a pair of interconnected NAND gates to eliminate chatter and false counts. The output of the relay and the latch is connected with a monostable pulse shaper 221 by way of conductor 223. The monostable pulse shaper shapes the pulse to give a positive signal of a time duration Δt . The output of the monostable pulse shaper is connected with the hex inverter (HEX INV) 225. The hex inverter 225 is employed to give enough power to drive the Darlington transistors, referred to simply as Darlington, (D) for each pulse. The Darlington, in turn, drive their respective solenoids by connecting them to ground. Specifically, a data print solenoid 231 is used in the delivery data advancing means to step the delivery data printing means responsive to delivery of

units of quantity of the material. A voltage source V, data print solenoid 231, first Darlington 229, and ground are serially connected. Thus, conduction of the first Darlington 229 completes an electrical circuit through solenoid 231, energizing it. Energizing solenoid 231 advances the delivery data printing means one entity. The hex inverter 225 is connected with first Darlington 229 via conductor 227 for rendering the first Darlington 229 conductive.

As illustrated, each Darlington is also connected with the voltage source V by way of respective Zener diodes 233 and diodes 235. The respective Zener diodes 233 and diodes 235 serve as "clipper" devices to prevent the back electromotive force (emf) from the collapsing field of the respective solenoids from damaging the respective Darlington when they are suddenly rendered nonconductive. In operation, the diode 235 does not allow current to flow from positive voltage source V, but allows current to flow the other way. Zener diode 233 prevents current flow up to its breakdown voltage; for example, minus 20 volts; preventing spurious solenoid action. When the negative going voltage from the collapsing field becomes greater than its breakdown voltage, however, a parallel path is provided, preventing damage to its Darlington. Suitable conductor 237 may be employed for energizing pilot lamps and the like.

A step switch 239 is serially connected with the data print solenoid 231 for manually stepping the solenoid to effect synchronization. The step switch 239 can also be seen mechanically in FIG. 2. This manually operable step switch 239 ordinarily is not accessible to the operator, since the ticket drawer can be locked and sealed closed to prevent introduction of false counts during a delivery.

The hex inverter 225 has its output terminal also connected with a second Darlington 241 via conductor 243. The second Darlington 241 is connected with a delivery counter solenoid 245 and a cumulative flow solenoid 247. The delivery counter solenoid 245 is connected with a delivery counter wheel 249, FIG. 1, at the front panel 27 to show the operator the quantity delivered. A suitable reset button 251 is employed for resetting the delivery counter at the beginning of each delivery. The cumulative flow solenoid 247 is connected with cumulative delivery counter wheels 250 at the front panel 27, FIG. 1. The cumulative delivery counter wheels 250 should always agree with the delivery data print wheels 291. To help obtain agreement, a step switch 253, FIGS. 2 and 20, is provided for actuating the respective solenoids 245 and 247. The step switches 239 and 253 can be employed to bring the delivery and the cumulative flow counters, or counter wheels 249 and 250, into synchronization with the delivery data print wheels 291. As can be seen in FIG. 20, the step switches 239 and 253 are serially interconnected intermediate their respective solenoids and ground, the solenoids being connected with a source of power such as voltage V. Operation of either of the step switches one time actuates their respective solenoid to advance the associated counter wheel one count.

The hex inverter 225 is connected with the transaction counter solenoid 255 by way of AND gate 257 in order to register only one transaction for a given delivery. The output signal from the hex inverter will operate the transaction solenoid only one time for a given transaction, since the other input pin of the AND gate

257 will only render the AND gate conductive for the initial signal, or pulse from the pulse generator 214, and not for any others thereafter. Specifically, the hex inverter 225 is connected with one input pin of AND gate 257 via conductor 259 and the output pin of AND gate 257 is connected with the transaction Darlington 261 by way of conductor 263. The transaction Darlington 261 is connected with the transaction solenoid 255 by way of conductor 265.

In order to render the AND gate 257 conductive for transmission, or conduction, of the initial pulse there-through to operate the transaction solenoid 255, a transaction limit switch 267, also shown in FIGS. 1 and 9 et seq, is provided. A lateral protrusion 269, such as a rotatably mounted cylinder, FIGS. 10 and 11, is provided on the cam 123 to actuate the transaction limit switch 267 when moved therepast by rotation of the cam 123. The transaction limit switch is electrically connected with its latch 271, comprising a pair of interconnected NAND gates similar to latch 219. The latch 271 is electrically connected via conductor 273 with flip-flop 275. The output terminal of flip-flop 275 is connected with the other input terminal of AND gate 257 via conductor 277. Thus, when the transaction limit switch is closed by the actuation of the first print hammer 77, the protrusion 169 closes the transaction limit switch 267 and operates the flip-flop 275 to render the AND gate 257 ready to conduct when it receives a pulse from the hex inverter 225.

