United States Patent

Dreimanis et al.

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[54] DOCUMENT ELEVATION APPARATUS FOR A STRIP PRINTER

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[52] **U.S. Cl.** .....**197/133 R,** 197/138, 178/42

[51] **Int. Cl.** **B41j 15/00**

[58] **Field of Search**.....197/133, 138, 48, 49, 124, 197/127, 133 T, 135, 135 A, 136, 180; 178/42

[56] **References Cited**

UNITED STATES PATENTS

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[57] **ABSTRACT**

Elevation apparatus for printing at various vertical levels on a document in a strip printer including a chamber for laterally supporting the document and for defining a printing area, a front edge stop for indexing the leading edge of the document and an elevation mechanism for adjusting the vertical position of the document. The elevation mechanism includes a plurality of rotatable cams on a common shaft; the cams having like series of steps or shoulders to support the bottom edge of the document at different heights.

8 Claims, 4 Drawing Figures

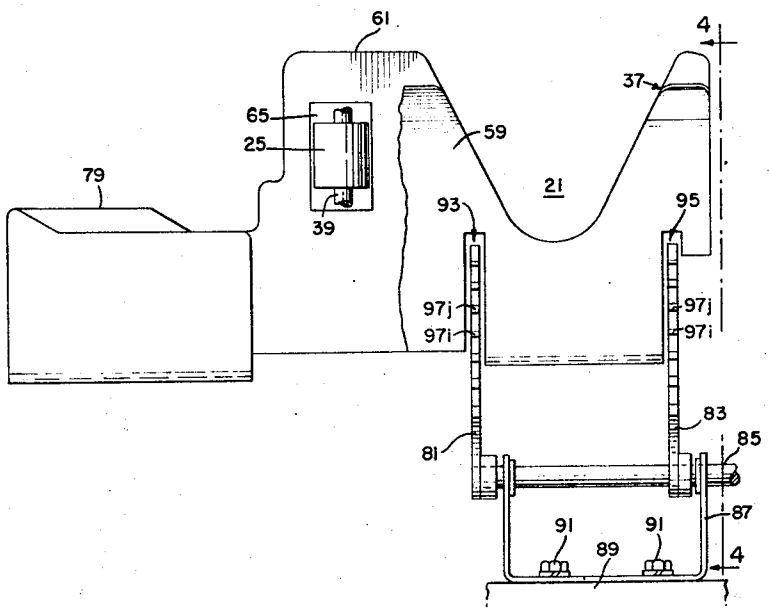


FIG. 1
(PRIOR ART)

