

Dec. 12, 1961

SANAE AMADA

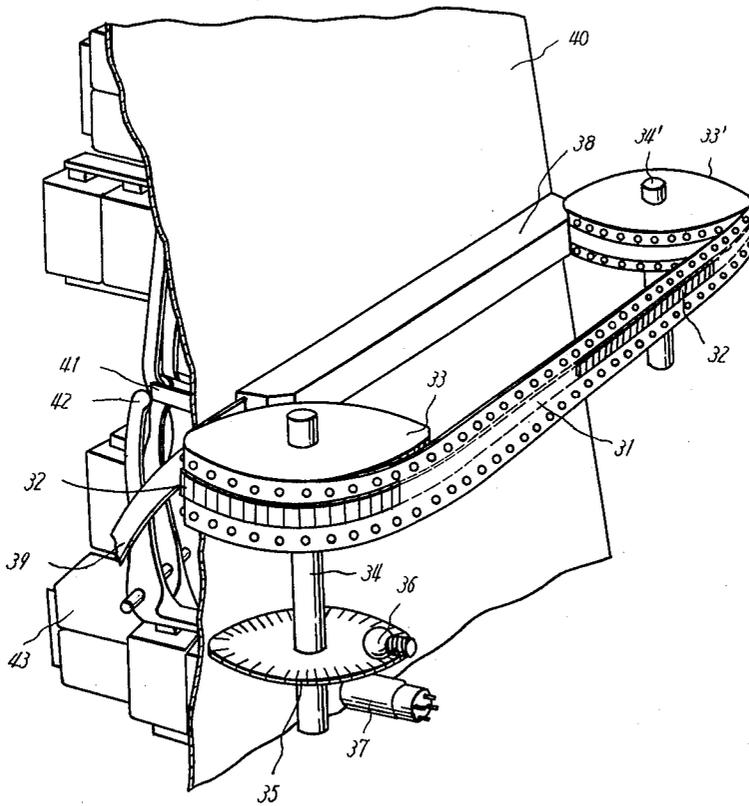
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HIGH SPEED PRINTING SYSTEM

Filed Sept. 24, 1958

3 Sheets-Sheet 1

Fig 1



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Fig 2

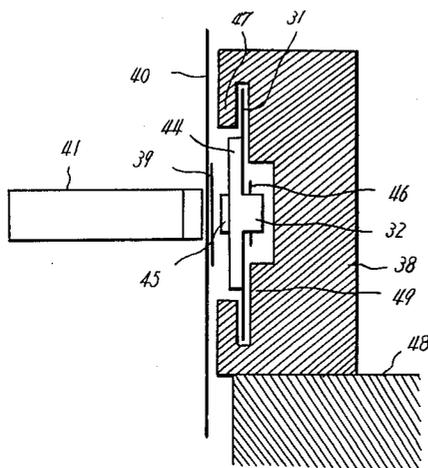


Fig 4

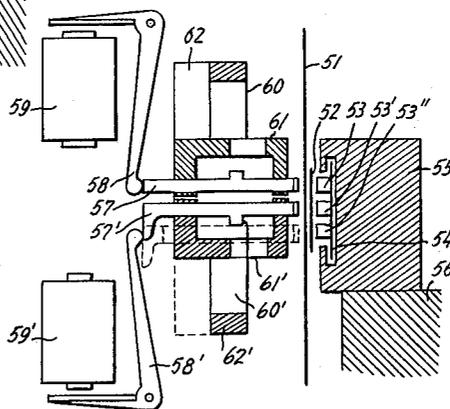
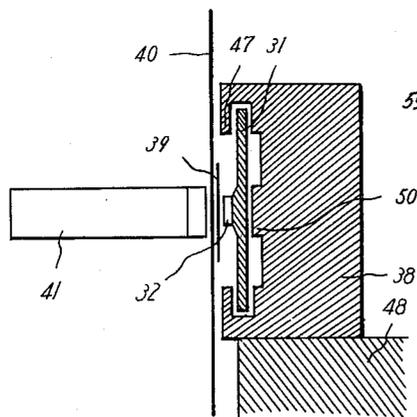


