

United States Patent [19]

Tramposch et al.

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[54] HIGH SPEED PRINTER

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2,919,002	12/1959	Palmer.....	197/16
3,442,365	5/1969	Ragland et al.....	197/53
3,538,413	11/1970	Baylis et al.....	318/8
3,596,745	8/1971	Waldenburger.....	197/18

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318/8, 318/320, 318/538, 318/539, 318/696

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[58] Field of Search..... 197/53, 18, 48, 49; 318/8,
318/320, 538, 539, 696; 178/34; 101/93 C

[56] References Cited

UNITED STATES PATENTS

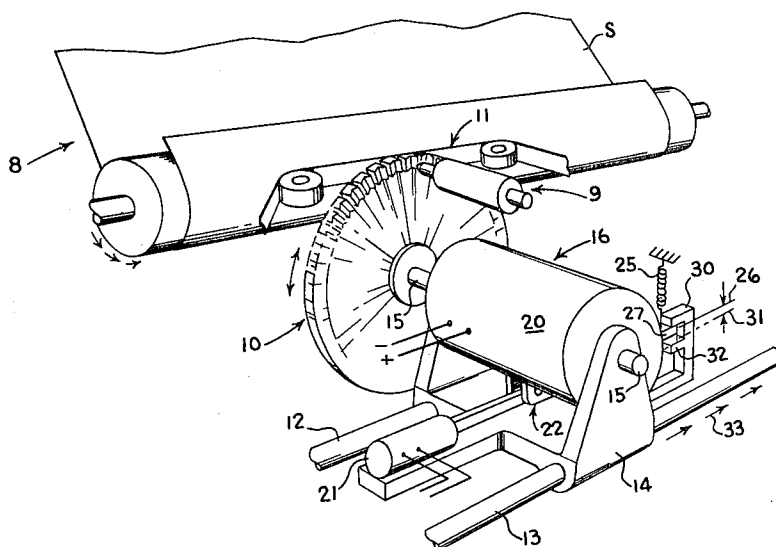
2,459,821	1/1949	Kozma et al.....	178/34
2,720,832	10/1955	Luning.....	178/34

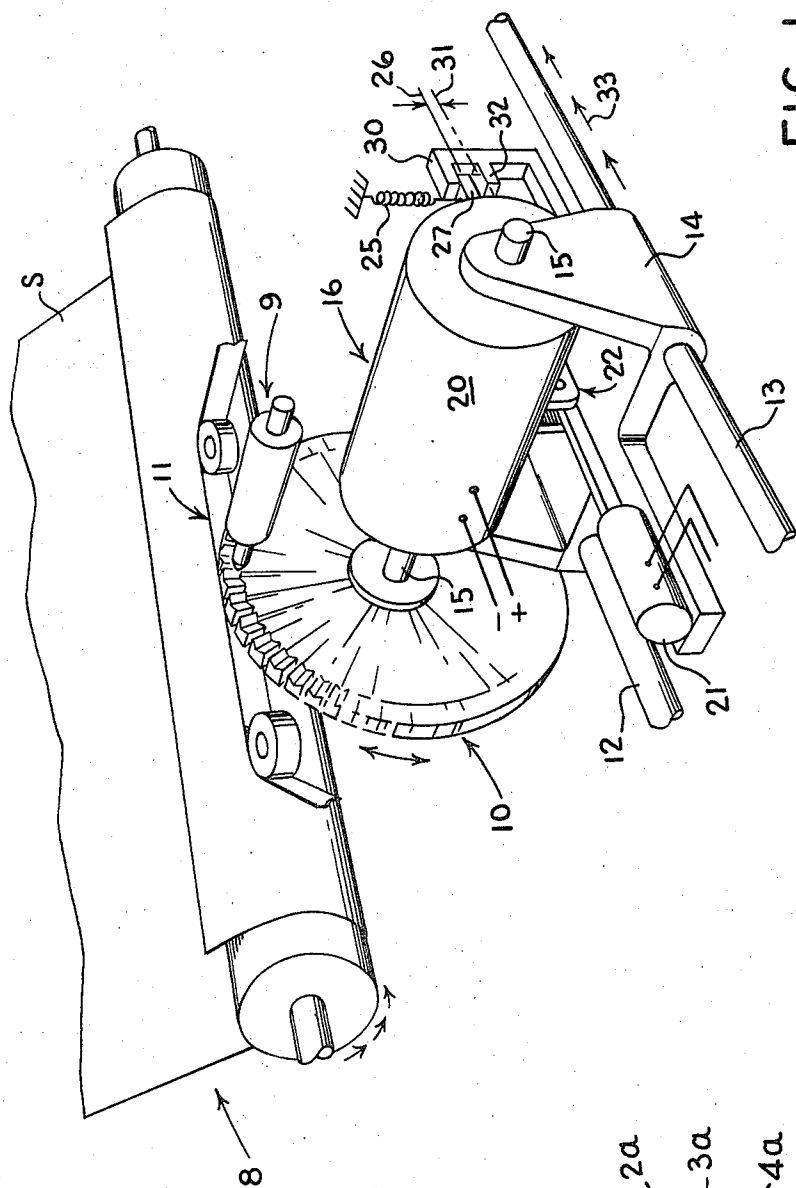
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ABSTRACT

