

AN IMPACT TYPE DOT PRINTER
AND A METHOD OF DETERMINING
A PRINT STARTING POSITION THEREFOR

5 The present invention relates to an impact type dot printer and to a method of determining a print starting position therefor.

10 Impact type dot printers are known which comprise a printing head having an electromagnetically driveable print hammer extending therefrom substantially in the direction in which a recording medium is fed, and a platen rotatably disposed in confronting relationship to the print hammer with a plurality of axial ridges or projections on its circumference. The print hammer is selectively actuatable to hit the projections one at a time for selectively forming dots of dot-matrix characters on recording medium fed between the hammer and the projections of the platen.

15 Unlike wire printers and other types of printers, the positions of printed dots are determined by the positional relationship between the print hammer and the projections on the platen. Print timing pulses are generated by a sensor attached to a transmission gear and energizable in synchronism with rotation of the platen. Such a print timing signal comprises a pulse-free blank which is
20 used as a reference to detect the rotational position of the projections on the platen with respect to the print hammer. More specifically, one of the projections on the platen is arranged to meet the print hammer to form a first row of a dot matrix when the first print timing pulse subsequent to the pulse-free
25 blank arrives. The printing head is movable in spacing increments in synchronism with the platen at a certain relative speed by means of a transmission gear train, a clutch mechanism, and a carriage. A home sensor detects when the printing head leaves a home position. A print starting position is determined
30 by using as a reference the first pulse-free blank which arrives after the printing head has left the home position. Since there are some backlashes inherent in the transmission gear train

and other intermediary mechanisms, the signal generated by the home sensor and the signal generated by the sensor attached to the transmission gear train tend to undergo a relative phase shift which can result in the printing head starting to print at different positions on different lines, and hence to print characters in staggered positions. It has been customary practice to try to overcome this problem by manufacturing the parts of the dot printer with increased precision so as to reduce the amount of backlash in the system as much as possible. Such an approach is, however, disadvantageous as it increases the manufacturing costs of the dot printers, and as, in reality, it is almost impossible to avoid mechanical backlashes completely.

According to a first aspect of the present invention there is provided an impact dot type printer comprising: a rotatable platen; a printing head movable from a home position in increments in a direction parallel to the axis of the platen for forming dot-matrix characters on a recording medium positioned between the platen and the head; means for producing a print timing signal in synchronism with rotation of the platen, the signal comprising a plurality of pulses and a pulse-free blank; means for producing a home signal when the printing head is moved away from the home position; counting means for counting the pulses of the print timing signal from the production of the home signal until the arrival of the first pulse-free blank during a pre-spacing operation and during a normal printing operation; storage means for storing data related to a phase relationship between the print timing signal and the home signal on the basis of the number of pulses counted during the pre-spacing operation; and means for setting a print starting position in dependence upon a comparison of the stored data and the number of pulses counted during a printing operation.

Preferably, the pre-spacing operation is effected automatically after the printer has been actuated.

The platen may have a plurality of angularly spaced projections around the periphery thereof, the projections extending along the longitudinal axis of the platen. The printing head may comprise a print hammer which is actuatable
5 to strike the projections on the platen.

The means for producing a print timing signal may comprise a wheel which rotates with the platen and which carries a plurality of indications around the periphery thereof corresponding to the pulses of the print timing signal. The wheel may carry 27 equally
10 spaced indications with a gap which corresponds to 3 indications between the first and last indications.

According to a second aspect of the present invention there is provided a method of determining a print starting position for an impact type dot printer comprising a rotatable platen, a
15 printing head movable from a home position in increments in a direction parallel to the axis of the platen for forming dot-matrix characters on a recording medium positioned between the platen and the head, the method comprising the steps: producing a print timing signal in synchronism with the rotation of the
20 platen, the signal comprising a plurality of pulses and a pulse-free blank; producing a home signal when the printing head is moved away from the home position; counting the pulses of the print timing signal from the production of the home signal until the arrival of the first pulse-free blank during
25 a pre-spacing operation; storing data related to a phase relationship between the print timing signal and the home signal on the basis of the number of pulses counted during the pre-spacing operation; counting the pulses of the print timing
30 signal from the production of the home signal until the arrival of the first pulse-free blank during a printing operation, and setting a print starting position for the printing operation in dependence upon a comparison of the stored data and the latter count.