Fig 3



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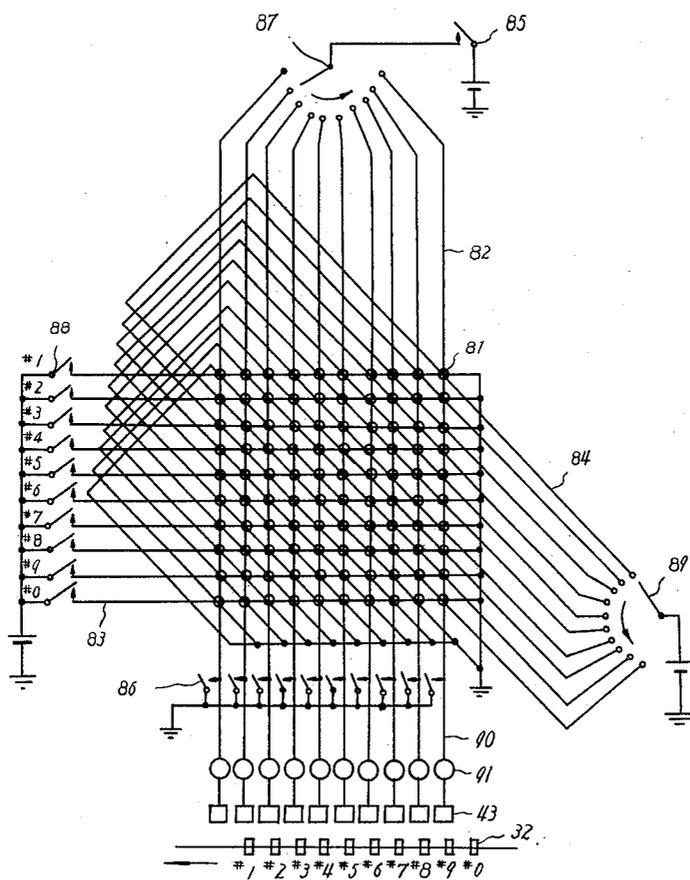
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HIGH SPEED PRINTING SYSTEM

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FIG 5



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HIGH SPEED PRINTING SYSTEM

Sanac Amada, 46 Jiyugaoka Meguro-ku, Tokyo, Japan

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2 Claims. (Cl. 101-93)

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This invention relates to a high speed printing system and, more particularly to a high speed printing apparatus used in conjunction with a high speed calculating mechanism.

When it is necessary to record a plurality of information very rapidly, such as the results of a high speed calculating machine or an electronic computer, the one by one word printing technique generally employed in printers used in conventional printing telegraph systems cannot accomplish the desired results. At present, a printing mechanism is used in which the records, contained in a line of printed matter, are completely printed in one operation of the printing mechanism; that is, in a rotation or a portion of a rotation of a type wheel of the printing mechanism used.

This invention provides an improvement of known printing devices, and it especially provides a device which is cheaper and smaller than devices used heretofore.

It is not easy to shorten the time of a recording operation more than a certain degree, but there is a possibility of increasing the number of words or letters printed in a line to increase the quantity of words or letters recorded in a unit time. This method of increasing the quantity of words or letters in a line, however, has a limit according to the construction of the mechanism employed and, for other reasons, this technique is not always advantageous.

An object of this invention is to provide an increase in the quantity of recordings per unit time and to this end the invention contemplates, for example, printing two lines for each operation.

In practical data processing are employed one-pitch-feed and two-pitch-feed whereby one line is temporarily skipped techniques. When two accumulated lines of printing mechanism are used to print only two lines simultaneously, the printing mechanism at the second line is to be reset for two pitch feed print stated above, and this means the half-fold decrease of printing capacity. In one embodiment of this invention, the printer is adapted to maintain a recording speed for a two pitch movement printing which is the same as the recording speed for the one pitch feed printing.