A high speed printer having a disc type matrix that is adapted to be rotatably driven to a plurality of selected print positions by means of a differential unit that includes two separate input motors. The simultaneous operation of these two motors is operative to decrease the average time required to selectively index the type matrix to said print positions and thus enables the printer to attain higher operative speeds.

3 Claims, 2 Drawing Figures





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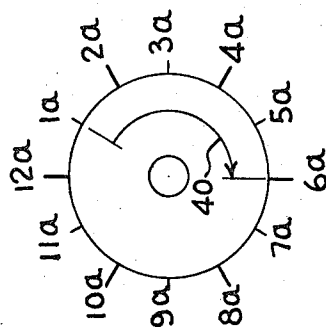


Fig. 2

HIGH SPEED PRINTER

BACKGROUND OF THE INVENTION

Several different modes have been proposed for driving and controlling the type matrix of a disc type serial printer. One such mode includes the use of an electric stepping motor having a main shaft on which is secured the disc matrix and which is bidirectionally driven in rapid incremental steps so as to sequentially bring the desired type characters to printing positions. One factor which tends to limit the speed at which such printers may operate is that in proceeding from the last print position to the next print position the stepping motor must be serially indexed through each and every one of the incremental steps between said last and next print positions. This sequential stepping action is unavoidable when stepping motors are so used and accounts for a significant portion of the time required for each printing cycle. As will be apparent an increase in printing speed could be obtained if the time required to rotatably indexing the disc matrix can be appreciably reduced.

SUMMARY OF THE INVENTION

The instant invention contemplates the use of two power drives to rotatably index a disc type printing matrix, these two drives being simultaneously applied to the disc matrix through a differential type drive arrangement. The use of two drive inputs, each of which is of a stepping type, results in each such drive requiring fewer stepping increments for a given arc of matrix rotation, and hence for any given stepping frequency any given arc may be traversed by the disc matrix in a proportionately shorter time. This action will thus increase the potential operational speeds of the printer.

The primary object of the instant invention is to provide a novel drive and control arrangement for a rotary disc type serial printer wherein a differential drive arrangement is used between the disc matrix and two separate power means.

DETAILED DESCRIPTION OF THE INVENTION

In the drawings:

FIG. 1 is a perspective view illustrating the structural aspects of the instant invention.

FIG. 2 is a diagram illustrating the functional aspects of the apparatus of FIG. 1.

Referring to FIG. 1, there is shown a conventional print receiving sheet supporting means, generally indicated at 8, and a hammer printing means generally indicated at 9. Operatively positioned between the means 8 and 9 are a disc type matrix 10 and a suitable ink ribbon means 11. The matrix 10, which is radially slotted and has a character type secured to the outer end of each flexible radial arm, is adapted to be rotatably indexed so as to serially bring selected type characters to operative print positions. This general arrangement is known in the art and need not be further particularized here.

The machine base includes a pair of parallel rods 12 and 13 on which is slidably mounted a carriage 14; the carriage rotatably supporting the main shaft 15 of an electric stepping motor 16, and the disc type matrix 10 being secured to the inner end of said motor shaft 15. The housing 20 of the motor 16 is adapted to be rotatably indexed about shaft 15 by means of a solenoid 21

that is mounted on frame 14 and is operatively connected to said housing by means of a suitable clevis connection such as that generally indicated at 22. The motor housing 20 is biased by means of a suitable spring 25 to a normal counter-clockwise position 26 as determined by engagement of a pin 27, secured to said housing 20, with a stop 30 carried by said frame 14. When solenoid 21 is actuated the motor housing 20 will be rotated to a clockwise position 31 about shaft 15 as determined by engagement of said pin 27 with a second stop 32 also carried by said frame 14.

