

Sept. 26, 1967

D. P. SCOTT ET AL
AUTOMATICALLY CONTROLLED PRINTER FOR
PRINTING AND CODING DOCUMENTS

3,343,482

Filed April 14, 1965

3 Sheets-Sheet 1

Fig. 2

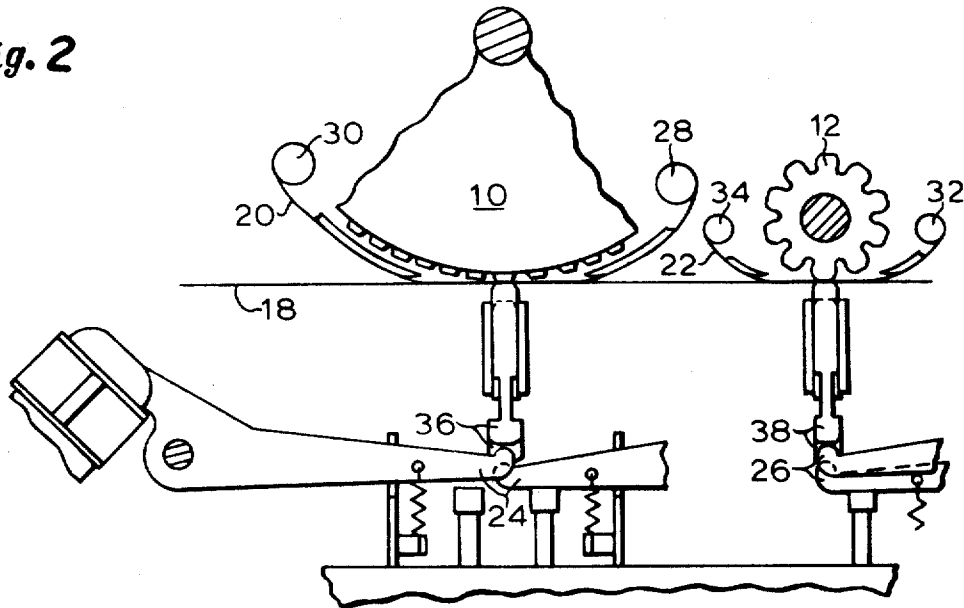
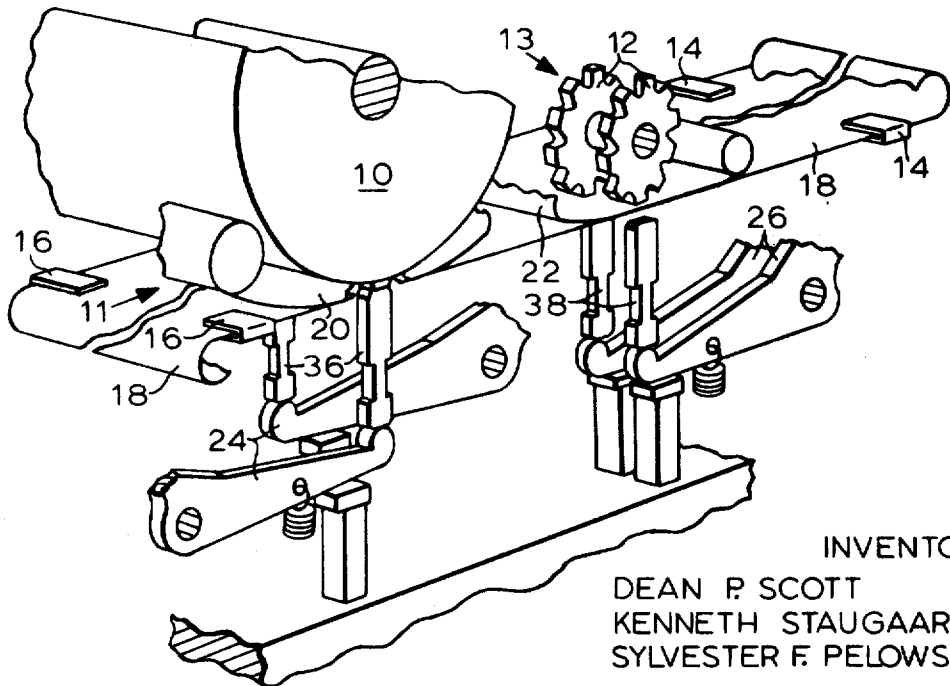