A reset switch 279, FIGS. 9 and 20, is disposed adjacent the first cam 123 so as to be closed by the protrusion 269 when the second print hammer is actuated. The reset switch 279, a trigger network 281, conductor 283, hex inverter 225, and flip-flop 275 are serially electrically connected to maintain proper synchronization. Specifically, the hex inverter has one output terminal connected with the reset terminal R of the flip-flop 275 by way of conductor 285 such that the flip-flop 275 is reset by the trailing edge of the first pulse from the pulse shaper 221. Thereafter the AND gate 257 will not pass remaining pulses of any given delivery. If, however, there are no delivery signals, such as a pulse from the pulse shaper 221, and the drawer is pulled out; the flip-flop 275 must be reset or it will be out of synchronization. Closing of the reset switch 279 by actuation of the second print hammer to release the drawer resets the flip-flop 275 into the proper mode, regardless of whether or not there has been delivery signals.

An automatic reset network 287 is also connected with the hex inverter 225 to ensure synchronization. Expressed otherwise, the automatic reset network 287 effects automatic resetting of the flip-flop 275 when power is first turned on.

In operation, the ticket printer is connected with the delivery device such as pump 207, as illustrated and described hereinbefore. When the ticket printer 11 is not in use, the empty ticket drawer 15 may be fully inserted into the front panel 27. This eliminates catching clothing on the drawer and the like. The drawer 15 may be left in any other position desired, however. With the ticket drawer 15 fully inserted, the operator pushes the knob 157, ordinarily labeled PUSH TO PRINT, tripping the internal mechanical printing system and freeing the ticket drawer which pops out about three quarters of an inch from the front panel 27 by pressure of spring 303, FIG. 17. The operator then manually pulls the drawer

out to its fully extended position, normally about four inches. The drawer must be fully withdrawn before it can be reinserted after ticket loading. As implied hereinbefore, this operation would place the flip-flop 275 in the wrong mode, if it were not for the reset switch 279 or the automatic reset network 287. In the wrong mode, the flip-flop 275 would fail to prepare the AND gate 257 to pass the first pulse from pulse shaper 221 upon closure of transaction limit switch 267; and the transaction print wheels 295 would not be advanced. Either or both reset switch 279 and reset network 287 reset, via reset pin R, the flip-flop 275 to ensure proper synchronization, or operation into the correct mode.

The ticket printer 11 has a plurality of respective step positions into which it is operated following particular operations. It is believed helpful to describe the operations broken down into these steps and to illustrate the components at each of the steps. The step 1 position has the drawer means extended outwardly for insertion of the ticket, as described hereinbefore. The step 1 position is illustrated in FIGS. 4 and 13 looking from the center section of the ticket printer, toward, respectively, the right and left sides. As can be seen, neither one of the print hammers 77 or 89 is armed and the toggle mechanism 183 will have been tripped to allow inward movement of the drawer 15. The step 1 position is equivalent to the loading position for loading the ticket and is the same as the release position for unloading a ticket that has been previously printed. Consequently, that drawing is not duplicated in the release position.

A multiple copy ticket pack is inserted into the drawer 15 in its step 1 position before beginning a delivery. The ticket is inserted with the bottom edge of the ticket inward and with the ticket pack inverted, printed face down. The ticket pack, or ticket 49, is pressed against the floor of the drawer and passed under the cross bar piercing mechanism 41 until the ticket 49 hit a stop at the rear of the drawer. The stop is preset to receive the full length of the particular ticket pack. A plurality of guide plates and the stop on the drawer (not specifically called out) can be adjusted to receive a variety of ticket sizes.

