June 2, 1964 J. T. POTTER 3,135,195

HIGH SPEED PRINTER WITH MOVING CHARACTERS AND SINGLE HAMMER

Filed June 22, 1961 2 Sheets-Sheet 1

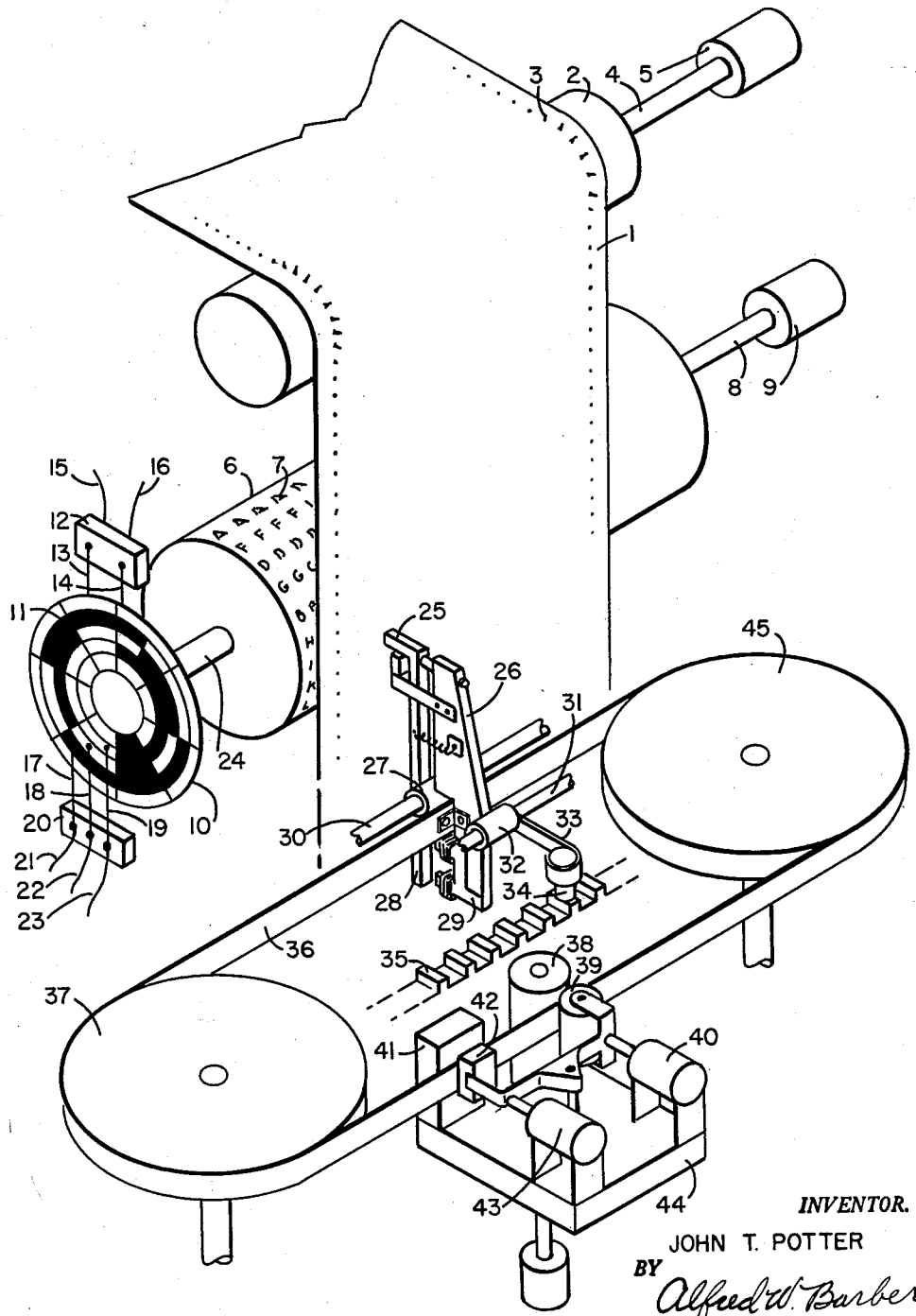


FIG. 1

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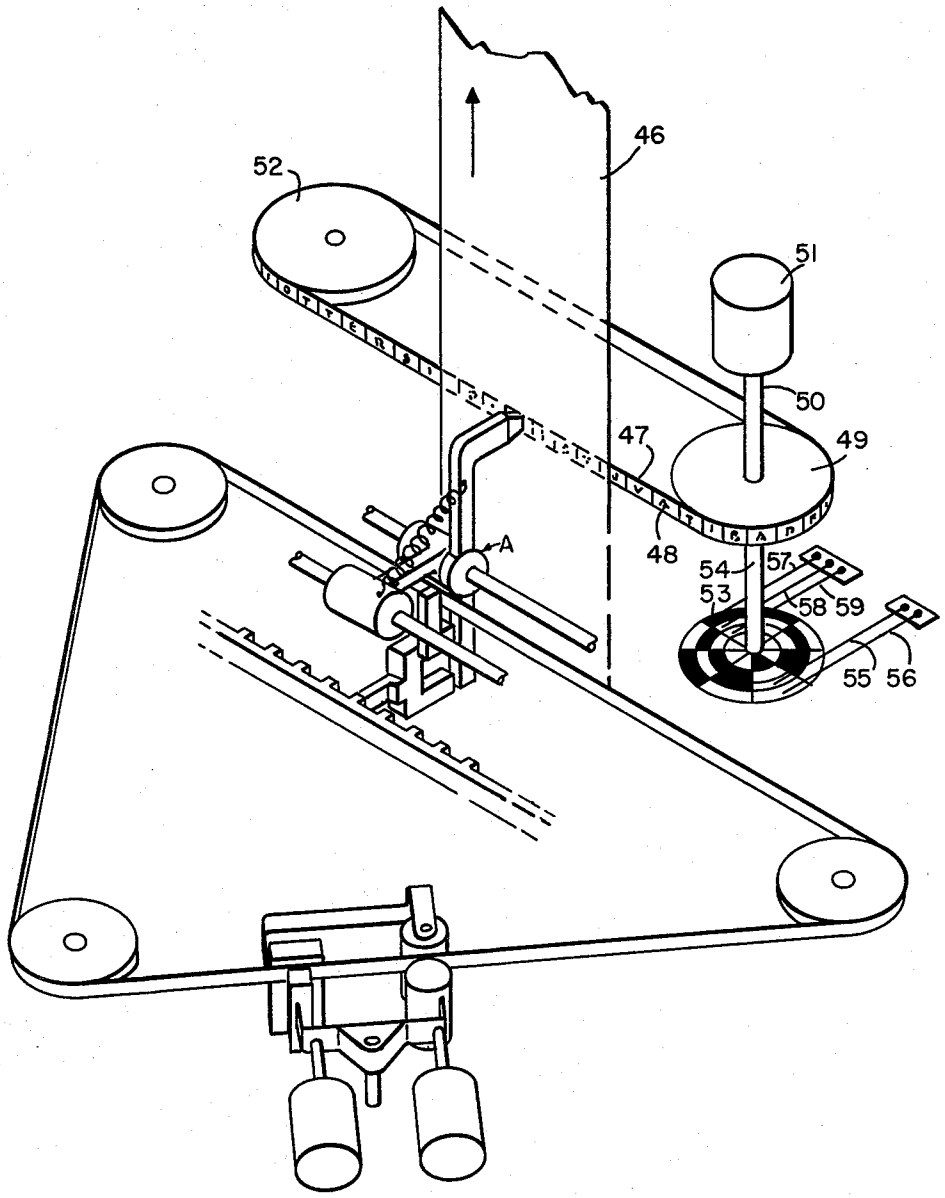


FIG. 2

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3,135,195

HIGH SPEED PRINTER WITH MOVING CHARACTERS AND SINGLE HAMMER

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5 Claims. (Cl. 101—93)

The present invention concerns high speed printers and, in particular, hammer arrangements suitable for use and in combination with printers utilizing continuously moving type on a drum or a belt.

