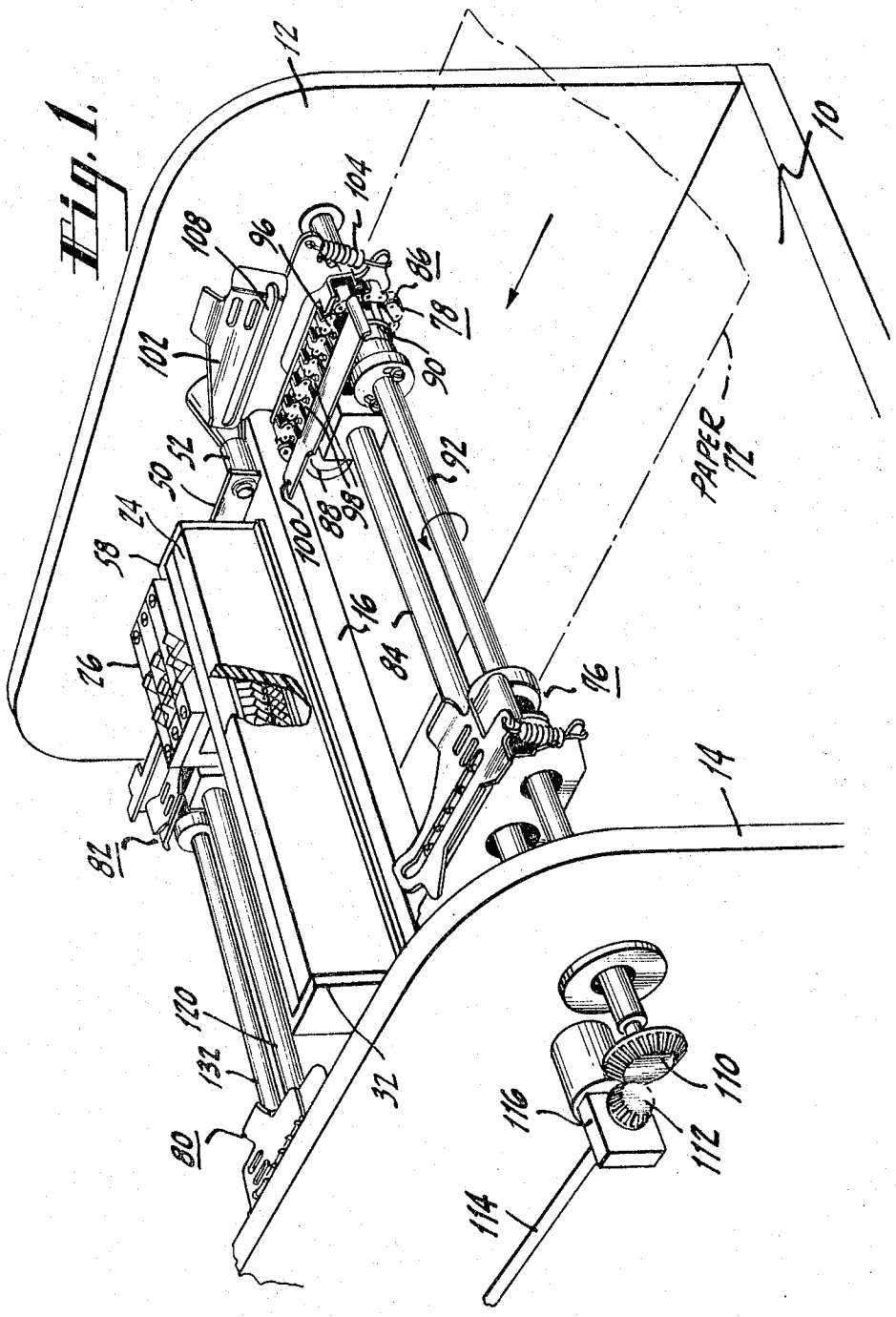
May 2, 1967 C. J. YOUNG 3,317,017

PRINTER WITH ROLLING ANVIL MEMBER

Filed Aug. 6, 1965 5 Sheets-Sheet 1

Fig. 1.



INVENTOR.
CHARLES J. YOUNG
BY John V. Regan
ATTORNEY

May 2, 1967 C. J. YOUNG 3,317,017

PRINTER WITH ROLLING ANVIL MEMBER

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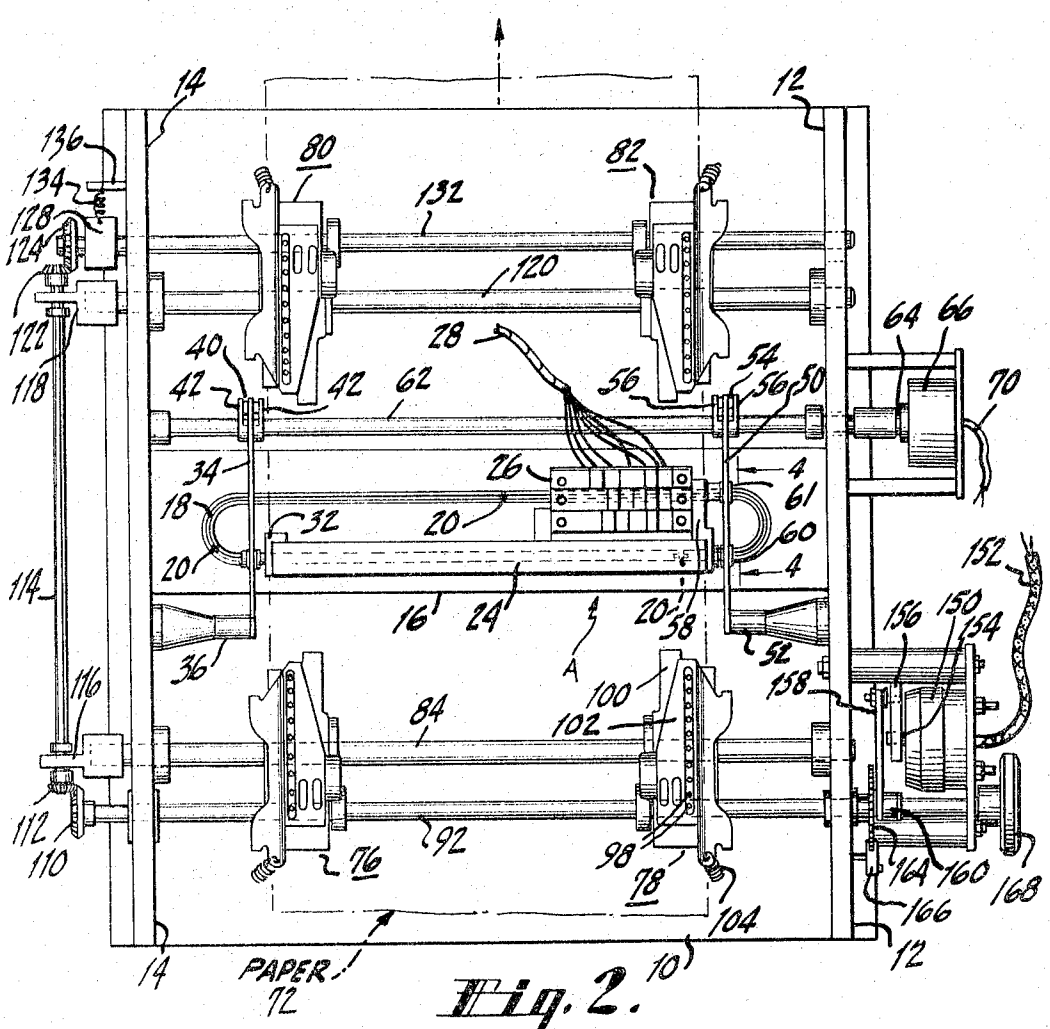


