

[54] HIGH SPEED PRINTER

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[51] Int. Cl.² B41J 1/20

[58] Field of Search 101/111, 93 C, 105, 93.14, 101/93.15

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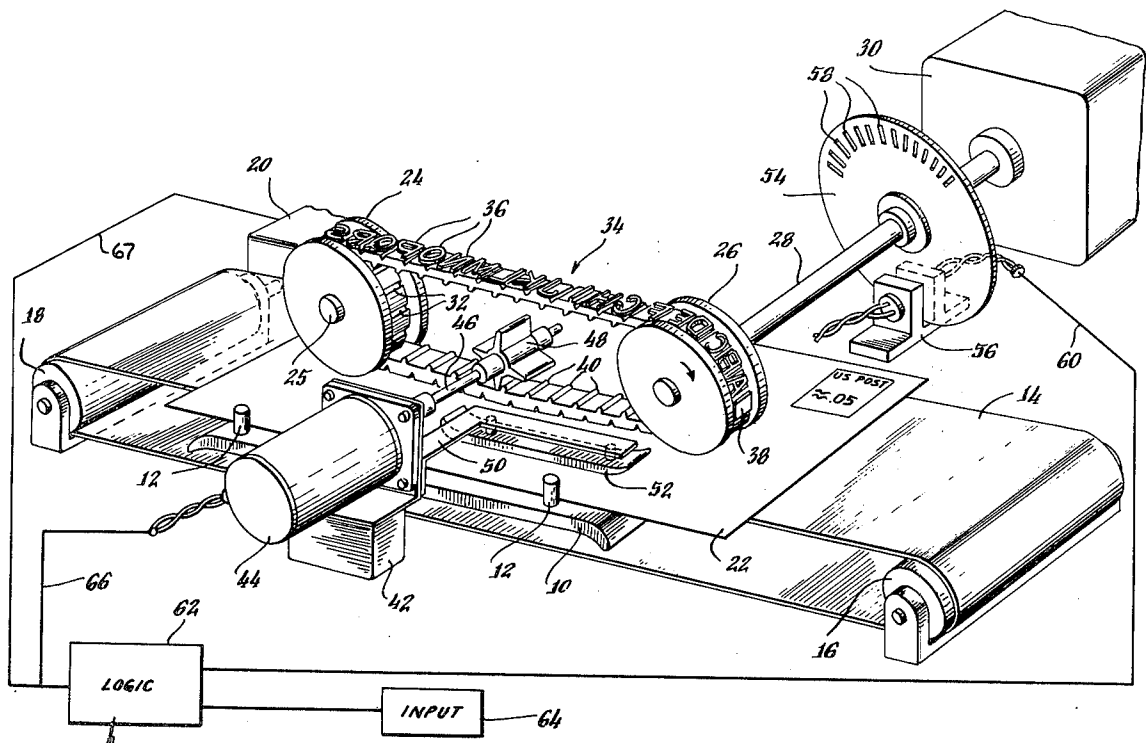
[57] ABSTRACT

A high-speed printer comprising a resilient printing

belt supported for rotation about a pair of rollers and having on its outer surface a font of type. The belt is rotated continuously and belt position is indicated by any suitable means such as an encoder disc. A document to be printed is positioned on a support surface so as to be slightly spaced from the type belt. A star wheel is mounted adjacent the back surface of the type belt and normally out of engagement with it. A stepping motor is connected to the star wheel and upon receipt of an electrical command causes the star wheel to rotate slightly to engage a selected rib on the rear surface of the type belt. The moving type belt is forced downwardly against the document by the star wheel causing the associated type face to be impressed upon the document and the latter to be advanced along said supporting surface.

The foregoing abstract is not to be taken either as a complete exposition or as a limitation of the present invention. In order to understand the full nature and extent of the technical disclosure of this application, reference must be had to the following detailed description and the accompanying drawings as well as to the claims.