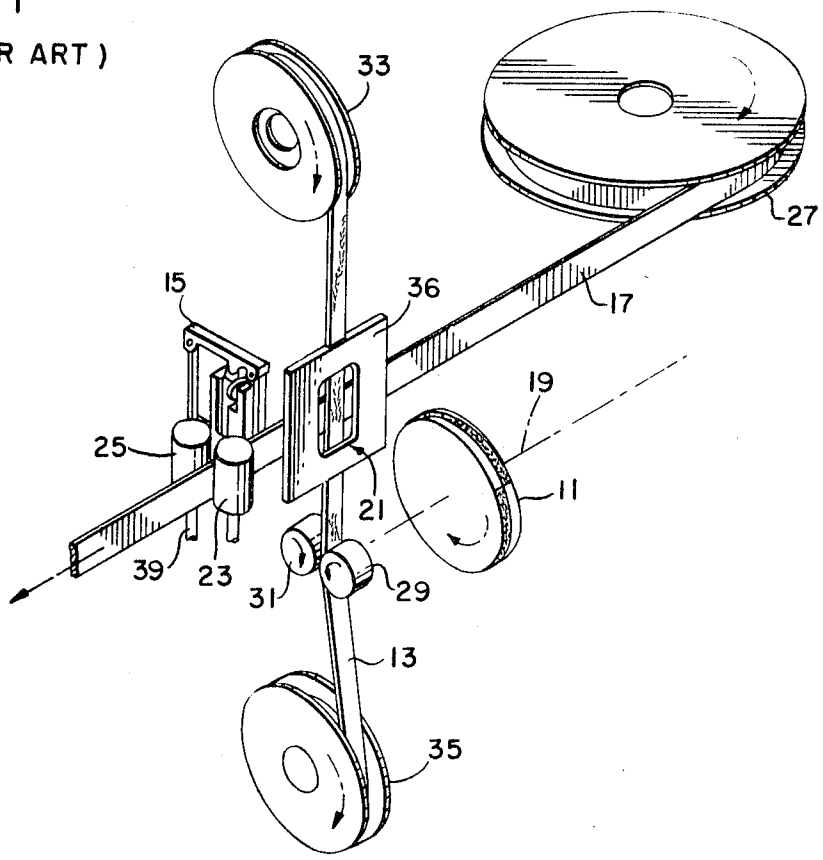
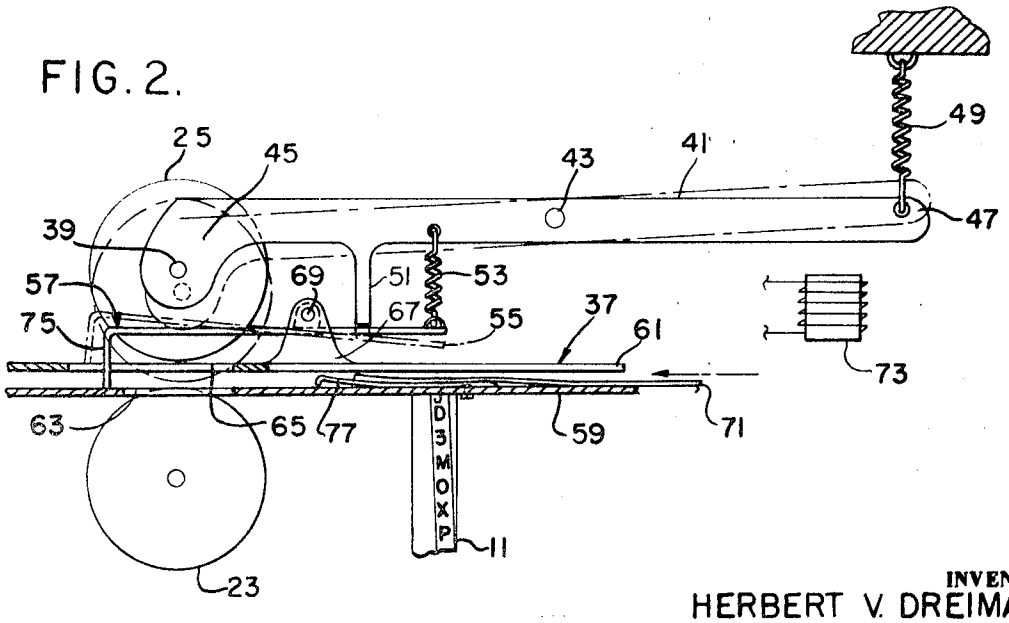


FIG. 2.



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FIG. 4.

