

[54] **TILTABLE MATRIX PRINT HEAD TO PERMIT VIEWING OF THE CHARACTERS**

[75] Inventor: **George N. Liles**, Dayton, Ohio
[73] Assignee: **NCR Corporation**, Dayton, Ohio
[22] Filed: **July 23, 1973**
[21] Appl. No.: **381,974**

[52] U.S. Cl. **197/1 R; 101/93.05**
[51] Int. Cl. **B41j 3/04**
[58] Field of Search **197/1; 101/93 C**

[56] **References Cited**

UNITED STATES PATENTS

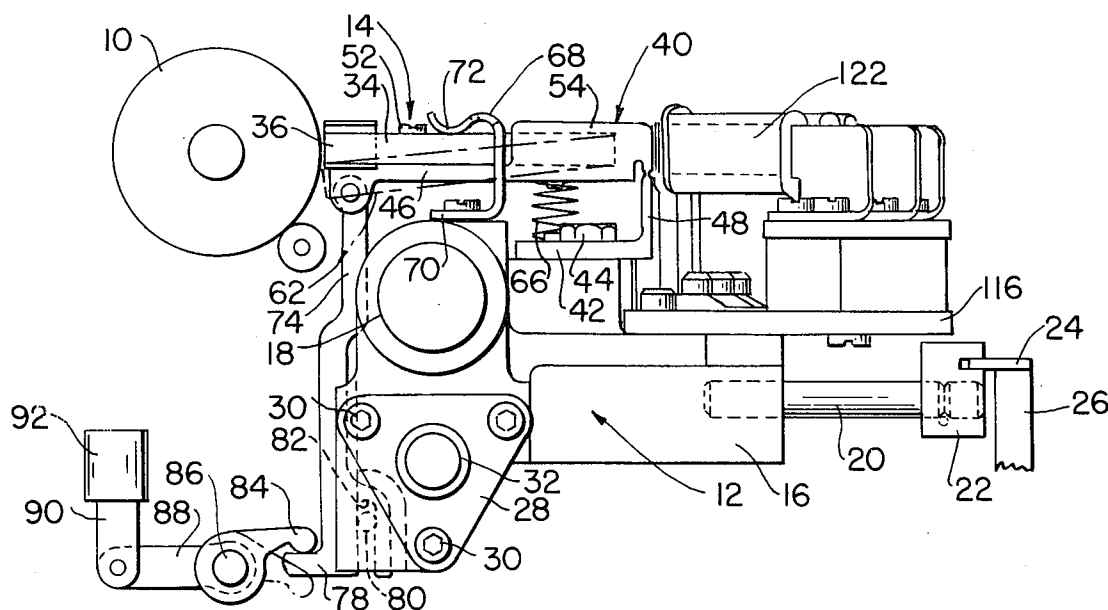
2,907,270	10/1959	Furman et al.	101/93 C
2,911,085	11/1959	Leathers	197/1 R
3,400,798	9/1968	Smith	197/1 R
3,426,880	2/1969	Blodgett	197/1 R
3,592,311	7/1971	Chon et al.	101/93 C X
3,633,723	1/1972	Kosters	197/17
3,685,629	8/1972	Rott	197/66
3,759,359	9/1973	Stellmach	197/1 R

Primary Examiner—Edgar S. Burr
Assistant Examiner—R. T. Rader
Attorney, Agent, or Firm—J. T. Cavender; Arthur L. Sessler, Jr.; Elmer Wargo

[57] **ABSTRACT**

A low inertia wire matrix print head which tilts below the line of printing on a printer to permit viewing of the characters which are printed. The printer includes a carriage which is traversed along the line of printing, and the print head is mounted thereon. The print head includes a housing in which the associated wire plungers are slidably mounted, and the rear end of the housing is pivotally mounted on the carriage and the front end thereof is adjacent to the line of printing. The actuators for the wire plungers do not pivot with the housing but are fixed to the carriage to provide a low inertia, tilting, print head. Linkage attached to the front end of the housing lowers the print head to permit viewing of the characters which are printed.