Fig. 2.

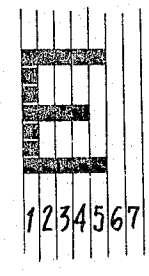


Fig. 8.

INVENTOR.
CHARLES J. YOUNG
BY John V. Regan
Attorney

May 2, 1967 C. J. YOUNG 3,317,017

PRINTER WITH ROLLING ANVIL MEMBER

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Fig. 3.

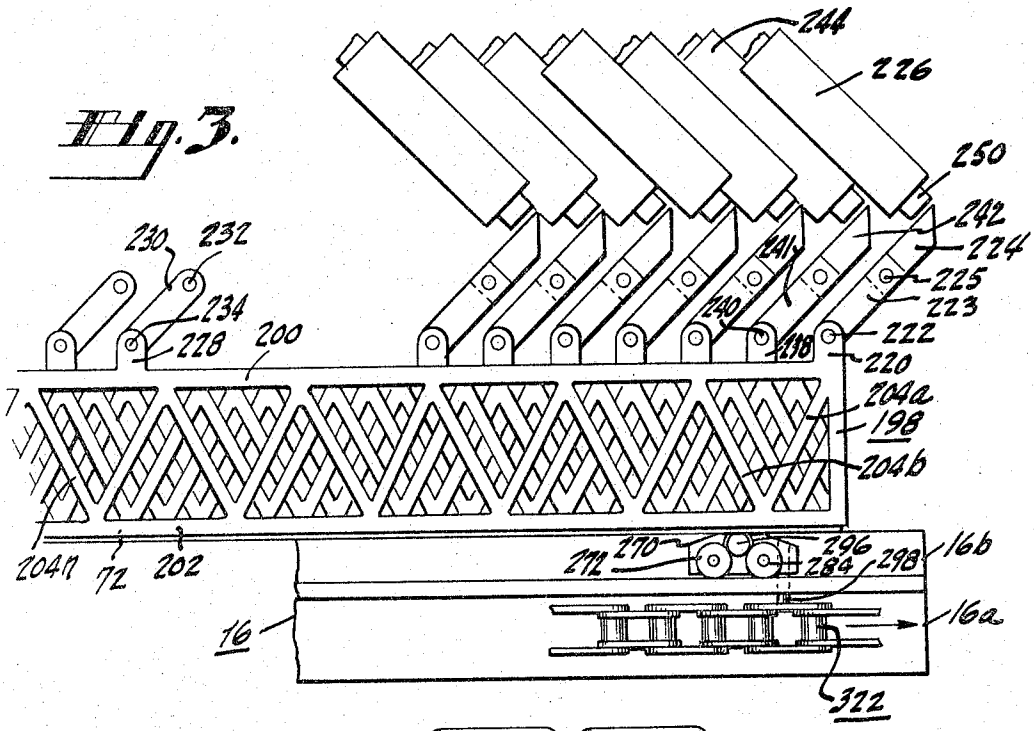
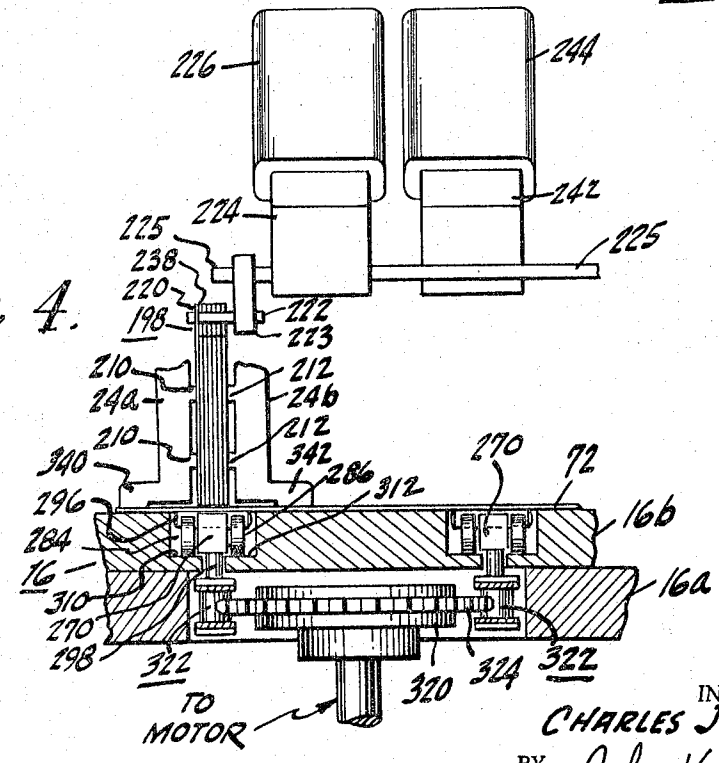


Fig. 4.



