

[54] **MULTI-STATION HIGH-SPEED PRINTING MECHANISM**

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[21] Appl. No.: **71,936**

[52] U.S. Cl. .... **101/93 C, 197/49**  
 [51] Int. Cl. .... **B41j 1/26**  
 [58] Field of Search... **101/93 C, 90; 197/49, 50, 51, 197/52, 55, 53, 54**

[56] **References Cited**

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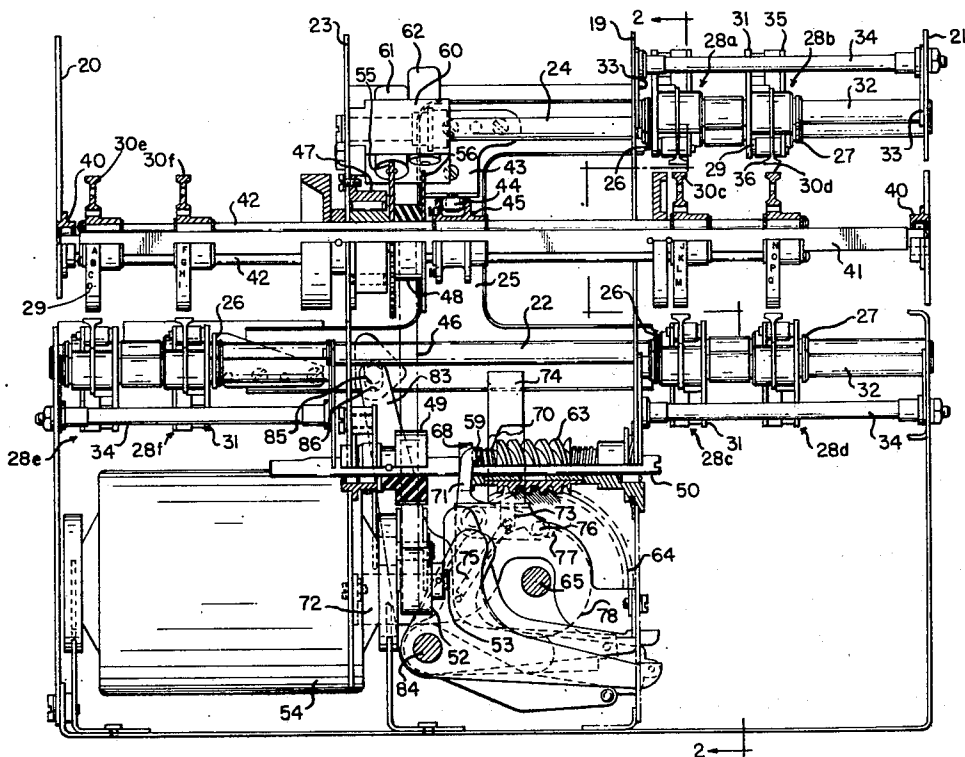
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[57] **ABSTRACT**

A high-speed on-the-fly type of printing mechanism which includes three printing stations for producing three separate records of a transaction. A slidably-mounted carriage supports the printing hammer and drives the type wheels which constitute the three printing stations. The carriage is reciprocally driven by a cam-actuated drive mechanism which is motor-driven. The type wheels are mounted on a pair of rod members forming an assembly which is moved by the carriage during its reciprocal movement.

