

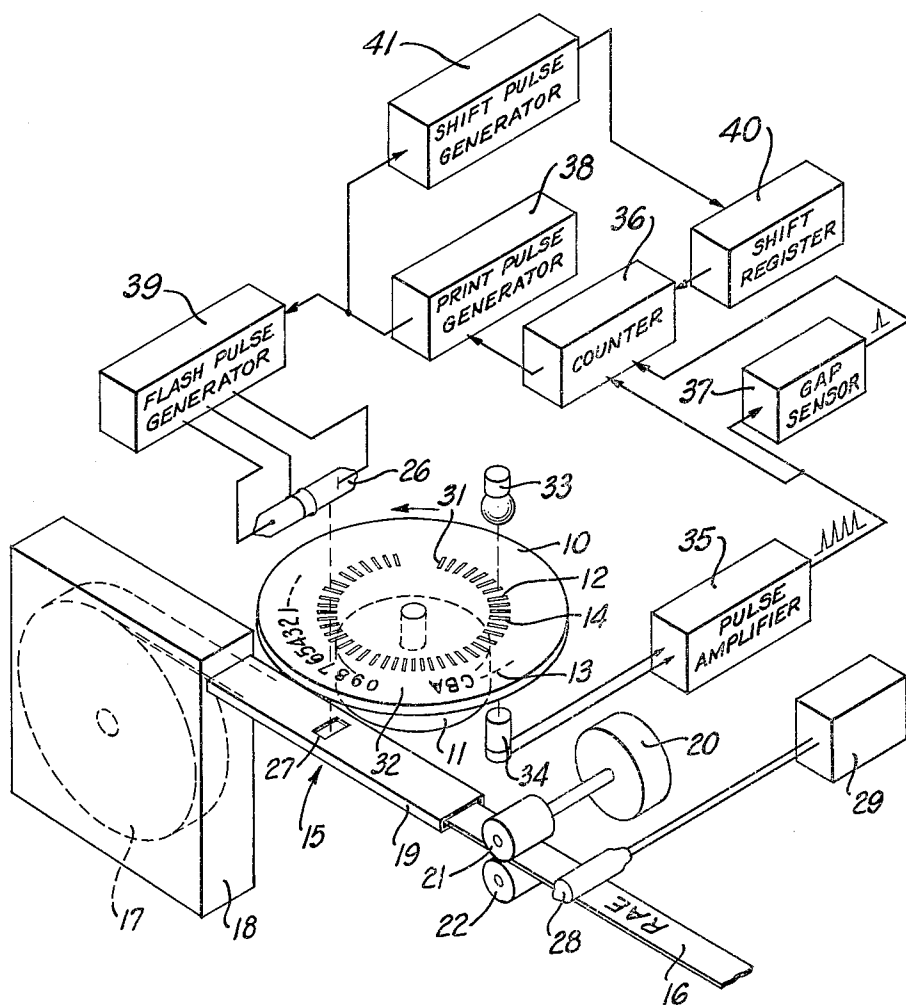
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PRINTER

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1

3,064,545
PRINTER

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This invention relates to printers and, in particular, to printers for operating at very high information rates. The printer is especially adapted for printing stock market reports as described in my copending application entitled Data Storage System With Selective Readout, Serial No. 20,965, filed concurrently with this application.

It is an object of the invention to provide a device that can print characters, such as alphanumeric characters or the like, at rates of ten characters per second and greater. A further object is to provide such a printer for printing the characters in sequence from information received in digital form.

It is an object of the invention to provide a printer utilizing a rotating wheel having a pulse-generating band and a character-generating band with the character band and a strip of printing paper moving past a printing zone, and with pulse-generating means positioned adjacent the pulse-generating band for generating a train of pulses corresponding to the characters of the character-generating band passing the printing zone, and with means for energizing the character-generating band at the printing zone to print a particular character on the printing paper when a predetermined pulse is generated. A further object is to provide such a printer wherein the printing paper is light sensitive and the character-generating band consists of transparent characters in an opaque band and wherein a short-duration light source is flashed as a particular character is positioned over the printing paper to print such character. Another object is to provide such a device wherein the printing paper and the printing wheel are moving continuously, with the printing light controlled by the pulse-generating band and the information to be recorded.