Preparatory to printing the beginning delivery information from the delivery data printing means, the drawer 15 is moved into its step 2 position. That is, it is pushed firmly into the panel until it encounters the first stop arm 99, leaving about $\frac{3}{8}$ inch of the drawer protruding from the panel, as illustrated in FIGS. 5 and 14. As implied hereinbefore, the beginning delivery information includes cumulative delivery data from delivery data print wheels 291, the product identification from the product identification wheel 293 and the transaction number from the transaction wheels 295. As the ticket drawer is moved inwardly to cock, or arm, the print means 19, the cross bar piercing mechanism 41 that rests on top of the ticket is cammed downwardly by the pair of rollers 57 to force its pin 47 downwardly through the ticket to retain it in place. The pin 47 is retained in place penetrating the ticket 49 by the leaf springs 53.

In the step 2 position, the rack 127 will have rotated the driving pinion 129 to raise the first and second print hammers 77 and 79 upwardly and arm them. As can be seen in comparing FIG. 5 with FIG. 14, however, the first print hammer 77 is more nearly completely armed, by having its first cam follower 131 nearer its drop-off

163 on its cam 123; than is the second print hammer 79. As can be seen in FIG. 14, the print bar 17 will have been lowered downwardly onto the ticket 49 by rolling of the roller 69 off of the ledge 73. This prepares the print bar for effecting better printing when struck by a print hammer. Note that the toggle mechanism 183 allows inward movement of the drawer, but prevents movement of the drawer outwardly until it has reached its extreme inner position, or second location. As indicated hereinbefore, the print hammers are armed by way of the transmission means connecting the drive pinion 129 with the shaft 65 onto which the cams are mounted. The respective print hammers are heavily biased downwardly to strike the print bar 17 and effect the printing when actuated.

As can be seen from FIG. 9, the ratchet wheel 159 in the step 1 position is not rotated such that the ratchet tooth 161 can engage one of the two ratchet teeth on the peripheral portion of the ratchet wheel to effect further rotation of the shaft 65 and on the respective cams 123 and 125. In contrast, as illustrated in FIG. 10, the ratchet wheel 159 will have been rotated sufficiently that the cam tooth 161 can engage a first ratchet tooth 299 on the ratchet wheel 159 for effecting further rotation of the shaft 65. The rotation of the cam 123 about 15° to effect peripheral travel of about ½ inch will allow the first cam follower 131 to traverse rapidly inwardly along the first drop-off 163. In contrast, the second cam 125 (dashed lines) will require approximately 90° or about 2 inches of peripheral travel before its second drop-off 165 will be emplaced beneath its cam follower 133, which is aligned with the first cam follower 131 and is not visible in FIG. 10.

The ticket printer 11 is actuated into its step 3 position with the drawer 15 at its first location and with the print means, or first print hammer 77 actuated by the actuator means 23 for effecting initial printing of beginning delivery data. The step 3 position is illustrated in FIGS. 6 and 15. Referring to FIG. 6, the first print hammer 77 will have been actuated, by having its first cam follower 131 traverse rapidly downwardly along its first drop-off 163, to strike the print bar 17. The print bar 17, in turn, strikes the ticket 49 and effects printing of the beginning delivery data from the respective delivery data printing means. In contrast, the second print hammer 79, FIG. 15, remains in its substantially armed position with its second cam follower 133 engaging its dwell notch 137 on the peripheral surface of its cam 125. As indicated hereinbefore, the dwell notch 137 encounters the second cam follower 133 to prevent overrunning of the respective shaft and cams when the first cam follower 131 traverses rapidly down the drop-off 163.

Referring to FIGS. 10 and 11, the additional rotation of the shaft 65 and the first cam 123 is effected by pushing inwardly on the actuator means 23, or the knob 157, FIG. 1, pushing the push rod 155 and the ratchet tooth 161 inwardly, effecting rotation of the ratchet wheel 159. As can be seen in FIG. 11, the first cam follower 131 will have been rolled over the drop-off 163 and fallen rapidly radially inwardly toward the shaft 65 for actuating the first print hammer 77. Specifically, responsive to strong biasing by spring 81, the first print hammer carriage 89 pivots rapidly inwardly when the drop-off 163 is rotated beneath the cam follower 131. The first print hammer is moved rapidly inwardly to strike the print bar 17. Yet, excessive stop-

ping stress and wear are avoided because the heavy print hammer 77 is free to over travel by virtue of its previously described pivotal mounting on cam follower shaft 85.

As the ratchet wheel 159 is rotated, rotating the first cam 123, the protrusion 269 actuates a transaction limit switch 267, as indicated hereinbefore to prepare the AND gate 257 to conduct the first incoming pulse from the delivery device or pulse generator 214 to the transaction solenoid 255 for advancing the transaction print wheel 295.