INVENTOR.
CHARLES J. YOUNG
BY John V. Regan
ATTORNEY

May 2, 1967 C. J. YOUNG 3,317,017

PRINTER WITH ROLLING ANVIL MEMBER

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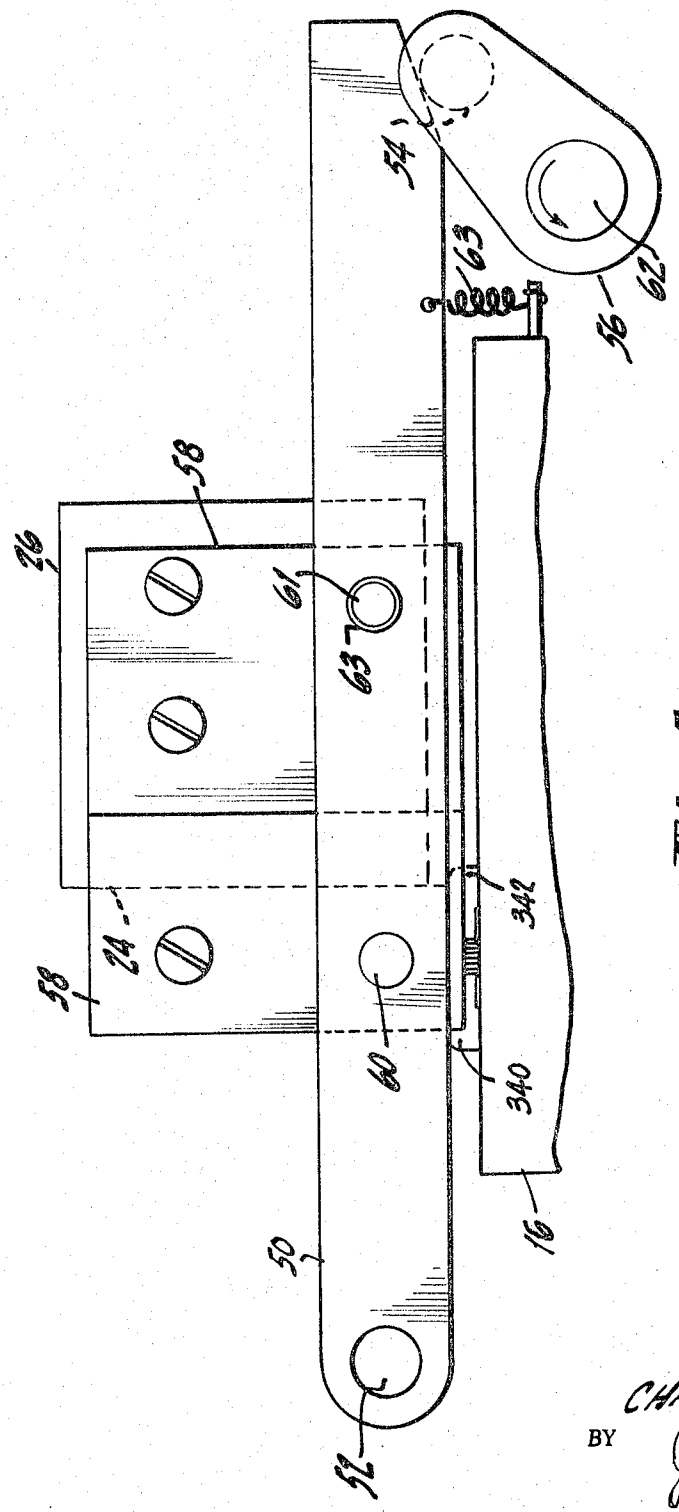


Fig. 5.

INVENTOR.
CHARLES J. YOUNG
BY John V. Regan
ATTORNEY

May 2, 1967 C. J. YOUNG 3,317,017

PRINTER WITH ROLLING ANVIL MEMBER

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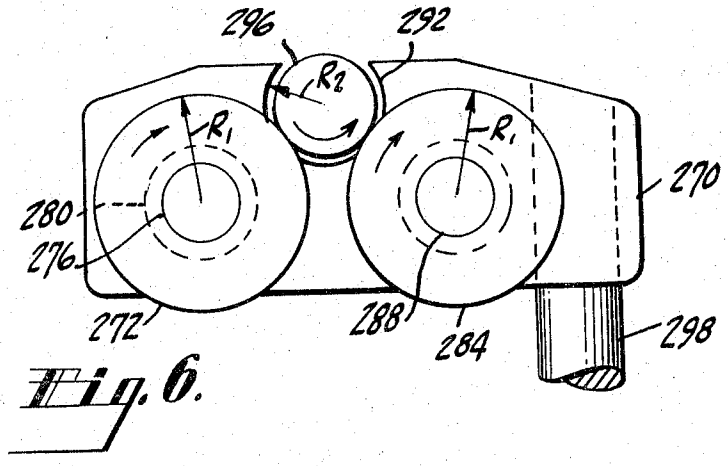


Fig. 6.

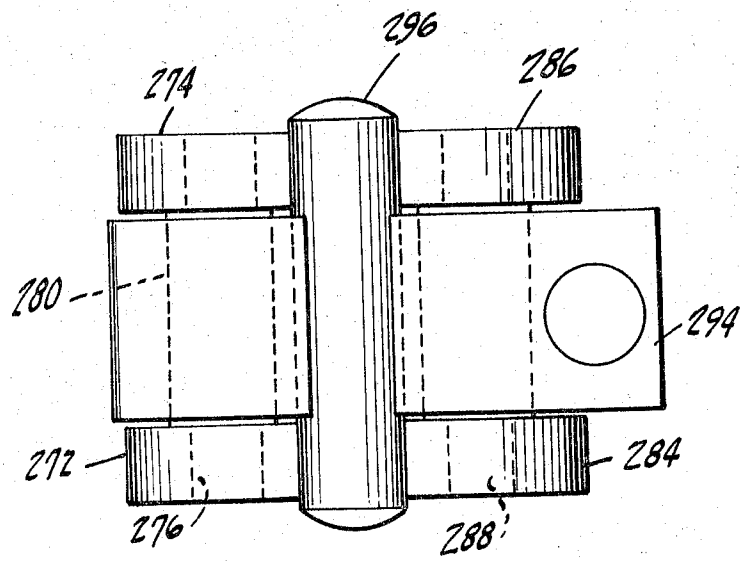


Fig. 7.

