

[54] **PRINTER PAPER GUIDE WHICH COMPENSATES FOR THE THICKNESS OF DOCUMENT PACK**

[75] Inventors: **Richard G. Dobner**, Webster;
Donald G. Hebert, Pittsford, both of
N.Y.

[73] Assignee: **The Singer Company**, New York,
N.Y.

[22] Filed: **Mar. 7, 1973**

[21] Appl. No.: **338,776**

Related U.S. Application Data

[63] Continuation of Ser. No. 142,702, May 12, 1971,
abandoned.

[52] U.S. Cl. **197/127 R**, 197/133 R, 101/93 C

[51] Int. Cl. **B41j 13/00**

[58] **Field of Search** 197/126 R, 126 A,
197/126 B, 127 R, 128, 133 R, 133 T, 133 P,
133 F, 133 A, 134, 138 R, 151, 1, 135 R,
136, 139, 143, 43, 170, 180, 183; 101/93 C;
226/93, 95, 147, 149, 150; 188/161, 163, 164

[56] **References Cited**

UNITED STATES PATENTS

3,282,203	11/1966	Kalbach et al.	101/93 C
3,291,043	12/1966	Bernard	197/151 X
1,929,449	10/1933	Trego	197/127 R
1,997,077	4/1935	Racz et al.	197/127 R
2,784,392	3/1957	Chaimowicz	197/1 R X
3,145,650	8/1964	Wright	101/93 C
3,185,283	5/1965	Spitsbergen et al.	197/133 R
3,421,612	1/1969	Pitt	197/138 R X
3,550,745	12/1970	Bisone et al.	101/93 C X
3,586,149	6/1971	Miller	197/133 R

3,653,483 4/1972 Cortona et al. 197/133 R X

Primary Examiner—Ernest T. Wright, Jr.

