

METHOD FOR DOT PRINTING ON CARDS**DESCRIPTION**

The present invention refers to a method for dot printing on cards.

In particular, the invention can be used for printing on cards made of plastic material such as, for example,
5 credit cards, smart cards, magnetic cards, etc.

As known, these cards usually bear signs, images, trademarks, that help the users to identify the purpose of the card and to distinguish each card from the others. The Applicant has found that, in order to obtain
10 satisfactory results from the printing process, it is important that the position of the card to be printed is precisely determined, so that the ink ejected by the printhead lands exactly on the expected spot on the card's surface and, step by step, a correct printing is
15 performed.

In particular, the Applicant has verified that it is important that the card to be printed is precisely positioned on the support carriage that moves the card inside the printer and brings it to a suitable position
20 at the printing station.

In view of the above, it is an object of the present invention to provide a method for dot printing on cards that is capable of properly positioning the card with respect to the printing station that executes the
25 printing process.

It is another object of the present invention to provide a method for dot printing on cards that is capable of properly positioning the card to be printed on the support carriage in a simple and quick manner.

30 It is another object of the present invention to provide a method for dot printing on cards that can be executed

with a structure that is simple and has reduced overall dimensions.

These and other objects are achieved by a dot printer for printing on cards according to the claims appended
5 hereto.

Further features and advantages will be apparent from the description of a non-exclusive and preferred embodiment of the invention.

The description is provided for herebelow with reference
10 to the attached drawings, wherein:

- figure 1 is a schematic perspective view of a printer by means of which the method according to the invention can be carried out;
- figures 2-5 are schematic perspective views of portions
15 of the printer of figure 1;
- figure 6 is a schematic diagram showing possible operative configurations of the printer of claim 1;
- figure 7 is a schematic cross section view of portion of the printer of figure 1;
- 20 - figures 8 and 9 are schematic perspective views of details of the printer of figure 1;
- figures 10a-10c schematically show a succession of operative conditions of the printer of figure 1;
- figures 11a-11b schematically show two different
25 operative configurations of a portion of the printer of figure 1.

In the attached drawings, reference numeral 1 indicates a dot printer by means of which the method according to the present invention can be performed.

30 The method according to the invention is suitable for dot printing on cards like credit cards, smart cards, magnetic cards, etc.

Preferably, the method according to the invention is a

method for ink-jet printing on cards.

The printer 1 (figure 1) preferably comprises a storage zone 10 wherein one or more cards are stored.

5 Preferably the cards include, or are made of, a thermoplastic material.

In particular, the thermoplastic material can be selected in the group comprising: polyvinylchloride (PVC); polyvinylchloride (PVC) filled with mineral fillers; laminate polyvinylchloride (PVC); acrylonitrile-
10 butadiene-styrene (ABS) terpolymers; polyethyleneterephthalate (PET); glycol containing polyethyleneterephthalate (PET-G); polylacticacid (PLA).

The laminate polyvinylchloride is formed by a central layer of polyvinylchloride filled with mineral fillers,
15 and a couple of transparent polyvinylchloride films applied each on a respective surface of the central layer.

Preferably the cards have a substantially plate-like shape, having a substantially rectangular shape in a
20 plant view; the rectangular shape has a larger side and a smaller side.

Preferably the larger side has a length comprised between 80mm and 90mm, and in particular substantially equal to 85.7mm.

25 Preferably the smaller side has a length comprised between 50mm and 60mm, and in particular substantially equal to 54mm.

Preferably the plate-like shape has a thickness comprised between 0.4mm and 0.8mm, and in particular between 0.5mm
30 and 0.76mm.

Preferably the printer 1 (figure 1) comprises an extraction station or picking station 20 adapted to extract a card 11 from the storage zone 10.

Preferably, the extraction station 20 is provided on a base structure 2, that will be disclosed in detail in the following.

The extraction station 20 picks one card at a time from
5 the storage zone 10 and places it on a support carriage 40.

The extraction station 20 (figures 2, 5) has an output 20a, through which the card 11 is output from the extraction station 20.

10 In a preferred embodiment, the extraction station 20 comprises a plurality of rollers, that act on the card 11 in order to move the same from the storage zone 10 to the output 20a of the extraction station 20.

Due to the action of such rollers, the card 11 is placed
15 on a support carriage 40.

The carriage 40 comprises (figures 1, 3) a plate-like element 48, on which the card 11 is positioned.

Preferably, the plate like-element 48 has a shape, in a plant view, similar to that of the card 11.