It is an object of the invention to provide a printer utilizing a rotating printing wheel with a series of markers thereon for generating synchronizing signals for the printing operation. A further object is to provide such a device utilizing an opaque marker band with a plurality of transparent portions moving between a light source and a light-sensitive unit to generate a pulse train as the timing signals. A further object is to provide a control for such a printer utilizing a counter for receiving the data to be printed and receiving the pulse train with a full count producing a print pulse for actuating the printing element. Another object is to provide such a control wherein the data representing the next character to be printed is automatically shifted into the counter after the previous count has been completed.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. The drawing merely shows and the description merely describes a preferred embodiment of the present invention which is given by way of illustration or example.

A wheel or disc 10 is driven in rotation by a motor 11. The wheel carries a pulse or marker-generating band 12 and a character-generating band 13. In this preferred form, the wheel is a glass plate with an opaque surface. Each marker of the pulse-generating band is a transparent rectangle 14 formed in the opaque material and, similarly, each character in the character-generating band is a transparent area in the opaque material. Alternatively, the wheel could consist of a metal plate with the characters

2

and pulse rectangles comprising appropriately shaped holes therein.

Printing occurs at the printing zone indicated generally at 15, with the character-generating band 13 and a strip of printing paper 16 being moved past the zone. The printing paper, which preferably is a light-sensitive paper, is stored in a roll 17 in a light-sensitive container 18. The strip is drawn from the container through a light-tight tube 19 by a drive motor 20 and drive rolls 21, 22.

A light source 26, capable of producing a relatively high intensity flash of light of short duration, is positioned over the character-generating band above an opening 27 in the tube 19. Printing is carried out by energizing the source 26 when a particular character of the character-generating band is positioned over the opening 27. The flash of light must be of very short duration so that the character is printed on the paper without blurring. Light sources of this type are available, a typical device being a General Electric Co. type FT-30. A few seconds after exposure, the printed character will appear on the light-sensitive paper. The developing period may be shortened by heating the paper and exposing it to incandescent or fluorescent light, such as from a fluorescent tube 28 excited from a transformer 29.

Photosensitive printing paper which requires no development following exposure to light has been known and used for a long time. Typical of such paper is the Eastman Kodak Company paper sold under the name "Linagraph." Papers of this type require no developing process other than exposure to light. The chemistry of this type of paper is not pertinent to the present invention. The paper is generally referred to as printing-out paper, which term refers to a method of making photographic prints in which the image is fully brought out by the direct actinic action of light without subsequent development by means of chemicals.

A piece of information comprising a series of characters is printed on the strip of paper by energizing the light source 26 at appropriate times as the wheel 10 continues to rotate and the paper 16 is continuously advanced past the printing zone. The individual pulse markers of the pulse-generating band correspond to individual characters of the character-generating band to provide a synchronizing signal for operation of the printer. A preferred form of control circuit is shown in the drawing.

The rectangles 14 of the pulse-generating band are substantially equally spaced with the exception of a gap 31 which functions as a zero indication. The characters of the character band are also substantially equally spaced with the exception of a corresponding gap 32. A lamp 33 is positioned on one side of the pulse-generating band and a photocell 34 is positioned on the opposite side so that movement of the wheel will generate a train of pulses. The photocell 34 is connected to a pulse amplifier 35 which, in turn, is connected to a counter 36 and a gap sensor 37. A count corresponding to the particular character to be printed is preset in the counter. The pulse train from the pulse amplifier 35 is blocked in the counter 36 until a pulse is received from the gap sensor 37. The gap sensor produces a single pulse when the gap 31 passes the photocell to indicate the zero position. Then the counter is unblocked and when a full count is achieved, the counter energizes a print pulse generator 38 which, in turn, energizes a flash pulse generator 39. The flash pulse generator provides the required high intensity short duration excitation for the light source 26.

Ordinarily, it will be desired to print a series of characters in sequence on the paper. The data to be printed may be stored in a shift register 40. Then the print pulse generator 38 also energizes a shift pulse generator 41

which causes the shift register 40 to shift one character and transfer the next character to be printed into the counter 36. Then when the next gap occurs and the counter is unblocked by the gap sensor, the printing cycle is repeated.