The present invention will now be described, merely by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a plan view of an impact type dot printer according to the present invention;

Fig. 2 is an enlarged cross-sectional view taken along line II - II of Fig. 1;

5 Fig. 3 is an enlarged front elevational view of a printing head of the printer shown in Fig. 1;

Fig. 4 is an enlarged elevational view of a projection of a platen and a print hammer of the printing head of the printer shown in Fig. 1 as they are moved relatively to each other;

10 Fig. 5 is an enlarged front elevational view of a detection disc of the printer shown in Fig. 1;

Fig. 6 is a diagram showing signal waveforms indicative of a phase relationship between a print timing signal and a home signal produced by the printer shown in Fig. 1;

15 Fig. 7 is a block diagram of an electric circuit of the printer shown in Fig. 1;

Figs. 8 and 9 are flowcharts showing successive steps in a method according to the present invention;

20 Fig. 10 is an enlarged front elevational view of dot-matrix characters as may be produced by a printer or method according to the present invention;

Fig. 11 is an enlarged front elevational view of a detection disc of a known printer;

25 Fig. 12 is a diagram showing signal waveforms indicative of a phase relationship between a printing timing signal and a home signal produced by the known printer; and

Fig. 13 is an enlarged front elevational view of dot-matrix characters as may be printed by the known printer.

Terms such as "top", "bottom", "left" and "right" used in the following description are to be understood to refer to directions
5 in the accompanying drawings.

Prior to the description of a method for determining print starting positions with a printer according to the present invention, the mechanical construction of the impact type dot printer used will be described in detail.

10 Fig. 1 shows an impact type dot printer having a pair of parallel side plates 1, 2 fixed to a frame (not shown) and spaced a given distance from each other, and a shaft 4 rotatably supported by the side plates 1, 2 and supporting a rotatable drum or platen 3. A printing head 5 is mounted on a carriage 6 in confronting relation
15 to the platen 3, the carriage 6 being slidably supported on a pair of upper and lower guide shafts 7 (shown in Fig. 2) fixed to and extending between the side plates 1, 2. The side plate 2 supports a drive motor 8 from which rotative power can be transmitted through a motor pinion 9, a gear 10 held in mesh therewith, and a
20 gear 11 secured to the gear 10, to a gear 12, which jointly serve as a speed reducer. The gear 12 is affixed to an end of the shaft 4 which projects through the side plate 2. Therefore, the platen 3 is rotatable about its own axis in response to energization of the drive motor 8.

25 Rotative power from the gear 12 is also transmitted through a pinion 13 fixed thereto, a gear 14, and a pinion 15 secured to the gear 14, to a gear 16. The gear 16 has on a righthand side thereof a clutch disc 17 facing another clutch disc 19 secured to a lefthand side of a gear 18. The gear 16 is rotatably
30 supported on a shaft 22 of a clutch solenoid 21 which extends through a sleeve 20 affixed to a righthand side of the side plate 2. The gear 16 is mounted so as to be freely rotatable

on the shaft 22, but is prevented from axially moving with respect thereto. The shaft 22 is normally urged to the left by a return spring (not shown) so as to bring the clutch discs 17, 19 into mutual meshing engagement. When the clutch solenoid 21 is energized, the shaft 22 is caused to move to the right against the biasing force from the return spring (not shown) so as to disengage the clutch discs 17, 19 from each other. The gear 18 is held in driving mesh with a gear 23 to which there is fixed a takeup drum 24 around which a cable 25 is wound with one end fastened thereto. The cable 25 extends around a pulley 26 and has a portion extending parallel to the guide shafts 7, the other end of the cable 25 being attached to the carriage 6. When the cable 25 is wound around the takeup drum 24, the carriage 6 and the printing head 5 thereon are caused to move to the right along the guide shafts 7. The carriage 6 is normally urged to the left by a return spring 27. Thus, the carriage 6 automatically returns to its home position at the left hand end of the shafts 7 under the resiliency of the return spring 27 when the clutch discs 17, 19 are disengaged from each other.

