

[54] **TYPE MOUNTING MEANS FOR HIGH SPEED FRONT PRINTER**

[72] Inventor: **James M. Cunningham**, Bradenton, Fla.
[73] Assignee: **International Business Machines Corporation**, Armonk, N.Y.
[22] Filed: **Dec. 15, 1969**
[21] Appl. No.: **884,953**

[52] U.S. Cl. **101/93 C, 101/111**
[51] Int. Cl. **B41j 7/38, B41j 1/20**
[58] Field of Search **101/93, 111**

[56] **References Cited**

UNITED STATES PATENTS

3,144,821	8/1964	Drejza	101/93
3,188,946	6/1965	Schacht	101/93
3,224,366	12/1965	Cunningham	101/111 X
3,241,480	3/1966	Cunningham	101/93

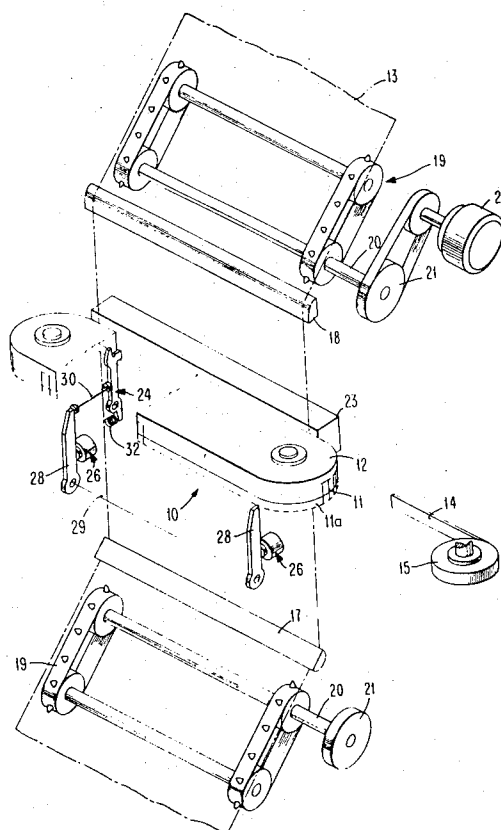
3,343,482	9/1967	Scott et al.	101/90
3,354,816	11/1967	Giannuzzi	197/133 X
3,359,921	12/1967	Arnold et al.	101/93
3,379,125	4/1968	Antonucci	101/93
3,416,442	12/1968	Brown et al.	101/93
3,451,335	6/1969	Cunningham	101/93

Primary Examiner—William B. Penn
Attorney—Hanifin and Jancin and Francis V. Giolma

[57] **ABSTRACT**

In a high speed front printer a type cartridge comprises a plurality of type carriers guided along a print line by a continuous guide rail. Each type carrier has a plurality of pivotal levers carrying raised type characters adjacent their free ends. The type carrier levers are impacted by selected type hammers in the different print positions to impact a document and a ribbon or the like for printing in selected positions as the type carriers move by the print positions.