Fig. 1



INVENTORS

DEAN P. SCOTT
KENNETH STAUGAARD
SYLVESTER F. PELOWSKI

BY *Vincent L. Carney*

ATTORNEY

Sept. 26, 1967

D. P. SCOTT ET AL
AUTOMATICALLY CONTROLLED PRINTER FOR
PRINTING AND CODING DOCUMENTS

3,343,482

Filed April 14, 1965

3 Sheets-Sheet 2

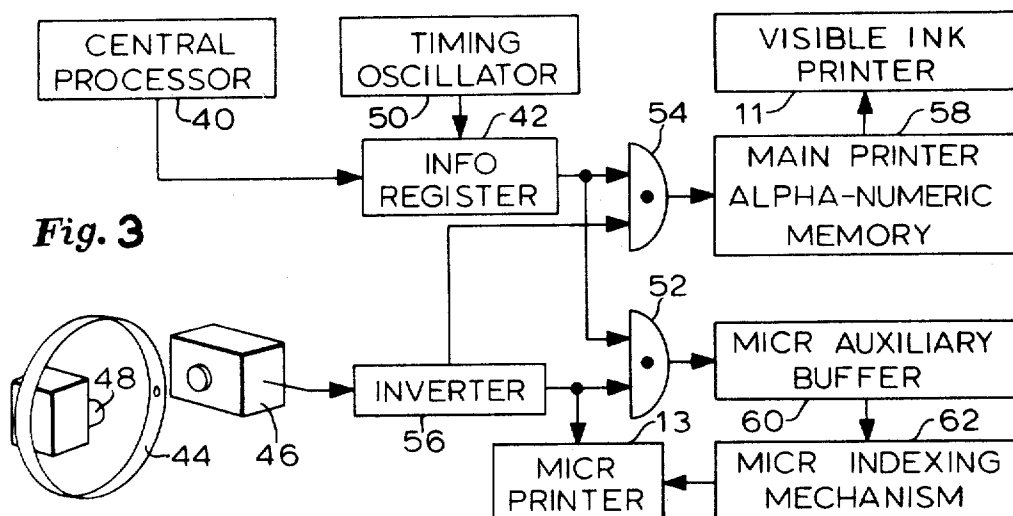
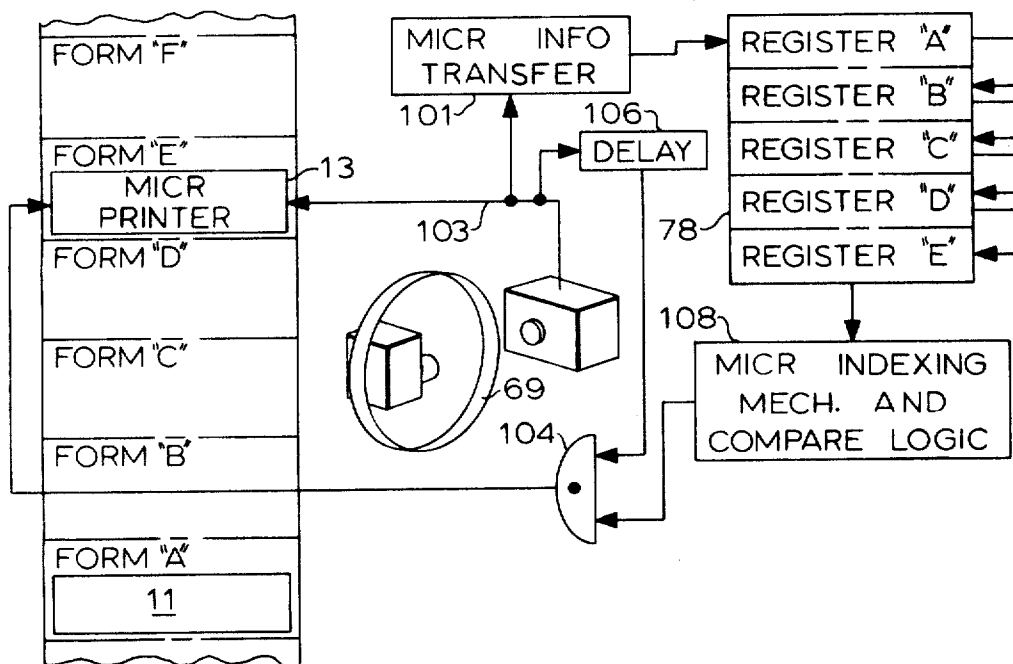