As better shown in Fig. 2, the platen 3 has on its circumference a plurality of integral ridges or projections 28 extending axially of the platen 3 and spaced at equal angular intervals around the circumference of the platen 3. As illustrated in Figs. 2 and 3, the printing head 5 has a plate-like print hammer 29 which confronts one of the projections 28 at a time. The print hammer 29 is inclined at an angle to and extends across the projection 28. The print hammer 29 has a lower end clamped in a slot 32 in a movable yoke 31 which is fixed to a free end of a spring plate 30. The spring plate 30 has a pair of tongues 33, 33, which extend from a lower side thereof, the lower side being fastened to a support plate 35 by means of pins 34. The support plate 35 has an extension which is secured to the carriage 6 by a screw 46. A front yoke 37 is affixed by the pins 34 to the spring plate 30 with a spacer plate 36 therebetween. The front yoke 37 is substantially circular in shape and has a

central hole 38 through which a rear end of the movable yoke 31 extends. An annular permanent magnet 39 is secured to the front yoke 37 on the other side from the spring plate 30. A cylindrical, cup-shaped rear yoke 40 is affixed to the permanent magnet 39 on the other side from the front yoke 37. A central yoke 41 is secured to the centre of the bottom of the rear yoke 40 and extends towards the front yoke 37. The movable yoke 31 is normally magnetically attracted to a front end of the central yoke 41 under the magnetic force from the permanent magnet 39. Therefore, the print hammer 29 is normally kept retracted from the projections 28 on the platen 3. A release coil 42 is wound around the central yoke 41 for cancelling out magnetic fluxes generated by the permanent magnet 39 when the release coil 42 is energized. Upon energization of the release coil 42, the movable yoke 31 is released from the magnetic attraction toward the central yoke 41, and hence the spring plate 30 is no longer urged rearward, whereupon the print hammer 29 is caused by the resilient force of the spring plate 31 to move forward into striking engagement with one of the projections 28 on the platen 3. Since a recording medium 43 and an ink ribbon 44 extend between the projection 28 and the print hammer 29 as illustrated in Fig. 2, a dot is formed on the recording medium 43 where the print hammer 29 hits the projection 28.

The projections 28 and the print hammer 29 will meet at successively shifted positions in a manner described below to form characters on the recording medium 43. The projections 28 are successively brought into confronting relation to the print hammer 29 in response to rotation of the platen 3. As the projections 28 are thus shifted, they meet the print hammer 29 at successive positions to form a vertical column of a dot-matrix character to be printed, as shown in Fig. 4. At the same time, the printing head 5 on the carriage 6 moves laterally in increments to enable the print hammer 29 to meet the projections 28 at successive positions to form a horizontal row of the dot-

matrix character to be printed. With the print hammer 29 inclined with respect to the projection 28, the projection 28 and the print hammer 29 will cross each other on the aligned dots along a given column of a matrix even when the platen 3 rotates and the printing head 5 moves laterally at the same time. As the print hammer 29 moves to the right, the release coil 42 (Fig. 2) is energized for selected intervals to force the print hammer 29 to selectively strike the projections 28 to form desired dot-matrix characters such as those shown in Fig. 10 on the recording medium 43.

A print timing at which the print hammer 29 is to be driven can be determined by signals generated by a dot sensor 48 shown in Fig. 1. The dot sensor 48 contains a light-emitting device and a photodetector (not shown) which are disposed in confronting relation across a slot in the dot sensor 48. An outer peripheral edge of a detection disc 49 which is secured to the motor pinion 9 passes through the slot in the dot sensor 48. The detection disc 49 thus rotates in synchronism with the motor 8 and the platen 3.