INVENTOR.
CHARLES J. YOUNG
BY John V. Regan
Attorney

United States Patent Office 3,317,017 Patented May 2, 1967

3,317,017

PRINTER WITH ROLLING ANVIL MEMBER

Charles J. Young, Princeton, N.J., assignor to Radio Corporation of America, a corporation of Delaware

Filed Aug. 6, 1965, Ser. No. 477,789
7 Claims. (Cl. 197—1)

This invention relates to printers and, in particular, to an improved printer mechanism for use in a serial printer.

A serial printer is one in which characters are printed seriatim at selected, successive print locations along a document print line. One advantage of a serial printer is that it is relatively simple and inexpensive as compared to a parallel printer or an "on-the-fly" printer, and requires little or no buffering or memory. An example of a serial printer is the so-called facsimile or matrix printer in which each different character is made up of a distinctive group of small "picture" elements.

In one known matrix printer, the picture elements of a character are printed column by column from carbon paper by the pressure between seven parallel, independently movable print bars and a scanning anvil. The print bars are located on one side of the document and carbon, and extend across the entire width of the document. These print bars are individually controlled by electromagnets and are movable in a direction generally perpendicular to the surface of the document or paper stock. The anvil is located on the opposite side of the document or paper stock and moves at constant speed from one end of the print line to the other. A character is printed by selective energization of the electromagnets during a series of timed intervals during which the anvil is moved a distance corresponding to the width of a printed character.

In order to accomplish printing at high speed in such a printer, the print bars should be located as close to the paper as possible, whereby they are required to move only a short distance during printing, preferably a distance of the order of a few thousandths of an inch. A requirement of most printers is that they be able to print multiple copies when the need arises. However, if the number of copies required in a particular application is large, the several documents or sheets of paper and the interleaved carbons may fill the entire space between the print bars and the scanning anvil. In such a situation, there may be sufficient pressure on the carbon to effect undesired printing when no electromagnet is energized. Further, the anvil may drag the paper in the direction of anvil movement. Also, print smearing, dragging and even tearing of the paper may result when the anvil moves beneath an actuated printer bar.

Accordingly, it is one object of this invention to provide an improved printer mechanism.

It is another object of this invention to provide an improved printer mechanism in which the printer bars may be located very close to the paper without undesired recording when the number of copies is large.

It is a further object of this invention to provide an improved printer mechanism in which the anvil rolls as it scans along beneath the print bars, whereby there is little or no horizontal drag on the paper.

It is yet another object of the invention to provide an improved anvil assembly.

A printer mechanism embodying the invention comprises a least a first roller which is rolled along a track from one end of the print line to the other, and a second roller in rolling contact with the first roller and the paper. The second roller functions as a rolling anvil.

In the preferred embodiment, the anvil assembly comprises a carriage which has forward and trailing rollers constrained to move along a track or pair of tracks. The cylindrical scanning anvil is carried by the carriage in rolling contact with the rollers.

In the accompanying drawing, like reference characters denote like components, and:

FIGURE 1 is a view in perspective of a printer embodying the invention;

FIGURE 2 is a plan view of the printer;

FIGURE 3 is a fragmentary view taken in the general direction of arrow A of FIGURE 2, and showing details of the printer bar structures and anvil assembly;

FIGURE 4 is an end view of the printer mechanism taken along the lines 4—4 of FIGURE 2, with the print head mounting bar and plate and the print head casing removed to show the relation of the printer bars to the anvil assembly;

FIGURE 5 is a side view of one of the print head mounting and positioning assemblies;

FIGURE 6 is a view in front elevation of one of the anvil assemblies;

FIGURE 7 is a plan view of the anvil assembly of FIGURE 6; and

FIGURE 8 is a diagram illustrating the method of printing.

The overall printer system will first be described in general terms, after which various portions of the system will be described in detail. Reference should first be had to FIGURES 1 and 2. As shown therein, the printer system is supported by and between a pair of vertical side plates **12**, **14** which, in turn, are mounted on, or otherwise supported by, a horizontal base plate **10**. A platen **16** extends between, and is supported by, the side plates **12**, **14** in an elevated position. The top surface of platen **16** lies in a horizontal plane and has a generally oval-shaped raceway **18** therein. Several rolling anvil assemblies **20**, three of which are shown in FIGURE 2, move continuously along the raceway. The forward and rear sections of the raceway are straight.

Positioned above platen **16** is a print head which comprises a printer bar housing **24** containing a plurality of elongated printer bar structures. These structures extend from one end of the housing to the other and overlie the forward section of raceway **18**. The printer bar structures, which are illustrated in FIGURE 3 and will be described in detail hereinafter, may be seen in FIGURE 1 through the cutout in the front of housing **24**. As will be described, the individual printer bar structures are pivotally mounted for movement toward and away from platen **16**. At the back right side of the printer bar housing is a solenoid block **26** which houses a plurality of solenoids for individually driving the printer bar structures. Signals are applied to the individual solenoids by way of separate leads in a cable **28**.

At the left side of the printer bar housing, as viewed in FIGURE 2, is an end plate **32** to which the housing **24** is affixed. Plate **32** is pivotally pinned to a lifting bar **34** which is pivotally pinned at its forward end to a stud **36** mounted on side plate **14**. The other end of bar **34** overlies a roller **40** carried by and between a pair of vertical side members **42** of a supporting yoke. A similar lifting bar assembly is located at the right side of the printer bar housing and comprises a lifting bar **50** pivotally pinned at its forward end to a stud **52** mounted on side plate **12**. The back end of lifting bar **50** overlies a roller **54** carried by and between a pair of vertical side members **56** of a supporting yoke. Bar **50** is pivotally pinned to an end plate **58** affixed at the right end of the printer bar housing **24**. As illustrated in FIGURE 2, end plate **58** may also serve as a support for the solenoid block **26**. The supporting yokes are fixedly mounted on a cam shaft **62**, which is rotatable in bearings (not shown) in side walls **12** and **14**. The right hand end of the shaft projects through an aperture in side plate **12** and is coupled to the shaft **64** of a rotary solenoid **66**.