**5 Claims, 5 Drawing Figures**



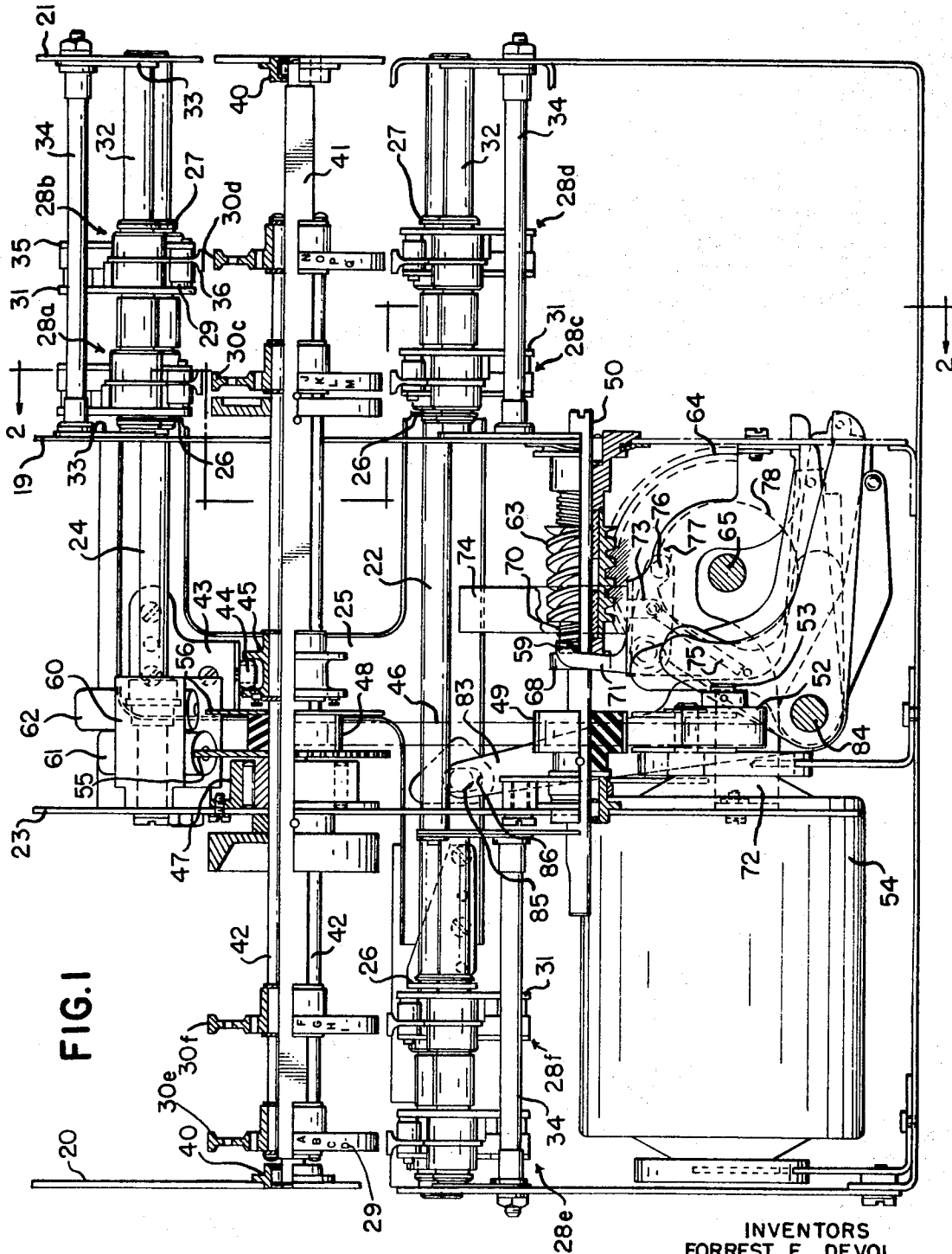


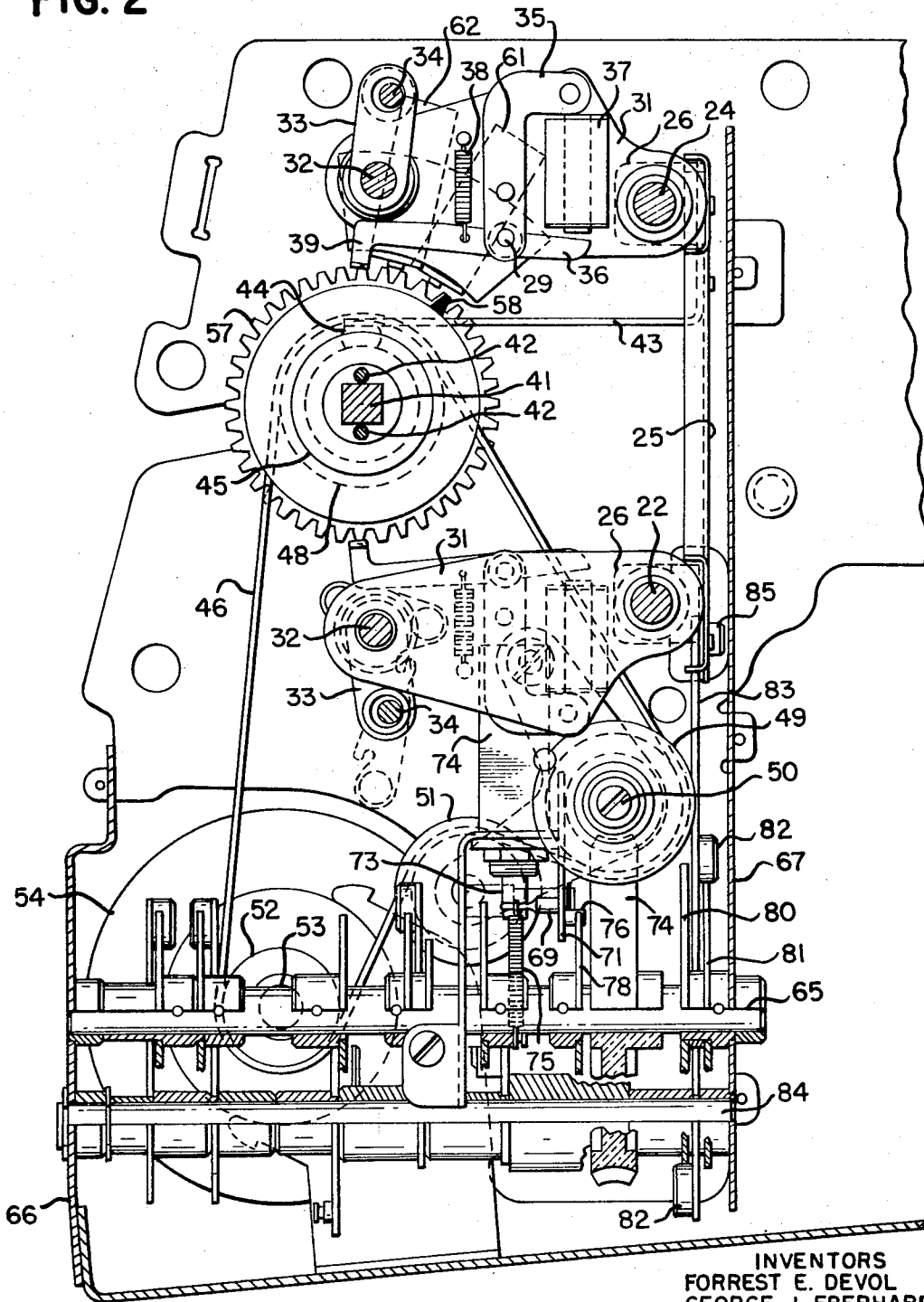
FIG. 1

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FIG. 2



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FIG. 3

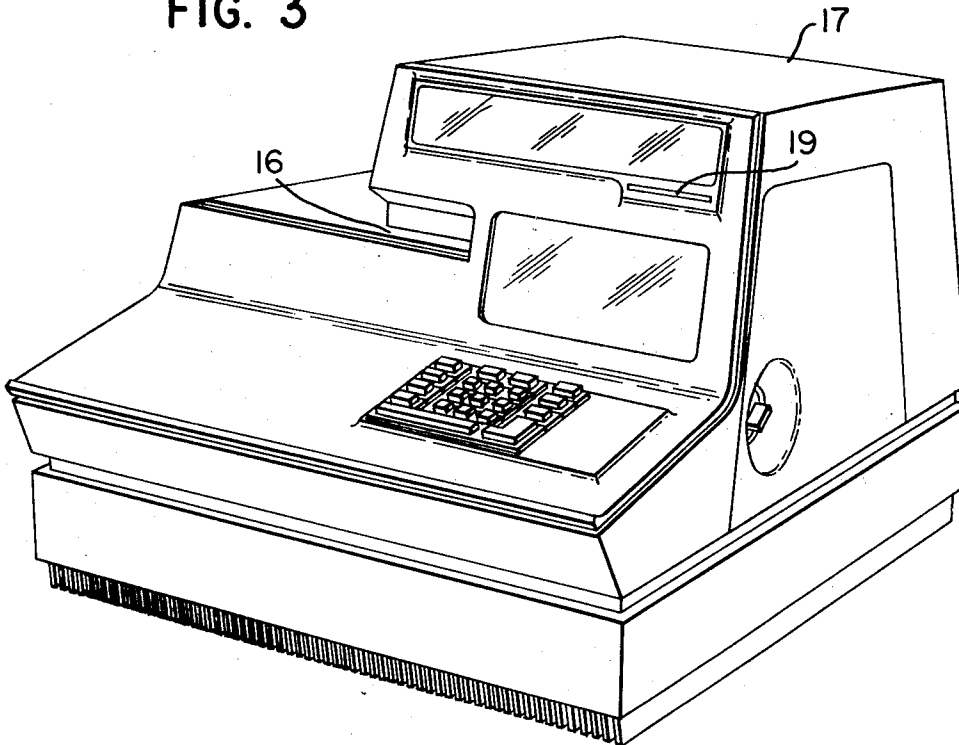


FIG. 4

YOUR RECEIPT  
THANK YOU

1612/28      280      333      456

12 5    159            |    14.50 MDS  
15       123456       |    25.00 MDS  
                         |    5.98 MDS  
                         |    23.42 MDS  
                         |    68.90 STL  
4                        |    30.00 DEP  
                              |    3.11 TAX  
                              |    40.00 ATD  
                              |    10.00 CDU

03/09/72    3 CHG      42.01 TTL

18

FIG. 5

15

CUSTOMER COPY				04243	
CUSTOMER ACCOUNT NUMBER			C.C.U. NO.	CASH	CHG. ALL
