

## Description

The invention relates to a non-impact dot matrix printer comprising a print head of the ink jet type, mounted on a movable carriage and comprising an ink container of elongated form, and fixing means arranged to hold the container on the carriage.

Such a printer is known from DE 2 856 581 but the ink container is fixed on to the carriage by means which do not allow easy replacement. Since the ink is a consumable it is necessary to replace the container from time to time and the object of the invention is to provide a printer of the above type in which the ink container is easily replaceable.

This object is met by the printer according to the invention, which is characterized in the manner set out in claim 1.

The invention will be described in more detail, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a partial plan view of a first embodiment of the printer according to the invention;

Fig. 2 is a sectional view according to line IV—IV of Fig. 1 to an enlarged scale;

Fig. 3 is a longitudinal section on the line III—III of Fig. 1 to an enlarged scale;

Fig. 4 is a longitudinal section through a second embodiment of a printer according to the invention;

Fig. 5 is a frontal view of a detail of Fig. 4.

With reference to Figs. 1 and 3, a casing 10 having walls 11b, 11c, 11d and a bottom 12 encloses all the component parts of the printer according to the invention. A D.C. motor 15 is contained in a housing 18, with its axis of rotation vertical. A vertical shaft 22 is formed integrally with a cover 20, and on it there rotates a pulley 23 formed of a hub 23 and the cylindrical parts 25 and 26 connected to the hub 24 through spokes 27.

On the upper part 25 a variable pitch thread 28 is provided, whereas on the lower part 26 there is provided straight toothing 29 with which there engages a toothed belt 30, which also engages with a sprocket wheel 31 of the shaft 32 of the motor 15.

A carriage 48 can slide on two parallel cylindrical guides 50 and 51 fixed to the casing 10. The carriage 48 is formed from a lower member 52, of elongated form transverse to the guides 50 and 51, which is rigidly connected to a support 53 elongated in a direction parallel to the guides 50 and 51.

In the lower member 52 of the carriage 48 there is provided a rectilinear slot 54 perpendicular to the guides 50 and 51, and the support 53 is rigid with two slide blocks 55 and 56 slidable on the guide 50. An aperture 62 in which the guide 51 passes is provided at one end 60 of the lower member 52.

A disc 65 rotates on the free upper end of the shaft 22, supported by a collar 66 forming part of a rib 67 on the inside of the casing. The disc

65 is rotated by the pulley 23 by means of two pegs 68 rigid with the pulley 23.

A peg 70 with a vertical axis is fixed on the disc 65 near to its outer edge, and engages in the slot 54, so that the rotation of the disc 65 reciprocates the carriage 48 along the guides 50 and 51 with harmonic motion.

A circular slot 71 is provided in the lower face 72 of the disc 65 and is offset eccentrically by 180° with respect to the peg 70.

A slider 90 is slidable on transverse guides 91 secured to the casing 10 and is provided with a peg 92, engaging the groove 71.

The slider 90 is also provided with additional masses 93, constituted by lead blocks, in order to balance the action of the mass of the carriage 48 on the disc 65.

The carriage 48 is also provided with a metal blade 128 having two sets of rectangular equidistant slots 130 and co-operating with a printed circuit board 120 for generating synchronizing signals. Particularly the circuit 120 is fixed to a rib 121 of the casing 10 and carries a track 122 in form of a double comb, constituted by a pair of longitudinal strips 123 each one connecting a plurality of arms 124 having a width L and spaced by a pitch P.

As it has been already described the counterweight slider 90 is weighted by slugs 93 so as substantially to cancel out the inertial forces of the reciprocating carriage.

A platen 80 of material having a high coefficient of friction, for example rubber, is rigid with a shaft 81, rotatable in the casing 10. The plate 80 supports and entrains a strip of plain paper 82 on which the printing is to be carried out. On the shaft 81 there is keyed a toothed pulley 84 about which a toothed belt 86 is entrained. The belt is also entrained about a toothed pulley 88 rotatable on a shaft 34, and rigid with a helical gear 35 engaged with the thread 28. This latter includes a pair of portions B (only one being shown in Fig. 3) which are inclined by an angle  $\alpha$  and are interleaved with three longitudinal portions A, C and E. The head 28 is thus adapted to control the line spacing of the paper at a predetermined time with respect to the transverse movements of the carriage 48.

A resilient metal strip 89 fixed to the casing 10, partly wraps about the platen 80 in order to guide and press the paper against the platen 80 and to constitute an electrode in the manner described hereinafter.