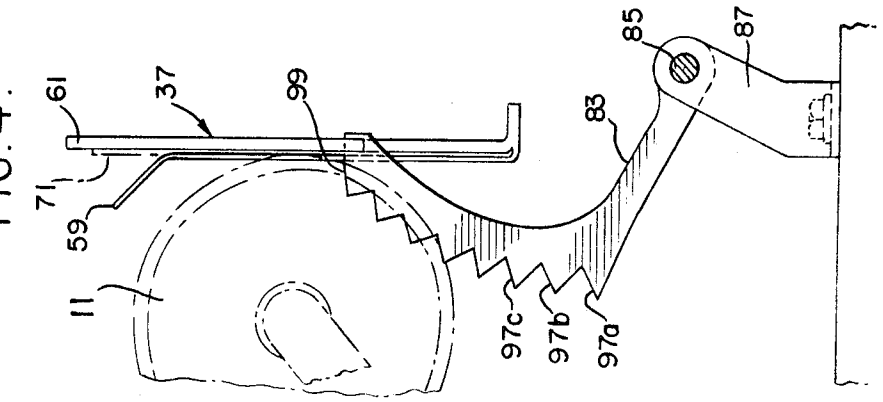
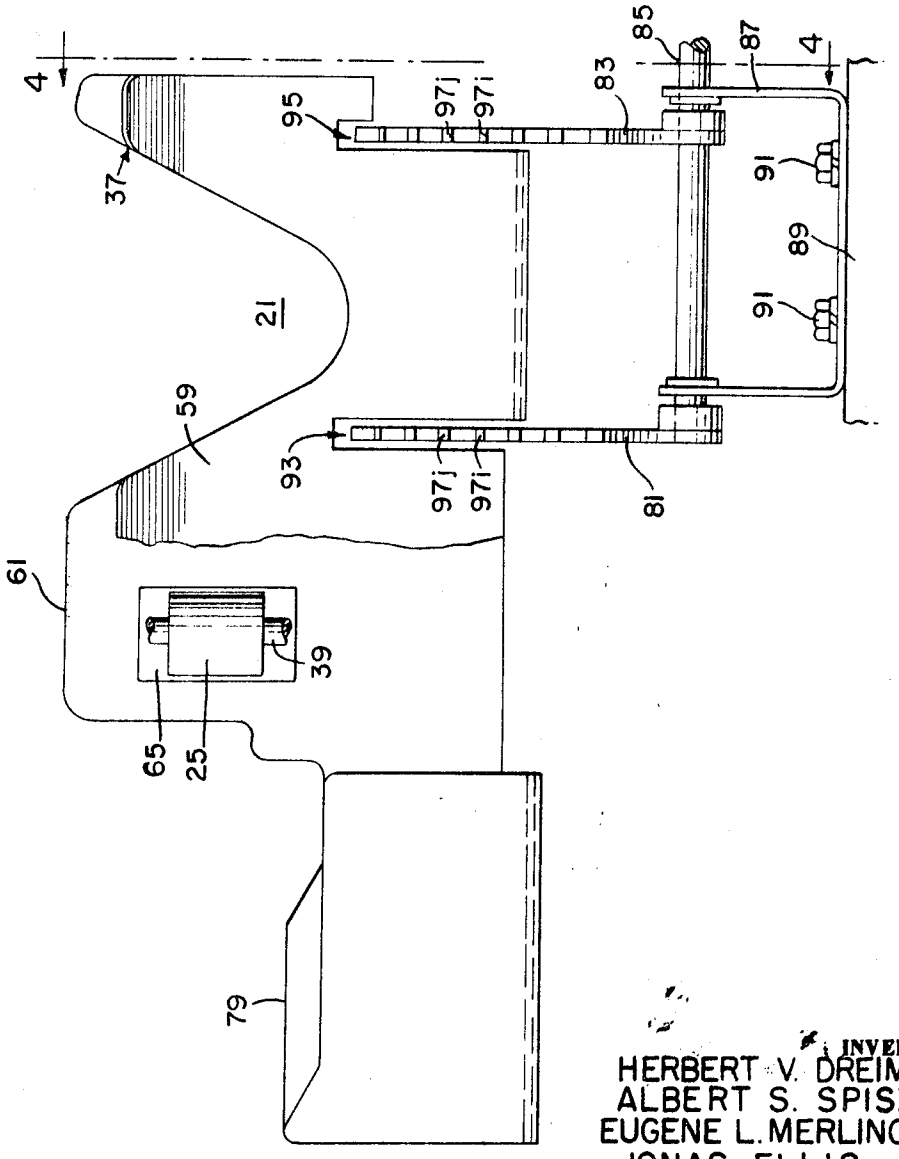


FIG. 3.



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DOCUMENT ELEVATION APPARATUS FOR A STRIP PRINTER

BACKGROUND OF THE INVENTION

Printers utilizing a rotating type wheel or code wheel are well-known and have been put to many uses. For example, one class of code wheel printers is that wherein the code wheel rotates about its axis but does not advance and the strip of paper is fed past the code wheel during the printing operation. Prior to the present invention, in order to print at various vertical levels on the strip of paper with this non-advancing code wheel a plurality of code wheels were required, one at each of the several printing levels. This is seen, for example, in U. S. Pat. No. 962,082, Foote. However, there are the expected problems of driving a plurality of code wheels in synchronism and the expense of the plurality of wheels and print hammers.

In a second type of printer the code wheel, in addition to rotating about its axis, is advanced along the line of print. The paper or other document is stationary for a single line of print and then is advanced one line as the code wheel returns to the start of line position. This type of printer is used in teletype printouts and has the normal problem of synchronization between paper movement, advancing the code wheel and the code wheel return at the end of each line.

Prior to the invention described in this specification, there was no apparatus which could be used with a conventional strip printer having a single non-advancing print wheel for printing at various vertical heights or levels on a document.

SUMMARY OF THE INVENTION

Therefore, with the prior art problems in mind, the invention contemplates the solution of these problems by providing a new elevation apparatus for printing on a single document with a strip printer at various vertical levels.

It is a further object of the present invention to permit printing at several levels on a document using only a single print hammer and a single non-advancing print wheel.