As the drawer was moved inwardly to the step 3 position, the first stop arm 99 was moved upwardly to stop further inward movement of the drawer 15, as indicated. Thereafter, actuation of the first print hammer 77 moves the forward end 115 of the first stop arm 99 out of the path of the drawer 15 and allows the drawer to be moved inwardly to its second location for its step 4 position.

Preparatory to printing the final delivery data onto the ticket 49, the ticket printer 11 is moved into its step 4 position with the drawer 15 being moved inwardly to its second location, as shown by FIGS. 7, 12 and 16. The ticket 49 in the drawer 15 will have its READING FINISH block emplaced adjacent the delivery data printing means. As can be seen in FIG. 16, the second print hammer 79 is moved more nearly to its fully armed position with its second cam follower 133 traversing further along the peripheral surface of the cam 125, having moved out of its dwell notch 137. Expressed otherwise, further inward movement of the drawer rotates the shaft 65 further, simultaneously rotating the respective cams 123 and 125 further. Movement of the drawer 15 and the ticket 49 into their innermost position, or their second location, actuates the ticket sensing switch 205, by raising upwardly the switch arm 209, FIG. 7. The ticket sensing switch 205 must be actuated before the delivery pump 207 can be turned on. Following actuation of the ticket sensing switch 205, the delivery pump 207 is ready to commence delivery of the product.

As can be seen in FIG. 7, also, the toggle mechanism 183 will have been moved by toggle actuator 193 to its other angle to allow outward movement of the drawer 15, once it has been otherwise released.

As noted hereinbefore, the finger 117 of the second stop arm 109 will have been moved upwardly into engagement with the slot in the drawer 15, FIG. 16, such that the second stop arm 109 in combination with the flange engaging the front panel 27 immobilizes the drawer 15 and the ticket 49 therein. As can be seen in FIG. 12, the ratchet wheel 159 will have been rotated such that the ratchet tooth 161 can engage the second ratchet tooth 301 on the ratchet wheel 159 for actuation of the print means 19, or second print hammer 79, after the product has been delivered.

After the transaction limit switch 267 has been closed to prepare the AND gate 257, the first pulse from the pulse generator 214 will actuate the transaction number solenoid 255 to move the transaction print wheel 295 one unit. The trailing edge of the first pulse from pulse shaper 221 resets the flip-flop 275 such that the AND gate 257 will not thereafter pass pulses until the flip-flop 275 is again actuated by closure of the transaction limit switch 267. Consequently, only the first pulse is effective to advance the transaction print wheel 295. Thereafter, the pulses coming in from the

pulse generator 214 will effect advancing of the delivery data print wheels 291; and, at the front panel 27, the delivery counter wheel 249 and the cumulative delivery counter wheel 250.

After the product has been delivered, the actuator means 23 may be moved inwardly to cause the ratchet wheel 159 and the shaft 65 to rotate further, allowing the second cam follower 133 to fall off of the second drop-off 165. The movement of the ticket printer 11 into its step 5 position is illustrated in FIGS. 8 and 17. The step 5 position for the ticket printer 11 is effected by the second print hammer 79 having been actuated by the further rotation of its second cam 125 until its second cam follower 133 drops off of its drop-off 165, as illustrated in FIG. 17. The rotation of the ratchet wheel 159 into the step 5 position is the same as the step 1 position of FIG. 9. The finger 117 of the second stop arm 109 is moved out of engagement with the slot in the drawer 15 allowing the drawer to be moved outwardly by interiorly mounted spring 303. Note that both print hammers 77 and 79 have been dis-armed so there is very little danger of striking the print bar 17 and effecting printing again.

As indicated hereinbefore, when the actuator means 23 is moved inwardly to actuate the second print hammer 79, the lateral protrusion 269 on cam 123 actuates the reset switch 279. The reset signal is effected by way of the hex inverter 225 to reset the flip-flop 275 such that it can be energized upon the next closure of the transaction limit switch 267.

All that remains to be done then is to pull the drawer outwardly to its release position to release the ticket. As the drawer is pulled outwardly, the L-shaped member 59 engages the roller 57 to lift the cross bar piercing mechanism 41 to move the pin 47 out of the ticket 49. Thereafter, the ticket may be lifted easily out of the drawer 15 by movement of a finger or the like upwardly through the aperture 307, FIG. 4.