Documents to be printed are movable along a feed path

between the top of platen **16** and the bottom of printer bar housing **24**. Thus, the printer bar structures comprising the print head are located above the document, or "document receiving zone" at the print station, and the anvil assemblies **20** move beneath the document, or document receiving zone. The anvil assemblies are so spaced from one another that only one anvil assembly moves beneath the printer bars at any one time. The document may be one having a carbon backing. Alternatively, a separate sheet of carbon may be provided for each document at the print station.

The printer system is designed to handle documents in the form of continuous sheets of paper stock and carbon supplied from rolls or from fanfold stacks (not shown). A section of paper stock is illustrated in phantom in the drawing and may be identified by reference character **72**. Multiple copies may be printed simultaneously by feeding a sheaf of interleaved carbons and paper stock through the print station from different supply rolls. The paper stock and carbons are of the type which have sprocket feed holes near both side edges.

Located at the front of the printer is a pair of paper feed tractor assemblies **76, 78**. A like pair of tractor assemblies **80, 82** is located at the rear of the printer. These assemblies are alike in construction, wherefore only assembly **78** will be described in any detail. This assembly is mounted on a fixed supporting rod **84** and includes (FIGURE 1) an endless chain **86** mounted on a pair of spaced wheels **88** and **90**. Wheel **88** is an idler wheel which is part of the tractor assembly proper. Wheel **90** is a drive wheel which is mounted on a tractor shaft **92**. Shaft **92** extends through apertures in the side walls **12, 14** and is rotatable in bearings therein.

Each of the links in chain **86** has a projecting tab **96** which carries an upstanding sprocket tooth **98**. Both the chain **86** and the sprocket teeth **98** lie in planes which are parallel to the side walls **12** and **14**. A horizontal platform **100** for supporting the paper is fixedly attached to the assembly. The sheaf of paper stock and carbons rests on platform **100** with the top sprocket teeth **98** projecting upwards through the sprocket holes in the sheaf. A retaining member **102** is hinged on the tractor assembly and is adapted to clamp down loosely on the top of the sheaf to assure that the sprocket holes in the sheaf of papers are maintained in cooperation with the sprocket teeth **98**. The retaining member **102** is shown in an upright position in FIGURE 1 for receiving a new document. After the document is properly positioned on the tractor assemblies **76, 78, 80** and **82**, the various retaining members are moved to the horizontal or paper retaining position (see assembly **76**, for example) and held in that position by bias springs **104**. Retaining member **102** has an elongated slot **108** through which the top sprocket teeth **98** project when the retaining member is in the horizontal position.

All of the tractor assemblies are movable. Ordinarily, of course, tractor assembly **78** is clamped in a fixed position on rod **84**, and drive wheel **90** is clamped to tractor shaft **92**. However this entire assembly may be unclamped and slid along rod **84** and shaft **92**. The other tractors are similarly movable. Thus, paper stock of various widths can be accommodated.

A first bevel gear **110** is fixedly mounted on the left end of tractor shaft **92**. Cooperating therewith, and driven thereby when tractor shaft **92** rotates, is a second bevel gear **112** mounted on the forward end of a pinion shaft **114**. The latter shaft is supported near its forward end in a bearing housing **116** mounted on the left end of rod **84**, and is supported near its back end in a bearing housing **118** (FIGURE 2) on the left end of fixed rod **120**. A third bevel gear **122** is mounted on the back end of pinion shaft **114** and drives a fourth bevel gear **124**. Fourth bevel gear **124** drives the back tractor shaft **132** by way of a spur gear differential housed in box **128**. A first sun gear (not shown) of the differential

is pinned to fourth bevel gear **124** and driven thereby. The second sun gear of the differential is mounted on the end of back tractor shaft **132**. The spider containing the sun gears is spring biased by a spring **134** connected to a pin **136**, and spring **134** biases the spider in a direction to maintain the paper flat and under tension in the area between the front and back tractor assemblies.

During the printing of a line of information, the tractor shafts **92** and **132** are stationary. For reasons to be discussed later, the sheaf of documents and carbons is pressed down firmly against the platen **16** at this time and held in clamped position by the housing **24**. In order to advance the paper when printing of a line thereon is complete, it is first necessary to raise the print head away from the platen. The manner in which this is accomplished may best be seen from a consideration of FIGURES 2 and 5, of which the latter is a side view of the right hand lifting bar arrangement. The yoke and side members **56** thereof are shown therein in the normal or rest position (rotary solenoid **66** de-energized). Lifting bar **50** has its right end overlying the roller **54** carried between the side members **56**.

To lift the printer bar housing, a signal is applied over cable **70** (FIGURE 2) to energize the rotary solenoid **66**. When the solenoid is energized, cam shaft **62** is rotated through a given angle in the direction indicated in FIGURE 5, and rotates the yoke through the same angle. When the yoke is rotated, the roller **54** rides along the chamfered cam surface of lifting bar **50** and causes the bar to rotate in an upward direction about the pivot pin in the stud **52**. The end plate **58**, and the printer bar housing **24** affixed thereto, are thus moved in an upward direction away from the paper stock. The action of the left hand lifting bar **34** assembly is similar to that just described. Since end plate **58** is coupled to bar **50** by a pivot pin **60**, the plate **58**, print head, etc. will tend to rotate about pin **60**, during the upward movement of the bar, due to the weight of the solenoid block **26**. To limit the amount of rotation, a pin **61** is mounted on plate **58** and extends through an oversized aperture **63** in bar **50**.