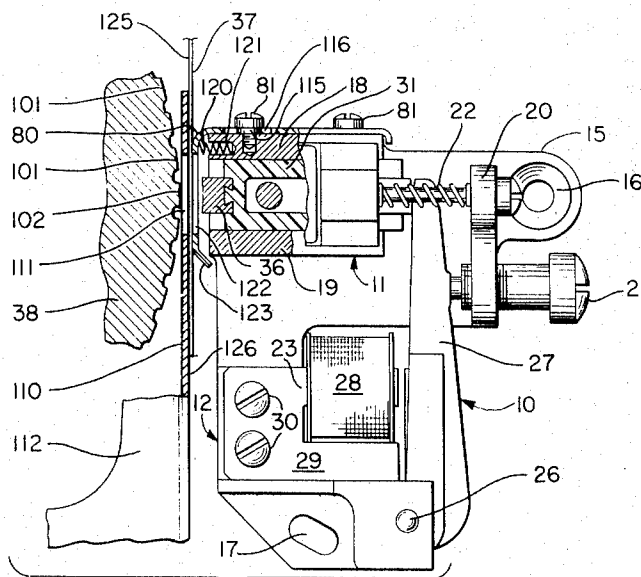
Attorney—Charles R. Lepchinsky

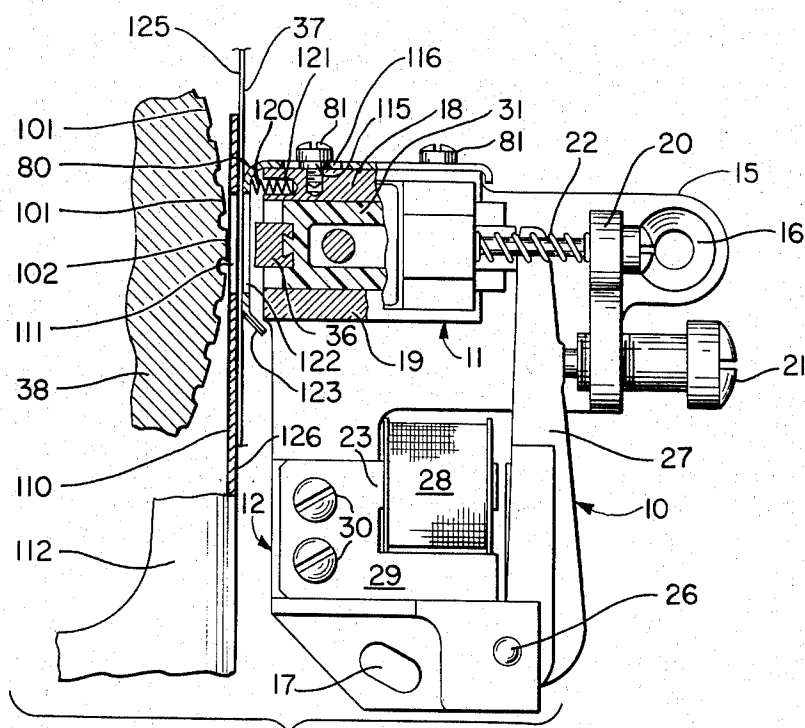
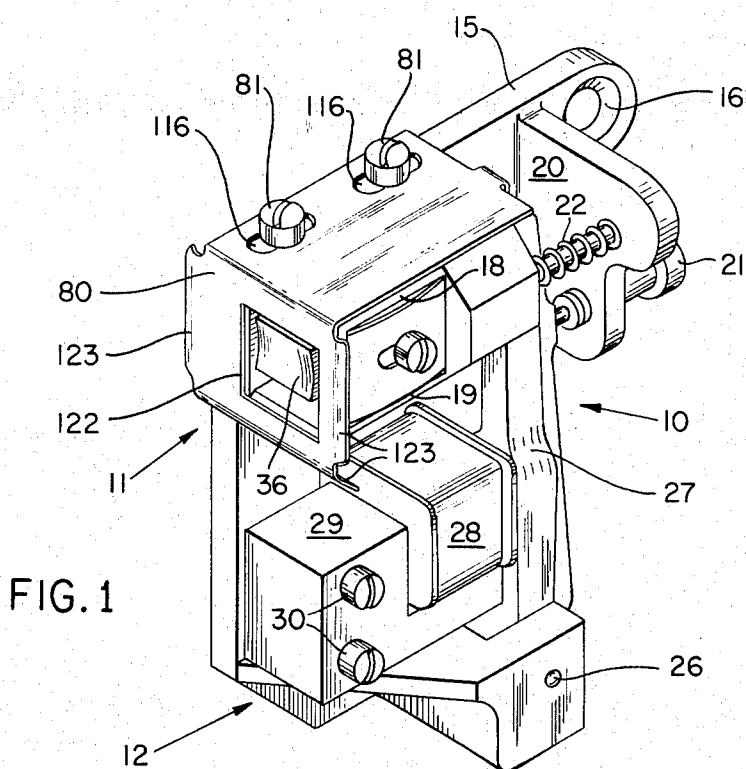
[57]

ABSTRACT

An improved document support system for use in a character by character printer of the type that employs a rear striking hammer to drive the document, at the printing position, into contact with a selected symbol on a rotating type font. Typically, the type font would be on the surface of a constantly rotating wheel. In application, a front paper guide is provided which limits and defines the normal spacing between the document and the type font in the area of the printing position; the said spacing normally being quite small. A rear paper guide is supported by the hammer structure and is spring biased towards the front paper guide. Both paper guides include cutouts or openings so that the printing hammer can drive the document towards the selected character of the font to effect a printing action. The paper guides cooperate to maintain the document in a fixed location, relative to the type font, and serve to compress the document pack which may comprise an original document, carbons, and multiple copies, so that there are no separations, or air pockets, therebetween at the printing position. The paper guides enable the production of a more uniform appearing print of improved quality. Supporting and holding the document in a known position allows a constant portion of the kinetic energy of the print hammer to be available for affecting a print action, thus increasing the quality of the print.

1 Claim, 2 Drawing Figures





PRINTER PAPER GUIDE WHICH COMPENSATES FOR THE THICKNESS OF DOCUMENT PACK

This is a continuation of co-pending application Ser. No. 142,702 filed May 12, 1971, now abandoned.