6 Claims, 4 Drawing Figures



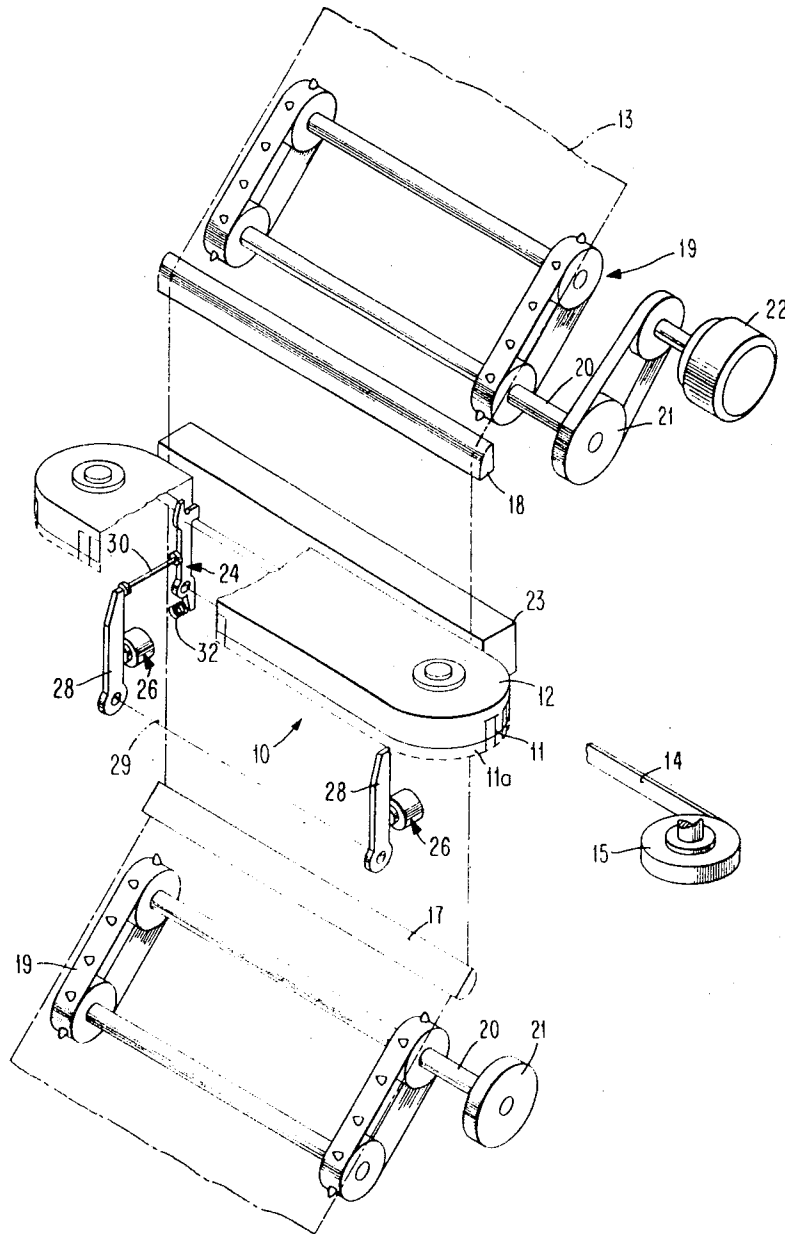


FIG. 1

INVENTOR

JAMES M. CUNNINGHAM