4 Claims, 4 Drawing Figures



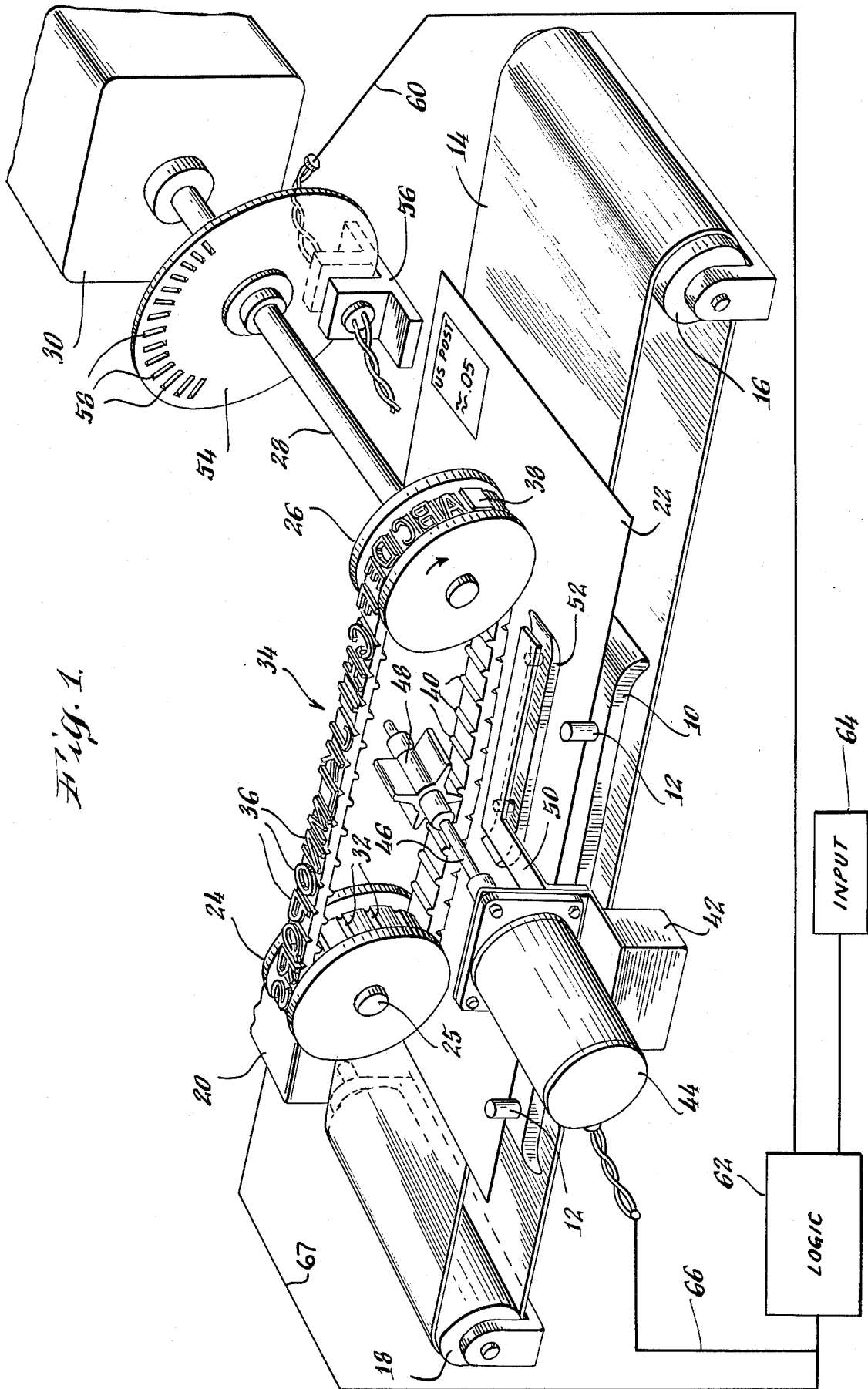
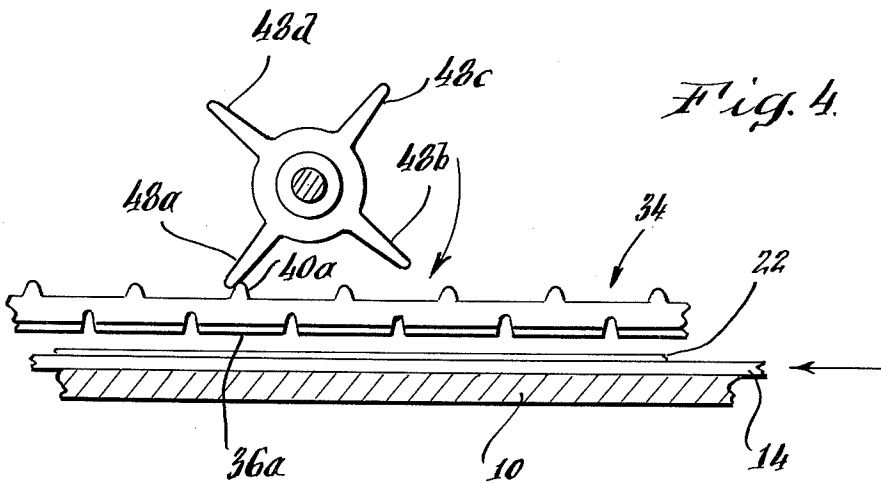