High speed printers find many applications as, for example, in connection with electronic computers and the like. Many of such high speed printers utilize continuously moved type faces carried on the surface of rotating drums or belts. In order to print at high speed from these moving type faces or characters certain logical control systems must be utilized. A typical logical system is set forth in detail in United States Patent No. 2,692,551. While this patent shows and describes a type drum system similar logical control may be utilized with belt printers, i.e. printers employing type faces or characters carried by continuously rotating endless belts.

In brief, the prior art high speed printers employing continuously moving type face provide a row of printing hammers, one for each character along a printing line, and control logic which electromagnetically actuates each hammer at an appropriate instant. While such a system permits printing at high speed, it is expensive since a large number of relatively expensive hammers are required; and requires considerable power and reserve power since several hammers may be required to operate simultaneously. Printing logic compares each character position along a printing line with the characters to be printed and whenever a match is found, the corresponding hammer is actuated substantially instantaneously. Since several characters may be in printing position simultaneously, enough reserve power must be provided to meet the peak load condition thereby imposed.

It has been found according to the present invention that essentially the same logical controls can be used in a drum or belt printer provided with only a single printing hammer, provided this hammer is moved along the printing line to successively occupy each position normally occupied by one of a plurality of hammers. If a single sequence of characters without repetition is carried on a belt or on each band or column of characters on a drum, the belt or drum will be given one revolution for each discrete hammer position. If two or more complete sequences of characters is provided on the belt or drum column, the printing hammer may be moved two or more times per revolution.

The present invention concerns a single printing hammer for use with a belt or drum printer and with methods of and means for moving this single hammer to accomplish the function of two or more stationary hammers along the printing line of a belt or drum printer. In the preferred form of the invention, the single hammer is mounted to slide on two guide rails parallel to the printing line and is attached to an endless belt which is moved as required by a capstan and pinch roller combination. A transducer attached to the hammer generates a signal to indicate when it is aligned with a given printing position to trigger the hammer firing circuit.

Accordingly, one object of the present invention is to provide methods of and means for utilizing a single printing hammer to perform the function normally performed by a plurality of hammers in a character drum or belt type printer.

Another object is to provide positional signals for actuating a single printing hammer used in connection with a drum or belt type printer.

Still another object is to greatly reduce the peak power requirements of a high speed printer utilizing a character drum or belt.

A further object is to provide moving and guiding means for a single printing hammer used in combination with a character drum or belt in a high speed printer.

These and other objects will be apparent from the detailed description of the invention given in connection with the various figures of the drawing.

In the drawing:

FIGURE 1 is a simplified drawing of a high speed printer with a single hammer in accordance with the present invention and utilizing a printing drum.

FIGURE 2 is a simplified drawing of the present invention applied to a belt or chain type high speed printer.

FIG. 1 shows a printing web such as a continuous sheet of paper 1, drawn upward by a sprocket 2 having teeth 3 driven at a suitable speed or stepped by a motor 5 coupled to sprocket 2 by means of shaft 4. The printing characters 7 are carried on the surface of a drum 6 rotated continuously by a motor 9 coupled by means of shaft 8. The logical character position determinations may be made by a suitable coded disk and commutator such as disk 10 carrying on its surface coded conducting segments 11 contacted by brushes 13, 14, 17, 18 and 19 which in turn are held by blocks 12 and 20 and are connected to the appropriate logical circuits over leads 15, 16, 21, 22 and 23. Disk 10 may be mounted to turn with drum 6 through a coupling over shaft 24. This type of logic may be the same generally as that shown in the application for Letters Patent of Carl Wasserman entitled "Series—Parallel Code Generator" filed on October 5, 1960 and bearing Serial No. 60,601. Up to this point the system is constructed substantially as set forth in the patent and application references.