BY *Francis V. Giolma*
ATTORNEY

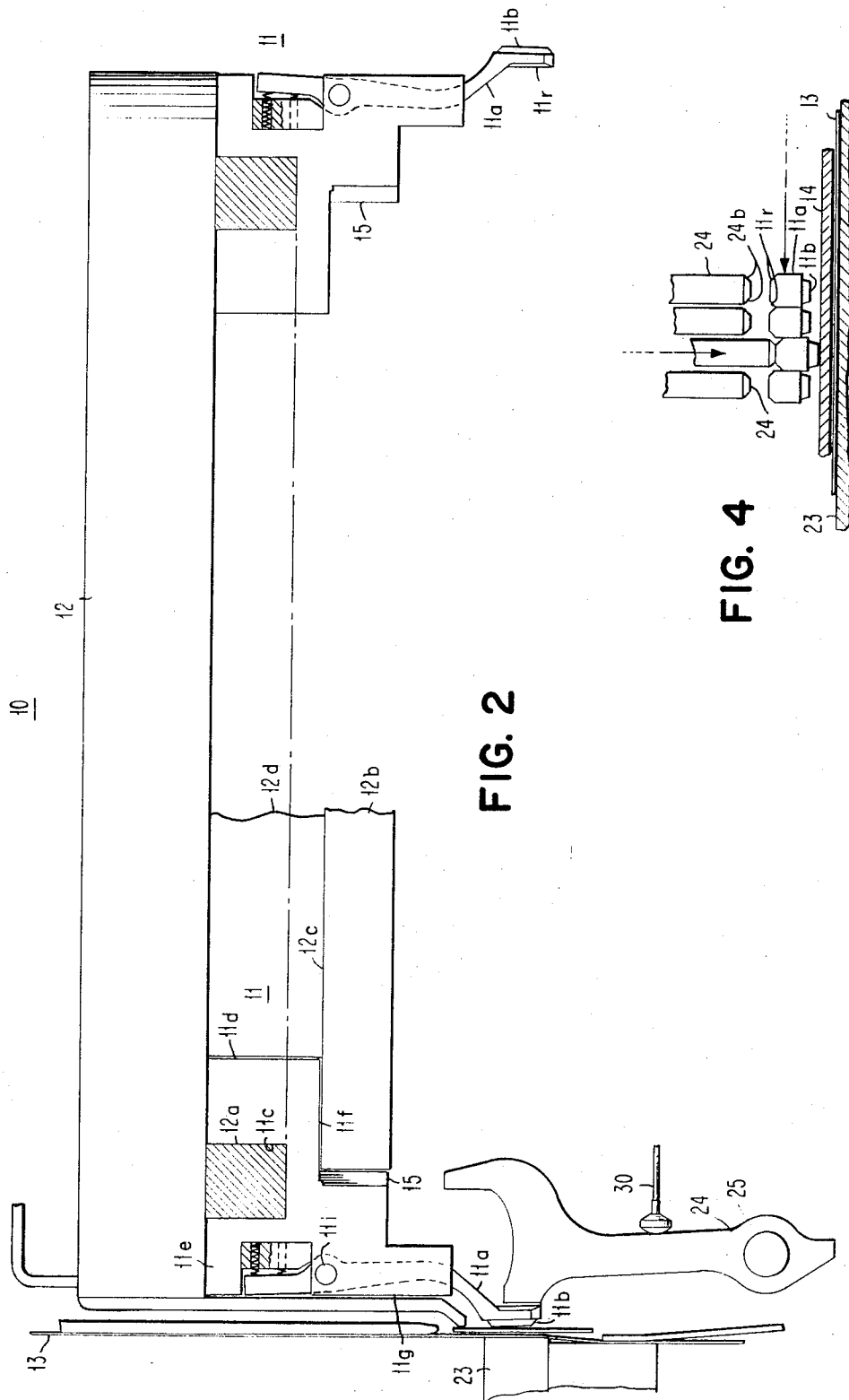
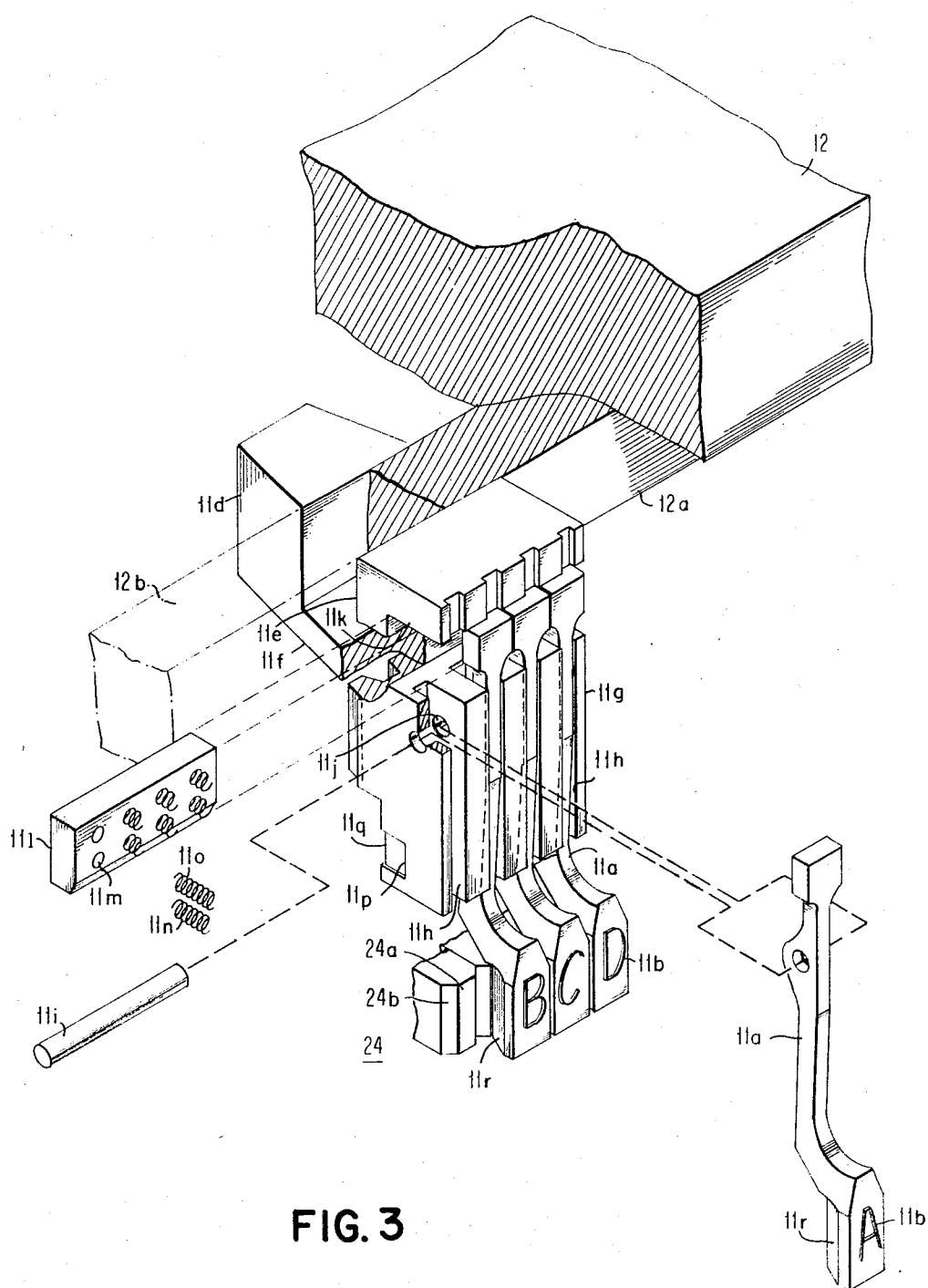