Paper advance is controlled by a rotary solenoid **150**, which receives an energizing signal over line **152**. The shaft **154** of the solenoid rotates through a given angle when the solenoid is energized and, in turn, rotates a link **156** through the given angle. Pinned at the end of link **156** is an arm **158** which is coupled at its forward end to tractor shaft **92**. Coupling may be made by way of a cam clutch **160** or other clutch arrangement of a type wherein the clutch grips the tractor shaft instantaneously when the arm **158** is rotated in a first direction by the energized solenoid, and wherein the clutch is freely rotatable in the opposite direction. In particular, when solenoid **150** becomes energized, the back end of arm **158** is driven in a downward direction by link **156** and, in turn, rotates tractor shaft **92** a given amount in the direction indicated in FIGURE 1. Back tractor shaft **120** is rotated in the same direction through the gear train described previously. When solenoid **150** becomes deenergized, the back end of arm **158** is driven in an upward direction by link **156** to the rest position. However, arm **158** does not rotate shaft **92** during its upward movement because of the action of the clutch **160**. In order to prevent movement of the paper in the opposite direction, a ratchet wheel **164** is mounted on the right end of tractor shaft **92**. A pawl arm **166** is biased into engagement with the ratchet wheel and prevents rotation of the latter in a counterclockwise direction, as viewed from the right side of the printer. The paper **72** also may be moved manually any given amount by turning the hand knob **168** on the end of tractor shaft **92**.

The printer bar structures and their relation to other components at the print station are shown in detail in FIGURES 3 and 4. Consider the forwardmost printer bar structure in FIGURE 3 by way of example. This structure **198** comprises first and second elongated mem-

bers **200**, **202** which extend from one end of the printer bar housing **24** (FIGURES 1 and 2) to the other across the width of the paper stock. A plurality of struts **204***a*–**204***n* are arranged in a regular or repetitive zigzag pattern along the lengths of the elongated members **200**, **202**, and are joined at their opposite ends to the bottom of member **200** and the top of member **202**. These struts **204***a*–**204***n* maintain the elongated members **200**, **202** in spaced, parallel relation, whereby the structure **198** may be made very thin and light in weight while still retaining structural stability. This is very desirable in the interests of providing a low inertia structure for high speed printing.

The various printer bar structures, seven of which are shown, are stacked in side-by-side relation one behind the other (FIGURE 4), and are held in stacked relation by the front and back sections **24***a* and **24***b* of the printer bar housing. This prevents the light weight structures from wobbling or twisting as they move. Front housing section **24***a* has a pair of elongated bumper ribs **210** which extend the length of the housing, and back housing section **24***b* has a pair of similar, opposed bumper ribs **212**. The ribs **210** and **212**, which are in contact with the struts of the first and last printer bar structures, respectively, provide support for the stack while at the same time presenting a relatively small surface area of frictional contact with the struts of the associated structures.

The ends of all of the printer bar structures are aligned. As may be seen in FIGURE 3, the zigzag pattern of struts of adjacent printer bar structures are "out- of-phase" with each other by approximately a quarter of a "pitch," or a quarter of a pattern section. By this arrangement, the struts of one printer bar structure are transverse to adjacent struts of next adjacent printer bar structures, whereby there is only a small area of frictional contact between struts of adjacent structures. The aforementioned and other features of the printer bar structures are discussed in greater detail in the copending application of Maurice Artzt, Ser. No. 477,875, entitled, Printer, which is filed concurrently herewith and assigned to the same assignee as the instant invention.

Each of the printer bar structures is pivotally mounted for rotation toward and away from the platen **16**. Forwardmost structure **198** has a vertically projecting tab **220** at the top right end thereof. A pivot pin **222** extends through an aperture in the tab **220** and is affixed at its other end to a crank arm **223**, which is fastened to the shaft **225** of the armature **224** of a first solenoid **226**. Armature **224** rotates shaft **225** when solenoid **226** is energized. Although it is not clearly shown in FIGURE 4, the left end of shaft **225** may be supported in a bearing in the rear housing section **24***b*, and the right end of the shaft may be supported in a bearing in the back wall of the solenoid housing block **26** (FIGURE 1). Structure **198** also has one or more other vertically projecting tabs spaced along the length of the member **200**. One of these latter tabs **228** is illustrated in FIGURE 3 and is pivotally pinned to a link **230** which, in turn, is pivotally mounted on a fixed pin **232**. Thus, the entire printer bar structure **198** can swing through a small angle on shaft **225** and pivot pin **232**.

Elongated members **200** and **202** are parallel to one another. Also, the shaft **225** and pin **232** lie in a horizontal plane, and the distance between pin **222** and shaft **225** is the same as that between pins **232** and **234**. Accordingly, the entire bottom surface of elongated member **202**, which is the printing surface, is always in a horizontal plane and parallel to the paper, regardless of the position of the printer bar structure **198**. Each of the other printer bar structures is similarly mounted. Tab **238** at the right end of the second printer bar structure, for example, is pivotally mounted on a pin **240** which is affixed at its back end to a crank arm **241** fixed to the shaft of the armature **242** of solenoid **244**.

In operation, the bottom, printing surfaces of all of the printer bar structures rest in contact with the top sheet of paper (or carbon) when the solenoids are de-energized. In prior art arrangements which employ a plurality of elongated printer bar structures, the anvil which is scanned or moved beneath the printer bars, from one end thereof to the other, is of a type which is rigidly mounted on a drive belt or other transport means. Accordingly, the anvil translates as it scans beneath the printer bars. Printing is accomplished by driving one or more of the printer bars in a downward direction to press the documents and carbons against the scanning anvil. In the arrangement of FIGURE 3, for example, the printer bars are selectively driven in a downward direction by energizing the associated solenoids. When solenoid **226** is energized, the top of armature **224** is attracted to the core **250** of the solenoid, whereby the armature **224** rotates shaft **225** in a counterclockwise direction and drives the printer bar **198** against the anvil.

In order to provide uniform print density throughout a document and readable print on all of the copies, it is generally necessary to press the sheaf of papers firmly against the scanning anvil during printing. When the anvil is of the prior art type which only translates, the anvil may drag the paper or papers in the direction of anvil movement due to friction resulting from the pressure imposed by the activated printer bars. In fact, the paper may even tear. Further, if the printer bars are in contact with the paper when no solenoid is energized and the anvil also is in contact with the paper, undesired printing and smearing may result, even though no printing is desired. These objectionable features of prior art systems are eliminated by the novel rolling anvil pin assembly of my invention.