CUSTOMER NAME					CA. +
ADDRESS				SOLD BY	
CITY		STATE	ZIP CODE	GR. APP. AUTH.	
THIS SALES CHECK HAS BEEN DESIGNED TO SAVE YOU TIME IN SHOPPING	TRANS. NUMBER	TERM NO.	STORE NO.	SLSPN'S NO.	
	1612/28	280	333	456	
	DEPT.	ARTICLE OR SKU NO.	QY.	AMOUNT	
	12 5	159		14.50 MDS	
	15	123456		25.00 MDS	
				5.98 MDS	
				23.42 MDS	
				68.90 STL	
	4			30.00 DEP	
				3.11 TAX	
			40.00 ATD		
			10.00 CDU		
ACCOUNT NUMBER				AMOUNT	
9 12345678					
DOCK	DEL.	TAKE	DATE	TYPE SALE	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	03/09/72	3 CHG	42.01 TTL
			DATE	TYPE SALE	AMOUNT
			03/09/72	3 CHG	42.01 TTL
X _____ CUSTOMER'S SIGNATURE					

## MULTI-STATION HIGH-SPEED PRINTING MECHANISM

### BACKGROUND OF THE INVENTION

This invention relates to a high-speed on-the-fly type of printing mechanism in which a shiftable carriage supporting a print hammer and engaging a type wheel is continuously moved past a record medium to print on the record medium. Prior carriage-type printer mechanisms have utilized a single type wheel in their construction. The mechanisms developed for controlling the movement of the type wheel and the printing hammer along a printing line when adapted to a multi-type-wheel and print hammer arrangement become complex and quite costly. Therefore it is an object of this invention a printing device used in data terminal apparatuses and more particularly to. Therefore it is an object of this invention to provide a high-speed on-the-fly type printer mechanism having a plurality of print stations, the construction of which is relatively simple and of low cost.

Another object of the invention is to provide an improved carriage drive system which is positive in its operation and capable of being controlled by electrical signals.