The hand knob 309 is connected with the product identification wheel 293 is located internally and is accessible only when the ticket printer is pulled out away from its mounting frame.

The ticket printer 11 may be operated on any desired power source. As illustrated, 110 volts alternating current is supplied. A male receptacle in the electrical interconnection 215 is employed for connection with power. A female receptacle is employed to bring in the input signal from the delivery device, such as the pulse generator 214.

The concomitant operation of both the first and second arming means 21 and 25 is described hereinbefore for arming simultaneously the first and second print hammers 77 and 79 by the inward movement of the drawer 15. Respective and separate arming means could be employed to arm a print means, such as a single hammer, during movement of the drawer 15 into its respective first and second locations. Specifically, the print means 19 could be armed by movement of the drawer inwardly to its first location, thereafter actuated by the actuator means 23, and then armed a second time when the drawer is moved further inwardly to its second location for printing the final delivery data.

The use of a one-way clutch in the transmission intermediate the shaft 65 and the drive pinion 129 have been described hereinbefore. If desired, the one-way clutch principle could be employed intermediate the shaft 65 and each of the respective cams. As will be

seen from a consideration of the operational description, however, this latter approach would be more complicated and present problems of maintaining synchronization that are obviated by the presently disclosed embodiment. Such an arrangement is deemed to be within the scope of this invention, however.

While a separate rack 181 has been described hereinbefore, the rack 127 could be employed, although it would complicate the manufacture to have to keep the toggle mechanism 183 separate from the driving pinion 129.

While the Darlington transistors have been described hereinbefore for operation of the respective solenoids, any other logic arrangement can be employed that will effect the operation of the solenoid positively and safely at the operative voltage levels of the circuit.

From the foregoing it can be seen that this invention provides a unitary ticket printer in which the operations are semi-automatically carried out responsive to inward pushing of a drawer carrying the ticket into the ticket printer and manual operation of an actuator means, with safety features making a mistake virtually impossible. Moreover, this single piece of equipment replaces the cumbersome multiple pieces of the prior art and accomplishes the objects delineated hereinbefore in effecting improvements in the prior art apparatus. The ticket printer can be employed at a location remote from the delivery device, such as pump 207; and electrical interconnection is the only connection that has to be made. Moreover, the apparatus can be employed with most conventional delivery units without requiring any additional interfacing accessories.

Although this invention has been described with a certain degree of particularity, it is understood that the present disclosure is made only by way of example, and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of this invention.

What is claimed is:

1. Apparatus for printing tickets showing units of quantity of a material delivered via a delivery device, comprising:

- a. delivery data printing means for printing delivery data in units of quantity at the beginning of a delivery and at the end of a delivery;
- b. delivery data advancing means for advancing said delivery data printing means; said delivery data advancing means being connected with said delivery device so as to effect said advancing of said delivery data printing means responsive to signals from said delivery device; and
- c. a ticket printer comprising:
 - i. a frame;
 - ii. drawer means for receiving a ticket thereinto; said drawer means being slidable longitudinally of said ticket printer frame;
 - iii. print bar mounted adjacent said delivery data printing means with space therebetween for receiving said ticket when said drawer means is pushed inwardly;
 - iv. print means for moving said print bar so as to effect printing of said ticket with information from said delivery data printing means;
 - v. first arming means for arming said print means preparatory to printing beginning delivery data; said first arming means being connected with

said drawer means and said print means so as to arm said print means when said drawer means is moved inwardly to a first location;

vi. actuator means for actuating said print means after said print means is armed; and

vii. second arming means for arming said print means preparatory to printing ending delivery data; said second arming means being connected with said drawer means and said print means so as to arm said print means when said drawer is moved inwardly to a second location.

2. The apparatus of claim 1 wherein a print bar positioning means is connected with said print bar for moving said print bar toward said delivery data printing means before said drawer means is moved inwardly to its said first location and for moving said print bar away from said delivery data printing means after said drawer means has been moved to its said second location and said print means has been actuated to print the beginning and the ending delivery data from said delivery data printing means, whereby a ticket with good printing and almost no smudging is produced, and said drawer means is readily movable in its respective directions without inference from said print bar.

3. The apparatus of claim 2 wherein said print bar positioning means comprises a roller attached to said print bar and a ledge mounted on said drawer means and traversing longitudinally thereof to a first predetermined position; said roller changing the position of said print bar when said first predetermined position passes said roller.