In the top of the carriage 48 there are fixed two forks 95 and 96 (Figs. 3, 4) between which a container or tube 100 of heat-resistant insulating material, for example, glass, quartz, ceramic material or a heat-resistant resin gripped, being snapped into seats in the fork under pressure. The tube 100 is positioned perpendicularly to the roller 80 and contains a cylindrical rod 102 of ink composed of a solid mixture of powdered graphite and a resin binder as described in our published British patent specification No. 2 014 514.

The end wall 105 facing the platen 80 has an orifice of small diameter bore 106. The rod 102 is kept pressed against the end wall 105 by a metal spring 107 retained by a substantially cylindrical metal cap 110 fitting over the tube 100 and fixed so that it closes the other open end 112 of the tube 100.

A leaf spring 115, fixed to the carriage 48, has two resilient arms 116 and 117 disposed perpendicularly to each other, so that the arm 116 presses on to the cap 110 to hold it in the closed position, and the arm 117 slides on the guide 51 in order to electrically connect the ink rod 102 to the metal guide 51. In order to be able to easily replace the tube 100 when its ink has run out, a grip 103 in the form of a plastics saddle of length equal to the distance between the forks 95 and 96 and insertable between them, is fixed on to the tube 100 in a central position.

In operation, a high voltage generator is selectively operable to apply pulses to the ink rod via the spring 115, the cap 110 and the spring 107, the pulses being negative with respect to the counter electrode 89. The counter electrode is in the form of a fixed plate and, as is apparent from Fig. 1 of the drawings, it extends along the platen 80 over a length at least equal to the stroke of the carriage 48.

In a second embodiment of the invention, the peg 70 is carried by a disc 276 (Figs. 4 and 5) rotatable about a vertical axis and connected to the counterweight 90 to balance the carriage inertia force so that the carriage moves transversely with reciprocating harmonic movement substantially in the manner heretofore described.

The printing head is operated by a strobe signal obtained by an optical transducer 250 constituted by a light emitting diode 252, a phototransducer 254 and a strobe disc 256 provided with slots in proximity to its periphery. The strobe disc 256 is fixed to a wheel 262 provided with a hollow hub 264 and rotatable on a bush 66 in one piece with a horizontal rib 66' of the casing 10. A backing disc 265 is a tight press fit on to the hub 264 in order to lock the strobe disc 256, which also carries a ring gear 269 with which the toothed belt 30 engages.

Inside the hollow hub 264 there is mounted a pin 274 rigid with the disc 276 provided with a scroll or thread 277 on its lateral surface 278. The scroll 277 engages with a wheel 280 comprising front pegs 281 and which rotates on a shaft 282 parallel to the printing platen 80. The wheel 280 transmits motion to the platen 80 by way of two pairs of gears 283, 284, 285 and 286 (Fig. 4), of which the gear 286 is connected to the shaft 81 of the platen 80 by way of a unidirectional clutch, not shown.

In order to make the insertion of the head tube 100 between two resilient forks 95, 96 easier, a leaf spring 316 is provided, fixed to the ends 60 of the carriage 48 and formed with two

arms 317, 318 perpendicular to each other. The arm 317 is bent to form a loop 319 and a straight portion 320 lying below the metal cap 110, the outer surface of which is curved, while the bent end of the arm 318 is forced resiliently against the metal guide 51 to constitute a sliding contact. When the tube 100 is inserted between the forks 95, 96, the cap 110 comes into contact with the portion 320 of the spring 316.

## Claims

1. A non-impact dot matrix printer comprising a print head of the ink jet type, mounted on a movable carriage and comprising an ink container of elongated form, and fixing means arranged to hold the container on the carriage, characterised in that the fixing means comprise two spaced, resilient forks (95, 96) fixed to the carriage (48), and a grip (103) rigid with the container and by means of which the container (100) can be inserted between and extracted from the forks, by manual force on the grip.

2. A printer as claimed in claim 1, characterised in that the grip (103) is fixed on to the central zone of container (100) and is disposed between the forks (95, 96) when the container is mounted on the forks.

3. A printer as claimed in claim 1 or 2, comprising a high voltage generator which can be selectively operated to apply pulses to the ink which are negative with respect to a counter-electrode, characterised in that the fixing means also comprise an electrically conducting resilient element (115) which is fixed on to the carriage (48) and effects connection from the generator to the ink.

4. A printer as claimed in claim 3, in which the container is of insulating material and comprises a terminal portion, at the opposite end to the print platen, which is of conducting material and is in contact with the ink, characterised in that the resilient element (115) is disposed below the container (100) and is arranged to engage the said terminal portion (110) to make the connection effective only when the container is mounted on the carriage (48).