FIG. 2

FIG. 4



TYPE MOUNTING MEANS FOR HIGH SPEED FRONT PRINTER

CROSS-REFERENCE TO RELATED APPLICATIONS

This invention is related to the inventions of John E. Drejza et al., application Ser. No. 836,345 (Docket EN968029), filed June 25, 1969, and James M. Cunningham, U.S. Pat. No. 3,451,335, which issued June 24, 1969, and relate to platen structures and control systems therefore for use with a front printer type carrier of the type disclosed in the subject invention.

FIELD OF THE INVENTION

The invention relates generally to printers and it has reference primarily to front printers and a type cartridge therefore.

DESCRIPTION OF THE PRIOR ART

High speed printers have heretofore generally been of the back printing type wherein type characters on a chain or drum have been moved past the print positions behind a document on which printing is to be performed and a type hammer has been projected to impact the document and a ribbon or the like against raised type characters on the chain or drum to effect printing on the document.

SUMMARY OF THE INVENTION

Generally stated, it is an object of this invention to provide an improved high speed printer.

More specifically, it is an object of this invention to provide an improved type cartridge for a high speed front printer.

Another object of the invention is to provide a high speed printer in which a plurality of pivotal type carrying members are moved along a rail positioned adjacent a print line on a document and are actuated toward the document to impact the document for printing thereon.

It is also an object of the present invention to provide for pivotally supporting a plurality of type levers on a type carrier which is movable along a track in predetermined spatial relation to a document for printing thereon.

Yet another object of the invention is to provide for resiliently biasing a plurality of pivotal type levers on a movable type carrier to a neutral position on the carrier and for providing a predetermined preloading of the biasing means to minimize rebound of the type levers.

Still another object of the invention is to provide for pivotally mounting a plurality of type levers on a common pivot and for independently biasing each of them to a neutral position by means of multiple springs positioned in recesses in a common retaining member for the plurality of levers.

It is also an important object of the invention to separately locate a plurality of pivotal type levers in individual slots in a movable type carrier and to utilize a common plastic damping member positioned in a recess common to each of the slots for controlling rebound of the type levers.

Yet another object of the invention is to provide for retaining a plurality of movable type carriers on a continuous guide rail on the underside of a base plate by means of a cover plate, so that depending pivotal type levers on the carriers can be impacted by print hammers as they pass different print positions along a print line to impact a carbon ribbon or the like against a document on which a printing operation is to be performed.

Another important object of the invention is to provide for so matching the inertias of a plurality of print hammers and type levers with the characteristics of the return springs therefore so that double impact problems between the type and document are minimized.

Still another important object of this invention is to provide a front printing type carrier wherein a plurality of type character bearing levers are pivotally supported for being impacted against a document by means of a pivot disposed intermediate their ends, one of which carries a raised type

character and the other of which is provided with a return spring positioned in a recess in a common carrier member which is located in a transverse slot in the type carrier.