4. The apparatus of claim 1 wherein said printing means comprises first and second print hammers, said first print hammer being connected with said first arming means and said second print hammer being connected with said second arming means; each said print hammer being movable toward and away from said print bar and said delivery data printing means.

5. The apparatus of claim 4 wherein biasing means is provided for biasing said print hammer toward said print bar and said delivery data printing means;

said first and second arming means include respective first and second moving means for moving respective said first and second print hammers away from said print bar and said delivery data printing means and against said biasing means to an armed position responsive to inward movement of said drawer means; and

said actuator means includes a manually operable member accessible at the front of said ticket printer and a release means for releasing respective said print hammers after they have been moved into their armed position; said release means being connected with said manually operable member and said respective first and second moving means for effecting respective releases of armed said first and second print hammers responsive to manual operation of said manually operable member.

6. The apparatus of claim 5 wherein said first and second moving means include:

- a first and second cams mounted on a rotatable shaft so as to rotate in unison therewith;
- a rack fixed to and extending longitudinally of said drawer;
- a drive pinion drivingly connected with said shaft so as to effect rotation thereof when said drive pin-

ion is rotated in a first direction and engaging said rack so as to rotate when said drawer is moved longitudinally of said ticket printer frame; and

d. first and second cam followers connected to respective said first and second print hammers and riding on the peripheral surface of respective said cams for arming said print hammers as said first and second cams are rotated; and said release means includes:

e. a precipitous drop-off of the respective cam surfaces radially interiorly of said cam for allowing respective said cam followers to move rapidly radially inwardly when said respective cams are rotated sufficiently; and

f. a ratchet means including a ratchet wheel connected with said shaft and a ratchet tooth connected with said manually operable member for advancing respective said cams at respective times for releasing respective print hammers.

7. The apparatus of claim 6 wherein a ticket sensing switch is connected to said delivery device so as to inhibit operation thereof until a ticket is inserted into said ticket printer and moved upwardly by moving said drawer means to its said second location.

8. The apparatus of claim 6 wherein said drawer means has a rack fixed to and extending longitudinally thereof and a toggle mechanism is pivotally mounted on said frame; said toggle mechanism having two oppositely disposed arms such that one arm engages said rack when said toggle mechanism is at a first angle and allows movement of said drawer means in only one direction, and the other arm engages said rack when said toggle mechanism is at a second angle and allows movement of said drawer means in only the other direction; and toggle actuators are provided at each end of said rack for moving said toggle mechanism to its other angle.

9. The apparatus of claim 6 wherein said drawer means includes a ticket fixing means for trapping a ticket in place in said drawer means responsive to inward movement of said drawer means.

10. The apparatus of claim 9 wherein said ticket fixing means comprises:

- a cross bar piercing mechanism for trapping a ticket and retaining it in place; and
- a cross bar positioning means for forcing said cross bar piercing mechanism downwardly to trap an inserted ticket when said drawer means is moved inwardly; said cross bar positioning means including:
 - a cross bar biasing means biasing said cross bar to trap an inserted ticket; and
 - a cross bar camming means for also forcing said cross bar piercing mechanism to release said inserted ticket when said drawer is moved outwardly to its release position.

11. The apparatus of claim 10 wherein said cross bar positioning means comprises a pair of rollers mounted on said frame at respective sides of said cross bar piercing mechanism contiguous its upper surface so as to force said cross bar piercing mechanism downwardly to trap said inserted ticket as said drawer is moved inwardly; and an upwardly extending member on each side to engage said roller and lift said cross bar piercing mechanism to free said ticket when said drawer is moved outwardly to its said release position.

12. The apparatus of claim 6 wherein said ticket printer has a plurality of respective step positions that include:

- a. a step 1 position with said drawer means extended outwardly for insertion of a ticket therinto;
- b. a step 2 position with said drawer means moved inwardly to a first location with said ticket having a beginning delivery data block adjacent said delivery data printing means, said print means being armed by said first arming means;
- c. a step 3 position with said drawer means at said first location and said print means actuated by said actuator means for effecting initial printing of beginning delivery data;
- d. a step 4 position with said drawer means moved to a second location with said ticket having an ending delivery data block adjacent said delivery data printing means, said print means being armed by said second arming means;
- e. a step 5 position effected by said print means having been actuated a second time by said actuator means for printing said ending delivery data and releasing and moving said drawer means outwardly; and
- f. a return to said step 1 position for releasing said ticket and repeating said operation with another ticket.