These and other objects and advantages are accomplished in a document elevation apparatus for a strip printer having a single non-advancing print wheel including a chamber which provides lateral support for the document and defines a printing area, an elevation means for adjusting the vertical position of the document, and a front edge stop which indexes the horizontal position of the document at the start of the line of the print. The elevation means includes a plurality of cams rotatably mounted on a common shaft. Each of the cams has a series of like steps or shoulders to provide support for the bottom edge of the document.

When a document is to be inserted in the strip printer for printing at the various levels, the drive rollers which normally feed the strip of paper past the printer are retracted and a front edge stop is moved into position. The operator rotates the cams to adjust the vertical position of the document for each line of print. The sheet document is then inserted and moved up to the front edge stop to index the document horizontally with respect to the printing area, whereupon the drive rollers are returned to their drive position and the front edge stop is retracted.

BRIEF DESCRIPTION OF THE DRAWING

The foregoing objects and advantages of the invention, together with other objects and advantages which may be attained by its use, will be apparent from the following detailed description when read in conjunction with the drawing.

In the drawing wherein like numerals identify corresponding elements:

FIG. 1 is a schematic perspective view of a prior art strip printer;

FIG. 2 is a top view of a strip printer illustrating portions of the present invention;

FIG. 3 is a partial front elevation view illustrating the support chamber and the elevation means of the present invention; and

FIG. 4 is a side elevation taken along line 4—4 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, the elements of a representative type of prior art strip printer will be described. The strip printer includes a print wheel or code wheel 11, an inking ribbon 13, and a hammer 15 for printing on a strip of paper 17. The print wheel 11, which may be a disc having the type elements around the periphery in either a circular or a helical path, rotates about its axis 19 to bring the desired type element opposite print hammer 15. Hammer 15 presses the ribbon 13 and paper 17 against the print or code wheel 11 at a printing station or printing area 21.

The strip of paper 17 is drawn by front and rear paper drive rollers 23, 25 from a supply reel 27 past the printing station 21. A pick-up reel (not shown) may be located on the opposite side of the print station 21 from the supply reel 27. The inking ribbon 13 is driven by front and rear ribbon rollers 29, 31 from a supply reel 33 through print station 21 to a pick-up reel 35. A support chamber 36 provides lateral support for guiding the ribbon 13 and the paper strip 17 as they pass the print station 21. Each roller 23, 25, 29, 31 and reel 27, 33, 35 is conventionally mounted for rotation about its axis. Rear paper roller 25, mounted for rotation on shaft 39, may be taken as exemplary. Conventional logic circuitry (not shown) operates the rotation of the print wheel 11 and synchronizes the firing of print hammer 15 when the desired type element is in position in front of the print station 21.

Referring now to FIGS. 2 and 3, the cooperation between the drive rollers 23–25, front edge stop 57, and portions of the lateral support chamber 37 of the invention will be explained as improvements on the strip printer of FIG. 1. The majority of the elements shown in FIG. 1 have been omitted from FIGS. 2 and 3 for clarity, however, the front and rear drive rollers 23, 25 and the print wheel 11 are shown in FIG. 2.

The features which are shown in FIG. 2 may be located above (or alternatively below) the level of the paper 17. This is to prevent interference with the flight of the impact print hammer 15. To accomplish this, rear drive roller shaft 39 extends above (or below) the level of the paper strip 17. In FIG. 2 it is assumed that these features are located above the level of paper strip 17.

Disposed behind support chamber 37 is a lever 41 which has its pivot or axis of rotation 43 intermediate its ends 45,47. Shaft 39 of rear drive roller 25 is journaled in one end 45 of lever 41. The other end 47 of lever 41 is connected to spring 49. The lever 41 is pivotally mounted to the frame of the apparatus (not shown) at its fulcrum 43 and spring 49 urges the lever 41 in a counter-clockwise direction about its fulcrum 43. Shown in broken lines is the counter-clockwise position of the lever 41. In this counter-clockwise position rear drive roller 25 will advance paper 17. Shown in solid lines is the clockwise position of the lever 41. In this latter position drive roller 25 is retracted from the region of paper 17. Hence the motion of lever 41 serves to engage or retract rear drive roller 25. As illustrated in FIG. 2 only a small change in position of the drive roller 25 and lever 41 is involved.