### SUMMARY OF THE INVENTION

A high-speed printing mechanism which includes a carriage mechanism supporting a plurality of printing hammer modules and which engages a plurality of type wheels mounted together on rods and slidably supported on a type wheel drive shaft. A cam-activated drive mechanism engages the carriage mechanism for reciprocally moving the carriage mechanism in a lateral direction and includes an electromagnetically operated clutch mechanism for coupling and cam drive shaft to a constantly-rotating motor-drive shaft.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of the printing mechanism. FIG. 2 is a side sectional view taken on the line 2—2 of FIG. 1.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2, there are shown views of the high-speed three-station printing mechanism utilized in the present embodiment. As shown in FIG. 1, secured between a pair of machine side frames 20, 21 is a shaft 22, while secured between a side frame 23 and the side frame 21 is a second shaft 24. Slidably mounted on these two shafts is a carriage assembly which includes a carriage member 25 containing a number of bent-over flange ends 26, which support sleeve members 27 slidably mounted on the shafts 22, 24. As shown in FIG. 1, secured to the sleeve member 27 are three sets of hammer modules, each set comprising two hammer modules 28. Hammer modules 28a, 28b, are part of the receipt printer section, 28c, 28d are part of the journal printer section and hammer modules 28e, 28f, are part of the slip printer section.

Associated with each hammer module 28 is a type wheel 30, on which are arranged, in helical fashion, a plurality of raised characters 29 or symbols which are to be printed on a record medium that is positioned

between the hammer modules and the type wheel. As shown in FIG. 1, hammer modules 28e, 28f, are associated with type wheels 30e, 30f respectively to print on a slip record 15 (FIG. 5). The slip is normally positioned on the table 16 of the data terminal 17 shown in FIG. 3. The hammer modules 28a, 28b, are associated with the type wheels 30c, 30d, to print a receipt 18 (FIG. 4) which is delivered through the slot 19 of the data terminal 17 (FIG. 3). The type wheels 30c, 30d also associated with hammer modules 28c, 28d to print on a continuous journal record the same information that is printed on the receipt 18 (FIG. 4). Each set of hammer modules 28 comprises a printing station having a capability of printing thirty columns of characters across the record material. By having two hammer modules for each station, each module with print fifteen columns, which provides a faster printing cycle. When used with a data input device, as shown in FIG. 3, for processing commercial transactions, a journal, a receipt, and a slip record can be produced by the printing apparatus of the present embodiment.

Each hammer module 28 includes a frame member 3 (FIG. 2) rotatably mounted to one of the sleeve members 27. The other end of the frame member 31 is rotatably mounted on a shaft 32 supported between a pair of arm members 33, which in turn are mounted to an eccentrically-shaped shaft 34 mounted between the side frames 21, 19, the rotation of which provides vertical adjustment of the shaft 32. This construction allows adjustment of the hammer modules with respect to the type wheels 30.

Mounted to the frame member 31 is an L-shaped bracket 35, which rotatably supports a hammer member 36 by means of a stud 29 mounted between the frame member 31 and the bracket 35. One end of the hammer member 36 is positioned adjacent a solenoid 37, the hammer member 36 functioning as an armature which will be rocked into engagement with the solenoid 37 upon the energization of the solenoid, this movement being against the action of a spring 38 secured between the hammer and a stud mounted on the frame member 31. As viewed in FIG. 2, this counter-clockwise movement of the hammer 36 by the energization of the solenoid 37 will result in the face 39 of the hammer striking a record medium, an ink ribbon, and the type wheel 30 to provide a printing operation.

Rotatably mounted on bearing 40 secured to the side frames 20, 21 is a square shaft 41. Positioned on opposite sides of the square shaft 41 are two rod member 42, which are engaged by four type wheels 30. While only four type wheels are shown, it is obvious that any number of type wheels can be mounted on rod member 42. The type wheels are secured to the rod member 42 by means of clips, thereby forming an assembly which will slide along the square shaft 41. As will be described more fully hereinafter, rotation of the square shaft 41 rotates the type wheels, while the lateral shifting of the carriage member 25 results in the lateral movement of the type wheel 30 and the rod member 42 along the square shaft 41.