8 Claims, 6 Drawing Figures



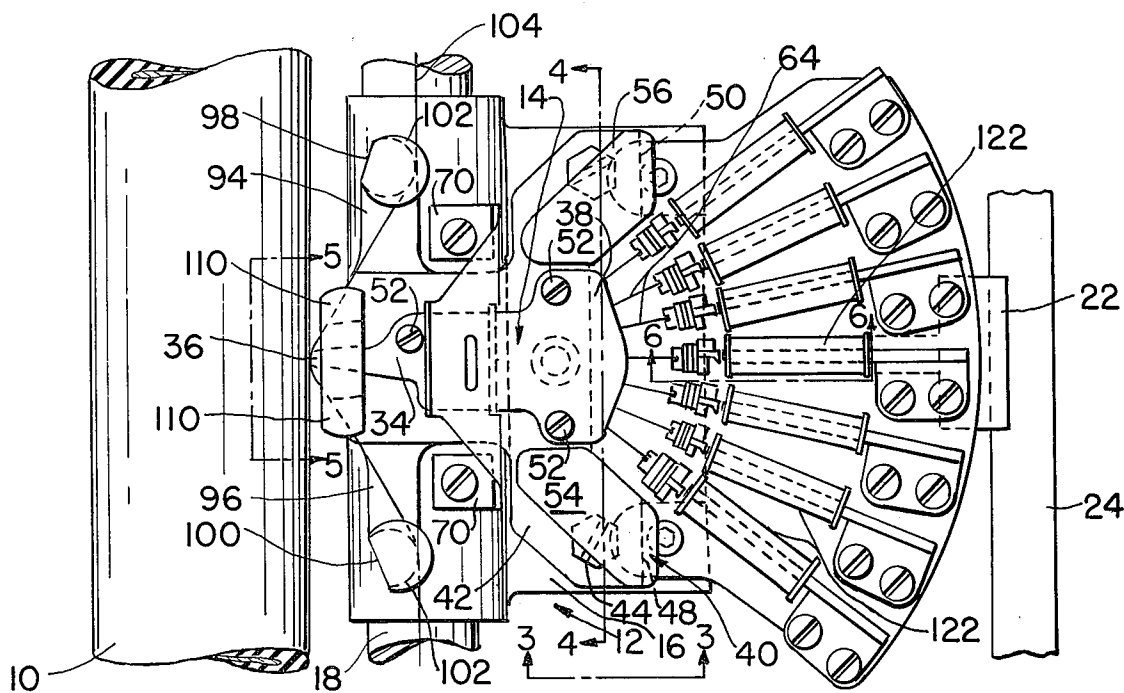


FIG. 1

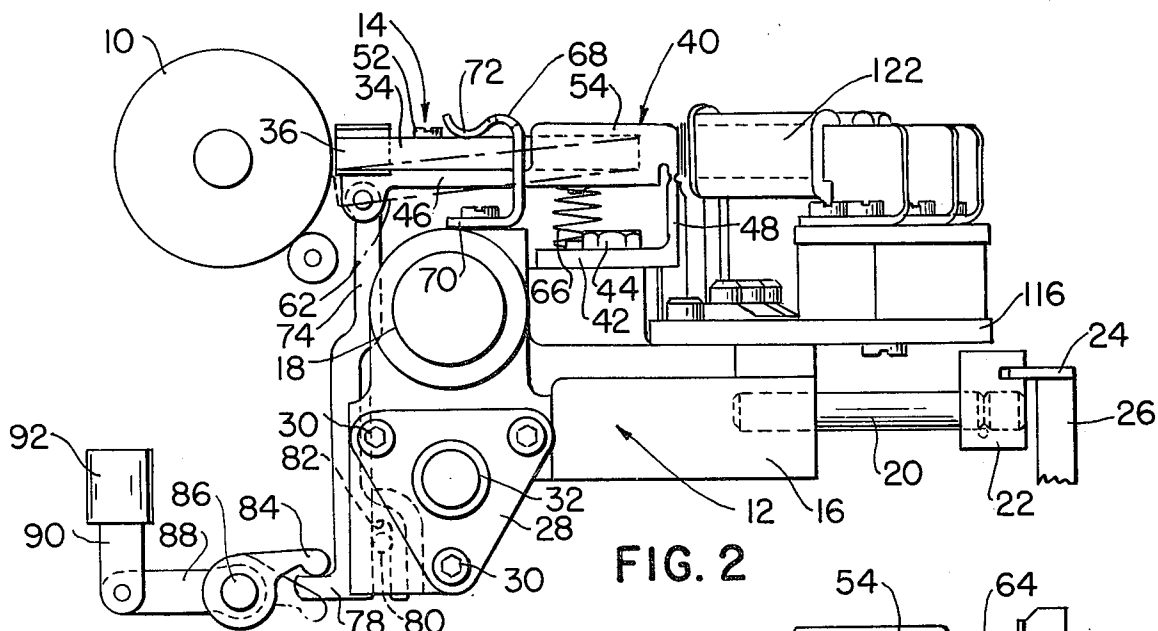


FIG. 2

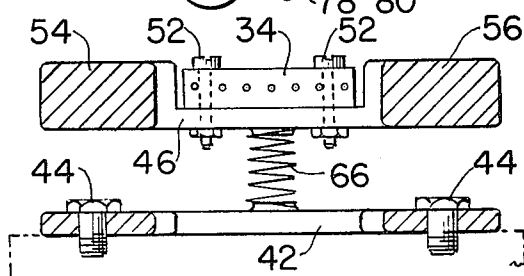


FIG. 4

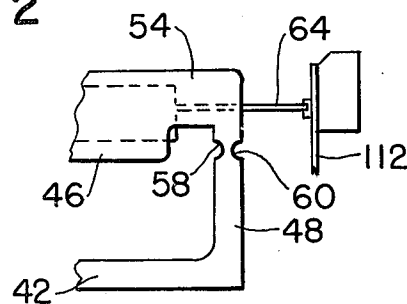


FIG. 3

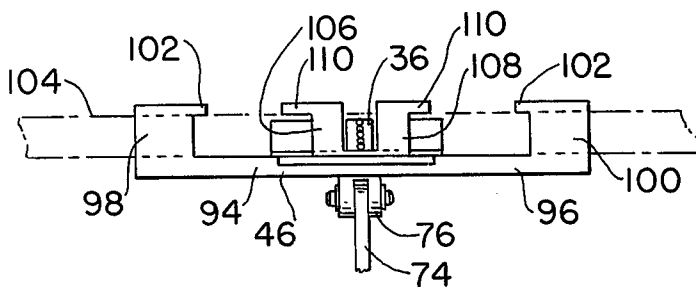


FIG. 5

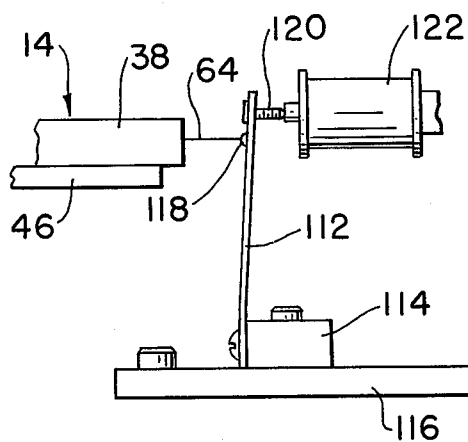


FIG. 6

TILTABLE MATRIX PRINT HEAD TO PERMIT VIEWING OF THE CHARACTERS

BACKGROUND OF THE INVENTION

This invention relates to a line printer which includes a low inertia, wire matrix print head which tilts below the line of printing to permit viewing of the most recently printed characters.

One of the problems with the prior art line printers of the wire matrix variety is that it is difficult to view the most recently printed characters. This is due to the fact that the front end of the housing (through which the associated wire plungers emerge) must be positioned close to the line of printing to provide a short distance for the plungers to travel when impacting against a record medium positioned at the line of printing. Also, when inking ribbon guides are fixed to the front end of the housing, they tend to obscure the most recently printed characters.

A prior art wire matrix printer is shown in the West German Pat. No. 2,108,006 which issued on Aug. 31, 1972. This patent discloses a wire matrix printer having a wire guide housing which tilts slightly to provide for the printing of upper and lower case letters. The actuators for the wire plungers are mounted on the housing so that both the actuators and the housing are tilted, making the combined mass quite large.

Another prior art wire matrix printer is shown in the U.S. Pat. No. 3,592,311 which issued on July 13, 1971 on the application Albert S. Chou, Monte Sereo, and Edgar A. Brown; however, this print head is fixed relative to its associated carriage means.

The U.S. Pat. No. 3,685,629 which issued on Aug. 22, 1972 on the application of John G. Rott discloses an impactless printer having a solenoid control for controlling the position of the electrostatic type printing head relative to the paper to be printed upon.

The present invention obviates the disadvantages mentioned relative to prior art printers described. The present invention provides a wire guide housing whose front end can be tilted below the line of printing to enable the most recently printed characters to be viewed. Because only the wire guide housing and not the actuators for the wire plungers is tilted, a minimum of mass is moved which is essential for a fast cycle time. The fast cycle time is necessary so that the motion of the print head is not distracting to an operator using the printer. With a smaller mass to be moved, smaller energy requirements are necessary to move the print head, and with the smaller mass, the print-escapement cycle is not slowed down. It was discovered that a slight flexing of the wire plungers, when the housing was tilted below the line of printing, did not affect their operation.