5. A printer as claimed in claim 4, characterised in that the resilient element (115) comprises a first part (318) which permanently slides on a metal guide (51) of the carriage connected electrically to the generator, and a second part (316) having a horizontal portion (317) in contact with the container only when the latter is mounted on said carriage.

6. A printer as claimed in claim 4 or 5, wherein the terminal portion comprises a cap, characterised in that the cap (110) is closed by an end wall arranged to co-operate with the resilient element (116) which acts in the direction of the container axis.

7. A printer as claimed in claim 4 or 5, wherein the terminal portion comprises a cap, characterised in that the cap (110) has an outer



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The end wall 105 facing the platen 80 has an orifice of small diameter bore 106. The rod 102 is kept pressed against the end wall 105 by a metal spring 107 retained by a substantially cylindrical metal cap 110 fitting over the tube 100 and fixed so that it closes the other open end 112 of the tube 100.

A leaf spring 115, fixed to the carriage 48, has two resilient arms 116 and 117 disposed perpendicularly to each other, so that the arm 116 presses on to the cap 110 to hold it in the closed position, and the arm 117 slides on the guide 51 in order to electrically connect the ink rod 102 to the metal guide 51. In order to be able to easily replace the tube 100 when its ink has run out, a grip 103 in the form of a plastics saddle of length equal to the distance between the forks 95 and 96 and insertable between them, is fixed on to the tube 100 in a central position.

In operation, a high voltage generator is selectively operable to apply pulses to the ink rod via the spring 115, the cap 110 and the spring 107, the pulses being negative with respect to the counter electrode 89. The counter electrode is in the form of a fixed plate and, as is apparent from Fig. 1 of the drawings, it extends along the platen 80 over a length at least equal to the stroke of the carriage 48.

In a second embodiment of the invention, the peg 70 is carried by a disc 276 (Figs. 4 and 5) rotatable about a vertical axis and connected to the counterweight 90 to balance the carriage inertia force so that the carriage moves transversely with reciprocating harmonic movement substantially in the manner heretofore described.

The printing head is operated by a strobe signal obtained by an optical transducer 250 constituted by a light emitting diode 252, a phototransducer 254 and a strobe disc 256 provided with slots in proximity to its periphery. The strobe disc 256 is fixed to a wheel 262 provided with a hollow hub 264 and rotatable on a bush 66 in one piece with a horizontal rib 66' of the casing 10. A backing disc 265 is a tight press fit on to the hub 264 in order to lock the strobe disc 256, which also carries a ring gear 269 with which the toothed belt 30 engages.

Inside the hollow hub 264 there is mounted a pin 274 rigid with the disc 276 provided with a scroll or thread 277 on its lateral surface 278. The scroll 277 engages with a wheel 280 comprising front pegs 281 and which rotates on a shaft 282 parallel to the printing platen 80. The wheel 280 transmits motion to the platen 80 by way of two pairs of gears 283, 284, 285 and 286 (Fig. 4), of which the gear 286 is connected to the shaft 81 of the platen 80 by way of a unidirectional clutch, not shown.

In order to make the insertion of the head tube 100 between two resilient forks 95, 96 easier, a leaf spring 316 is provided, fixed to the ends 60 of the carriage 48 and formed with two

arms 317, 318 perpendicular to each other. The arm 317 is bent to form a loop 319 and a straight portion 320 lying below the metal cap 110, the outer surface of which is curved, while the bent end of the arm 318 is forced resiliently against the metal guide 51 to constitute a sliding contact. When the tube 100 is inserted between the forks 95, 96, the cap 110 comes into contact with the portion 320 of the spring 316.

# Claims

1. A non-impact dot matrix printer comprising a print head of the ink jet type, mounted on a movable carriage and comprising an ink container of elongated form, and fixing means arranged to hold the container on the carriage, characterised in that the fixing means comprise two spaced, resilient forks (95, 96) fixed to the carriage (48), and a grip (103) rigid with the container and by means of which the container (100) can be inserted between and extracted from the forks, by manual force on the grip.

2. A printer as claimed in claim 1, characterised in that the grip (103) is fixed on to the central zone of container (100) and is disposed between the forks (95, 96) when the container is mounted on the forks.

3. A printer as claimed in claim 1 or 2, comprising a high voltage generator which can be selectively operated to apply pulses to the ink which are negative with respect to a counter-electrode, characterised in that the fixing means also comprise an electrically conducting resilient element (115) which is fixed on to the carriage (48) and effects connection from the generator to the ink.

4. A printer as claimed in claim 3, in which the container is of insulating material and comprises a terminal portion, at the opposite end to the print platen, which is of conducting material and is in contact with the ink, characterised in that the resilient element (115) is disposed below the container (100) and is arranged to engage the said terminal portion (110) to make the connection effective only when the container is mounted on the carriage (48).