20 For example, the plate like-element 48 can have a substantially rectangular shape, having a larger side comprised between 75mm and 85mm, and in particular substantially equal to 80mm, and a smaller side comprised between 45mm and 55mm, and in particular substantially
25 equal to 50mm.

It is to be noted that the card 11 is preferably larger than the plate-like element 48. Accordingly, the ink used for printing on the card 11 does not reach the plate-like element 48, since the latter is shielded by the card 11.

30 This feature achieves an advantage in that the plate-like element 48 can be, in practice, a printed circuit board (PCB) including heating means for heating the card 11, that would be damaged by an interaction with the ink.

Preferably, the printer 1 comprises a base structure 2, that has a substantially plate-like shape. When the printer 1 is in use condition, the base structure 2 is arranged in a substantially horizontal position, i.e. substantially parallel to the ground.

Preferably the carriage 40 is mounted to and guided by a guide plate 41 (figures 3, 5, 8, 11a-11b). Preferably, the guide plate 41 is mounted on the base structure 2.

Preferably, the carriage 40 has a first end and a second end 140a, 140b (figures 5, 11b). The first end 140a is slidably and rotatably mounted with respect to the guide plate 41; in particular the first end 140a is slidably and rotatably mounted on a rod 45 fixed to the plate 41 (figure 5); the second end 140b is slidably mounted on the guide plate 41.

As schematically shown in figures 11a-11b, the plate-like element 48 is rigidly mounted on a first support element 141 and a second support element 142, that are arranged at the first and second end 140a, 140b of the carriage 40 respectively.

The first support element 141 has an end rigidly connected with the plate-like element 48.

The first support element 141 has also a through aperture 141a for engaging the aforementioned rod 45. Preferably the rod 45 is substantially parallel to the guide plate 41, and has the same longitudinal extension as the guide plate 41.

The second support element 142 has an end rigidly connected with the plate-like element 48, and an opposite end slidably engaged with the guide plate 41.

Preferably, the carriage 40 moves on the guide plate 41 along a substantially rectilinear path P (figures 3, 4).

The path P is transverse, and preferably perpendicular,

to the direction according to which the card 11 is moved when is it output by the extraction station 20.

With respect to the direction according to which the card 11 is moved when is it output by the extraction station 20, the card 11 has a front end FE and a rear end RE, as schematically shown in figure 11a.

Preferably the printer 1 comprises an abutment element 90, that faces the output 20a of the extraction station 20.

10 Preferably the abutment element 90 defines a main abutment surface AA for the card 11.

Preferably, the abutment element 90 has a substantially planar surface 91 defining said main abutment surface AA. In practice, as schematically shown in figure 11a, the abutment element 90 can be a planar element 92.

For example, the planar element 92 can be a plate-like wall, 50mm to 56mm wide, 30mm to 32mm long, 0.8mm to 1.2mm thick.

The printer 1 further comprises an abutment structure 20 100, comprising a first abutment portion 110 and a second abutment portion 120 (figures 5, 9, 10a-10c).

The first abutment portion 110 defines a first abutment surface A1 for the card 11. The second abutment portion 120 defines a second abutment surface A2 for the carriage 25 40.

The first abutment surface A1 is parallel to the second abutment surface A2 and offset from said second abutment surface A2 by a first distance d1.

Preferably the main abutment surface AA is transverse, and in particular perpendicular, to the first and second abutment surfaces A1, A2.

30 Preferably the first abutment surface A1 is a substantially planar surface.

Preferably the second abutment surface A2 is a substantially planar surface.

Preferably the main abutment surface AA is a substantially planar surface.

- 5 Preferably, the abutment structure 100 comprises a base portion 130, to which the first and second abutment portions 110, 120 are integrally mounted.

In a preferred embodiment, the first abutment portion 110 extends from the base portion 130 by a first height h_1 ,
10 and the second abutment portion 120 extends from the base portion 130 by a second height h_2 .

Preferably, the first height h_1 is larger than the second height h_2 (figure 10b).

Preferably, the base portion 130 is a substantially
15 planar element, as schematically shown in figure 9.

Preferably, the abutment element 90 and the abutment structure 100 are integral with each other, as schematically shown in figure 5.

As schematically shown in figures 5 and 9, the first
20 abutment portion 110 can comprise a couple of pins, protruding from the base portion 130.

In order to receive the card 11, the support carriage 40 is in a first position P1 (figure 6, 10a, 11a), immediately downstream with respect to the output 20a of
25 the extraction station 20.

In particular, in the first position P1, the carriage 40 is interposed between the output 20a of the extraction station 20 and the abutment element 90.

Preferably, in the first position P1, two sides of the
30 plate-like element 48 are substantially parallel to the direction according to which the card 11 is moved when it is output by the extraction station 20.