Another important object of the present invention is to provide a type cartridge for a front printer which eliminates moving the document against the type when printing and reduces the tendency to shadow print in adjacent print positions.

It is also an important object of the present invention to provide for pivotally mounting a plurality of type levers in slots in a type carrier, and for utilizing a common hardened insert member to limit rebound wear of the carrier by the type levers.

Yet another object of the invention is to provide in a printer having a plurality of pivotal type carrying members moving past a plurality of type hammers, for utilizing a cam surface arrangement between the type carrying members and the print hammers for minimizing interference between the members and hammers as the type carrying members move past the hammers.

The foregoing and other objects, features, and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention as illustrated in the accompanying drawing.

DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a partial schematic isometric showing of one type of printer apparatus with which the invention may be used.

FIG. 2 is an enlarged partly-sectioned schematic cross section view of the print hammer, type cartridge, and platen structure of FIG. 1.

FIG. 3 is an enlarged, exploded isometric view of a type carrier such as shown in FIGS. 1 and 2, and

FIG. 4 is a schematic partial plan view showing the relationship of the type hammers and type levers in the type cartridge of FIGS. 1 and 2.

DESCRIPTION OF A PREFERRED EMBODIMENT

FIG. 1 shows a printer apparatus of one type with which the present invention may be used and comprises a TYPE CARTRIDGE 10 having a plurality of individual TYPE CARRIERS 11 movable along a continuous path on a STATIONARY FRAME or BASE PLATE 12. A portion of the path of the TYPE CARRIERS 11 includes a straight portion along which printing can occur and which hereinafter is referred to as the print line. Each TYPE CARRIER 11 has one or more pivotal TYPE LEVERS 11a with different engraved characters disposed on the surface thereof adjacent the print line. Plural sequences of type characters are obtained by assembling the TYPE CARRIERS 11 in predetermined arrangements on the FRAME or BASE PLATE 12. The type carriers are driven preferably in the form of a train along the FRAME or BASE PLATE 12 so that they travel at a constant velocity and are maintained in abutting relation with each other along the straight portion of the path of travel.

The printer apparatus of FIG. 1 is a front printer, but is generally similar to the back printer which is described in U.S. Pat. No. 3,224,366, which issued on Dec. 21, 1965, to J. M. Cunningham and in accordance with the well-known operational principles thereof a PAPER DOCUMENT or FORM 13 is positioned behind an INK RIBBON 14 or the like, which in turn is positioned immediately adjacent a plurality of PRINT HAMMERS 24 located at the various print positions along a straight line to effect impact between the DOCUMENT 13 and various type characters formed on the faces of the TYPE CARRIERS 11 which are described in the Cunningham U.S. Pat. No. 3,224,366, as movable at a constant speed in a continuous path in a direction transverse to the direction of feeding of the PAPER DOCUMENT 13. The PRINT HAMMERS 24 may be pivotally mounted on a HORIZONTAL SUPPORT ROD 25 (shown in FIG. 2). Operating means for the HAMMERS 24 may take various form, but preferably include an

ELECTROMAGNET 26, ARMATURE 28 pivotally mounted on a SUPPORT PIVOT ROD 29, and an interconnecting movable PUSH ROD 30. SPRINGS 32 bias the HAMMERS 24, PUSH RODS 30, and ARMATURE 28 to a retracted or neutral position when the ELECTROMAGNET 26 is de-energized. When the ELECTROMAGNET 26 is energized, ARMATURE 28 is attracted thereto so as to pivot on PIVOT ROD 29. The ARMATURE 28, when pivoting, drives the PUSH ROD 30 and HAMMER 24 forward against the bias of SPRING 32. In the preferred form the stroke of the ARMATURE 28 is limited by the core of the ELECTROMAGNET 26 so that the PUSH ROD 30 and HAMMER 24 move under their own inertia to strike the TYPE CARRYING LEVERS 11a and cause them to move and impact the RIBBON 14 and DOCUMENT 13 against a PLATEN 23. The INK RIBBON 14 is fed between a pair of rotatable spools represented by SPOOL 15 in any well-known manner. The PAPER DOCUMENT 13 is fed upwardly over LOWER and UPPER GUIDE BARS 17 and 18, respectively, by means such as a FORMS FEED TRACTORS 19. The TRACTORS 19 are connected to suitable drive means such as the MOTOR 22 and PULLEYS 21 whereby the DOCUMENT 13 is fed in a step-like manner under the control of means well-known in the art for advancing the PAPER DOCUMENT 13 each time a complete line of data is printed on the DOCUMENT 13.