The single hammer utilized in accordance with the present invention includes a printing head 25 at the end of the magnetic armature 28 and pivoted around bearing 27 carried on guide rod 30. The hammer is actuated electromagnetically by electro-magnet 29 at the end of frame 26 and adapted to follow on the second guide rod 31. Frame 26 is moved by belt 36 passing around guide pulley wheels 37 and 45 and belt 36 in turn is pulled by the clamping action of pinch roller 39 moved by actuator 40 to engage belt 36 with rotating capstan 38. The motion of the belt 36 may be stopped on command by brake shoe 42 squeezing it against pad 41 by means of actuator 43. The drive and brake mechanisms are mounted in any suitable manner as, for example, on frame 44. The required stopping points opposite columns of characters as the hammer is progressed along the printing line is under command of suitable control circuits, not shown, and under command of signals generated by transducer 34 carried by arm 33 of the hammer structure and passing over teeth 35. Teeth 35 are formed and positioned so that when one of them induces a signal in transducer 34 it signals that the hammer is at one of its possible printing positions. The hammer is maintained at each printing position for the duration of one pass of a complete sequence of characters to be printed past it on the drum (or belt in FIG. 2). The return of the hammer to the starting point may be accomplished by a pinch roller and reversely rotating capstan otherwise similar to pinch roller 39 and capstan 38 operating on belt 36 in a manner which will be apparent to those skilled in the art and therefore not shown.

FIG. 2 shows the single hammer of the present invention applied to a belt or chain printer. In this applica-

tion printing is carried out on a paper sheet 46 drawn by suitable means, not shown, by means of type faces or characters 48 carried by a belt or chain 47 and drawn continuously along a printing line by a drive pulley 49. Drive pulley 49 is driven at suitable speed and continuously by motor 51 coupled over shaft 50. Belt or chain 47 completes its required path over idler pulley 52 so as to maintain a straight line movement along the desired printing line across sheet 46. Logical character position signals are provided by code disk 53 carried on shaft 54 and contacted by brushes 55, 56, 57, 58 and 59. The single printing hammer is provided, mounted and moved as described above in connection with FIG. 1 except that the printing hammer is allowed to dwell at each printing position during one complete passage of a type face or character sequence on belt 47 and then stepped to the next position.

While only two embodiments of the present invention have been shown and described, many modifications will be apparent to those skilled in the art and within the spirit and scope of the invention as set forth in particular in the appended claims.

What is claimed is:

1. In a high speed printing system utilizing type moving continuously past a plurality of discrete character printing positions, the combination of, a type carrier for moving a predetermined array of type characters arranged in a row continuously in sequence past a printing field defined by a predetermined number of said characters in said array, means connected with the type carrier for providing character position information, a single electromagnetically operable printing hammer, a belt and stepping drive device for moving said hammer across said field from one printing position to another in forward and return movements, support means for the hammer so that the hammer may be moved to each printing position, and a position signal generating transducer for signalling the arrival of said hammer at any printing position in said field.

2. In a high speed printing system utilizing type moving continuously past a plurality of discrete character printing positions, the combination of, a type drum, means to rotatably support the drum in a laterally fixed position, a plurality of rows of type characters in a predetermined array on the drum for continuous movement in sequence past a printing field defined by said rows, a single electromagnetically operable printing hammer for

printing from said drum along a line parallel with the axis of said drum, a stepping drive device including a flexible connection for moving said hammer across said field from one printing position to another in forward and return movements along said line, support means for the hammer so that the hammer may be moved to each printing position, and a position signal generator for signalling the arrival of said hammer at any printing position in said field.

3. In a high speed printing system utilizing type carried by a belt continuously along a printing line, the combination of, a endless loop belt type carrier, a predetermined number of sequences of type characters on the belt, support means for moving the belt continuously along the printing line, means connected with the belt for providing character position information, a single electromagnetically operable printing hammer for printing from said type along said line, a stepping drive device including a flexible connection for moving said hammer from one printing position to another in forward and return movements along said line, support means for the hammer so that the hammer may be moved to each printing position, and a position signal generator for signalling the arrival of said hammer at each of said printing positions.

4. In a high speed printer as set forth in claim 3 including a pinch roller drive mechanism positioned to engage said flexible connection means for moving said hammer.

5. In a high speed printer as set forth in claim 4 including a brake mechanism supported to engage said flexible connection means when said pinch roller is disengaged.

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