SUMMARY OF THE INVENTION

This invention relates to a line printer which includes a low inertia, wire matrix print head which tilts below the line of printing to permit viewing of the most recently printed characters.

The printer includes a carriage which is traversed along the line of printing, and the print head is mounted thereon. The print head includes a wire guide housing in which the associated wire plungers are slidably mounted, and mounting means are included to pivotally mount the rear end of the housing on the carriage.

The front end of the housing is normally aligned with the line of printing by a spring means, and a link means is used to lower the front end of the housing below the line of printing to permit the viewing of the most recently printed characters. The print head also includes actuator means which are fixed to the carriage and do not tilt with the housing, and are used for actuating the wire plungers. This invention may also be used for printing upper and lower case letters.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view looking at the top of a printer embodying this invention showing a platen, carriage means, a wire matrix print head having a wire guide housing, mounting means for mounting the rear end of the housing on said carriage means, wire plungers, and actuator means therefor.

FIG. 2 is a side of the invention shown in FIG. 1, showing additional details of said mounting means and also showing means for tilting the housing below a line of printing on the platen.

FIG. 3 is a slightly enlarged, side view, in elevation, taken along the line 3—3 of FIG. 1, to show details of a hinge which is part of the means for tilting the housing.

FIG. 4 is a cross-sectional view, in elevation, taken along the line 4—4 of FIG. 1, to show additional details of the mounting means.

FIG. 5 is an end view, in elevation, taken along the line 5—5 of FIG. 1, to show a ribbon carrier means which is part of the mounting means.

FIG. 6 is a side view, in elevation, taken along the line 6—6 of FIG. 1, to show additional details of the actuator means.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 is a plan view of a printer embodying this invention, including a platen 10, carriage means 12, and print head means designated generally as 14.

The carriage means 12 (FIGS. 1 and 2) includes a support member 16 which is suitably apertured to slidably receive a rod 18 whose ends are mounted in the side frames (not shown) of the printer. The rod 18 is aligned in spaced parallel relationship with the longitudinal rotating axis of the platen 10 so as to enable the print head means 14 to be traversed along a line of printing on the platen. A rod 20, extending from the side of the support member 16 away from the platen 10, has a block 22 secured thereto by a retaining pin to allow alignment of the block 22 with the bar 24, as shown in FIG. 2. The block 22 has a horizontally positioned slot therein to slidably receive a horizontally positioned bar 24 whose ends are supported on stationary supports 26. The block 22 and bar 24 tend to stabilize and support the support member 16 to keep the print head means 14 aligned with the line of printing on the platen 10.

A traversing means for traversing the carriage means 12 along the line of printing on the platen 10 is also shown in FIG. 2. This means includes a threaded plate 28 (functioning as a nut) which is secured to the support member 16 by fasteners 30. A traversing screw 32, cooperating with the threaded plate 28, is used to traverse the carriage means 12 when the screw 32 is rotated. The rotating axis of screw 32 is positioned parallel to the longitudinal axis of rod 18 and the screw 32 is conventionally rotated in both directions by a step-

ping motor (not shown) to index the print head means 14 along the line of printing on the platen 10 in response to a conventional control means.

The print head means 14, FIGS. 1 and 2, includes a wire guide housing 34 having a front end 36 and a rear end 38. The housing 34 is pivotally mounted near its rear end 34 on the carriage means 12 by a mounting means designated generally as 40, to enable the front end 36 to tilt below the line of printing on the platen 10.

The mounting means 40 functions as a support for the wire-guide housing 34, as a hinge to enable the housing to be tilted below the line of printing, and as a ribbon carrier. The mounting means 40 is made of a plastic material like polyterephthate and has the molded shape shown in FIGS. 1-5. The mounting means 40 is generally U-shaped in cross section and includes a first flat portion 42 which is secured to the carriage means 12 by fasteners 44, a second flat portion 46, and bendable third sections 48 and 50 which together act as a hinge. The housing 34 is secured to the second portion 46 by fasteners 52, and the flat second portion 46 is thickened at areas 54 and 56 to stiffen the second portion near the bendable third sections 48 and 50, respectively. As is apparent from FIG. 3, each third section (48,50) has horizontally positioned grooves 58,60 on opposed sides thereof to provide a reduced thickness portion in sections 48, 50 which act as a hinge to enable the print head means 14 to be tilted below the line of printing as shown in dashed outline 62 in FIG. 2. The grooves 58 and 60, forming the hinge, should be located as close to an imaginary plane including the wire plungers 64 as is possible to thereby provide a hinging action in which the wire plungers 64, associated with the print head means 14, bend the least when the front end 36 of the housing 34 is lowered. In the embodiment shown, the thickness of the portion between the grooves 58 and 60 is about 0.030 inch; however, the thickness of the portion will depend upon the design parameters of the particular print head and material being used. Because such designing may be conventional, it is not described in further detail.