In the printer apparatus of FIG. 1, the arrangement is shown generally for a front printer. Details of the type carrier used in the front printer according to the present invention are shown in FIGS. 2 and 3 wherein a TYPE CARRIER 11 is shown having one or more pivotally mounted FINGERS or LEVERS 11a, each with a TYPE CHARACTER 11b on the depending free end of a FINGER 11a. The TYPE CARRIERS 11 are, as described in the Cunningham U.S. Pat. No. 3,224,366, slidably disposed on a GUIDE RAIL 12a. As shown, printing occurs when the TYPE CHARACTERS 11b on the FINGERS or LEVERS 11a of the type carriers 11 impact the RIBBON 14 and PAPER DOCUMENT 13 against the PLATEN 23 associated therewith. The impacting occurs at various print positions along the print line to eventually form a complete line of data. For this purpose the plurality of PRINT HAMMERS 24 are mounted on their PIVOT ROD 25 beneath the CARTRIDGE 10 and in front of the depending type character bearing FINGERS 11a of the TYPE CARRIERS 11, which are guided by the GUIDE RAIL 12a on the FRAME or BASE PLATE 12. The TYPE CARRIERS 11 are retained on the GUIDE RAIL 12a by a COVER PLATE 12b or the like, suitably secured by means including a SPACER 12d in spaced relation to the FRAME or BASE PLATE 12. The PRINT HAMMERS 24 are arranged to be uniformly spaced so that one PRINT HAMMER 24 occupies each print position along the print line, and the HAMMERS 24 are aligned in a single row parallel to the print line. Each PRINT HAMMER 24 is a part of an individual hammer unit which comprises the ELECTROMAGNETS 26 with ARMATURE 28 and PUSH ROD CONNECTOR ELEMENT 30 with BIAS SPRINGS 32, which maintain the HAMMERS 24 out of contact with the TYPE FINGERS 11a, when the ELECTROMAGNET 26 is de-energized. Each HAMMER 24 is individually operable, and the operation of the various HAMMERS 24 occurs selectively at random positions along the print line in accordance with the instructions from suitable control means (not shown), which comprises a type tracking device and a co-acting storage device which indicates the particular data to be printed. Further details of a suitable control system may be more fully understood by a reference to U.S. Pat. No. 2,993,437 of F. M. Demer and E. J. Grenchus for a High Speed Printer, which issued July 25, 1961.

As shown, more particularly in FIGS. 2 and 3, the TYPE CARRIER 11 comprises a substantially inverted chair-shaped body having a rectangular-shaped CHANNEL 11c defined by LEG PORTIONS 11d and 11e to receive the GUIDE RAIL 12a, along which the CARRIER 11 is disposed to be moved. The lower seat or PLANE SURFACE 11f of the body portion

of the TYPE CARRIER 11 is disposed in close relation with the UPPER SURFACE 12c of the COVER PLATE 12b, which operates to retain the CARRIERS 11 on the GUIDE RAIL 12a. GEAR TEETH 15 are provided for mating with corresponding teeth on driving gears (not shown) as described in detail in the Cunningham U.S. Pat. No. 3,224,366.

Instead of having raised type characters arranged on the up-standing VERTICAL FLANGE or BACK PORTION 11g of the chair-shaped TYPE CARRIER 11, as in the Cunningham patent, hereinbefore referred to, a number of PARALLEL SLOTS 11h are provided in side-by-side spaced-apart relation on the TYPE CARRIER 11 to accommodate a plurality of TYPE CARRYING LEVERS 11a. A TRANSVERSE PIVOT PIN 11i extends through an OPENING 11j intersecting with SLOTS 11h for pivotally supporting the TYPE LEVERS 11a. A TRANSVERSE RECESS 11k to the rear of the SLOTS 11h accommodates a generally rectangular-shaped RETAINER MEMBER 11l having a plurality of RECESSES 11m aligned with the different TYPE LEVERS 11a for receiving SPRINGS 11n, 11o, which are used to maintain the TYPE LEVERS 11a in a neutral or restored position. The RETAINER MEMBER 11l may be formed of a suitable resilient plastic material to absorb some of the stored energy of the type levers, and function to dampen their operation and prevent rebound, if desired.