As the carriage 14 is letter spaced (33) by means not shown, suitable electrical controls are imposed on the stepping motor 16 and the solenoid 21 so as to cause said disc 10 to present the desired characters in proper sequence for serial printing on the print receiving sheet S by said hammer means 9. It will be noted that each of the cantilevered character fingers of the disc matrix 10 is provided with a V-type notch as shown so as to insure final alignment for each character to be printed by the impact action of the inner conical end of the hammer means 9; this alignment action continuing while each of said disc fingers flexes slightly towards the platen or sheet supporting means 8 during printing operations.

By having two power inputs from 16 and 21 to drive the matrix disc 10 a reduction in the average time to operatively index the disc between successive operative print positions will be obtained as will be explained in connection with FIG. 2. The matrix disc 10 has disposed about its periphery the desired number of characters, alpha, numeric, etc.; however to simplify the discussion in connection with FIG. 2 only a relatively small number of print positions will be considered for the type circle. Let it be assumed that there are 12 rotary positions 1a-12a inclusive to which a type matrix is selectively indexed. If, for example, this matrix were to be operationally indexed from a position 1a to a position 6a, as indicated by arrow 40 of FIG. 2, a conventional stepping motor drive arrangement would have to index the disc through five successive steps, i.e., from 1a to 2a, 3a, 4a, 5a and 6a. For a given stepping speed for such a drive motor the time for the motor to step through the five indexed positions, indicated by said arrow 40, would be fixed and relatively slow. In the present indexing system, the stepping motor, such as 16, is arranged to rotationally step between every other rotative position (e.g. 2a, 4a, 6a, etc.) of the type disc, while the intervening rotative positions (e.g. 1a, 3a, 5a, etc.) may be reached by appropriate operation of the associated solenoid, such as 21 of FIG. 1; i.e., the operation of the solenoid is arranged so as to effectively produce a displacement of the type disc through only one of said steps such as from position 9a to position 10a. Thus, in the present example of indexing from 1a to 6a, FIG. 2, the stepping motor would need to rotate only through two of its incremental steps (thereby rotating the disc through four of its operative positions) while the solenoid is simultaneously actuated so as to further index the disc through one of its positions whereby a total of five steps 1a to 6a of the type disc is produced. As will be seen this smaller number of steps taken by the rotary stepping drive motor and the simultaneous stepping action of the solenoid may be executed in a shorter period of time than that required in the conventional arrangement where the same frequency motor must index through five serial steps. As

will be apparent more than one solenoid or other means may be used where the motor housing is desired to be indexed through more than two rotational positions. The instant disc drive and control system will thus make it possible to obtain significantly higher serial printing speeds than that for a conventional disc printer having the same frequency stepping drive motor.

Referring again to FIG. 1, it will be seen that the effective one character step indexing action of solenoid 21 on the motor housing 20 is superimposed on the normal rotary stepping action of the motor shaft 15, and that this arrangement in effect defines a differential drive input to the disc matrix 10. The two independent drive inputs are simultaneously operated by suitable electrical controls so as to successively and rapidly bring the desired characters on the matrix periphery into operative printing positions.

The solenoid 21, or similar power means, may be arranged to index the motor housing 20 to more than just two predetermined rotary positions, and this may further reduce the print cycle time for the instant device in that stepping motor 16 need then step between only a correspondingly fewer number of discreet rotary positions during each revolution of the disc matrix 10.

I claim:

1. In a high speed printing device having a print receiving sheet supporting means, a type matrix, a hammer means adapted to cause a selected type on said matrix to impact print on a print receiving sheet carried by said supporting means;

a carrier frame supporting said type matrix for rotary movement;

means mounting said frame and said sheet supporting means for relative movement; and

a stepping motor having an output shaft connected to rotatably index said type matrix when said motor is operated; the improvement comprising

means for rotatably mounting the housing of said stepping motor for swinging movement to at least two predetermined indexed positions relative to said frame; and

power actuating means for selectively indexing said motor housing to its said positions relative to said frame, said type matrix thereby being capable of being selectively displaced to a plurality of predetermined rotative print positions by the combined operation of said stepping motor shaft and said power actuating means.

2. Apparatus as defined by claim 1 wherein said type matrix comprises a disc, and wherein said power actuating means comprises a solenoid.

3. Apparatus as defined by claim 1 wherein the said housing of said stepping motor is mounted for swinging movement about said output shaft whereby said motor may rotatably index said shaft and matrix and said motor housing may be independently rotatably indexed relative to said frame, whereby said matrix may be rotatably indexed by the combined action of said stepping motor and said power actuated means.

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