As shown in FIG. 2, mounted to the carriage member 25 is an L-shaped support bracket 43, on which is rotatably mounted a roller member 44. The roller member 44 is positioned within the flange portions of a hub member 45 (FIG. 1) slidably mounted on the

square shaft 41 and secured to the rod members 42 by means of clips. Upon the lateral movement of the carriage member 25 in a manner to be described more fully hereinafter, the roller member 44 will engage one of the flange portions of the hub member 45, thus shifting the type wheel assembly along the square shaft 41. During this movement, the hub member 45 is being rotated by the square shaft 41, thereby rotating the roller member 44 about its axis.

Secured to the side frame 23 (FIG. 1) is a bearing member 47, which rotatably supports the square shaft 41. Mounted adjacent the bearing member 47 is a pulley member 48 pinned to the square shaft 41. Mounted on the pulley member 48 is a drive belt 46, which extends over a second pulley member 49 (FIG. 2) pinned to a shaft 50, which in turn is rotatably mounted between the side frames 23, 19. The belt also extends over an idler pulley 51 mounted on a bracket 89, slidably mounted on the side frame 23, and a drive pulley 52, secured to a drive shaft 53 of a motor 54 mounted on the framework of the machine. It will be seen from this construction that, upon the operation of the motor 54, the square shaft 41 will be rotated by the pulley 48, thereby rotating the type wheels 30.

As shown in FIG. 1, the pulley 48 has a pair of timing wheels 55, 56 mounted on its sides. As shown in FIG. 2, the timing wheel 55 contains forty tooth members 57 on its periphery, each of which represents a character of data, while the wheel 56 has a single tooth member 58, which is used for clocking in a manner well known in the art. Mounted on a support member 60, which is secured to the side frame member 23, are a pair of reluctance heads 61, 62, which coact with the tooth member 57, 58 to generate a control pulse when ever a tooth member passes through the magnetic field generated by the reluctance heads. As is well known in the art, these pulses are used to control the energization of the solenoids 37 during a printing operation.

Referring to FIG. 1, rotatably mounted on the shaft 50 is a worm gear 63, which engages a worm wheel 64 pinned to a cam shaft 65 journaled between a front frame member 66 (FIG. 2) and a rear frame member 67 of the machine. Pinned to the shaft 50 and abutting the worm gear 63 is a collar member 68. Both the collar member 68 and the worm gear 63 are engaged by a spring clutch 70, which is released by the counter-clockwise rotation of a trip pawl 71 (FIG. 1) rotatably mounted on a machine frame member 72 (FIG. 2). The upper end of the trip pawl 71 hooks over an end portion 59 of the spring clutch 70, thereby holding the clutch in an unwound position, which allows the shaft 52 to rotate free of the worm gear 63. The counter-clockwise rotation of the trip pawl releases the spring clutch to clutch the collar 68 to the worm gear 63, thereby allowing the shaft 50 to rotate the worm gear. Rotation of the worm gear 63 by the shaft 50 results in the rotation of the worm wheel 64 and the cam shaft 65.

The trip pawl 71 has a stud 69 mounted thereon, which is engaged by the armature 73 of a solenoid 74 mounted on the frame member 72. Upon energization of the solenoid 74, the trip pawl 71 will be rotated counter-clockwise about its pivot point against the action of a spring 75 secured between the stud 69 and the machine framework. As shown in FIG. 1, the pawl 71

has, mounted on its front portion, a stud 76, which is positioned within a cut-out portion 77 of a control disc 78 secured to the cam shaft 65. After the trip pawl 71 has been rocked counter-clockwise by the energization of the solenoid 74, the cam shaft 65 will start its rotation due to the clutching of the worm gear to the shaft 50, as described previously. This action will position the edge of the control disc 78 adjacent the stud 76, thereby holding the trip pawl 71 in its counter-clockwise position, since, at this time, the solenoid has been deenergized, and the pawl 71 is now being held in engagement with the edge of the disc 78 by the action of the spring 75. At the end of one revolution of the cam line shaft 65, the cut-out portion 77 of the disc 78 will be positioned adjacent the stud 76 of the trip pawl, allowing the stud 76 to drop onto the cut-out portion, thereby allowing the spring 75 to rotate the trip pawl clockwise. This movement engages the end portion 59 of the spring clutch 70, which disables the clutch, thereby freeing the worm gear 63 from the operational control of the shaft 50. Thus the cam shaft 65 is rotated through one revolution during each energization of the solenoid 74.