Located on lever 41 intermediate end 45 and pivot 43 is a finger 51 which projects from lever 41 towards the support chamber 37. Located intermediate finger 51 and pivot 43 and connected to lever 41 is a second spring 53. The other end of spring 53 is connected to the long side 55 of rotatable right-angle front edge stop or indexing member 57 as will be more fully explained hereinafter.

To provide lateral support for the ribbon 13 and paper 17 as they are advanced through the print area 21 the support chamber 37 includes a front guide plate 59 and a rear guide plate 61. Front guide plate 59 is generally "U"-shaped to provide room for the print wheel 11 to contact the paper 17 and the guide plate 59 has an opening 63 to permit front paper drive roller 23 to contact the paper 17. Rear guide plate 61 is also "U"-shaped to permit the hammer 15 to contact the paper 17 and has an opening 65 to permit the rear drive wheel 25 to advance the paper 17 and to provide access to the support chamber 37 for the front edge stop 57. Protruding rear-

wardly from rear guide plate **61** is a shoulder **67**. The front edge stop **57** is pivotally connected to this shoulder **67** by a pin connection **69** which serves as an axis for rotation of the front edge stop **57**.

When it is desired to print at various levels on a single document, or print medium, **71** it is necessary to remove the paper strip **17**. Means are provided for retracting the rear drive roller **25**. Specifically a solenoid **73** (or mechanical linkage which provides the same result) attracts end **47** of lever **41** and rotates the lever **41** clockwise against the urging of spring **49** to its document inserting (solid-lined) position about axis **43**. The clockwise rotation of lever **41** retracts rear drive roller **25** from its drive position. Paper strip **17** may then be removed preparatory to the insertion of a document **71**. At the same time as lever **41** is rotated, since finger **51** is no longer in contact with the long side **55** of front edge stop **57**, the urging of spring **53** is not resisted and front edge stop **57** is rotated in a counterclockwise direction about its pivot **69**. This latter rotation moves the short end **75** of the front edge stop **57** through opening **65** in rear guide plate **61** to thereby serve as a front or leading edge limit for the document **71**.

With the paper strip **17** removed from the chamber **37** and the front edge stop **57** so positioned as a leading edge limit, the operator may select the desired vertical print position on the document **71**. Of course this could be programmed into the printer but for the purposes of this explanation a manual selection will be assumed. Referring to FIG. **3**, various components of the document elevation apparatus will be observed. Print wheel **11** and print hammer **15** are omitted in FIG. **3** for clarity but are in front of and behind print area **21**, respectively. The front and rear guide plates **59**, **61** are shown in FIG. **3** along with a take-up area **79** in which the printed documents **71** or paper **17** can be gathered. The left side of front guide plate **59** has been omitted to illustrate the position of opening **65** in rear guide plate **61** and the rear drive roller **25**. Located below the print area **21** and disposed within support chamber **37** is the elevation means which includes two cams **81**, **83** which are mounted for common rotation on shaft **85**. A bracket **87** is attached to the base **89** of the printer by conventional means, such as two screws **91**, and the shaft **85** is journaled in the bracket **87**.

When it is desired to select or to change the level of printing on the document **71**, the operator manipulates an appropriate keyboard control (not shown). This control is coupled (not shown) to shaft **85** and the manipulation of the control rotates shaft **85** which, in turn, causes a rotation of the cams **81**, **83**, to thereby select predetermined steps **97***i* of the cams **81**,**83** as hereinafter explained. An opening **93** is provided through the front and rear guide plates **59**,**61** for cam **81** and similar opening **95** is provided through the front and rear guide plates **59**,**61** for cam **83**. These openings provide the cams **81**,**83** with access to chamber **37**.

FIG. **4** is a side view of the elevation apparatus taken along line 4—4 of FIG. **3**. Cam **81**, rear drive rollers **23**, **25**, and lever **41** and its associated apparatus have been omitted for clarity, but print wheel **11** is shown. Each cam **81**,**83** has a like series of steps **97***a*, **97***b* . . . **97***n* and a top step **99** on one surface. Before inserting a document **71** between the guide plates **59**, **61**, for printing on a predetermined line of the document **71**, the operator (or a program control) rotates the shaft **85** which rotates cams **81**, **83** to bring the desired and corresponding steps **97***i* within the support chamber **37**. The document **71** is then inserted to limit on the selected steps **97***i* and moved to the left to limit against the front edge stop **57**. Spring **77** (FIG. **2**), which is optional, is a flat spring which is used to urge the document **71** rearwardly within the chamber **37** to ensure that the leading edge of the document **71** will contact the short arm **75** during this leftward shifting movement.