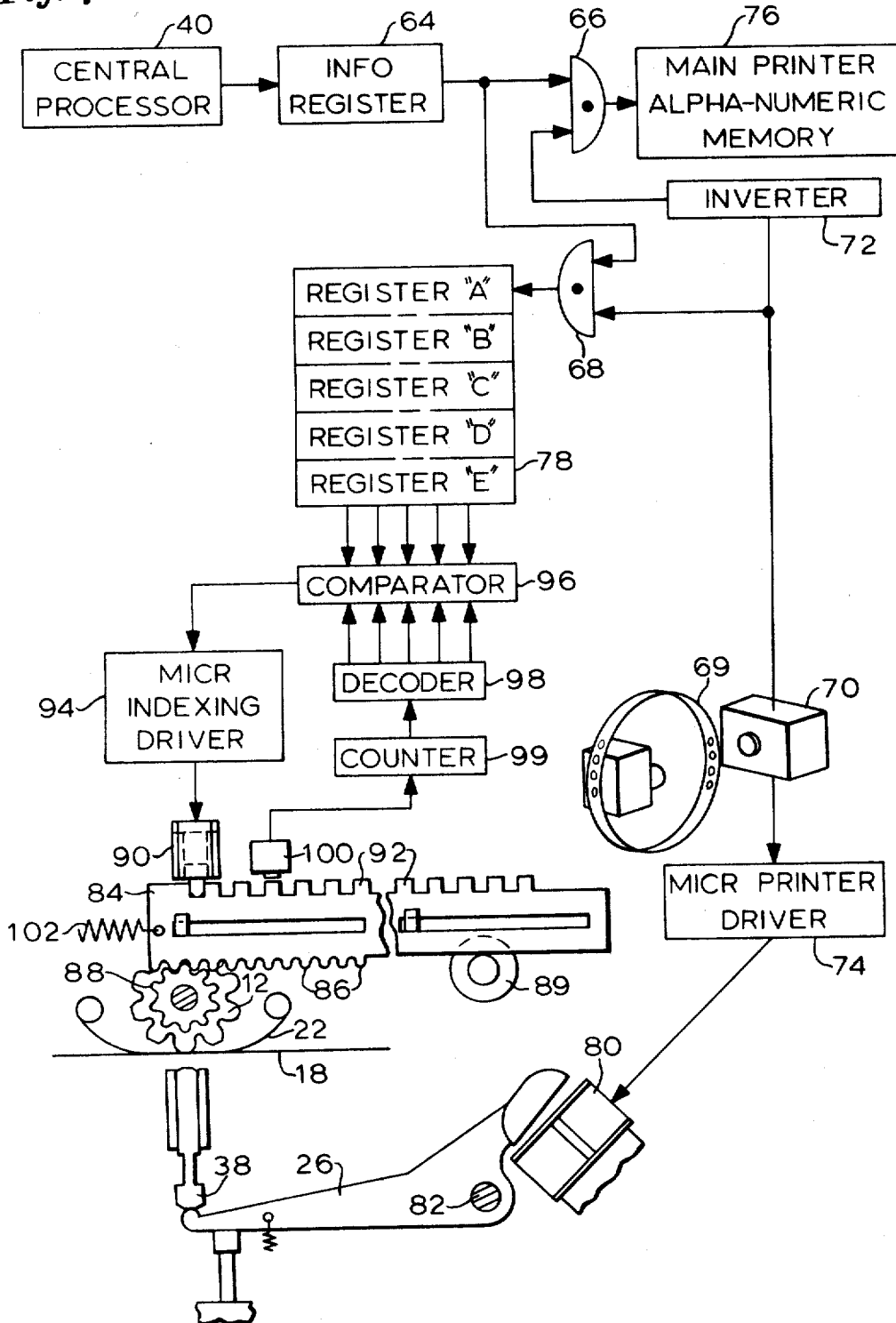
Fig. 5



D. P. SCOTT ETAL
AUTOMATICALLY CONTROLLED PRINTER FOR
PRINTING AND CODING DOCUMENTS

3 Sheets-Sheet 3

Fig. 4



1

3,343,482

AUTOMATICALLY CONTROLLED PRINTER FOR PRINTING AND CODING DOCUMENTS

Dean P. Scott, Livonia, Kenneth Staugaard, Rochester, and Sylvester F. Pelowski, Warren, Mich., assignors to Burroughs Corporation, Detroit, Mich., a corporation of Michigan

Filed Apr. 14, 1965, Ser. No. 448,114
6 Claims. (Cl. 101—90)

This invention relates to printers and more particularly, relates to automatically controlled printers which are capable of performing different types of printing operations.

In many applications it is desirable to use several kinds of printed indicia on a single document. For example, it may be desirable to print the format for a check in visible ink for human reading and also to code it with magnetic ink for automatic sorting purposes. It is also desirable to be able to change the specific indicia printed on these checks so that they might vary in the indicia or in the amount of money indicated.

Frequently these checks are printed on punched cards with visible ink to establish the format of the check. Then the addresses are stamped on the check and it is signed. The punched cards may then be used to calculate the amounts included on the checks.

In such an application it is clear that the punching requires a separate run and the printing another run. This means the process of preparing the check so as to have visible indicia and also some other indicia suitable for machine reading requires several runs through equipment. This lengthens the time necessary for the preparation of the documents. It also requires that several files be maintained, each of which contains information to be placed on the documents in some different form.