Preferably, in the first position P1, the other two sides

of the plate-like element 48 are substantially parallel to the main abutment surface AA.

In a preferred embodiment, the longer sides of the plate-like element 48 are parallel to the output direction of the extraction station 20, whereas the shorter sides of the plate-like element 48 are parallel to the main abutment surface AA.

Preferably, in the first position P1, the carriage 40 is arranged side-by-side with the abutment structure 100.

10 Preferably when the carriage 40 is in the first position P1, it is closer to the second abutment portion 120 than to the first abutment portion 110.

Preferably, the plate-like element 48 has a main edge 48a (figure 10a) that has a second distance d2 from the second abutment portion 120 that is larger than the first distance d1, i.e. the distance between the first and second abutment surfaces A1, A2.

Preferably, the main edge 48a of the plate-like element 48 is substantially rectilinear.

20 In the preferred embodiment, the main edge 48a is one of the longer sides of the plate-like element 48, and in particular the one that is closer to the abutment structure 100.

Preferably, the abutment structure 100 is so arranged that the first and second abutment surfaces A1, A2 are substantially parallel to the output direction of the extraction station 20, i.e. the direction in which the card 11 is moved when it is output by the extraction station 20.

30 When the carriage 40 is in the first position P1, it can receive the card 11 from the extraction station 20.

In particular, the card 11 is placed on the plate-like element 48 so that the card 11 extends partly beyond the

main edge 48a, and a main side 11a of the card 11 has a third distance d3 from the main edge 48a that is larger than said first distance d1.

Preferably, the main side 11a of the card 11 is
5 substantially rectilinear.

As schematically shown in figure 10a, a portion of the card 11 is not in contact with the plate-like element 48; such portion is delimited, on one side, by the main side 11a of the card 11.

10 In a preferred embodiment, wherein the card 11 has a substantially rectangular shape, the main side 11a is one of the longer sides of the rectangular shape.

Preferably, when the carriage 40 is in the first position P1, the plate-like element 48 is in a tilted condition
15 (figure 11a), i.e. tilted towards the abutment element 90; in other words, the plate-like element 48 has a larger height, with respect to the base structure 2, at its end facing the output 20a of said extraction station 20, than at its end facing the abutment element 90.

20 Preferably, the higher end of the plate-like element 48 is close to the first end 140a of the carriage 40, and the lower end is close to the second end 140b of the carriage 40.

Preferably, the tilted condition is due to the shape of
25 the guide plate 41 and that of the support elements 141, 142.

In fact, in a preferred embodiment, the guide plate 41 is so shaped that when the carriage 40 is in its first position P1, the plate like element 48 is in the tilted
30 condition.

In particular, the guide plate 41 (figure 8) has a first portion 41a interposed between the output 20a of the extraction station 20 and the abutment element 90, and at

least a second portion 41b at a printing station 50, wherein printing on the card 11 can be performed.

Preferably the first portion 41a of the guide plate 41 is substantially homogeneously planar, i.e. all its parts
5 are arranged at the same height with respect to the base structure 2.

The first and the second support elements 141, 142 have different heights, i.e. maintain the respective ends 140a, 140b of the carriage 40 at different heights with
10 respect to the base structure 2 when the carriage 40 is in the first position P1.

In particular, the second support element 142 is shorter than the first support element 141.

A schematic representation of the carriage 40 in the
15 first position P1 is shown in figures 10a and 11a.

As schematically shown in figure 11a, the second support element 142 is in abutment with a first zone Z1 of the first portion 41a of the guide plate 41.

In view of the above, due to the action of the rollers
20 belonging to the extraction station 20 and the tilted condition of the plate-like element 48, the card 11 is moved in a first direction X1 to reach the abutment element 90, so that the front end FE of the card 11 is in abutment with the abutment element 90.

25 In a preferred embodiment, the first direction X1 is substantially parallel to the longer sides of the card 11, and the front end FE of the card 11 is one of the shorter sides.

Preferably, the main abutment surface AA is the surface
30 substantially perpendicular to the base structure 2 and including the front end FE of the card 11 when the latter is in abutment with the abutment element 90.

Then the method according to the invention comprises a

step of performing a first movement, in a second direction X2, of the carriage 40 towards the abutment structure 100 (figure 10a).

Preferably, the second direction X2 is transverse, and
5 more preferably perpendicular, to the first direction X1. Following the first movement of the carriage 40, first the main side 11a of the card 11 impinges on the first abutment portion 110 and stops at the first abutment surface A1 (figure 10b).