CROSS REFERENCE TO RELATED APPLICATION

The present invention constitutes an improvement and modification of the structure disclosed and claimed in the copending application of Donald G. Hebert, Ser. No. 95,645 and filed on Dec. 7, 1970 now U.S. Pat. No. 3,726,213 issued Apr. 10, 1973. The cited Hebert patent application is incorporated herein by reference and should be consulted for any details relative to the structure and operation of the mechanism disclosed herein but which does not form an essential part of the present invention. For convenience, the two digit reference numbers used in this application will relate to parts which have a similar function in the cited Hebert application and which have the same two digit reference numbers, while those reference numbers which are unique to this application will comprise three digit reference numbers.

BACKGROUND OF THE INVENTION

In the pack printing art, a wide variety of printing techniques have been used, including those employed in the ubiquitous typewriter, the drum printer, the wheel printer, and the chain or belt printer. With drum and/or chain printers, it is conventional to provide a print hammer for each character position with the drum or chain on one side of the document and the print hammers on the other side. In such printers, the documents are not supported in the same manner that they are in the ubiquitous typewriter. In typical applications, the documents are continuous forms and are indexed in the line spacing direction by a document feed mechanism which cooperates with uniformly spaced feed holes along the vertical edges of the document form. In addition, other support and/or guide members are conventionally provided to support and position the document in the area where printing is to take place. Typically, such supports are frame mounted and do not move relative to the printer frame, although some adjustments might be provided to adjust the supports, permit insertion of a new document form and/or adjust for the thickness of the document pack.

In another class of printers, notably the wheel or disc printer, it is normal to employ a single print hammer. In such applications, the single print hammer, together with the printing wheel or disc, must move character by character relative to the document. In such printers, the document is indexed, or line spaced, in the same manner as that previously described. However, the document support in the vicinity of the printing area differs materially because of the motion of the print wheel and the print hammer laterally across the document as the desired characters are printed on a character by character basis.

The paper guide of the present invention is intended for use in a printer which can present successive characters, in their respective printing positions, in rapid succession. The paper guide provides an improved support in the printing area irrespective to the thickness of the document pack and enables the printer to produce a print of improved quality and uniformity.

SUMMARY OF THE INVENTION

The present invention comprises a moving two-part paper guide with one part on the front side of the document and the other part on the rear side of the document. The parts cooperate with each other to compress the document pack and move in a letter spacing direction together with the print wheel and the print hammer. The front paper guide locates the plane of the document a predetermined distance from the print wheel. The rear paper guide, which is supported on the moving frame of the hammer, is spring biased towards the front paper guide to compress the document pack at the point of printing impact. The compression of the document pack eliminates any air pockets which might exist between the elements of the document pack and which would tend to cause a deragation in the quality of the print. In addition, the paper guides support the document in a known plane so that a constant portion of the available energy of the print hammer is always available to effect a printing operation. That is, the print hammer is not required to expend a variable portion of its energy to compress the document pack and/or to move the document by varying amounts towards the print wheel.

The fact that the rear paper guide is spring biased makes it self-adjusting for different thicknesses of document packs.

BRIEF DESCRIPTION OF THE DRAWING

The inventive characteristics of the paper guide will be more fully understood when reference is had to the following description considered together with the accompanying drawing, which comprises two FIGS. and wherein:

FIG. 1 is a perspective view of a print hammer assembly incorporating the rear paper guide, and

FIG. 2 is a cross-section view of the hammer assembly and a portion of the print wheel together with the front and rear paper guides.

In accordance with standard drawing practice, a given element of the embodiment incorporating the invention is always identified by the same reference numeral in all figures. In addition, for the convenience of the reader, the two digit reference numbers used herein relate to parts which are similar to those in the cited Hebert patent application and which are identified by the same two digit reference numbers. Those reference numbers which are unique to this patent application are three digit reference numbers.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more specifically to FIG. 1, there is shown therein a print hammer and print hammer actuating structure 10 which includes a hammer and hammer support structure 11 and electromagnetic control means 12 together with a rear paper guide 80. The print hammer and actuating structure 10 are mounted on, and supported by, a mounting plate 15, with mounting holes 16 and 17 (see FIG. 2), upstanding portions 18 and 19 for guiding and supporting a longitudinal hammer 31 (see FIG. 2), and upstanding portion 20 for supporting backstop screw 21 and impression control screw 22. An electromagnetic coil 28 is wound on one leg 23 (see FIG. 2) of a U-shaped magnetic core 29 which is adjustably fastened to the mounting plate 15

by screws 30. Connections, not shown, for selectively completing an electrical circuit to the coil 28 are provided.