5. A printer as claimed in claim 4, characterised in that the resilient element (115) comprises a first part (318) which permanently slides on a metal guide (51) of the carriage connected electrically to the generator, and a second part (316) having a horizontal portion (317) in contact with the container only when the latter is mounted on said carriage.

6. A printer as claimed in claim 4 or 5, wherein the terminal portion comprises a cap, characterised in that the cap (110) is closed by an end wall arranged to co-operate with the resilient element (116) which acts in the direction of the container axis.

7. A printer as claimed in claim 4 or 5, wherein the terminal portion comprises a cap, characterised in that the cap (110) has an outer

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cur surface arranged to co-operate with the resilient element (317) which acts in a radial direction with respect to the container (100).

8. A printer according to any preceding claim, wherein the ink is in the form of a solid rod, the carriage is movable parallel to a paper support platen, and the printer comprises a high voltage generator which can be selectively operated in order to apply negative pulses to the solid ink, and a counter-electrode connected to the positive pole of the generator, characterised in that the counter-electrode (89) is situated between the container (100) and the platen (80).

9. A printer as claimed in claim 8, characterised in that the counter-electrode is formed from a fixed plate (89) parallel to the platen (89) and having a length equal at least to the stroke of the carriage (48).

#### Revendications

1. Une imprimante à matrice de points sans percussion qui comprend une tête d'impression du type à jet d'encre montée sur un chariot mobile et comprenant un réservoir d'encre de forme allongée et des moyens de fixation agencés pour maintenir le réservoir sur le chariot, caractérisée en ce que les moyens de fixation comprennent deux fourches élastiques espacées (95, 96) fixées au chariot (48) et un organe de préhension (103) solidaire du réservoir et au moyen duquel on peut introduire le réservoir (100) entre les fourches et l'extraire d'entre les fourches en exerçant une force manuelle sur l'organe de préhension.

2. Une imprimante telle que revendiquée dans la revendication 1, caractérisée en ce que l'organe de préhension (103) est fixé sur la zone centrale du réservoir (100) et est disposé entre les fourches (95, 96) lorsque le réservoir est monté sur les fourches.

3. Une imprimante telle que revendiquée dans la revendication 1 ou 2, comprenant un générateur haute tension qui peut être sélectivement actionné pour appliquer à l'encre des impulsions qui sont négatives par rapport à une contre-électrode, caractérisée en ce que les moyens de fixation comprennent également un élément élastique (115) électriquement conducteur qui est fixé au chariot (48) et assure la connexion entre le générateur et l'encre.

4. Une imprimante telle que revendiquée dans la revendication 3, dans laquelle le réservoir est en une matière isolante et comprend, à l'extrémité opposée à celle proche du rouleau d'impression, une partie terminale qui est en une matière conductrice et est en contact avec l'encre, caractérisée en ce que l'élément élastique (115) est disposé au-dessous du réservoir (100) et est agencé pour être en appui contre ladite partie terminale (110) de façon à n'établir effectivement la connexion que lorsque le réservoir est monté sur le chariot (48).

5. Une imprimante telle que revendiquée

dans la revendication 4, caractérisée en ce que l'élément élastique (115) au-comprend une première partie (318) qui coulisse en permanence sur un guide métallique (51) du chariot connecté électriquement au générateur et une seconde partie (316) qui comporte une partie horizontale (317) qui n'est en contact avec le réservoir que lorsque ce dernier est monté sur ledit chariot.

6. Une imprimante telle que revendiquée dans la revendication 4 ou 5, dans laquelle la partie terminale est constituée par un capuchon, caractérisée en ce que la capuchon (110) est fermé par une paroi d'extrémité agencée pour coopérer avec l'élément élastique (116) qui agit dans la direction de l'axe du réservoir.

7. Une imprimante telle que revendiquée dans la revendication 4 ou 5, dans laquelle la partie terminale est constituée par un capuchon, caractérisée en ce que le capuchon (110) a une surface extérieure incurvée agencée pour coopérer avec l'élément élastique (317) qui agit dans une direction radiale par rapport au réservoir (100).

8. Une imprimante selon une quelconque revendications précédentes dans laquelle l'encre se présente sous la forme d'un bâton solide, et dans laquelle le chariot est mobile parallèlement à un rouleau support de papier, l'imprimante comprenant un générateur haute tension qui peut être sélectivement actionné afin d'appliquer des impulsions négatives à l'encre solide, et une contre-électrode connectée au pôle positif du générateur, caractérisée en ce que la contre-électrode (89) est située entre le réservoir (100) et le rouleau (80).