In general terms, the rolling anvil assembly of my invention comprises at least one roller which is rolled along a track on one side of the paper from one end of the print line to the other. A cylindrical anvil pin, having its axis parallel to that of the roller, is disposed between the roller and the paper, and is maintained in rolling contact with the roller as the latter rolls along the track. Preferably, the anvil pin also is in rolling contact with the paper as the pin scans along the print line. Regardless of the printing pressure, there is rolling friction only between the anvil pin and the document, whereby there is no tendency for the anvil pin to drag the paper. Also there is rolling friction only between the anvil pin and the roller, and between the roller and the track.

The particular manner in which the desired physical relationship between the anvil pin and roller is maintained, and hence the actual form the assembly may take, depends upon the drive means employed, the available space, and other factors. A preferred form of anvil assembly embodying my invention is shown in enlarged side view in FIGURE 6 and in plan view in FIGURE 7. As there illustrated, the assembly includes a carriage body **270** borne by a pair of rollers whose axes are parallel to one another. Each of the rollers preferably comprises a pair of wheels mounted on a common axle. For example, the first roller may comprise a pair of wheels **272**, **274** mounted on an axle **276** which projects through the front and back side walls of the carriage body **270**. The central portion **280** of the axle may be larger in diameter than that portion of the axle on which the wheels **272** and **274** are mounted. The second roller preferably comprises a pair of wheels **284**, **286** mounted on an axle **288** which projects through the front and back side walls of the carriage body **270**. Each of the wheels **272**, **274**, **284** and **288** has a radius R_1.

The front side wall of the carriage body, which wall is transverse to the axles **276**, **288**, has a rounded notch **292** in the top edge thereof. The radius of this notch is R_2, and the center of the notch is equidistant from the axes of rotation of all of the wheels, and spaced therefrom a distance less than R_1+R_2. Thus, as may be clearly seen FIGURE 6, the portions of the notch nearest the wheels **272** and **284** are closer than R_1 to the axes

of rotation of the wheels. A similar notch is located in the back side wall of the carriage body **270** and has its center aligned with the center of notch **292** parallel to the axles **276** and **288**.

A cylindrical anvil pin **296** is cradled in the notches in the two side walls and projects outward from the carriage body in either direction. The radius of the anvil is slightly less than that of the notches, whereby the anvil is free to rotate. Moreover, the centers of the notches are below the top edges of the side walls, whereby the openings at the tops of the notches are less than the diameter of the anvil pin and the anvil pin **296** cannot escape from the notches at the tops thereof. The carriage body **270** also has a top member **294** which extends between the front and back walls and terminates adjacent the notches in the side walls. The carriage body **270**, although not essential to the invention, provides a convenient means for assuring the proper physical relationship between the anvil pin **296** and the wheels, as well as a convenient means for driving the wheels.

A vertical pin **298** projects downward through the bottom of the carriage body, and may be attached to drive means to be described. Because of the particular relationship of the radii of the wheels **272**, **274**, **284**, **288**, the notches and the anvil pin **296**, the anvil pin **296** is in contact with all of the wheels. When the assembly is driven, the wheels roll along the supporting surface (to be described), and the anvil pin **296** preferably rolls along the bottom surface of the sheaf of documents. The surface speeds of the anvil pin and the wheels are equal to each other and to the speed of the carriage. Moreover, the direction of rotation of the anvil pin is opposite to that of the wheels. Hence, there is rolling friction only, both at the surface of the sheaf of documents and at the surface of the raceway, regardless of the pressure of the printer bar structures on the anvil pin **296**. There is thus no tendency for the anvil pin to drag the paper in the direction of movement of the carriage. Further, the rolling action of the anvil pin eliminates, or at least greatly reduces, print smearing and undersirable printing when the printer solenoids are deenergized.

The anvil assemblies are driven continuously around the raceway **18** (FIGURE 2) and beneath the printer bar structures. As may be seen in FIGURES 3 and 4, the platen **16** preferably comprises two plates **16***a*, **16***b* which are sandwiched together. The raceway **18** (FIGURE 2) is located in upper plate **16***b* and comprises a groove or channel which is rectangular in cross section and has a slot at the bottom thereof. The vertical carriage pin **298** projects through this slot, and the carriage wheels ride along the bottom of the groove on either side of the slot. Essentially, the bottom surfaces **310**, **312** of the groove serve as tracks for the carriage wheels. The width of the channel is only slightly greater than the length of the anvil pin, whereby the pin cannot escape from the carriage at the sides thereof.

The bottom plate **16***a* of the platen is hollow in the area beneath the entire raceway. Located in this hollow, near one end of the raceway, is a drive sprocket wheel **320**, shown in FIGURE 4. A second, idler sprocket wheel is located in the hollow at the other end of the raceway, and a chain **322** is carried by the drive wheel **320** and the idler wheel. Drive wheel **320** has teeth **324** which are spaced to mesh with the links of the chain. Drive wheel **320** is driven by a motor (not shown) at constant speed and, in turn, drives the chain at constant speed below the raceway. The pins **298** of the different carriage assemblies are affixed to different ones of the links, whereby they are driven by the chain at constant speed. As clearly shown in FIGURES 3 and 4, the top longitudinal surface of that anvil pin which is moving beneath the printer bar structures faces the bottom, printing surfaces of the structures, and is closely adjacent to the bottom of the sheaf of papers.

Preferably, the top surface of the anvil pin **296** is in contact with the bottom paper. The printer bar structures are so suspended (FIGURE 3) that they are free to pivot under their own weight into light contact with the top of the paper. However, because of the light weight construction of the structures and the rolling action of the anvil pin, there is insufficient pressure therebetween to cause printing or smearing when no printer solenoid is energized. An advantage of this spatial relationship between the rest positions of the printer bar structures and the rolling scanning anvil pin is that the structures need only move a very short distance to effect printing. For example, a printer bar structure may move about 0.003 inch when its solenoid is energized.