The hammer 31 is electromagnetically actuated by the longitudinal actuating means 27, which is pivoted at pivot pin 26 and actuated by the electromagnetic coil 28.

Referring now more specifically to FIG. 2, it may be seen that the longitudinal hammer 31 has an anvil portion 36. The anvil portion 36 is curved to match the radius of curvature of the print wheel 38. The print wheel 38 rotates on a center (not shown) and has at its periphery a full set of alphanumeric characters and symbols 101. With the print wheel 38 rotating at a constant angular velocity each of the alphanumeric characters and symbols 101 are successively presented at the printing position 102 which is shown in FIG. 2 as being occupied by one of the alphanumeric characters and symbols 101 and which is in axial alignment with the print hammer anvil portion 36. Accordingly, once per revolution of the print wheel 38, each of the alphanumeric characters and symbols 101 are present at the printing position 102. After each cycle or revolution of the print wheel 38, the print wheel 38 and print hammer and actuating structure 10 are advanced relative to the document 37 by the width of one character or symbol 101 printing space in a direction parallel to the rotational axis of the print wheel 38. The required relative motion may be obtained by moving either the document 37 or the combination of the print wheel 38 and the print hammer and actuating structure 10. In practice, the document 37 usually comprises part of an endless form the handling mechanism of which has substantial weight. Accordingly, it is usually more expedient to move the print wheel 38 and the print hammer and actuating structure 10, than to move the document 37 and the associated handling mechanism (not shown). The required movement may be provided by an escaping action or by providing a constant advance of the print wheel 38. By arranging the alphanumeric characters and symbols 101 about the surface of the print wheel 38 in spiral fashion, each successive alphanumeric character and symbol 101 on the print wheel 38 is presented at the printing position 102 in perfect alignment with the desired print area on the document 37 as disclosed in U.S. Pat. No. 2,843,243, issued July 15, 1958, in the name of E. E. Masterson.

A front paper guide 110 having an opening 111 at printing position 102 is supported and mounted on the same carriage (not shown) as that which supports the print wheel 38. The front paper guide 110 includes a flange 112 which helps to strengthen and position the front paper guide 110. In order to avoid obscuring the print wheel 38 only the lower portion of the front paper guide 110 flange 112 is shown in FIG. 2. Preferably, the flange 112 would extend to or near the top of the front paper guide 110. With the front paper guide 110 mounted on and supported by the same carriage (not shown) that supports the print wheel 38, it is possible to adjust and position the front paper guide 110 so that it is quite close to the print wheel 38.

A rear paper guide 80 is mounted on the upstanding portion 18 of the hammer and hammer support structure 11, by screws 81. The screws 81 have shoulders 115 which are slightly higher than the thickness of the rear paper guide 80. In addition, the holes 116 in rear paper guide 80 through which screws 81 pass are elongated

gated slots positioned such that the rear paper guide 80 may move small amounts from left to right as viewed in FIG. 2. The rear paper guide 80 is biased to a leftward position, as viewed in FIG. 2, by spring 120, which is captured in hole 121 of the upstanding portion 18 of the hammer support structure 11. The rear paper guide 80 has an opening or cut out 122 through which the hammer anvil position 36 may be seen in FIG. 1. The portion of the rear paper guide 80 which has the opening 122 is essentially a plane except for the bent over edges 123.

The document 37 may comprise a single sheet of paper or if multiple copies are required, the document 37 may comprise a plurality of sheets of paper with interleaving carbon paper. Accordingly, the document 37 may be relatively thin or relatively thick and may be fairly flexible or relatively stiff. Furthermore, if the document 37 does comprise a plurality of sheets and interleaving carbon paper, there might be at least an occasional tendency for air pockets to form between various components of the document pack 37 and thereby tend to derogate the print quality. That is, if there are air pockets in the document pack 37 at the printing position 102, at least some of the force of the hammer 31 may be expended in compressing the document pack 37 and driving out the air bubbles rather than in providing a good character impression. In such cases, the printed character may tend to be light as insufficient energy was available for the printing impact.