In a particular embodiment of the printer, the information to be printed is stored in the shift register in the form of a six-bit binary code, providing for sixty-four characters. The pulse-generating band 12 has sixty-four marker rectangles and sixty-four corresponding characters or blank spaces are provided in the character-generating band. Then the circuit is arranged so that when the counter 36 is driven to the full count by the pulse train from the photocell 34, the print pulse generator will be energized. For example, when the character C is to be printed, the shift register 40 will transfer a count of two into the counter. Then sixty-two pulses from the pulse train will produce a full count of sixty-four in the counter, producing a light flash when the sixty-second character is at the printing zone, which is the character C.

Of course, other forms of counters and character-synchronizing circuits can be used. The counter could be a count-down counter rather than a count-up counter, or a comparison or coincidence circuit could be used for comparing the pulse count with the code of the particular character to be printed.

The printer of the present invention is particularly adapted for operation at extremely high speeds. Both the printing paper and the printing wheel are driven continuously without interruption and no other mechanical motion is required in the printing operation. Hence, the problems of friction, starting and stopping times and acceleration and deceleration are entirely eliminated. The maximum printing rate is limited by the minimum flash duration obtainable from the light source 26 and not by the mechanism of the printer itself. In one commercial embodiment utilizing the General Electric Co. FT-30 lamp, the printer prints at the rate of ten characters per second, the data input rate, and will operate at a rate in excess of fifty characters per second without blurring. If some blurring is acceptable, this printer could be operated at a much higher data rate.

Although an exemplary embodiment of the invention has been disclosed and discussed, it will be understood that other applications of the invention are possible and that the embodiment disclosed may be subjected to various changes, modifications and substitutions without necessarily departing from the spirit of the invention.

I claim as my invention:

1. In a printer, the combination of: a wheel having concentric opaque character and timing bands with the character band having transparent characters formed therein and the timing band having transparent timing markers of substantially equal size formed therein, with each character having a corresponding marker and with a synchronizing gap in said band of markers with no

marker therein; means for rotating said wheel to move said character band past a printing zone; means for driving a strip of light-sensitive printing paper past said printing zone; a character light source, with said character band moving between said character light source and said printing paper; a timing light source and a light-sensitive unit positioned on opposite sides of said timing band for generating a train of pulses corresponding to the characters of said character band passing said printing zone; a pulse counter for generating a printing signal when a complete count is attained; means for setting a partial count in said counter corresponding to a preselected character to be printed; means for sensing the gap in the pulse train; means for coupling said pulse train to said counter after a partial count has been set therein and after a gap in the pulse train has been sensed; means for coupling said printing signal to said character light source to print the preselected character on the paper when a pulse identified by said partial count is generated; and means actuated by said print signal for setting a new partial count in said counter after a print signal has been generated for repetition of the printing operation.

2. In an apparatus for printing characters at a high rate in response to character information in digital form, the combination of: a wheel having a pulse-generating band and a character-generating band, said pulse-generating band comprising a series of markers of substantially equal size with a gap therein at a predetermined location with no marker in said gap, with each character of the character-generating band having a corresponding marker; means for rotating said wheel to move said character-generating band past a printing zone; means for driving a strip of printing paper past said printing zone; pulse-generating means positioned adjacent a sensing zone of said pulse-generating band for generating a train of pulses corresponding to said markers, with a pulse for each marker and no pulse for the gap; printing means for energizing said character-generating band at said printing zone to print a particular character on the paper; gap signal generator means having said train of pulses as an input for generating a gap signal during the no pulse condition when said gap passes said sensing zone; a shift register having the character information to be printed stored therein; control means for generating a print signal for actuating said printing means, said control means including a counter having the output of said shift register as a setting input and said pulse train as a counting input, with a count being initiated by a gap signal following setting to generate said print signal on completing a count; and means actuated by said print signal to energize said shift register and set the next character into said counter.

References Cited in the file of this patent

UNITED STATES PATENTS

2,775,172	Higonnet	Dec. 25, 1956
2,787,654	Peery	Apr. 2, 1957
2,846,932	Hooven	Aug. 12, 1958