A TRANSVERSE SLOT 11p adjacent the lower end of the VERTICAL EXTENSION 11g and to the rear thereof, accommodates a HARDENED WEAR INSERT 11q which provides a backstop for the TYPE LEVERS 11a.

In one form of machine the TYPE LEVERS 11a had an inertia of 3.58×10^{-7} in lb sec², the TYPE HAMMER 24 an inertia of 16.15×10^{-7} in lb sec², and the TYPE SPRINGS 11n, 11o had a cumulative spring rate and preload assumed to be acting as a single spring at 0.188 inches from the PIVOT 11i at a rate of 113 lb/in. to 140 lb/in. with a preload of 1.1 lb. to 1.4 lb.

Referring particularly to FIG. 4 of the drawing, it will be seen that the striking FACE 24a of the HAMMER 24 is provided with one or more INCLINED CAM SURFACES 24b adjacent either edge, while the corresponding rear face of the TYPE LEVER 11a may also be provided with one or more INCLINED CAM SURFACES 11r adjacent the opposite edges. These cam surfaces are disposed to cooperate or interact and provide for a rapid return of the TYPE HAMMER 24 to its neutral position after striking a TYPE LEVER 11a, so as to minimize interference between the TYPE HAMMER 24 and an adjacent TYPE LEVER 11a, as the TYPE LEVERS 11a move past the HAMMERS 24 along the print line.

From the above description and the accompanying drawing it will be apparent that this invention provides a simple and effective type cartridge for a front printer in which a plurality of character bearing type levers may be selectively impacted as they pass a particular print position to impact a document and a ribbon against a suitable platen for printing on the document. By providing a plurality of pivotal type levers, which are spring-loaded to a neutral position, and are selectively impacted by pivotal type hammers as they pass the print positions, shadow printing is reduced to a minimum, and long life of the type levers and print hammers is obtained by minimizing interference therebetween as the type levers move past the print hammers.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. In a high speed front printer for printing on a document a platen positioned to define a print line of said document, a type cartridge comprising a support member positioned in spaced relation with said platen to provide space therebetween for said document and having a continuous guide rail secured to said support member on one side,

said type cartridge including also a train of a plurality of individual type carriers mounted on and movable along said guide rail with each of said type carriers having a pivot shaft secured thereto with at least one type lever pivotally mounted thereon adjacent one end of said type lever so as to be pivotally movable in a direction transversely of said guide rail and having a raised type character thereon adjacent the other end of said lever positioned in close proximity to said document and platen,

said support member having a cover plate secured thereto on the same side as said guide rail and having an edge portion positioned in spaced relation with said support member and extending over a portion of each of said type carriers in overlapping relation therewith to retain said type carriers on said guide rail, and

print hammer means located adjacent said other ends of said type levers operably to engage said type levers and actuate them toward said platen to impact said document against said platen.

2. The invention as defined in claim 1 characterized by said one side of said support member being the underside and said pivotal type levers being pivotally supported by said pivot shaft at their upper ends and depending from said type carrier.

3. The invention as defined in claim 2 characterized by said type levers and print hammer means having inclined cam sur-

faces on each side of adjacent surfaces where they engage and which interact as inclined plane surfaces to restore the print hammer means to their rest positions in response to movement of the type levers along the print line past said print hammer means.

4. The invention as defined in claim 2 characterized by said type carriers each having a plurality of vertical slots defined by spaced rib portions on one side, each slot of which receives one of said type levers, all of which are mounted on a common pivot shaft extending through said rib portions and traversing said slots.

5. The invention as defined in claim 2 characterized by said type levers and print hammer means each having beveled edges on either side thereof which interact as inclined plane surfaces to restore the print hammer means and minimize interference between an operated print hammer means and an adjacent type lever as the type levers move past the print hammers.

6. The invention as defined in claim 5 characterized by said biasing means comprising a spring individual to each said type lever with said springs being located in recesses in a common carrier member mounted in said type carrier and matched with the masses of the type levers and print hammers so as to minimize rebound of the type levers and double printing.

* * * * *

30

35

40

45

50

55

60

65

70

75