Referring back to FIG. **2**, after the document **71** has been placed in its proper vertical position it is necessary to return the rear drive roller **25** to its document advancing position and to withdraw front edge stop **57** to prevent interference with document advance. Means are provided to return the drive roller **25** and withdraw the front edge stop **57**. Specifically, the aforementioned solenoid **73** releases end **47** of lever **41**. Spring **49** urges lever **41** to its counterclockwise or document advancing (broken-lined) position. Since shaft **39** of rear roller **25** is journaled in end **45** of lever **41** the motion of the lever **41** returns the rear roller **25** into drive position. As the lever **41** moves in the counterclockwise direction the finger **51** contacts the long arm **55** of front edge stop **57** and rotates it in a clockwise direction about pin or pivot **69** to move the short arm **75** out of chamber **37** and, therefore, out of the path of travel of the document **71**.

After a single line has been printed on the document **71** it may be necessary or desirable to print a second line on the same document **71**. To accomplish this the previous sequence of steps must be repeated, after first removing the document **71** from its position between the guide plates **59**,**61** and area **79**. Solenoid **73** is activated to move lever **41** to its retracted position and to remove drive wheel **25** from contact with the document **71**. The operator (or program) manipulates an appropriate keyboard control after the document **71** has been removed, to again rotate shaft **85** which, in turn, causes a rotation of the cams **81**, **83**. This rotation brings successively higher steps **97***j* into position within the chamber **37**, whereupon the document **71** is re-inserted to limit on the higher steps **97***j*, and moved to the left to limit against front edge stop **57**. This permits printing at a different (lower) vertical level on the document **71**.

Again, solenoid **73** releases end **47** of lever **41** and the lever **41** and rear drive roller **25** return to the proper position to advance the document **71**.

After the several lines on a document **71** have been printed the document **71** may be removed and paper strip **17** or another document **71** may be inserted for printing.

While the invention has been described in the environment of a strip printer it should be realized that this elevation apparatus, including a plurality of stepped cams **81**,**83**, can be used in other environments. Any number of cams **81**,**83** may be used on shaft **85**, depending on the length of the document **71**, or a single cam **83** may be used. In this latter situation it may be desired to use a wider step **97** to provide broader support for the base of the document **71**. Furthermore there are various arrangements of drive rollers **23**,**25** which may be used and the lever arm **41**, retractable stop **57**, and guide plates **59**,**61** may be modified extensively to meet the requirements of individual machines without departing from the spirit and the scope of the invention.

What is claimed is:

1. In a strip printer including a rotatable non-advancing print wheel, lateral support means for supporting a strip on edge and strip advancing means, an auxiliary elevation apparatus for printing at various levels on a single document comprising:

means cooperating with said lateral support means, and said advancing means for aligning the horizontal position of said document, and

means for selectively supporting said document at different heights within said lateral support means.

2. The apparatus of claim **1** wherein said means for selectively supporting said document includes:

at least one rotatably mounted generally arcuate cam having a plurality of steps, and

means for rotating said cam for sequentially presenting said steps to the bottom edge of said document.

3. The apparatus of claim **2** including:

two rotatably mounted generally arcuate cams having a like plurality of steps.

4. The apparatus of claim **2** wherein said aligning means includes:

means for retracting said advancing means from engagement with said document and for simultaneously moving an indexing member across said lateral support means.

5. The apparatus of claim **4** wherein said aligning means further includes:

means for removing said indexing member from said lateral support means as said advancing means engages said document.

6. In a printer having a print station for printing on a vertically oriented print medium, an apparatus for supporting the print medium at different heights for printing at different levels thereon comprising:

stationary means for supporting said print medium at said print station and having means for guiding longitudinal and vertical movement of said print medium within the stationary means, and

at least one auxiliary support member having a series of ascending steps positioned thereon, said auxiliary support member being pivotally mounted for presenting a selected step to the lower edge of said print medium.

7. The apparatus of claim 6 wherein said at least one auxiliary support member is a pair of like support members pivotally mounted for simultaneous movement and wherein said series of ascending steps is arcuately positioned on each member.

8. The apparatus of claim 6 including means for advancing said print medium through said print station, ancillary means for aligning the leading edge of a print medium at the print station and mutually exclusive means cooperating between said advancing means and said ancillary aligning means for disengaging said advancing means when said aligning means is actuated.

* * * * *