A home position sensor 51 is mounted adjacent the side plate 1, and also comprises a light-emitting device and a photodetector (not shown) which face each other across a slot (Fig. 2). The carriage 6 includes a pair of vertical legs 52 and 53, the leg 53 having an integral shield plate 54 which enters the slot in the home sensor 51 when the carriage 6 is moved back to its home position. As shown in Fig. 1, a bumper 55 made of elastomeric rubber is fitted over the upper guide shaft 7 at a lefthand end thereof. The bumper 55 serves to determine the home position of the printing head 5 or the carriage 6, and to absorb the shock of collision when the carriage 6 is retracted to the home position under the returning force of the return spring 27.

The operation of the printer described above will now be described.

The detection disc 49 has its outer peripheral edge divided into 30 equal regions, 27 of which comprise apertures 50, the apertures 50 being dispersed at equal angular intervals around part of the edge of the disc 49. No apertures are provided in the remaining 3 regions. With such a detection disc 49, the dot sensor 48 produces a print timing signal which comprises 27 successive equally spaced pulses followed by a pulse-free blank which corresponds to a three pulse interval, as illustrated in Fig. 6 (1). The print timing signal is indicative of positions in which the print hammer 29 strikes the projections 28. The home sensor 51 is arranged to produce a home signal which may be any one of three home signals H_1 , H_2 , and H_3 which are related in phase to each other, as shown in Fig. 6 (2), (3) and (4), when the printing head 5 moves to the right away from the home position. Each cycle of the print timing signal may be divided into three zones A, B and C and the home signals H_1 , H_2 , H_3 have falling edges in the zones A, B and C respectively. However, the timing of the falling edge of the home signals is affected by backlashes in the transmission gears 9 to 19. Thus, the falling edges of the home signals tend to have varied phases H'_1 , H''_1 or H'_2 , H''_2 , or H'_3 , H''_3 , as shown in Fig. 6 (2), (3) and (4). Such phase differences can however be limited mechanically to within a tolerable range, which corresponds to about ± 10 pulses of the print timing signal in the illustrated embodiment. The zones of the print timing signal are determined on the basis of such a tolerable range. The first zone A and the final zone C are selected to have a width substantially equal to the tolerable range with the zone A including the pulse-free blank (which corresponds to three pulses). The intermediate zone C occupies the remaining width in the print timing signal. In the illustrated embodiment, the width of the zone B is the same as that of the zones A, C, but it may be varied in accordance with the number of pulses of the print timing signal or the number of pulses corresponding to the pulse-free blank.

Before the printing head 5 is shifted by increments for a normal printing operation, that is immediately after the power supply for the dot printer has been switched on, the printing head 5 is shifted by a pre-spacing increment during a pre-spacing operation to determine the phase relationship between the home signal and the print timing signal.

A central processing unit (CPU) shown in Fig. 7 is responsive to the detected phase relationship to determine a print start position. The central processing unit includes a main control 56, a comparator 57, a counter 58 and a register 59 which operate in sequences as shown by the flowcharts in Figs. 8 and 9. The main control 56 is supplied with an output signal delivered from the comparator 57, the print timing signal generated by the dot sensor 48, and the home signal generated by the home sensor 49 for processing printing data fed from external apparatus (not shown) to generate drive signals for a printer mechanism comprising the printing head 5, the drive motor 8, and the clutch solenoid 21. During the pre-spacing operation the counter 58 is cleared by the falling edge of the home signal from the home sensor 51 to start counting pulses of the print timing signal received from the dot sensor 48. When the first pulse-free blank of the print timing signal arrives, the main control 56 issues a stop signal to stop the counting operation in the counter 58 and a signal related to the count in the counter 58 is stored in a register 59. The counting operation of the counter 58 is repeated each time the printing head 5 is moved to the right from the home position in subsequent printing operations, and the count signal from the counter 58 and stored data in the register 59 are compared with each other by the comparator 57 to determine a print starting position.