10 Then the main edge 48a of the plate-like element 48 impinges on the second abutment portion 120 and reaches the second abutment surface A2 (figure 10c).

In more detail, in the first movement of the carriage 40, the latter and the card 11 are initially moved together
15 along the second direction X2, until the card 11 stops at the first abutment surface A1. Then the carriage 40 continues the movement in the second direction X2, while the card 11 is maintained still by the first abutment portion 110, until the main edge 48a of the plate-like
20 element 48 reaches the second abutment portion 120.

In practice, during the second part of the first movement, the carriage 40 slides beneath the card 11.

When the first movement is completed, the mutual positioning of the card 11 and the carriage 40, i.e. the
25 plate-like element 48, is mechanically established by the abutment element 90 (along the first direction X1), and by the abutment structure 100 (along the second direction X2).

Preferably, the first abutment surface A1 is a plain
30 substantially perpendicular to the base structure 2 and that includes the main side 11a of the card 11 when the latter is in abutment with the first abutment portion 110.

Preferably, the second abutment surface A2 is a plain substantially perpendicular to the base structure 2 and that includes the main edge 48a of the plate-like element 48 when the latter is in abutment with the second
5 abutment portion 120.

Preferably, while the first movement of the carriage 40 is performed, the card 11, and in particular the front end FE thereof, is kept in abutment with the abutment element 90, so that the mutual positioning of the card 11
10 and the plate-like element 48 along the first direction X1 is maintained while the mutual positioning along the second direction X2 is achieved.

Preferably, after the main edge 48a of the plate-like element 48 has impinged on the second abutment portion
15 120, the method further comprising a step of performing a second movement of the carriage 40 in the second direction X2 for a preset additional path.

This ensures optimal abutment of the carriage 40 and the card 11 with the abutment structure 100.

20 Preferably, the abutment structure 100 is slidably and resiliently coupled to the frame of the printer 1, and in particular to the guide element 41.

Preferably, the abutment structure 100 is slidably engaged with a slot 143 of the guide element 41 (figure
25 5).

A resilient member, such as a spring, for example (not shown) is active on the abutment structure 100 so as to allow movement of the abutment structure 100 between a first position, wherein it receives the card 11 and the
30 carriage 40, and a second position, reached after performing said preset additional path, which is the actual end of stroke. After the carriage 40 has moved to the printing station 50, the abutment structure 100 is

brought back to the first position by the resilient member.

For example, the preset additional path can be 20mm to 30mm long.

- 5 The method according to the invention further comprises performing a main movement of the carriage 40 for bringing the card 11 to the printing station 50.

Preferably, the main movement is performed after the first movement, and in particular after the second
10 movement.

The main movement is performed along the rectilinear path P of the carriage 40 on the guide plate 41, in a direction opposite to the second direction X2.

In other terms, the main movement causes the carriage 40
15 to move away from the abutment structure 100.

The main movement brings the carriage 40 in a second position P2, wherein the card 11 card undergoes a printing process by the printing station 50.

Preferably, when the carriage 40 is in its second
20 position P2, the plate-like element 48 is substantially parallel to the base structure 2.

Preferably, when the carriage 40 is in its second position P2, it is at the second portion 41b of the guide element 41.

- 25 In particular, when the carriage 40 is in its second position P2, the plate-like element 48 is substantially parallel to the second portion 41b of the guide plate 41 (figure 11b).

The second portion 41b of the guide plate 41 includes a
30 second zone Z2, which the second support element 142 is in abutment with when the carriage 40 is in the second position P2.

The second zone Z2 is arranged at a higher height than

the first zone Z1 with respect to the base structure 2.

When the carriage 40 is in the second position P2, the rod 45 supports the first support element 141, and the second zone Z2 supports the second support element 142.

5 Preferably, the difference in height between the second zone Z2 and the remaining part of the second portion 41b of the guide plate 41 is substantially equal to the difference in length between the first and the second support elements 141, 142. Likewise, as mentioned above,
10 when the carriage 40 is in the second position P2, the plate-like element 48 is substantially horizontal, i.e. substantially parallel to the base structure 2.

Preferably, the guide plate 41 comprises a transition zone TZ (figure 8), interposed between the first zone Z1
15 and the second zone Z2, so that the height with respect to the base structure 2 gradually changes.

For example, the height difference between the first zone Z1 and the second zone Z2 is comprised between 10mm and 15mm.

20 For example, the length of the transition zone TZ, determined on a plane parallel to the base structure 2, is comprised between 30mm and 35mm.

The printing station 50 is then activated for dot printing on the card 11.