If a single automatically controlled printer is used, which printer is capable of imprinting with either magnetic ink or ordinary visible ink, some of these problems can be alleviated. Through the use of such a machine, the documents may be printed with both visible ink and a machine readable (magnetic) ink in one pass through the printer. However, printing wheels for imprinting with magnetic ink usually have a different pitch and are indexed at a different speed than printing wheels intended for use with ordinary ink.

Accordingly it is an object of this invention to provide an improved automatically controlled printer which is capable of imprinting with more than one type of printing medium.

It is a further object of this invention to provide a printer which is capable of imprinting on a document with both magnetic ink and ordinary visible ink in one pass through the printer while printing variable information according to a programmed format.

It is a still further object of this invention to provide a printer in which the document is imprinted with magnetic ink using one set of type and is imprinted with ordinary ink with a different set of type, with both sets of type being controlled from a single information source.

In accordance with the above objects a printer is provided having a document transport means, drum printing apparatus, and a magnetic ink printer. Information from a central processor is applied to the drum printer to control the information printed in ordinary ink and is also applied to the magnetic ink printer to control the information which is printed in magnetic ink. A format-control program controls the location of the printing and also determines which information is to be printed by the drum printer and which information is to be printed by the code wheels. The code wheels and the drum printer are spaced

2

apart along the length of the transport means so that the document passes under one of them before the other. The information which is to be imprinted by the last of the two printing means is delayed in time before it is utilized by the printer.