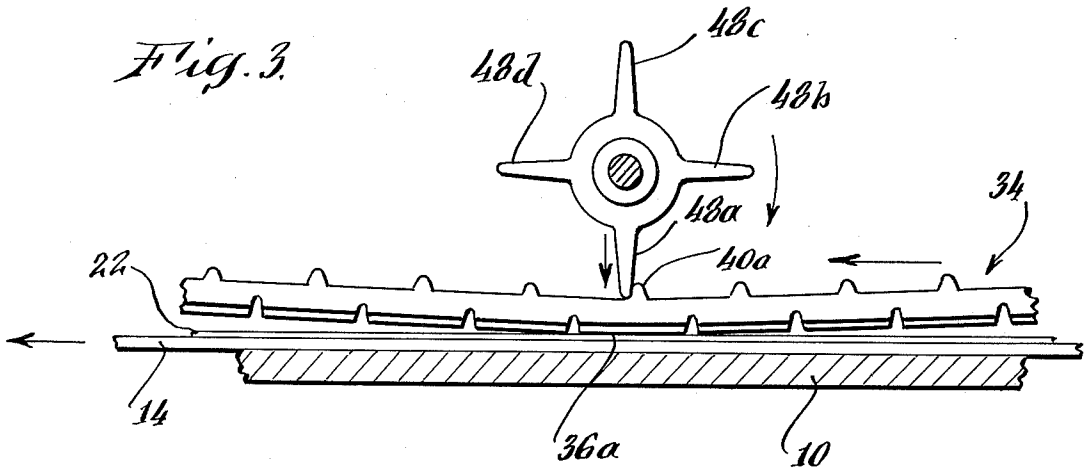
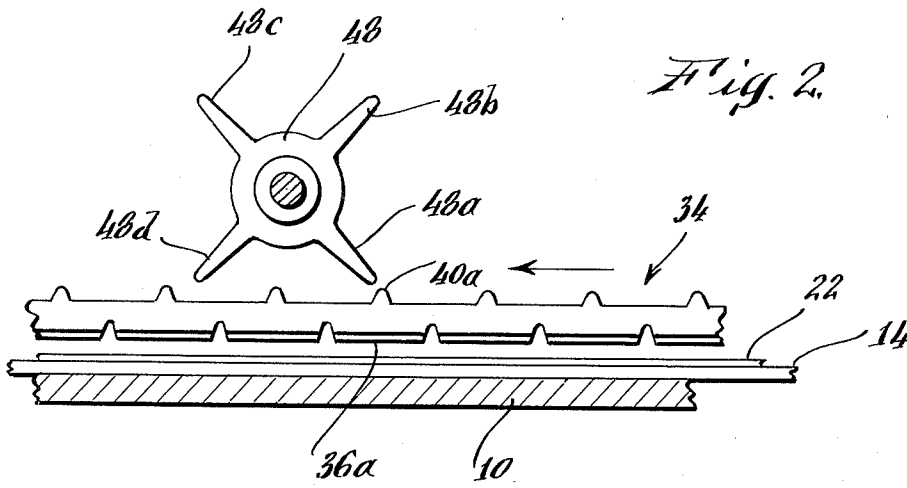