Pinned to the cam shaft 65 are a pair of cam plates 80, 81, which are engaged by a pair of rollers 82 mounted on a cam follower arm 83 (FIG. 2), which in turn is rotatably mounted on the shaft 84 mounted between the machine frame members 66, 67 (FIG. 2). A stud 85, mounted on the upper end of the cam follower arm 83, is positioned within a slot 86 located on the carriage member 25. During one revolution of the cam shaft 65, the cam follower arm 83 will reciprocally slide the carriage member to the right, as viewed in FIG. 1, and then back to its home position during a single revolution of the cam shaft 65. Since two hammer modules are used for each line of print, the lateral shifting of the carriage assembly by the cam follower arm 83 is of a very short duration, which increases the speed of operation of the printing unit. It is obvious that, by mounting more printing modules at each print station, the length of lateral movement of the carriage will be further reduced, thereby increasing the speed of operation of the printing mechanism.

In the operation of the printing mechanism, the motor 54 will drive the belt 46, the shaft 41, and the type wheels 30. Upon energization of the solenoid 74, the cam shaft 65 will be operated by the shaft 50, which allows the cam follower arm 83 to reciprocally drive the carriage 25, with its hammer modules 28 and their associated type wheel assembly, along the square shaft 41. Depending on the information to be printed, the appropriate solenoids 37 will be energized at the required time to allow the printing hammers 36 to strike the type wheel in a manner well known in the art.

What is claimed is:

1. In a printing apparatus for printing simultaneously on more than two record materials and having a continuously rotating drive shaft,
  - a. a plurality of type wheels having type characters arranged thereon, said type wheels slidably mounted on said drive shaft;
  - b. support means engaging said type wheels and slidably mounted on said drive shaft;
  - c. a carriage member positioned adjacent said drive shaft and adapted for reciprocal movement in a

direction parallel with said drive shaft, said carriage member having a pair of support arms positioned on opposite sides of one of said type wheels:

- d. a plurality of type hammer assemblies secured to said carriage member and adapted, when operated, to strike a selected type character on an associated type wheel, at least two of said type hammer assemblies being secured to said support arms and positioned to strike the same associated type wheel;
  - e. a hub member slidably mounted on said drive shaft and rotatably secured to said support means, said hub member being rotated continuously by said drive shaft;
  - f. a drive roller rotatably mounted on said carriage member and engaging said hub member, said drive roller being rotated by said hub member whereby said hub member and said support means are moved along said drive shaft by said carriage member;
  - g. means for reciprocally driving said carriage member in a direction parallel with said drive shaft including an arm member engaging said carriage member and adapted, when operated to reciprocally drive said carriage member in a direction parallel with the axis of said drive shaft;
  - h. continuously operating drive means;
  - i. and selectively operated clutch means for coupling said drive means to said arm member for reciprocally operating said arm member whereby said type hammer assemblies and their associated type wheels are reciprocally moved in a parallel direction for printing therefrom.
2. In a printing device having a continuously rotating drive shaft,
- a. a plurality of type wheels having type characters arranged thereon, said type wheels slidably mounted on said drive shaft and adapted to be rotated about their central axes by said drive shaft;
  - b. rod members secured to said type wheels and slidably mounted on said drive shaft;
  - c. a carriage member positioned adjacent said drive shaft and mounted for reciprocal movement in a direction parallel with said drive shaft;
  - d. a plurality of type hammers mounted on said carriage member and adapted, when operated, to

strike a selected type character on an associated type wheel;