13. The apparatus of claim 6 wherein a pulse generator is connected with said delivery device so as to generate a pulse each time a predetermined quantity of material is delivered and said delivery data advancing means is electrically connected with said pulse generator so as to advance said delivery data printing means responsive to said pulses from said pulse generator; whereby said apparatus for printing tickets may be employed at a location remote from said delivery device.

14. The apparatus of claim 6 wherein a transmission means that includes a one-way clutch is employed to drivingly connect said drive pinion with said first and second cams so as to rotate said cams when said drawer is moved inwardly and not to rotate said cams when said drawer is moved outwardly.

15. The apparatus of claim 6 wherein said print hammers are freely pivotally mounted on respective cam follower shafts that are connected with respective first and second cam followers; respective stops are connected with said cam follower shafts so as to move therewith; second biasing means bias said print hammers toward said stops; said print hammer being free to over travel because of inertia beyond the position of said cam follower shaft in moving with said respective cam followers rapidly radially interiorly down respective said drop-offs of respective said cam surfaces.

16. The apparatus of claim 6 wherein respective first and second hammer carriages carry respective said print hammers; said hammer carriages being pivotally mounted on said frame and having respective first and second extensions; first and second stop arms are pivotally mounted on said frame; said first stop arm engaging said first extension so as to move into position to stop inward movement of said drawer means at said first location as said first hammer is armed by inward movement of said drawer means and moved out of said position when said first print hammer is actuated; said second stop arm engaging said second extension so as to move into its holding position to releasably retain said drawer means at its second location after said second

print hammer is armed by inward movement of said drawer means toward its second location and to move out of its holding position to release said drawer means when said second print hammer is actuated.

17. The apparatus of claim 6 wherein first and second dwell notches are provided on respective first and second cams; said first cam having its first dwell notch disposed so as to prevent overrunning thereof when said second cam is rotated by having its biased cam follower travel rapidly radially inwardly of its said drop-off; and said second cam has its second dwell notch positioned to prevent its overrunning when rotated by said first cam as it is rotated by having its biased cam follower travel rapidly radially inwardly of its said drop-off.

18. The apparatus of claim 1 wherein said drawer means has a rack fixed to and extending longitudinally thereof and a toggle mechanism is pivotally mounted on said frame; said toggle mechanism having two oppositely disposed arms such that one arm engages said rack when said toggle mechanism is at a first angle and allows movement of said drawer means in only one direction, and the other arm engages said rack when said toggle mechanism is at a second angle and allows movement of said drawer means in only the other direction; and toggle actuators are provided at each end of said rack for moving said toggle mechanism to its other angle.

19. The apparatus of claim 1 wherein a ticket sensing switch is connected to said delivery device so as to inhibit operation thereof until a ticket is inserted into said ticket printer and moved inwardly by moving said drawer means to said second location.

20. The apparatus of claim 1 wherein a pulse generator is connected with said delivery device so as to generate a pulse each time a predetermined quantity of material is delivered; and said delivery data advancing means is connected with said pulse generator so as to advance said delivery data printing means responsive to pulses from said pulse generator; whereby said apparatus for printing tickets may be employed at a location remote from said delivery device.

21. The apparatus of claim 1 wherein said drawer means includes a ticket fixing means for trapping a ticket in place in said drawer means responsive to inward movement of said drawer means.

22. The apparatus of claim 1 wherein said ticket printer has a plurality of respective step positions that include:

- a. a step 1 position with said drawer means extended outwardly for insertion of a ticket therinto;
- b. a step 2 position with said drawer means moved inwardly to a first location with said ticket having a beginning delivery data block adjacent said delivery data printing means, said print means being armed by said first arming means;
- c. a step 3 position with said drawer means at said first location and said print means actuated by said actuator means for effecting initial printing of beginning delivery data;
- d. a step 4 position with said drawer means moved to a second location with said ticket having an ending delivery data block adjacent said delivery data printing means, said print means being armed by said second arming means;
- e. a step 5 position effected by having actuated said print means with said actuator means for printing said ending delivery data and releasing and moving said drawer means outwardly; and
- f. a return to said step 1 position for releasing said ticket and replacing said operation with another ticket.