The paper guide 80, 110 of the present invention maintains the document pack 37 at the printing position 102 in a compact assembly without any air pockets, inasmuch as the edges 123 of the rear paper guide 80 serve to gently compress the document pack 37 in the area of the printing position 102 and the spring 120 serves to urge the rear paper guide 80 in the direction of the front paper guide 110. It should be noted that the rear paper guide 80 and the means by which it is mounted together with its cooperating spring 120 causes the rear paper guide 80 to be self-compensating for any thickness of document 37 that is placed in the printer.

The spring 120 is preferably a compression spring, however, it could be a leaf spring which is suitably mounted to provide a component of force in the desired direction. Ideally, the spring 120 should urge the rear paper guide 80 only in the direction of forward motion of the hammer anvil portion 36. However, because of practical limitations in placement of the spring 120 there may be a component of force on the rear paper guide 80 which is not normal to the planes 126 and/or 125. Such component would not cause any undesired motion of the rear paper guide 80 as its motion is limited by the guiding action of the sides of holes 116 acting on the shoulders 115 of screws 81.

In addition to the foregoing, the rear paper guide 80 coacting with the document 37 and the front paper guide 110 serves to maintain the front plane 125 of the document 37 in the rear plane 126 of the front paper guide 110. That is, for all practical purposes, the planes 125 and 126 are the same. Accordingly, the distance from the plane 125 to the surface of the alphanumeric character or symbols 101 is always a constant and, for a given document 37, requires a constant amount of energy to deflect the document 37 through the opening 111 and into printing contact with the alphanumeric character or symbol 101. If the plane 125 of the docu-

ment 37 was not held in a known position, the amount of energy required to deflect the document 37 into printing contact with the alphanumeric character or symbol 101 would be variable and the print quality would tend to vary having light and dark characters. 5

From the foregoing, it is obvious that it might be necessary to be able to modify or alter the amount of energy transmitted to the print hammer 31 depending upon the makeup of the document 37. As disclosed more fully in the cited Hebert Patent application, impression control screw 22 may be used to control the amount of energy that is available for driving the document 37, at the printing position 102, into contact with the adjacent alphanumeric character or symbol 101. 10

While there has been shown and described what is considered at present to be the preferred embodiment of the invention, modifications thereto will readily occur to those skilled in the related arts. For example, the structure might be modified so that the rear paper guide 80 is fixed in position and the front paper guide 110 is spring biased towards the rear paper guide 80. It is believed that no further analysis or description is required and that the foregoing so fully reveals the gist of the present invention that those skilled in the applicable arts can adapt this invention to meet the exigencies of their specific requirements. 15 20 25

What is claimed is:

1. In a character by character printing device, the combination comprising:

- a. a print wheel having disposed thereon alphanumeric characters and symbols which are sequen-

tially presented at a print position once in each cycle;

- b. a front paper guide for maintaining at least a predetermined distance between said print wheel and a document at said print position, except during a print cycle, and having a planar surface in cooperative relationship with said document;
- c. a print hammer assembly including a print hammer disposed in cooperative relationship with said print wheel and said document for effecting a print impression on said document;
- d. a rear paper guide having a planar surface disposed in cooperative relationship with said document and substantially parallel to said planar surface of said front paper guide for retaining said document in a cooperative relationship with said front paper guide in the vicinity of said print position;
- e. means for movably mounting said rear paper guide on said print hammer assembly to enable the spacing between the planar surface of said rear paper guide and the planar surface of said front paper guide to be variable; and
- f. bias means coupled between said print hammer assembly and said rear paper guide for urging said rear paper guide toward said front paper guide;
- g. said front and said rear paper guide each having an opening therein whereby said print hammer can drive a portion of said document into contact with said print wheel at said print position.

* * * * *

35

40

45

50

55

60

65