The invention and the above noted and other features thereof will be understood more fully and completely from the following detailed description when considered with references to the accompanying drawings in which:

FIG. 1 is a simplified perspective drawing of an embodiment of the invention;

FIG. 2 is a simplified diagrammatic side view of an embodiment of the invention;

FIG. 3 is a block diagram of control circuitry forming a portion of an embodiment of the invention;

FIG. 4 is a block diagram of control circuitry forming a portion of another embodiment of the invention; and

FIG. 5 is a flow diagram illustrating the operation of an embodiment of the invention.

In FIG. 1 a perspective drawing of an embodiment of the invention is shown having a print drum 10 for a drum printer 11, a set of magnetic ink (MICR) code wheels 12 for a MICR printer 13, and a document transport means including the upper tractors 14 and the lower tractors 16. A continuous paper form 18 is transported by the transport means through the drum printer 11 and the MICR printer 13 which imprint the necessary information on it so that it may later be cut into a series of documents such as checks.

An ordinary ink ribbon 20 is held between the print drum 10 and the document 18; a magnetic ink ribbon 22 is held between the code wheels 12 and the document 18. Print hammers 24 selectively press the document 18 against the ink ribbon 20 under the control of a program; MICR hammers 26 selectively press the document 18 against the magnetic ink ribbon 22 under the control of the same program.

A section of the document 18 first passes under the ink ribbon 20 and the drum printer 10 at which time the hammers 24 are actuated to print selected type from the drum 10 onto the document 18. This printing may result in the visible format of a document and also in the variable visible information such as the address and name. The same section of the document 18 next passes under the MICR code wheels 12 at which time the MICR hammers 26 selectively press the section of the document 18 against the magnetic ink ribbon 22 to imprint it with magnetic characters from the type on the code wheels 12. This results in the machine-readable indicia on the document which may provide a sorting criteria such as the name and address of a person, or may provide computing information such as the amount of a check which is to be summed with other amounts to equal a payroll total.

In FIG. 2 a side view is shown in diagrammatic form having the print drum 10 and the MICR switch code wheels 12 adjustably positioned in a line along the length of the document 18. A standard ink ribbon 20 is passed between the drum 10 and the document 18 under the control of the spool 28 and the spool 30; the MICR ribbon 22 is passed between the MICR code wheel 12 and the document 18 under the control of the spool 32 and the spool 34.

As a section of the document 18, which is to have a character printed upon it, passes under the ribbon 20 and the drum 10, an interposer 36 is moved so as to be adjacent to the document 18, and the print drum 10 is indexed so that the desired character is next to the ribbon 20 and over the document 18. When the section of the document 18 is directly under a character on the drum 10, the print hammer 24 is actuated to press the interposer 36 against the underside of the document 18

forcing it against the character on the print drum 10. This indexing and printing operation is explained more fully in Patents Nos. 3,145,650 and 3,114,491 both of which are issued to Gerard C. Wright.

Similarly, as the document passes between an interposer 38 and the MICR ribbon 22, the MICR code wheel 12 is indexed to a selected character and imprinted on the document through the imprinting action of the hammer 26 on the interposer 38. A plurality of these code wheels are located side by side to print a full line of magnetic ink impressions. However, there are fewer lines of magnetic ink than of regular ink so that the MICR code wheels need not be indexed as often as the print drum 10.

In FIG. 3 a block diagram of control circuitry for an embodiment of the invention in which the MICR information and the visible ink information have been positioned by a central processor 40 so that they may be printed by the visible ink printer 11 and the MICR printer 13 as soon as they are received. In other words, the central processor 40 has delayed the indications relating to magnetic ink characters so that they may be imprinted on the proper section of a document directly as received from the central processor 40 and yet be aligned with the corresponding visible ink printing placed on the same section of the document earlier by the printer 11.

The printing information from the central processor 40 is applied to the information register 42 where it is stored prior to printing. The printer format tape 44 has a plurality of channels, one of which is shown, for controlling the timing of the printing of information stored in the register 42. Each of these channels has a plurality of holes punched in the tape 44. As a hole in the tape passes a photocell reader 46 light from the lamp 48 shines through the hole and causes the photocell reader 46 to generate an electrical impulse which is used to gate the information in the register 42 into the printer where it is converted to an indication on a document in synchronism with a timing oscillator 50.