The mounting means 40, in cooperation with a spring 66 (FIG. 2) and a limiting means 68 combine to maintain the print head means 14 in a first position in which the housing 34 of the print head means is aligned with the line of printing on the platen 10. The spring 66 is of the compression type and is positioned between the first portion 42 and second portion 46 of the mounting means 40 (as shown in FIGS. 2 and 4) to urge the front end 36 of the housing 34 upwardly as viewed in FIG. 2. The upward motion of the front end 36 is restrained by the limiting means 68 which is an apertured curved plate having the cross sectional shape shown in FIG. 2. The means 68 has two mounting flanges 70 which are secured to the support member 16 by suitable fasteners. The means 68 is apertured at its center to permit the housing 34 to pass therethrough, and it has an S-shaped bend at 72 (FIG. 2) on the top thereof which contacts the top of the housing at the central portion thereof to limit the upward motion of the front end of the housing 34 and to keep the housing 34 aligned with the line of printing.

The front end 36 of the housing 34 is tilted below the line of printing by the pivoting means shown in FIG. 2. This means includes a vertically positioned link 74 having one end pivotally joined to a bifurcated flange 76

(FIG. 5) depending from the lowerside of the second flat portion 46, and the remaining end of the link has a leg 78 projecting at a right angle therefrom (FIG. 2). The link 74 also has an extension containing a slot 82 on the side opposite the leg 78, which cooperates with a pin 80 mounted on the support member 16 to slidably constrain the motion of link 74 to a movement which is perpendicular to the line of printing on the platen 10. The link 74 is lowered to a second position by an arm 84 which is fixed to a shaft 86 which is rotatably mounted in the frame (not shown) of the printer. An arm 88 also has one end fixed to the shaft 86 and the remaining end thereof is pivotally joined to the operating plunger 90 of a solenoid 92. When the solenoid 92 is energized by said control means, the arm 84 is rotated in a clockwise direction (as viewed in FIG. 2) to lower the front end 36 of the housing 34 to a second position shown in dashed outline at 62, permitting the most recently printed characters to be viewed at the printing line. The top most end of the slot 82 limits the motion of the front end 36 at the second position. When the solenoid 92 is deenergized, the spring 66 returns the front end 36 to the first position in printing relationship with the platen 10.

As stated earlier, the mounting means 40 also functions as a ribbon carrier. The second portion 46 of the means 40 has laterally positioned extensions 94 and 96 (FIG. 5) which support the guides 98 and 100, respectively. Each of the guides has an overhang portion 102 to retain a ribbon 104 thereunder. The ribbon carrier also includes similar guides 106 and 108 located near the front end 36 of the housing 34 on opposed sides thereof as shown in FIG. 5 and these guides upstand from the second portion 46 and have overhang portions 110 to retain the ribbon 104 thereunder. The ribbon 104 passes around the guide 98, around guide 106, around the front end 36 of the housing 34, around guide 108, and around guide 100. The ribbon may be fed by conventional means (not shown). The ribbon carrier, just described, is lowered with the front end 36 of the housing 34 to permit viewing of the most recently printed carriers.

The actuator means for actuating the wire plungers 64 is shown in FIGS. 2, 3, and 6, and includes, for each wire plunger, a leaf spring 112 having one end fixed to a block 114 (FIG. 6) which is secured to a plate 116 which in turn is secured to the support member 16 of the carriage means 12. The free end of each leaf spring 112 has one end of the associated wire plunger secured thereto as shown at 118 in FIG. 6. This free end also has an adjustment screw 120, threadedly secured thereto, to contact the core of its associated actuator 122. The actuator may be an electromagnet which holds the associated leaf spring in the tensioned position shown in FIG. 6. When a particular wire plunger 64 is to be actuated to form a character, the associated actuator is momentarily deenergized permitting the tensioned leaf spring 112 to drive the wire plunger out of the front end 36 of the housing 34, and to impact against the ribbon 104 and paper at the line of printing on the platen 10. Upon reenergization of the actuator 122, the screw 120 contacts the armature of the actuator to retension the associated leaf spring 112.