The operation for determining the print starting position will be described in more detail with reference to Figs. 8 and 9. At an initial stage, the printing head 5 is in the home position at the lefthand end of the shafts 7. When the dot printer power supply is switched on, the clutch solenoid 21 and the drive motor 8

are energized. Energization of the clutch solenoid 21 disengages the clutch discs 17 and 19 from each other. Upon energization of the motor 8, the shaft 4 and hence the platen 3 are rotated by the gears 9 to 12, and at the same time the dot sensor 48 starts issuing the print timing signal as shown in Fig. 6 (1) in response to rotation of the detection disc 49. After a predetermined delay time has elapsed, that is a period of time has elapsed which is required for the motor 8 to reach a normal rotation mode, the clutch solenoid 21 is de-energized to allow the clutch discs 17, 19 to be interconnected, thereby enabling the gears 18 and 23 to rotate the takeup drum 24. The cable 25 then starts being wound around the drum 24, whereupon the carriage 6 starts to move to the right along the guide shafts 7 to shift the printing head 5 by a pre-spacing increment. As the shield plate 54 moves out of the home sensor 51, ie, the printing head 5 leaves the home position, the home signal generated by the home sensor 51 falls to zero as shown in Fig. 6 (2), (3) or (4). The counter 58 is then cleared to count pulses of the print timing signal from the dot sensor 48 until the first pulse-free blank arrives. The count in the counter 58 indicates in which zone (A, B or C) the falling edge of the home signal occurs. When the falling edge of the home signal occurs in zones A, B and C, the count K in the counter 58 is, respectively, in the range 27 to 21, 20 to 11, and 10 to 1.

When K lies in the ranges 27 to 21, 20 to 11, and 10 to 1, the register 59 stores a numerical value of "1", "2" and "3", respectively. The motor 8 is then de-energized and the clutch solenoid 21 is energized. The clutch discs 17 and 19 are disconnected, whereupon the carriage 6 returns to the home position under the force of the return spring 27. The clutch solenoid 21 is then de-energized again. The pre-spacing of the printing head 5 is thus completed. The pre-spacing increment of the printing head 5 is quite small.

Printing data for a line of print is then written into a character buffer within the main control 56 and when a printing command signal arrives, the following printing operation is carried out, as shown in Fig. 9. The motor 8 is energized and the clutch solenoid 21 is energized to disengage the clutch discs 17 and 19. When the motor 8 rotates at a normal speed, the clutch solenoid 21 is de-energized to engage the clutch discs 17, 19 with each other. The printing head 5 now moves to the right by a spacing increment and leaves the home position, whereupon the signal generated by the home sensor 51 drops to zero. The counter 58 is cleared to eliminate the previous count therein, and starts counting the pulses of the print timing signal produced by the dot sensor 48 until a pulse-free blank of the print timing signal arrives.

As described above, the print timing signal and the home signal are subjected to a phase difference of about ± 10 pulses due to backlashes in the gears 9 to 23. For example, if the falling edge of the home signal lies in the zone A of the print timing signal during the pre-spacing operation, at which time the register 59 stores "1", the home signal upon spacing for a normal printing operation may have its falling edge in the zone A, a prior zone C', or a subsequent zone B, as shown in Fig. 6 (2). Such a phase difference can be detected by the comparator 57 on the basis of the current count K in the counter 58. More specifically, if the current count K is 10 or less when the stored data R in the register 59 is "1", then the home signal has its falling edge in the zone C'. The main control 56 is then arranged to skip 27 pulses after the first pulse-free blank and to start a printing operation from the first pulse P1 following the second pulse-free blank. If the current count K is 11 or larger when the stored data R is "1", then the home signal has its falling edge in the zone A or B. The main control 56 is then arranged to start a printing operation from the first pulse P1 following the first pulse-free blank, which is the same as the second pulse-free blank mentioned above. After the printing of one line has been completed, the printing head 5 returns to the home position

to carry out the printing of successive lines.