In order that the invention may be more readily understood and carried into effect, the invention is hereinafter described by way of example and with reference to the accompanying drawings, in which:

FIG. 1 shows a printer according to one embodiment of this invention;

FIGS. 2 and 3 are cross-sections showing modified constructions of printing type belts according to this invention;

FIG. 4 shows a cross section of the main portions of a further modification of a printing mechanism used in the printing system according to this invention; and

FIG. 5 shows an example of a control circuit for a printing mechanism according to this invention.

In FIG. 1, numeral 31 shows a flexible printing type belt, 32 are printing types mounted thereupon, 33 and 33' are sprocket wheels to rotate the printing type belt, 34 and 34' are rotating shafts for the sprocket wheels, 35 is a signalling plate mounted on the shaft 34 to represent the rotating phase of the printing type belt 31, 36 is a light source to operate with said signalling plate 35, and 37 is a photo-sensitive element. Element 37 counts the

slots in plate 35 as the latter rotates. Furthermore, 38 is a guide to suppress the vibration of the printing type belt and to receive the force of the printing type. 39 is an ink ribbon, 40 is a paper to be typed upon, 41 are type hammers, 42 are operating levers, and 43 are magnets.

The operation of typing is effected when said type hammers are hammered upon the type wheels whereby the required information is typed upon the recording paper. But, in this invention the number of required printing types are smaller than some types of printing machines with type wheels, and the papers and printing ribbons are mounted on it more readily because it is not rounded in some type of printing machines.

FIG. 2 shows a cross-section of the printing type illustrating a construction of a printing type belt, and in the construction shown, a printing type 32 made of steel or other suitable material is mechanically mounted upon a thin springy steel sheet 31 or other suitable metallic material. Upon the upper side and under side of the printing type 32, there are extensions 44 thereunder, and 45 is a portion which constitutes the character and 46 are pins which fix the printing type upon the belt 31.

Guide 38 is manufactured in such a manner that the upper and lower end portions of it serves to hold the printing type belt, and it is fixed upon the main body 48 of the supporting frame. Therefore the printing type belt 31 mounted with types 32 can readily be shifted in directions to the right and left (vertical to the surface of the paper of FIG. 2), and can also suppress vibrations and shifting to a raised and lowered position. Furthermore, the power of hammering upon these parts can be absorbed by pressing the back wall 49 of the guide 38 by means of extensions 44 of the printing type 32.

FIG. 3 shows another embodiment wherein the printing type band 31 is constructed from a plastic material such as mylor having flexibility and anti-wear characteristics and suitable portions of it are inserted with types 32 having sufficient hardness. Other points of the construction are the same as the embodiment of FIG. 2, and the power of hammering of the type hammer 41 is absorbed by the back wall 50 of the guide 38.

FIG. 4 shows a cross-section of a modification according to this invention, in which 51 is a paper to be printed on, and said paper is to be fed upwards gradually, 52 is an ink ribbon which is to be suitably moved to a right or left direction, the same as an ordinary typewriter 53, 53' and 53'' are lines of printing type, which are to be moved continuously vertically to the drawing by suitably supporting mechanism 54. In using such supporting and printing mechanism in a printing machine, it is common to employ only one line of printing types attached to the supporting mechanism 54, but in the printing machine according to a modification of the invention, three lines of printing types are necessarily needed. 54 is a printing type belt for supporting said printing types, a printing belt as shown in the drawings or the periphery of a disc rotating in a horizontal plane may be used, 55 is a guide for said printing type belt, and said guide acts to prevent the rearward movement of type 53-53' when they are hammered, and to be accurately printed. Furthermore 57 and 57' are type hammers provided on the back side of the paper to be printed, 58 and 58' are operating levers which act to push out type hammers 57 and 57' at the instant when magnets 59 and 59' are excited. 60 and 60' are restoring springs for type hammers 57 and 57', 61 and 61' are guide combs for the type hammers, and 62 and 62' are brackets to maintain portions stated above.