Fig. 1.



HIGH SPEED PRINTER

BACKGROUND OF THE INVENTION

A number of relatively high-speed printing mechanisms are known to the prior art. The majority of such printers are characterized by mechanical complexity. This complexity arises from the need for mechanism for selectively and successively bringing selected type faces from a type font into engagement with the document. Other mechanism is required to advance the document into a new position for each successive type strike. As a result of such complexity, prior art high-speed printers tend to be expensive, prone to mechanical failure, and difficult to repair and maintain.

Accordingly, it is the primary object of the present invention to provide a high-speed printer having a construction much simpler than those known to the prior art. Other objects are to provide such a printer which is inexpensive, reliable, and simple to maintain. Other subjects, features, and advantages will be apparent from the following description and appended claims.

SUMMARY OF THE INVENTION

A high-speed printer comprising a document-supporting surface and a printing belt positioned closely adjacent, but spaced from, the supporting surface. Means are provided for rotating the belt and for monitoring its rotational position. Other means are provided which are responsive to the monitoring means for forcing a selected portion of the belt into engagement with a document on the supporting surface during rotation of the belt.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a printer in accordance with this invention, portions thereof being shown schematically for purposes of simplification;

FIG. 2 is a diagrammatic illustration of a portion of the printer of FIG. 1, shown in its non-printing position;

FIG. 3 is a view similar to FIG. 2 illustrating a printing operation; and

FIG. 4 is a view similar to FIGS. 2 and 3 illustrating the mechanism at the conclusion of a printing step.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With particular reference to FIG. 1, there is illustrated a printer including a document support plate 10 having document positioning posts 12 mounted thereon. Lying over support plate 10 is a document conveyor 14 supported on an idler roller 16 and a drive roller 18 connected to the shaft of a drive motor 20. FIG. 1 illustrates a document in the form of an envelope 22 positioned on conveyor 14 over support plate 10 for a printing operation.

Positioned above the document 22 is an idler pulley 24 rotatable about a shaft 25 and a drive pulley 26. In order to simplify the showing, the mechanical support for the idler pulley 24 has been omitted. The drive pulley 26 is driven through a shaft 28 by a motor 30. The pulleys 24 and 26 are flanged as illustrated and between the flanges define a plurality of slots 32 which are parallel to the axis of rotation. Carried by the pulleys 24 and 26 is a resilient printing belt 34 which carries on its outer surface a font of ink-impregnated type characters 36. It also carries on its outer surface at least one raised square 38 which is not ink-

impregnated. The inner surface of belt 34 carries a plurality of raised lugs 40 which are designed to be engaged by the slots 32 in the pulleys 24, 26. Each of lugs 40 is positioned directly opposite the center line of a type face on the opposite side of the belt. The pulleys and printing belt are so positioned that the lower surface of the belt is closely adjacent, but spaced from, the document 22.

Located to one side of support plate 10 is a bracket 42 upon which is mounted a stepping motor 44 having a shaft 46 carrying a star wheel 48. Star wheel 48 has four lobes or actuating members, 48 a-d, positioned to selectively engage the lugs 40 in a manner to be described. Also mounted on the bracket 42 is an L-shaped support arm 50 carrying a document restraining shoe 52 for retaining a document in position against conveyor 14 and support plate 10.

Mounted on the shaft 28 of motor 30 is an encoder disc 54 which is associated with an optical sensor 56. The disc 54 defines slots 58, each of which corresponds to a different one of type characters 36. The output from sensor 56 is representative of the particular type face located directly below the star wheel 48. The signal produced by sensor 56 is supplied via line 60 to a logic circuit 62 which also receives signals from an input 64 which may be, for example, a keyboard or a memory storage. The output signal from logic circuit 62 is supplied via lines 66 and 67 to the stepping motors 44 and 20 respectively. In the illustrated embodiment the output from sensor 56 is simply a series of pulses which may be stored in digital form by logic circuit 62 which thereupon determines from the total count the particular type face beneath star wheel 48. Alternatively, the disc may be encoded in such a manner as to produce a different signal for each type face. Many other shaft position indicators are known to the art and may be used with this invention.