25 Preferably, the printing station 50 is configured for ink-jet printing.

In particular, the printing station 50 (figure 4) comprises at least an ink-jet printhead 51 for ink-jet printing on the card 11.

30 The printhead 51 is provided with at least a reservoir 52 containing ink. Said ink comprises:

- a medium, or vehicle, consisting of a low-boiling organic solvent;

- an auxiliary solvent consisting of a high-boiling organic solvent;
- a colouring component soluble in said medium or vehicle.

5 In this context and in the following claims, the term "soluble" indicates solubility of at least 10% w/w.

Preferably the vehicle has a boiling temperature lower than 120°C and in particular lower than 80°C.

10 Preferably the vehicle is selected in the group of alcohols.

For example, the vehicle can be ethanol, n-propanol, n-butanol.

15 The vehicle has the tasks of dissolving the various components of the ink and sustaining the formation of the ink bubbles.

Preferably the auxiliary solvent has a boiling temperature higher than 120°C and in particular higher than 150°C.

20 Preferably the auxiliary solvent is able to dissolve or to swell the plastic materials, and in particular the thermoplastic material of which the cards are made.

Preferably the auxiliary solvent is soluble in the vehicle.

25 For example, the auxiliary solvent can be selected in the group comprising: N-methyl-2-pyrrolidone, N-ethyl-2-pyrrolidone, 1,3-dimethyl-imidazolidinone, ϵ -caprolactone, γ -butyrolactone; glycol ethers like: ethylene glycol monomethyl ether, diethylene glycol monobutyl ether, triethylene glycol monomethyl ether, 30 esters like: ethyl lactate, ethyl acetate; or mixtures thereof.

Preferably, the colouring components belongs to the so called Solvent family according to the Colour Index

terminology.

Preferably the colouring component is a substance that is capable of dissolving in the plastic material of which the cards are made, so as to become integral with the
5 cards and to obtain an optimal printing.

For example, the colouring component can be selected in the group comprising: solvent black 29, solvent black 27; solvent blue 67, solvent blue 44, solvent blue 70; solvent yellow 82, solvent yellow 88; solvent red 125,
10 solvent red 122.

Preferably, the ink also comprises one or more additives such as, for example, levelling agents, in order to improve the uniformity of the distribution of the ink on the cards.

15 For example, such additives can include silicon derivatives.

In the preferred embodiment schematically shown in figure 4, the printhead 51 is provided with two reservoirs 52.

The printing station 50 comprises a driving system (not
20 shown) adapted to move the printhead 51 back and forth, along a preset path, so that the printhead 51 can eject ink on the card 11 during a sequence of steps regulated by a properly configured regulation unit.

Preferably the printhead 51 is slidably mounted on a
25 support plate 53. In a preferred embodiment, the support plate 53 is transverse, and preferably perpendicular, to the path P of the carriage 40.

Preferably, in order to secure the card 11 to the plate-like element 48, the printer 1 comprises a suction system
30 70 (figure 7).

Preferably, the suction system 70 comprises a pump means 71, and at least a conduit 72.

The conduit 72 has a first end 72a and a second end 72b.

The first end 72a is connected with the pump means 71.

The second end 72b is engaged with the plate-like element 48 of the carriage 40.

Preferably the plate-like element 48 has one or more
5 through holes 49 for allowing said suction 70 system to act on said card 11.

In practice, the suction action generated by the pump means 71 is transmitted to the card 11 through the conduit 72 and the one or more through holes 49 of the
10 plate-like element 48.

Preferably one or more of the one or more through holes 49 have a first portion 49a and a second portion 49b.

The first portion 49a ends on the first surface 148a of the plate-like element 48. The first portion 49a has a
15 cross-section, on a first plain substantially parallel to the planar extension of the plate-like element 48. Such cross-section is referred to as "first cross-section".

The second portion 49b ends on the second surface 148b of the plate-like element 48. The second portion 49b has a
20 cross-section, on a second plain having the same position as (i.e. being distinct from and parallel to) said first plain. Such cross-section is referred to as "second cross-section".

Preferably, the first cross-section is larger than the
25 second cross-section. Advantageously, this improves the suction engagement between the card 11 and the plate-like element 48.

The suction system 70 is particularly advantageous in order to obtain the so-called "borderless printing", i.e.
30 a printing wherein 100% of the card's surface can be actually used.

In fact, by employing the above cited suction system 70, no further grabbing/picking/handling members are

necessary, that would be at least partly interposed between the printhead and the card's surface during the printing operation, thereby preventing the ink to reach the whole surface of the card.

5 Preferably, the suction system 70 is activated after completion of the first movement, and in particular after completion of the second movement.