The method of performing the printing operation with such a mechanism and its controlling circuit can be practiced by the method known heretofore, and to use

printing by one pitch feed, one can employ the apparatus shown in FIG. 4. When two-pitch-feed printing is used, the underside bracket 62' is shifted for one pitch of paper movement by some suitable means, e.g. an electromagnet or a combination of a clutch, cam and cam lever. By making such a modification, the underside type hammer 57' is moved downward with the guide comb 61', restoring spring 60', and underside type hammer 57' is placed in an opposite position corresponding to the most underside row of printing types 53". Accordingly, when a printing operation is accomplished in the usual manner, printing in the middle row 53' is not done. And, a printing and the next line but one is accomplished, and the speed of recording in such a manner is the same as the printing by successive lines. But, it is necessary to increase the speed of paper twice.

It can be readily understood that the printing device according to this invention is to be operated by any control circuit used in the similar printing apparatus, and an example of the control circuit is shown in FIG. 5. Said example refers to a device to print numerals 1-9 and 0, but when the number of numerals are increased, the principle of printing can be similarly employed. In the drawing, 81 are magnetic storage cores constituting a matrix 10 x 10, 82 and 83 are input lines to which are applied storage pulses, 84 are input lines to which are read out pulses, 80, 85 and 88 are control switching contacts, 87 and 89 are distributing contacts, 90 are output lines, 91 are amplifiers, 43 are magnets to operate respective type hammers, and 32 are printing types.

In such a printing mechanism as shown by this invention, it is general that a portion of time of functioning is employed in the storage of signs and the rest of the time is consumed in printing, and in this mechanism, contacts 85 and 86 are closed in time of the storage at first, and then the appointments of storage are down from the tenth order, ninth order, eighth order, . . . , first order. Simultaneously with the appointment of the storage order, one of the contacts No. 1 to No. 9 of contacts 88 corresponding to the number recorded is closed. By doing such an operation, a magnetic storing is accomplished in a magnetic storing core corresponding to the numbers of the order of matrix. In continuation to this, a printing function is performed by opening the contacts 85 and 86. And, by closing the contacts 80, the distributing contacts 89 are stepped in simultaneously with the passage of types 32 in front of respective type hammers (this simultaneous operation is obtained by the signals generated by the signalling disc 35, light source 36 and photo-sensitive element 37 shown in FIG. 1). Then, when the mounting position of the signalling disc 35 is suited, an output pulse appears on the output lines

60 at the instant when the requisite type 32 is placed in front of respective type hammers, and said output is amplified by an amplifier 91 and then the magnet 43 is excited, thereby the printing is done.

In the descriptions above, a flexible printing belt making a rotation is described, but a plurality of parallel printing discs making reciprocal movements will show the similar useful effects. Furthermore, the device according to this invention can treat a large quantity of information with extremely high speeds.

What I claim is:

1. A high speed printing machine comprising an endless printing type belt carrying a plurality of type characters adapted to be arranged in first, second and third rows, means for moving said belt at a predetermined speed, type hammer adapted for being arranged in correspondence with said first and second rows and operatively associated with the corresponding type characters to hit the same, means for feeding a paper, means for actuating said hammers, means for shifting selected of said type hammers to said third row, means for transmitting an electrical signal to said shifting means to move the position of rows of said type hammers, and means for supplying the electrical signal to said paper feeding means to change the rate of feeding in response to the position of rows of said type hammers.

2. A high speed printing machine comprising an endless printing type belt carrying a plurality of type characters arranged in four rows, means for moving said belt at a predetermined speed, type hammers arranged in two rows to hit the corresponding type characters, variable paper feeding means for feeding paper between the belt and hammers, means for supporting and shifting one row of type hammers to hit one of the first and the second rows of type characters and another row of type hammers to hit one of the third and the fourth rows of the type characters, means for transmitting an electrical signal to said shifting means to move the position of rows of said type hammers, and means for supplying the electrical signal to said paper feeding means to change the rate of feeding in response to the position of rows of said type hammers.

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