A single channel of the format control 44 is shown in FIG. 3. This channel illustrates the timing of information which is to be applied to either the drum printer 11 or the MICR printer 13. The photocell reader 46 has its output electrically connected to an AND gate 52 and also to a second AND gate 54. However, it is connected to a second AND gate 54 through an inverter 56 so that the same impulse from the photocell reader 46, indicating a hole in the format control tape 44, opens one AND gate and at the same time closes the other AND gate.

The output from the information register 42 is automatically connected to the other inputs of both the AND gate 52 and the AND gate 54 so that information stored in the register 42 is gated through either one of the AND gates at a time determined by the format control tape 44. At the same time the format control tape 44 determines which of the printers 11 or 13 will print the information. The output from the AND gate 54 is automatically connected to the main-printer alpha-numeric memory 58, which stores this information prior to applying it to the printer 11; the output of the AND gate 52 is automatically connected to the input of the MICR auxiliary buffer 60, which stores information prior to applying it to the MICR indexing mechanism 62 which controls the MICR printer 13.

In FIG. 4 a schematic block diagram of a control circuit for an embodiment of the invention is shown in which embodiment the information from the central processor 40 has the characters to be printed in visible ink stored with the characters that are to be printed on the same section of the document in magnetic ink. In this embodiment the information is first stored in an information register 64 which has its input electrically connected to the output of the central processor 40. The output from this information register is automatically connected to one of the two inputs of the AND gate 66 and to one of the two inputs of the AND gate 68.

A format tape 69, which operates in a manner similar to the format tape 44 illustrated in FIG. 3, selectively provides format control signals to a photocell reader 70. The output from the photocell reader 70 is electrically connected to the other input of the AND gate 66 through an inverter 72, is directly connected to the other input of the AND gate 68, and is electrically connected to the input of a MICR printer control driver 74. The output of the AND gate 66 is electrically connected to the main-printer, alpha-numeric memory 76 which controls the printer 11, as was the case illustrated by FIG. 3.

However, the output from the AND gate 68 is electrically connected to a MICR auxiliary memory 78 which comprises a series-connected plurality of shift registers indicated as registers A-E. The memory 78 shifts the information applied to it from the output of the AND gate 68 from stack to stack to provide a fixed delay before it reaches the output stage E. This delay is of sufficient length to compensate for the distance along the transport means between the printer 11 and the MICR printer 13. Because of this delay information from the information register 64 representing MICR characters is printed on the same section of the document as the corresponding visible ink characters stored together with the MICR characters in the information register 64 even though the printing of the MICR characters takes place at a later time.

The MICR type wheel 12 is positioned on the same side of the document 18 as the MICR ribbon 22, but on the opposite side of the document 18 as the solenoid operated MICR printing hammer 26. This print-hammer is spring biased away from the document 18. The hammer is controlled by the solenoid 80 so as to rotate about the pin 82 causing it to hit the document 18, pressing the document 18 against the selected character on the type wheel 12 through the MICR ribbon 22. The solenoid 80 is actuated by the output from the MICR printer driver 74 at a time determined by the format tape 69 as explained above.

The character on the MICR type wheel 12 is selected by the MICR indexing rack 84 which has a set of teeth 86 continuously engaged with a corresponding set of gear teeth 88 on the MICR type wheel 12. The MICR indexing rack is continuously spring-biased in one direction. A friction motor 89 synchronously drives the MICR indexing rack against the spring bias. An indexing solenoid 90 is adapted to engage a selected one of a plurality of teeth 92 positioned on one surface of the MICR indexing rack when actuated by a MICR indexing driver 94 to select the position of the MICR indexing rack and ultimately to select the character indexed on the MICR type wheel 12.