Preferably, the suction system 70 is activated before carrying out the main movement.

10 Preferably, the suction system 70 is maintained active along all the printing process by the printing station 50.

Preferably, the main movement, the first movement and the second movement of said carriage 40 are performed moving
15 the carriage 40 on the guide plate 41.

Preferably, the above mentioned first position P1 and second position P2 are defined on the guide plate 41.

In order to move the carriage 40 along its path P, the printer 1 comprises a driving motor.

20 Preferably, the driving motor is mounted to and integral with the base structure 2 of the printer 1.

Preferably, the driving motor is mounted at an end E1, E2 of the guide plate 41. End E1 is the one closer to the output 20a of the extraction station 20.

25 More preferably, the driving motor is mounted at the second end E2 of the guide plate 41.

Preferably, the driving motor is connected to the carriage 40 by means of a mechanism comprising a pulley and a belt. The pulley is force fitted on the motor
30 output shaft. The belt is engaged with the pulley and fixed onto the carriage 40.

The carriage 40 is also subject to the action of a resilient member, slidably mounted on the guide plate 41.

Preferably the resilient member comprises an auxiliary pulley and a spring. The auxiliary pulley is engaged with the belt. The spring has a first end engaged with the guide plate 41, and a second end, opposite to said first end, engaged with the auxiliary pulley through a support member.

The resilient member acts along the movement direction of the carriage 40 (i.e. the direction of path P) and, in cooperation with the driving motor, contributes to defining the movement of the carriage 40.

Preferably, the method according to the invention further comprises performing a third movement of the carriage 40, from the second position P2 to a third position P3 (figure 6). The third position P3 is substantially at the second end E2 of the guide plate 51. Thus, the second position P2 is preferably interposed between the first position P1 and the third position P3 along the path P.

When the carriage 40 is in the third position P3, the card 11 can be subject to the action of an ejection station 60. The ejection station is configured to move the card 11 away from the carriage 40 and, preferably, to make it land into a container 63.

As schematically shown in figure 3, the ejection station 60 comprises an ejection roller 61 activated by an activation mechanism 62.

In use, the ejection roller 61 is in contact with the upper surface of the card 11 and, rotating, acts on the card in order to eject the same.

Preferably the activation mechanism 62 is driven by an electro-mechanical actuator, such as an electric motor.

The activation mechanism 62 can comprise a suitable kinematic chain 64 that transfers the rotation of said electric motor to the ejection roller 61.

In a preferred embodiment, the ejection roller 61 and at least a part of the activation mechanism 62 are mounted on a movable plate 65, pivoted to a frame mounted on the base structure 2 of the printer 1. The movable plate 65
5 can be driven between a lower position, wherein it is in contact with the card 11 so as to move the same, and an upper position, wherein it allows the card 11 to reach the ejection station 60 after the printing operation. Preferably, the suction system 70 is maintained active
10 until the third movement is completed. Preferably, the suction system 70 is switched-off after completion of the third movement, before the ejection station 60 is activated. Preferably, the ejection station 60 act along an ejection
15 direction X3, that is transverse, and preferably perpendicular, to the path P of the carriage 40. In the preferred embodiment, the ejection direction is substantially parallel to the first direction X1. In particular, the rotation axis of the ejection roller
20 61 is advantageously parallel with respect to the path P, so as to eject the card 11 along a direction substantially perpendicular with respect to the same path P. In view of the above, the printer 1 can have a
25 substantially "C"-shaped structure, that is schematically shown in figure 6. This "C"-shaped structure comprises: the storage zone 10, the extraction station 20, the guide plate 41, the ejection station 60, and the container 63. The printer 1 preferably comprises a control system 200
30 (schematically shown in figure 6) configured for making the extraction station 20, the carriage 40, the printing station 50, the extraction station 60 carry out the functions described above.

The control system 200 may comprise an electronic processor, programmed so as to manage the working of the printer 1 and components thereof.

5 The control system 200 may further comprise actuators and mechanical connections associated to said processor and properly arranged so as to allow performing of said operations.

Advantageously the control system 200 may further comprise one or more sensors adapted to provide the
10 electronic processor with parameters and data representative of operative conditions of the printer, so that said processor is able to determine the proper action to be undertaken.

The invention achieves important advantages.

15 The method according to the invention allows a proper positioning of the card with respect to the printing station that executes the printing process.

Another advantage consists in that the card to be printed is positioned on the support carriage in a simple and
20 quick manner.

Another advantage consists in that the printer by means of which the method according to the invention is carried out is characterized by a simple structure and reduced overall dimensions.