9. Une imprimante telle que revendiquée dans la revendication 8, caractérisée en ce que la contre-électrode est formée par une plaque fixe (89) parallèle au rouleau (89) et ayant une longueur égale au moins à la course du chariot (48).

#### Patentansprüche

1. Nichtanschlagender Punkt-Matrixdrucker, der einen Druckkopf mit Farbstoff-düse, der auf einem bewegbaren Schlitten befestigt ist und einen Farbstoffbehälter von länglicher Form besitzt, sowie eine Befestigungseinrichtung enthält, die so angeordnet ist, daß sie den Behälter auf dem Schlitten hält, dadurch gekennzeichnet, daß die Befestigungseinrichtung zwei beabstandete, elastische Gabeln (95, 96), die auf dem Schlitten (48) befestigt sind, sowie einen Griff (103) enthält, der am Behälter starr befestigt ist und mit dem der Behälter (100) zwischen den Gabeln dadurch eingesetzt oder entfernt werden kann, daß auf den Griff händisch Kraft ausgeübt wird.

2. Drucker gemäß Anspruch 1, dadurch gekennzeichnet, daß der Griff (103) im Mittenbereich des Behälters (100) befestigt und zwischen den Gabeln (95, 96) angeordnet ist, wenn der Behälter an den Gabeln befestigt ist.



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3. Drucker gemäß Anspruch 1 oder 2, der einen Hochspannungsgenerator enthält, der wahlweise in Betrieb gesetzt werden kann, um an den Farbstoff Impulse anzulegen, die zu einer Gegenelektrode negativ sind, dadurch gekennzeichnet, daß die Befestigungseinrichtung weiters ein elektrisch leitendes Federelement (115) enthält, das am Schlitten (48) befestigt ist und eine Verbindung vom Generator zum Farbstoff herstellt.

4. Drucker gemäß Anspruch 3, wobei der Behälter aus Isolierstoff hergestellt ist und an dem der Druckwalze entgegengesetzten Ende einen Anschlußteil besitzt, der aus einem leitenden Material besteht und mit dem Farbstoff in Berührung tritt, dadurch gekennzeichnet, daß das Federelement (115) unterhalb des Behälters (100) vorgesehen und so angeordnet ist, daß es in den Anschlußteil (100) eingreift, um die Verbindung nur dann wirksam zu machen, wenn der Behälter auf dem Schlitten (48) befestigt ist.

5. Drucker gemäß Anspruch 4, dadurch gekennzeichnet, daß das Federelement (115) einen ersten Teil (318), der dauernd auf einer Metallführung (51) des Schlittens gleitet, die elektrisch mit dem Generator verbunden ist, sowie einen zweiten Teil (316) enthält, der einen horizontalen Teil (317) besitzt, der mit dem Behälter nur dann in Berührung steht, wenn dieser auf dem Schlitten befestigt ist.

6. Drucker gemäß Anspruch 4 oder 5, wobei

der Anschlußteil eine Kappe enthält, dadurch gekennzeichnet, daß die Kappe (110) mit einer Stirnwand verschlossen wird, die so angeordnet ist, daß sie mit dem Federelement (116) zusammenwirkt, das in Richtung der Behälterachse wirkt.

7. Drucker gemäß Anspruch 4 oder 5, wobei der Anschlußteil eine Kappe enthält, dadurch gekennzeichnet, daß die Kappe (110) eine gekrümmte Außenfläche besitzt, die so angeordnet ist, daß sie mit dem Federelement (317) zusammenwirkt, das in radialer Richtung zum Behälter (100) wirkt.

8. Drucker gemäß irgendeinem der bisherigen Ansprüche, wobei der Farbstoff in Form einer festen Stange ausgebildet ist, der Schlitten parallel zur Papiertransportwalze bewegt werden kann und der Drucker einen Hochspannungsgenerator, der wahlweise in Betrieb gesetzt werden kann, um an den festen Farbstoff negative Impulse anzulegen, sowie eine Gegenelektrode enthält, die mit dem positiven Pol des Generators verbunden ist, dadurch gekennzeichnet, daß die Gegenelektrode (89) zwischen dem Behälter (100) und der Gegendruckwalze (80) angeordnet ist.

9. Drucker gemäß Anspruch 8, dadurch gekennzeichnet, daß die Gegenelektrode von einer festen Platte (89) gebildet wird, die parallel zur Gegendruckwalze (80) liegt und eine Länge besitzt, die zumindest gleich dem Hub des Schlittens (48) ist.

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