The MICR indexing driver is actuated by the output from the comparator 96 which comparator may consist of a plurality of AND gates having their outputs connected in parallel to the input of the MICR indexing driver 94. One of the two inputs to each of the AND gates is electrically connected to a different one of the outputs of the shift register stage E of the memory 78. The other of the inputs of each of the AND gates is electrically connected to a different output of the decoder 98. A counter 99 counts the number of the teeth 92 of the MICR indexing rack that are driven past a magnetic pick-up device 100 during each cycle as the indexing rack is moved against the indexing spring 102. The decoder 98 converts this count to the code of the corresponding character on the MICR code wheel through a plurality of OR gates and applies this code to the comparator 96.

The manner in which the circuit of FIG. 4 controls the timing of the MICR printout is illustrated by the diagram shown in FIG. 5. In FIG. 5 a document 18 having a plurality of sections indicated as Forms A-F is carried past the drum printer 11 and the MICR printer 13.

The information from the information register is read into the drum printer 11 under the control of the format

tape 69 where it is printed on Form A. At the same time the MICR printer 13 is printing information on Form E, which information was supplied to the MICR auxiliary memory 78 at some earlier time. The MICR information which is to be printed on Form A is read into Register A of the memory 78 through the control circuitry 101 described in connection with FIG. 4. As Form A is moved along the transport means this information is shifted from register to register until it is in Register E. When this information is in Register E, Form A is under the MICR printer mechanism 13.

At this time the MICR printer is activated by a pulse from the format tape control 69 through line 103. Next the gate 104 is enabled by the output pulse from the format tape 69 which has been passed through the delay 106. The gate 104 then passes the information from stage E of the shift register under the control of the indexing apparatus 108 illustrated in more detail in FIG. 4 to index the MICR printer 13 for the next form.

It can be seen that the apparatus of this invention provides a novel system for printing with both machine readable and human readable type on a document with one pass of the document through the apparatus. This saves time and obviates duplicate filing systems for maintaining information to be printed on the document in machine readable form and in human readable form. This equipment is also economical in terms of the number of components needed in the control system and the printing system. This is because advantage is taken of the different amounts of printing usually necessary in the machine readable part of a document and in the human readable part of a document to control the timing of the operations involved.

Of course many modifications and variations of the invention are possible in the light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. The combination comprising:

transport means for moving a recording medium in at least a first direction;

first printing means for transferring information to said recording medium human readable form;

second printing means, spaced apart from said first printing means in said first direction, for transferring information to said recording medium in machine readable form;

a source of serially presented information having correlated sections representing human readable information and machine readable information in proximity to each other for printing on the same document by said first and second printing means;

buffer means, electrically connected to said information means and to one of said printing means, for temporarily storing information which is to be printed by said second printing means by a period of time corresponding to the time required to move a point on said recording medium between said first printing means and said second printing means by said transport means;

format control means for selectively connecting said serially printed information to said first printing means and to said buffer means.

2. The combination according to claim 2 in which said format control means comprises:

a first data transmission path to said first printing means;

a second data transmission path to said buffer means;

signal generating means for obtaining a plurality of preprogrammed control signals representing the location of printing to be placed on said recording medium; and

switching means for selectively connecting said information means to said first data transmission path and

to said second data transmission path in response to said control signals.

3. Apparatus according to claim 3 in which said switching means comprises:

a first AND gate having its output electrically connected to said first transfer path, having one input electrically connected to said source of information;

a second AND gate having its output electrically connected to said delay means and having a first input electrically connected to said source of information;

an inverter having its input electrically connected to said signal generating means and having its output electrically connected to a second input of said first AND gate; and

said second AND gate having a second input electrically connected to said signal generating means.

4. A printer comprising:

a transport means for moving a recording medium through the printer;

a first printing means for imprinting human readable information on the recording medium;

a second printing means spaced from said first printing means along the path of movement of the recording medium for imprinting machine readable information on the record medium;

a data source for serially entering information into the printer corresponding to information to be printed in human readable form by said first printing means and information to be printed in machine readable form by said second printing means;

a buffer means, electrically connected to said data source and to one of said printing means for temporarily storing information to be printed for a period of time corresponding to the time required to move a point on the recording medium between said first and said second printing means by said transport means; and

format control means for selectively connecting the serially presented information from said data source to determine the order of printing by said first and second printing means.