25

CLAIMS

1. Method for dot printing on cards comprising:

- activating an extraction station (20) for placing a card (11) on a support carriage (40), the carriage (40)
5 including at least a plate-like element (48) for supporting said card (11), said plate-like element (48) having at least a main edge (48a);
 - performing a main movement of said carriage (40) for bringing said card (11) to a printing station (50), said
10 card (11) having at least a main side (11a);
 - activating said printing station (50) for dot printing on said card (11);
- wherein placing said card (11) on said carriage (40) comprises:
- 15 - providing an abutment element (90) facing an output (20a) of said extraction station (20);
 - providing an abutment structure (100), comprising:
 - a first abutment portion (110) that defines a first abutment surface (A1) for said card (11);
 - 20 • a second abutment portion (120) that defines a second abutment surface (A2) for said carriage (40),
the first abutment surface (A1) having a first distance (d1) from said second abutment surface
25 (A2);
 - placing said carriage (40) at a first position (P1), in which said carriage (40) is interposed between the output (20a) of said extraction station (20) and said abutment element (90), and in which said main edge (48a) has a
30 second distance (d2) from said second abutment portion (120) larger than said first distance (d1);
 - placing said card (11) on said plate-like element (48) so that the card (11) extends partly beyond the main edge

(48a) and the main side (11a) has a third distance (d3) from the main edge (48a) that is larger than said first distance (d1);

- moving said card (11) in a first direction (X1) so as
5 to impinge onto said abutment element (90);

- performing a first movement, in a second direction (X2) transverse to said first direction (X1), of said carriage (40) toward said abutment structure (100), so that:

- first the main side (11a) of said card (11)
10 impinges on said first abutment portion (110) and stops at said first abutment surface (A1), and
- then the main edge (48a) of said plate-like element (48) impinges on said second abutment portion (120) and reaches said second abutment
15 surface (A2).

2. Method according to claim 1 further comprising keeping said card (11) in abutment with said abutment element (90) while the first movement is performed.

3. Method according to claim 1 or 2 wherein said abutment
20 element (90) defines a main abutment surface (AA) for said card (11), said main abutment surface (AA) being transverse, and preferably perpendicular, to said first and second abutment surfaces (A1, A2).

4. Method according to claim 3 wherein said abutment
25 element (90) has a substantially planar surface (91) defining said main abutment surface (AA).

5. Method according to anyone of the preceding claims wherein said first and second directions (X1, X2) are perpendicular to each other.

30 6. Method according to anyone of the preceding claims wherein said first abutment surface (A1) is parallel to the second abutment surface (A2).

7. Method according to anyone of the preceding claims

wherein the step of providing said abutment structure (100) comprises:

- providing a base portion (130), to which said first and second abutment portions (110, 120) are integrally mounted.
5

8. Method according to claim 7 wherein said first abutment portion (110) extends from said base portion (130) by a first height (h1), said second abutment portion (120) extends from said base portion (130) by a second height (h2).
10

9. Method according to claim 8 wherein said first height (h1) is larger than said second height (h2).

10. Method according to anyone of the preceding claims wherein said carriage (40) in said first position is closer to said second abutment portion (120) than to said first abutment portion (110).
15

11. Method according to anyone of the preceding claims further comprising, after the main edge (48a) of said plate-like element (48) has impinged on said second abutment portion (120), performing a second movement of said carriage (40) in said second direction (X2) for a preset additional path.
20

12. Method according to anyone of the preceding claims further comprising a step of providing a base structure (2), on which at least said extraction station (20) and printing station (50) are mounted.
25

13. Method according to claim 12 wherein the step of placing said carriage (40) at said first position (P1) comprises tilting said plate-like element (48) in a tilted condition wherein it is tilted towards said abutment element (90), so that that plate-like element (48) has a larger height, with respect to said base structure (2), at its end facing the output of said
30

extraction station (20) than at its end facing said abutment element (90).

14. Method according to anyone of the preceding claims comprising:

- 5 - providing a guide plate (41), having a first portion (41a) interposed between the output of said extraction station (20) and said abutment element (90), and at least a second portion (41b) at said printing station (50);
- slidably mounting said carriage (40) on said guide
10 plate (41),
the first position (P1) of said carriage (40) being defined on said guide plate (41),
the main movement, the first movement and the second movement of said carriage (40) being performed moving
15 said carriage (40) on said guide plate (41).