If the home signal has its falling edge in the zone C of the print timing signal and "3" is stored in the register 59 during the pre-spacing operation, the falling edge of the home signal may lie in the zone C, a prior zone B, or a subsequent zone A' upon movement in a spacing increment for a printing operation, as shown in Fig. 6 (4). If the current count K in the counter 58 is 20 or less when the stored data R in the register 59 is "3" then the home signal falls to zero in the zone B or C. In this case, the main control 56 is arranged to skip 27 pulses of the print timing signal after the first pulse-free blank and to start a printing operation from the first pulse P2 following the second pulse-free blank. If the current count K is 21 or greater, then the falling edge of the home signal lies in the zone A', whereupon the printing operation is started from the first pulse P2 following the first pulse-free blank, which is the same as the second pulse-free blank mentioned above. The printing head 5 returns to the home position after the printing operation is over, and then repeats the operation for successive lines.

If the home signal has its falling edge in the zone B of the print timing signal and "2" is stored in the register 59 upon pre-spacing, the falling edge of the home signal may lie in the zone B or the prior zone A, or a subsequent zone C upon movement in a spacing increment for printing operation, as shown in Fig. 6 (3). When the stored data R in the register 59 is "2", the printing operation is controlled by the main control 56 to start from the first pulse P1 following the first pulse-free blank irrespective of where the home signal falls to zero. The printing head 5 then moves back to the home position upon completion of the printing operation for one line, and the printing operation is repeated for successive lines.

The dot sensor 48 and the home sensor 51 may comprise magnetic sensors. Although not shown, the printing head 5 may be of different form from that described, and other mechanisms may be

used to move the head by spacing increments and to return the carriage 6 to a home position. The print timing signal may also be divided into only two zones, and the printing head may be shifted for periodical pre-spacing operations under command signals.

5 The printer may be arranged to effect the pre-spacing operation automatically after the printer has been actuated. A known arrangement for determining print starting positions will be described with reference to Figs. 11 to 13 for comparison with the method described above. As shown in Fig. 11, a known detection
10 disc 149 has a plurality of groups (three as shown) of apertures 150. The apertures 150 in each group are angularly spaced at equal angular intervals of 30° . The number of the apertures 150 in each group corresponds to the number of rows in the dot matrix to be formed. For example, where characters are represented by a
15 dot matrix having five columns and seven rows, the number of apertures in each group is seven with the aperture groups being spaced at intervals corresponding to three apertures. When the detection disc 149 is used, the dot sensor 48 shown in Fig. 1 periodically produces a print timing signal comprising groups of
20 seven successive pulses, as shown in Fig. 12 (1). The print hammer is selectively driven by the print timing signal. When the projections on the platen are displaced to the positions of the first, second,, seventh rows, the dot sensor produces first, second,, seventh pulses, respectively. The home sensor
25 generates a home signal H having a timing as shown in Fig. 12 (2) with respect to the print timing signal from the dot sensor. The phase relationship between the print timing signal and the home signal is adjusted when the dot printer is assembled. Thus, the home signal H is arranged to have a falling edge lying substantially
30 centrally of the print timing signal, for example, between the third and fourth pulses thereof. Printing operation starts to be effected from the first pulse P following the first pulse-free blank of the print timing signal after the home signal H has fallen to zero, that is, after the printing head has left the home position.
35 However, the phase difference between the print timing signal and

the home signal due to backlashes in the transmission system such as the gears 9 to 23 shown in Fig. 1 may correspond to an interval of about + 10 pulses of the print timing signal. Thus, if the falling edge of the home signal H is shifted to a position of H' as shown in Fig. 12 (2), then the printing operation will start from a pulse P', and if the falling edge of the home signal H is shifted to a position H'', the printing operation will be started from a pulse P''. The phase difference caused by the backlash thus results in different print starting positions for different lines, so the line may be one dot ahead or behind the reference print starting position initially selected, as shown in Fig. 13. This gives the printed characters an unsightly appearance.