A further advantage of the spatial relationship is that the activated printer bar structures move approximately the same distance regardless of the number of copies in the sheaf. Thus, there is no need to make printer adjustments when the number of copies is changed. This assumes, of course, that there are no substantial air pockets between the various carbons and papers. To assure this condition, and to reduce the driving force required of the printer solenoids, the bottoms of the front and back sections **24***a* and **24***b* of the printer bar housing are provided with spaced legs **340** and **342** (FIGURE 4) which extend the length of the housing. These legs are flat on the bottom faces thereof, and are separated a distance somewhat greater than the length of the anvil pin **296**. In the normal, rest position of the housing **24**, the housing **24** is biased or pressed firmly in a downward direction by a low rate spring **63** (FIGURE 5). The legs **340**, **342** press against the sheaf of documents and carbons and squeeze out any air therebetween in the area of the print station. Further details of the printer bar housing **24** construction, and the lifting bar arrangement for the housing, are given in the copending application of Everett J. West, Ser. No. 477,871, entitled, Printer, which is filed concurrently herewith and assigned to the same assignee as the present invention.

Printing is effected by energizing selected ones of the printer solenoids as an anvil pin **296** scans along the path beneath the printer bar structures. A character is printed at a desired location in the print line in a series of columnwise steps as the anvil pin is moved a distance equal to a character width at the desired location. The motion of the anvil may be considered to be divided into seven time zones per character. Five zones are used for printing, and two zones are allotted to intercharacter spacing. During each printing time zone, one or more of the printer solenoids may be energized to drive its associated printer bar structure in a generally downward direction to press the carbon and paper against the scanning anvil.

FIGURE 8 illustrates the manner in which a capital E is printed. All of the solenoids are energized during the first time zone to print a column of seven marks or "picture elements." Only the solenoids for the first, middle and last printer bar structures remain energized during the second, third and fourth time zones, and the solenoids for the first and last printer bar structures remain energized during the fifth time zone.

Although the invention has been described and illustrated as being embodied in a multi-printer bar printer system for printing characters in a 5 x 7 font, it will be understood by those skilled in the art that the invention has equal application in a single printer bar system for facsimile printing.

What is claimed is:

1. In a printer, the combination of:
a document path;
a print head disposed on one side of said path;
a track disposed opposite the print head and parallel thereto on the other side of the document path;
at least a first, drive roller;
means for rolling said drive roller on said track;

a cylindrical anvil pin adjacent the document path and in printing relation to said print head; and

means maintaining said anvil pin in rolling contact with said drive roller for rotation thereby as said drive roller is rolled on said track.

2. A rolling anvil assembly for a printer comprising:

a pair of rollers of radius R_1 having their axes in parallel, and a carriage body borne by said rollers;

said body including first and second spaced side members transverse to said axes;

a first rounded notch of radius R_2 in the top edge of the first side member, the center of said first notch being located at a distance greater than R_2 from said top edge and being located at a distance less than R_1+R_2 from the axis of at least one of said rollers;

a second rounded notch, similar to said first notch, in the top edge of the second side member, the centers of the first and second notches being aligned parallel to the axes of said rollers; and

a cylindrical anvil cradled in said notches and having a radius less than R_2, whereby said anvil is in frictional contact with said one of said rollers and is free to rotate in said notches.

3. The combination as claimed in claim 2, wherein each of said rollers includes a pair of wheels of radius R_1 and an axle on which said wheels are mounted.

4. In a recorder for recording information on a recording medium, the combination of:

a path for receiving a recording medium;

a recording head located on one side of said path;

a pair of drive rollers located on the other side of said path;

means maintaining said rollers in fixed spatial relation to one another with their axes in parallel;

means for rolling said rollers in a direction from one end of said recording head to the other;

a rotatable, cylindrical anvil adjacent said path and in recording relation to said recording head; and

means maintaining said anvil in frictional contact with at least one of said rollers for rotation thereby as the latter is rolled.

5. In a printer for printing information on a document, the combination of:

a document receiving path;

a plurality of printer elements located on one side of said path and defining a print head;

means for moving said printer elements selectively toward said document path;

a carriage on the other side of said document path and including a pair of rollers and a carriage body borne by said rollers;

a cylindrical anvil pin in frictional contact with at least one of said rollers and supported for rotation thereby in said carriage body, the axis of said anvil pin being parallel to the axes of said rollers; and

means for driving rollers in a direction from one end of said print head to the other, with a surface of said anvil pin being adjacent to said document path and in printing relation to said printer elements.

6. In a printer for printing a line of information on a document, the combination comprising:

a document path;

at least one elongated printer bar disposed on one side of said document path and having a printing surface facing said path;

a carriage oppositely disposed to said printer bar on the other side of said path and including two sets of wheels having their axes in parallel and a carriage body borne by said wheels;

a cylindrical anvil pin in frictional contact with each of said wheels and supported for rotation thereby in said carriage body, with a longitudinal surface of said anvil pin projecting above the top of said carriage body; and

means for driving said carriage from one end of said printer bar to the other with the top of said carriage body facing the printing surface of said printer bar and with the anvil pin adjacent to said document path and in printing relation to said printer bar.

7. In a printer for printing a line of information on a document, the combination comprising:

a document path;

a plurality of elongated printer bars disposed in side-by-side relationship on one side of said path and each having a printing surface facing said path;

a carriage assembly oppositely disposed to said printer bars on the other side of said path and including a pair of rollers of radius R_1 having their axes in parallel, and a carriage body borne by said rollers and having first and second spaced side walls transverse to said axes;

a first rounded notch of radius R_2 and depth D in the top edge of the first side wall, where $R_2<D<2R_2$, and a similar, second rounded notch of radius R_2 in the top edge of the second side wall, the centers of said notches being aligned parallel to said axes and being equidistant therefrom at a distance less than R_1+R_2;

a cylindrical anvil cradled in said notches and having a radius less than R_2; and

means for driving said carriage assembly on said rollers from one end of said printer bars to the other with a longitudinal surface of said anvil facing said printing surfaces and being adjacent to said document path and in printing relation to said printer.

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ROBERT E. PULFREY, *Primary Examiner.*

E. S. BURR, *Assistant Examiner.*