15. Method according to claim 13 and 14 wherein said carriage (40) has a first end (140a) and a second end (140b),
the first end (140a) is slidably and rotatably mounted
20 with respect to said guide plate (41),
the second end (140b) is slidably mounted on said guide plate (41),
said guide plate (41) being so shaped that:
- when the carriage (40) is in its first position (P1),
25 the plate-like element (48) is in the tilted condition;
- when the carriage (40) is in its second position (P2),
the plate-like element (48) is substantially parallel to the base structure (2).

16. Method according to claims 15 wherein said plate-like
30 element (48) is rigidly mounted on a first support element (141) arranged at the first end (140a) of the carriage (40), and on a second support element (142) arranged at the second end (140b) of the carriage (40).

17. Method according to claim 16 wherein said first support element (141) has an end rigidly connected with the plate-like element (48), and has also a through aperture (141a) for engaging a rod (45) substantially parallel to the guide plate 41.

18. Method according to claim 17 wherein said second support element (142) had an end rigidly connected with the plate-like element (48), and an opposite end slidably engaged with the guide plate (41).

19. Method according to claim 18 wherein the first portion (41a) of the guide plate (41) includes a first zone (Z1), which the second support element (142) is in abutment with when the carriage (40) is in the first position (P1), and the second portion (41b) of the guide plate (41) includes a second zone (Z2), which the second support element (142) is in abutment with when the carriage (40) is in the second position (P2), the first zone (Z1) being arranged at a lower height than the second zone (Z2) with respect to a base structure (2) of the printer (1).

20. Method according to anyone of the preceding claims further comprising:

- providing a suction system (70);
- activating said suction system (70) so as to act on said carriage (40) and said card (11) for securing said card (11) to said plate-like element (48).

21. Method according to claim 20 wherein said plate-like element (48) has one or more through holes (49) through which said suction system (70) acts on said card (11).

22. Method according to claim 21 wherein providing said suction system (70) comprises:

- providing a pump means (71);
- providing at least a conduit (72), having a first end

(72a) engaged with said pump (71), and a second end (72b) engaged with said plate-like element (48) for connecting said through holes (49) with said pump means (71).

23. Method according to anyone of claims 20 to 22 wherein
5 the step of moving said carriage (40) to said printing station (50) is carried out after activation of said suction system (70).

24. Method according to anyone of the preceding claims,
wherein said card (11) has a substantially plate-like
10 shape, having a substantially rectangular shape in a plant view, said rectangular shape having a larger side and a smaller side.

25. Method according to claim 24 wherein said main side (11a) is one between said larger side and shorter side,
15 preferably said larger side.

26. Method according to claim 24 or 25 wherein said larger side has a length comprised between 80mm and 90mm.

27. Method according to anyone of claims 24 to 26 wherein said smaller side has a length comprised between 50mm and
20 60mm.

28. Method according to anyone of claims 24 to 27 wherein said plate-like shape has a thickness comprised between 0.4mm and 0.8mm.

29. Method according to anyone of the preceding claims
25 wherein the main side (11a) of said card (11) is substantially rectilinear.

30. Method according to anyone of the preceding claims wherein the main edge (48a) of said plate-like element (48) is substantially rectilinear.

30 31. Method according to anyone of the preceding claims wherein said first abutment surface (A1) is a substantially planar surface.

32. Method according to anyone of the preceding claims

wherein said second abutment surface (A2) is a substantially planar surface.

33. Method according to anyone of the preceding claims wherein said main abutment surface (AA) is a
5 substantially planar surface.

34. Method according to anyone of the preceding claims wherein said printing station (50) performs an ink-jet printing on said card (11).

35. Dot printer for cards comprising:

- 10 - a carriage (40) including at least a plate-like element (48) for supporting a card (11), said plate-like element (48) having at least a main edge (48a), said card (11) having a main side (11a);
- an extraction station (20) for placing said card (11)
15 on the support carriage (40);
- a printing station (50) for dot printing on said card (11);
- an abutment element (90) facing an output (20a) of said extraction station (20);
- 20 - an abutment structure (100), transversal to said abutment element (90), comprising:
 - a first abutment portion (110) that defines a first abutment surface (A1) for said card (11);
 - a second abutment portion (120) that defines a
25 second abutment surface (A2) for said carriage (40),

the first abutment surface (A1) having a first distance greater than zero (d1) from said second abutment surface (A2); said printer (1) further comprising a control system

30 (200) adapted to:

- control said extraction station (20) to make it place said card (11) on the support carriage (40) so that said card (11) reaches said abutment element (90),

- move said carriage (40) so that the main side (11a) of said card (11) reaches said first abutment surface (A1), and the main edge (48a) of said plate-like element (48) reaches said second abutment surface (A2);
- 5 - move said carriage (40) to said printing station (50).