- e. means interconnecting said rod members with said carriage member for concomitant movement of said type wheels with said type hammers;
  - f. means for reciprocally driving said carriage member in a direction parallel with said drive shaft including
    - g. a cam shaft;
    - h. a drive member engaging said carriage member and operated by said cam shaft to drive said carriage member;
    - i. drive means engaging said drive shaft to rotate said drive shaft whereby said type wheels and said rod members are rotated;
    - j. a driving member operated by said drive means;
    - k. a gear member rotatably mounted on said driving member;
    - l. means interconnecting said gear member and said cam shaft whereby upon rotation of said gear member said cam shaft is operated;
    - m. a clutch member slidably engaging said driving member and said gear member;
    - n. means engaging said clutch member and adapted, when actuated, to operate said clutch member whereby said gear member is rotated by said driving member;
    - o. and electromagnetic means for actuating said engaging means when energized whereby said driving member will drive said carriage member.
3. The printing device of claim 2 in which said drive member comprises a cam follower arm.
4. The printing device of claim 2 in which said gear member comprises a worm gear and said interconnecting means comprises a worm wheel engaging said worm gear and mounted on said cam shaft whereby, upon rotation of said worm gear, said cam shaft is rotated.
5. The printing device of claim 4 in which said clutch member comprises a spring clutch slidably engaging said driving member and said worm gear; and said engaging means comprises a rotatably-mounted pawl member engaging said spring clutch and adapted, when actuated, to release said spring clutch for operation whereby said worm gear is rotated by said driving member.

\* \* \* \* \*

50

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,688,691 Dated September 5, 1972

Inventor(s) Forrest E. DeVol, George J. Eberhardt & Louis E.

Zurbuchen

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 5, after "to" insert "a printing device used in data terminal apparatuses and more particularly to".

Column 1, line 15, after "costly." insert "The present development of data terminal apparatuses requires the printing of a plurality of records due to the variety of business applications that the data terminal is designed to handle. Thus in addition to the normal receipt and journal records, the data terminal device is required to print a record slip for use in a charge transaction."

Column 1, line 16, delete "a printing device used in data ter-"

Column 1, line 17, delete "minal apparatuses and more particularly to. Therefore".

Column 1, line 18, delete "it is an object of this invention".

Column 1, line 33, after "shaft" insert "for moving the type wheels laterally along the drive shaft."

Column 1, line 33, delete "activated" and substitute "actuated".

Column 1, line 37, delete "and" and substitute "the".

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,688,691 Dated September 5, 1972

Inventor(s) Forrest E. DeVol, George J. Eberhardt & Louis E. Zurbuchen

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

- 2 -

Column 1, line 43, after "FIG. 1." insert the following paragraphs:

"FIG. 3 is an oblique view of the data terminal device in which the printing apparatus of the present embodiment is utilized.

FIG. 4 is an enlarged facsimile of the customer's receipt printed in the receipt printer section of the printing apparatus.

FIG. 5 is an enlarged facsimile of the charge slip printed in the slip printer section of the printing apparatus."

Column 1, line 58, delete "member" and substitute "members".

Column 2, line 6, after "28b" delete "," and insert "(FIG. 1)".

Column 2, line 9, after "30d" insert "are".

Column 2, line 23, delete "3" and substitute "31".

Column 2, line 34, after "35" insert "(FIG. 2)".

Column 2, line 49, delete "bearing" and substitute "bearings".

Column 2, line 51, delete "member" and substitute "members".

Column 2, line 55, delete "member" and substitute "members".

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,688,691 Dated September 5, 1972

Inventor(s) Forrest E. DeVol, George J. Eberhardt & Louis E. Zurbuchen

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

- 3 -

Column 2, line 61, delete "member" and substitute "members".

Column 3, line 35, delete "member" and substitute "members".

Column 3, line 39, after "37" insert "(FIG. 2)".

Signed and sealed this 10th day of April 1973.

(SEAL)  
Attest:

EDWARD M. FLETCHER, JR.  
Attesting Officer

ROBERT GOTTSCHALK  
Commissioner of Patents