During operation of the printer of this invention, the synchronous motor 30 runs at a constant speed in clockwise rotation, as viewed in FIG. 1. When it is desired to imprint a document, such as envelope 22, it is moved into position beneath the printing belt 34 by conveyor 14. When in the nonprinting state, the star wheel 48 is positioned as shown in FIG. 2 where it is out of engagement with the resilient printing belt 34. When the document has been moved into position, printing may begin. Assume, for example, that the first letter to be printed is the letter M. This information is fed into the logic circuit 62 from the keyboard or other input 64. When the letter M of the rotating printing belt 34 approaches the star wheel 48, as determined by the logic circuit 62 from the signal supplied by sensor 56, a suitable signal is supplied to stepping motors 44 and 20. Motor 44 thereupon rotates slightly, causing the lobe 48a of star wheel 48 to be displaced slightly downwardly to thereupon be engaged by the moving lug 40a. The lug 40a thereupon drives lobe 48a to the left, as viewed in FIGS. 2 and 3, and the corresponding type face 36a is thereby driven downwardly against the document as illustrated in FIG. 3, printing the character thereon. Simultaneously, the document 22 is driven to the left by the moving printing belt and the step action of motor 20, thus advancing the document the width of one character. Continued motion of the printing belt 34 drives the star wheel 48 through the position indicated in FIG. 4 until it releases the lobe 48a and the star wheel once again assumes the position illustrated in

FIG. 2. Successive characters are printed in a similar fashion. Should it be desired to space, as between characters or words, the uninked square 38 on printing belt 34 is selected, thereby advancing the document without imprinting thereon.

If desired the conveyor 14, together with the rollers 16 and 18, and the motor 20 may be eliminated and the longitudinal letter spacing movement of envelope 22 may be obtained solely by the above described print and feed action of the belt 34. Under these conditions the envelope 22 will intermittently slide over the smooth upper surface of support plate 10 during each printing stroke of the device.

It is believed that the many advantages of this invention will now be apparent to those skilled in the art. It will also be apparent that a number of variations and modifications may be made in this invention. For example, the invention has been described above as employing a pre-inked belt. Ink, however, could be applied from a separate source, such as an inking roller or an inked ribbon running beneath the printing belt. Also, as described above the printer would print only one line of material. However, multiple lines could be printed such as, for example, by displacing the document laterally and repeating the printing run along a new line. Similarly, a plurality of printing belts 34 could be employed, each with its own star wheel to simultaneously print several lines. It will also be apparent that the stepping motor 44 might be dispensed with and replaced by an equivalent mechanism, such as a solenoid. Accordingly, the foregoing description is to be construed as illustrative only, rather than limiting. This invention is limited only by the scope of the following claims.

I claim:

- 1. Apparatus for high speed printing of characters on a surface of a document; comprising:
 - a flexible belt;
 - a series of printing elements on one side of the belt;
 - a plurality of spaced lugs on the opposite side of the belt, said lugs being respectively behind said printing elements;

pulley means supporting said belt for movement of said printing elements in a predetermined direction along a path closely spaced from the surface of said document;

drive means for rotating said pulley means; an actuating member;

means mounting the actuating member for swinging movement about an axis from a first position on one side of the axis and in the path of travel of the lugs, through an overcenter position, to a position on an opposite side of the axis and out of the path of travel of the lugs;

said actuating member being of a dimension with respect to the location of its axis and the belt to engage and deflect a portion of the belt and a printing element on the belt laterally of the path of travel of the belt to print on the surface of the document during such overcenter movement; and

control means for moving said actuating member to said first position and into the path of travel of a selected lug;

said selected lug, with said actuating member in said first position, engaging said actuating member and moving the member through said overcenter position.

2. Apparatus according to claim 1 which further includes

support means for supporting said document for movement in the same general direction as the direction of movement of said printing elements along said path.

3. Apparatus according to claim 2 wherein said support means comprises a generally flat belt type conveyor.

4. Apparatus according to claim 1 and further comprising

additional actuating members like said aforementioned actuating member, said actuating members comprising radially extending arms of a star wheel mounted for rotation about said axis.

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