In the embodiment shown, there are seven actuators 122 which are fixed to the plate 116 on the carriage means 12. It should be noted that these actuators do not tilt when the wire guide housing 34 is tilted, and

consequently, the wire plungers 64 will bend somewhat in the sections thereof which are between the rear end 38 of the housing and the leaf springs 112. It was discovered that this small amount of bending did not adversely affect the wire plungers 64, and because the actuators 122 do not tilt, but are secured to the carriage means, the mass of the housing 34 is considerably lighter and can be tilted more rapidly than prior art devices. These wire plungers 64 fan out in a horizontal direction at the rear end 38 of the housing 34 (FIG. 1) and are aligned in a vertical direction at the front end 36 as shown in FIG. 5.

The particular control means, for controlling the actuators 122 and the stepping motor which rotates the traversing screw 32 to translate the print head means 14 to produce characters in the "5×7" matrix, may be conventional. In the normal operation of printing a line of characters, it may not be necessary to tilt the front end 36 to the lower or second position each time a character is formed; however, after a momentary lapse of printing, it may be convenient to have the solenoid 92 energized to lower the front end of the housing to permit viewing of the most recently printed characters. The housing 34 may also be lowered when desired by closing a manually-operated switch to energize solenoid 92. Suitable conventional controls to prevent printing when the housing 34 is lowered, may be employed.

Because of the small mass of housing 34 which is tilted, the structure disclosed in this application can be used to print upper and lower case letters as disclosed in said German patent and U.S. Pat. No. 3,592,311 which are incorporated by reference in this application.

What is claimed is:

1. In a wire matrix printer having a platen, a carriage means, and traversing means for traversing said carriage means along a line of printing on said platen, the improvement comprising:

a wire guide housing having a front end located adjacent to said platen, and a rear end;

mounting means for pivotally mounting said housing at said rear end to said carriage means to enable the housing to be pivoted between a first position in which said front end is aligned with said line of printing and a second position in which said front end dips below said line of printing to enable said line of printing to be viewed;

wire plungers slidably mounted in said housing;

plunger actuator means connected to said wire plungers and said carriage means to actuate said plungers to print in response to a control means;

said wire plungers each having one end extending from said rear end, in a straight line and lying in a plane which is parallel to said line of printing, and being secured to said plunger actuator means;

pivoting means to pivot said front end of said housing between said first and second positions to pivot

only said housing and the plungers therein to provide a low inertia print head in which the housing and the wire plungers therein pivot relative to said carriage means between said first and second positions, but said actuator means remain fixed relative to said carriage means.

2. The printer as claimed in claim 1 in which said mounting means includes a U-shaped means having first and second portions joined by bendable third portions, said first portion being secured to carriage means and said second portion being secured to said housing.

3. The printer as claimed in claim 2 in which said pivoting means includes resilient means to resiliently urge said housing to said first position and lever means secured to the front end of said housing to pivot said housing to said second position.

4. The printer as claimed in claim 3 in which said U-shaped means is made of a plastic material like polyterephthate and said third portions each have a reduced thickness portion therein forming a hinge line which is parallel to said line of printing to facilitate the bending of said third portions.

5. The printer as claimed in claim 4 in which said reduced thickness portion of each of said third portions is located near said plane including said wire plungers to minimize the bending of said wire plungers when said housing is pivoted to said second position.

6. The printer as claimed in claim 5 in which said U-shaped means is formed of a single piece of said plastic material and also includes a ribbon carrier means integrally formed on said front end of said housing to be pivoted therewith to said second position to enable said line of printing to be viewed.

7. The printer as claimed in claim 1 in which said plunger actuator means includes:

a leaf spring for each said wire plunger having one end fixed to said carriage means and the other end having one end of an associated wire plunger secured thereto near said rear end of said housing; each said leaf spring being biased to urge the associated wire plunger out of the front end of said housing; and

an actuator for each said leaf spring for holding the leaf spring in a tensioned position until released by said control means permitting the bias of the leaf spring to urge the associated wire plunger to impact against said platen.

8. The printer as claimed in claim 7 in which said mounting means includes a U-shaped means having first and second portions joined by a third means, said first portion being secured to said carriage means and said second portion being secured to said housing; said third means being bendable to provide a hinge to enable said pivoting means to pivot said front end of said housing between said first and second positions.

* * * * *