CLAIMS

1. An impact type dot printer comprising: a rotatable platen;
a printing head movable from a home position in increments in
a direction parallel to the axis of the platen for forming
5 dot-matrix characters on a recording medium positioned between
the platen and the head; means for producing a print timing
signal in synchronism with rotation of the platen, the signal
comprising a plurality of pulses and a pulse-free blank; means
for producing a home signal when the printing head is moved
10 away from the home position; counting means for counting the
pulses of the print timing signal from the production of the
home signal until the arrival of the first pulse-free blank
during a pre-spacing operation and during a normal printing
operation; storage means for storing data related to a phase
15 relationship between the print timing signal and the home signal
on the basis of the number of pulses counted during the
pre-spacing operation; and means for setting a print starting
position in dependence upon a comparison of the stored data
and the number of pulses counted during a printing operation.
- 20 2. A printer as claimed in claim 1 in which the pre-spacing
operation is effected automatically after the printing head
has been actuated.
3. A printer as claimed in claim 1 or 2 in which the platen
has a plurality of angularly spaced projections around the
25 periphery thereof, the projections extending along the
longitudinal axis of the platen.
4. A printer as claimed in claim 3 in which the printing head
comprises a print hammer which is actuatable to strike the
projections of the platen.



5. A printer as claimed in any preceding claim in which the means for producing a print timing signal comprises a wheel which rotates with the platen and which carries a plurality of indications around the periphery thereof corresponding to the pulses of the print timing signal.
6. A printer as claimed in claim 4 in which the wheel carries 27 equally spaced indications with a gap which corresponds to 3 indications between the first and last indication.
7. An impact type dot printer substantially as herein before described with reference to and as shown in figures 1 to 7 of the accompanying drawings.
8. A method of determining a print starting position for an impact type dot printer comprising a rotatable platen, a printing head movable from a home position in increments in a direction parallel to the axis of the platen for forming dot-matrix characters on a recording medium positioned between the platen and the head, the method comprising the steps: producing a print timing signal in synchronism with the rotation of the platen, the signal comprising a plurality of pulses and a pulse-free blank; producing a home signal when the printing head is moved away from the home position; counting the pulses of the print timing signal from the production of the home signal until the arrival of the first pulse-free blank during a pre-spacing operation; storing data related to a phase relationship between the print timing signal and the home signal on the basis of the number of pulses counted during the pre-spacing operation; counting the pulses of the print timing signal from the production of the home signal until the arrival of the first pulse-free blank during a printing operation, and setting a print starting position for the printing operation in dependence upon a comparison of the stored data and the latter count.



9. A method of determining a print starting position for an impact type dot printer substantially as herein before described with reference to figures 8 and 9 of the accompanying drawings.

10. A method of determining print starting positions for an impact type dot printer including a rotatable platen having a plurality of axial projections and a printing head movable from a home position in spacing increments along the platen and having a print hammer actuatable to hit the projections one at a time to print dot-matrix characters on a recording medium between the platen and the print hammer, said method comprising the steps of: generating a print timing signal in synchronism with rotation of the platen, said print timing signal being indicative of positions in which the print hammer strikes the projections and composed of a pulse-free blank and a plurality of subsequent pulses in one cycle; moving the printing head from the home position for pre-spacing prior to a normal printing operation; generating a home signal when the printing head leaves the home position; counting the number of pulses of said print timing signal until a first pulse-free blank arrives while the printing head is moved for pre-spacing; storing data on a phase relationship between said print timing signal and said home signal based on the counted number of pulses; counting the number of pulses of said print timing signal generated after the printing head has left the home position until the first pulse-free blank arrives each time the printing head is moved in spacing increments for normal printing operations; and setting print starting positions based on said stored data and said last-mentioned number of pulses as counted.