5. An apparatus for entering data onto a series of forms on a continuous web, which forms are adapted to be later separated from each other comprising:

transport means for moving the continuous web through the apparatus;

a data source for serially entering information into the apparatus some of which is to be printed in human readable form and some of which is to be printed in machine readable form;

buffer means electrically connected to said data source and to one of said printing means for temporarily storing information to be printed for a period of time corresponding to the time required to move a point on the continuous web between said first and said second printing means by said transport means;

a first printing means for printing information on the forms in human readable type in response to said format control means;

a second printing means spaced from said first printing means along the path of movement of the continuous web, for printing information on the forms with machine readable type in response to said format control means; and

format control means for controlling the order of printing of said first and second printing means.

6. Apparatus for entering data onto a series of forms on a continuous web, which forms are adapted to be later separated from each other according to claim 5 wherein said format control means comprises:

a program tape having a plurality of channels each of which has a series of punched holes representing the time at which information from said data source is to be printed;

7

a source of light in juxtaposition with said program tape;
 a plurality of photocell readout means on the opposite side of said tape from said light source;
 and each of said photocell readout means being placed in juxtaposition with a different one of said channels on said program tape;
 an information register, electrically connected to said data source, for temporarily storing the serial information;
 a plurality of first AND gates;
 a plurality of second AND gates;
 each of said plurality of first AND gates having an input terminal electrically connected to an output of said information register and having an output electrically connected to said first printing means;
 a plurality of inverters each of which corresponds to a different AND gate in said plurality of first AND gates;
 each of said inverters having its input electrically connected to a different one of said photocell readers and having its output electrically connected to the input of a corresponding one of said first AND gates;
 each of said AND gates in said plurality of second AND gates having one input electrically connected to an output of said information register and having a second input electrically connected to a different one of said photocell readers;
 said second printing means having a plurality of individual code wheels each corresponding to a different one of said channels of said program tape;
 a plurality of actuating means, each electrically connected to a different one of said photocell readers, for causing a corresponding one of said code wheels to print on said recording medium under the control of said programming tape;
 indexing means for driving said code wheels to a predetermined position;

8

character generator means for generating a signal corresponding to the character available to be printed by each of said code wheels from the position of said indexing means;
 register means, having its input electrically connected to the outputs of said plurality of said second AND gates, for delaying the signals from the output of said plurality of second AND gates by an amount of time corresponding to the time necessary to move a point on said continuous web between said first printing means and said second printing means by said transport means;
 comparison means having inputs electrically connected to said register means and to said character generator means for providing an output when the information received from said register means corresponds with the information received from said character generator means; and
 a plurality of braking means each corresponding to a different one of said indexing means for stopping the corresponding one of said indexing means upon receiving a signal from said comparison means indicating a correspondence between the information received from the said character generating means and said register means for the corresponding code wheel means.

References Cited

UNITED STATES PATENTS

2,002,437	5/1933	Maul	101—19 X
2,111,121	3/1938	Mills.	
2,567,134	9/1951	Stuiveberg.	
2,582,187	1/1952	Wolowitz.	
2,918,658	12/1959	Hoberg et al.	101—19 X
2,981,179	4/1961	Schwend	101—96
3,155,031	11/1964	Ingves et al.	101—19

WILLIAM B. PENN, *Primary Examiner.*

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,343,482

September 26, 1967

Dean P. Scott et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 65, for the claim reference numeral "2" read -- 1 --; column 6, line 3, for the claim reference numeral "3" read -- 2 --.

Signed and sealed this 15th day of April 1969.

(SEAL)

Attest:

Edward M. Fletcher, Jr.

Attesting Officer

EDWARD J. BRENNER

Commissioner of Patents