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EUROPEAN PATENT APPLICATION

21 Application number: **81102746.5**

51 Int. Cl.³: **B 41 J 3/04**
// G01D15/18

22 Date of filing: **10.04.81**

30 Priority: **16.06.80 US 159559**

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43 Date of publication of application: **23.12.81**
Bulletin 81/51

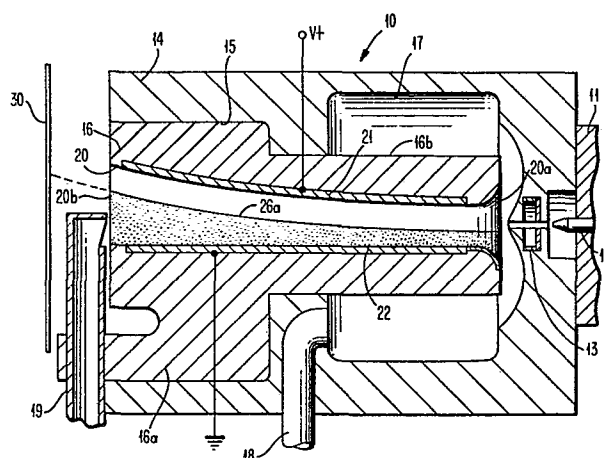
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84 Designated Contracting States: **DE FR GB IT**

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54 **Improved deflection electrode arrangement for an aspirated ink jet printer.**

57 Deflection electrode arrangement (10) for ink jet printer wherein charged ink droplets are deflected by charge deflection electrodes (21, 22) to effect printing, including a tunnel (20) for passage therethrough of air and the stream of ink. Within the tunnel (20) are first (21) and second (22) longitudinally extending deflection electrodes in spaced apart confronting relation for effecting deflection of the charged drops in the ink stream passing therebetween. Electrically conductive continuations (26, 27) of at least one (22) of the deflection electrodes extend towards the other electrode (21) and along the interior of the tunnel (20) so that during start up and shut down of the ink stream, misdirection of drops from the intended stream direction which would normally tend to impact the sidewall of the tunnel (20) will strike the electrically conductive continuations (26, 27) of the deflection electrode (22) thereby accommodating ink drop contamination of the tunnel interior.



IMPROVED DEFLECTION ELECTRODE ARRANGEMENT
FOR AN ASPIRATED INK JET PRINTER

The present invention relates to an aspirated ink jet printer,
and more particularly relates to a deflection electrode arrange-
5 ment for an aspirated ink jet printer.

In U. S. patent 4,097,872, issued on June 27, 1978 is described
an axial ink droplet aspirator for an ink jet printer. The
purpose of an aspirator in an ink jet printer is to inhibit if
not altogether cancel the effects of aerodynamic interaction on
10 the drop (in a continuous type or Sweet type ink jet printer) so
that complex drop interaction algorithms are unnecessary when
printing. In an aspirated printer, the aspirator tunnel which is
positioned downstream of the ink emitting nozzle, may become
coated with electrically conductive ink as a result of ink par-
15 ticles being misdirected upon ink stream start up and shut down.
The electric deflection field geometry is altered by this misdi-
rection and coating, printed drop trajectories are thereby chan-
ged, and the resulting printed characters are distorted. Accord-
ingly, it is desirable to incorporate some means to maintain
20 print quality even in the presence of ink "splatter".

Thus it is a principle object of the present invention to
provide means for maintaining print quality in an aspirated ink
jet despite ink splatter which may occur during ink stream start
up and shut down.

25 The means for accomplishing this described herein is based on an
aspirator configuration with sidewalls that include electrically
conductive and ink absorbing characteristics. The preferred
embodiment of the invention, includes means defining a tunnel
for passage therethrough of air and stream of ink, and first and
30 second longitudinally extending deflection electrodes in spaced
apart confronting relation in the tunnel for effecting deflec-
tion of charged drops in the ink stream passing therebetween,
the improvement comprising ; electrically conductive continua-
tions of at least one of the deflection electrodes extending
35 toward the other electrode and along the interior of the tunnel

so that during start up and shut down of the ink stream, misdirection from the stream direction of a drop which would tend to impact the sidewall of the tunnel will strike the electrically conductive continuations thereby inhibiting ink drop contamination of the tunnel interior.

Other objects and a more complete understanding of the invention may be had by referring to the following specification taken in conjunction with the following drawings.

Fig. 1 is a fragmentary sectional view in side elevation of an ink jet aspirator head assembly including a deflection electro-
arrangement constructed in accordance with the present invention ;

Fig. 2 is a fragmentary perspective view of the tunnel portion of the aspirator assembly illustrated in Fig. 1 and illustrating more clearly the apparatus of the present invention ; and

Fig. 3 is a fragmentary sectional view taken along line 33 of Fig. 2.

Turning now to the drawings and especially Fig. 1 thereof, an aspirator assembly 10 of a continuous type (Sweet type) ink jet printer is illustrated therein. As is conventional, the printer includes a printhead 11 having an outlet nozzle 12 to which ink is applied under pressure so as to produce a stream of ink from the nozzle 12. Within the printhead is means (not shown) to effect a perturbation of the ink at some cyclical rate which perturbrates the stream ejected from the nozzle causing the stream to break up into drops which receive a charge from a charge ring or electrode 13. The ink stream then passes between deflection electrodes 21 and 22, in the present instance mounted interiorly of a tunnel 20. Depending upon the charge placed on the ink drops by the charge electrode 13, the charged droplets will be deflected because of the electric field provided between the deflection electrodes 21 and 22 to effect the printing of indicia or the like on a print receiving medium 30. The

aspirator assembly 10 includes a housing 14 having a cavity 15 therein which cooperates with a core or body portion 16 which carries the tunnel 20 and deflection electrodes 21 and 22. As illustrated, the body portion has an enlarged portion 16a and
5 a reduced portion 16b, the reduced portion forming in conjunction with the cavity 15 a settling chamber 17 for receiving a supply of air through a tube 18 which passes through the housing 14. A blower (not shown) provides a supply of air to the settling chamber 17 to effect air flow entry into the tunnel 20 colinear-
10 ly with the stream of ink droplets, and at approximately the same velocity. A gutter 19, as is conventional in continuous ink stream ink jet printers, is utilized to catch ink drops not being utilized for printing and return the ink to the ink supply system.

15 Referring now to Figs. 1 and 2, the tunnel 20 including the upper deflection electrode 21 and lower deflection electrode 22 conventionally would have the sidewall or walls thereof 23, 24, composed of a ceramic or other insulative material which upon start up and shut down of the ink stream oft times will become contaminated, especially in the area of the dotted lines designated 25,
20 by stray ink contamination. This kind of contamination results in distortion of the electric field intermediate the deflection electrodes because the ink itself is conductive.

In accordance with the invention, electrically conductive
25 continuations 26 and 27, (see Fig. 3) of at least one of the deflection electrodes, in the present instance the deflection electrode 22, extends toward the other or confronting electrode 21 and along the interior of the tunnel 20 so that during start up and shut down of the ink stream, misdirection from the
30 stream direction of a drop which would tend to impact the sidewall of the tunnel, will instead strike the electrically conductive continuations 26 and 27 thereby inhibiting ink drop contamination of the uncovered tunnel interior which otherwise would cause field distortion. The electrically conductive
35 continuations 26 and 27 may be composed of the same material as the deflection electrodes 22, for example of an ink absorbing material such as porous stainless steel. Alternatively, the

electrical continuations may be formed of an electrically conductive thin film, such as a paint or deposited upon the side wall as at 26 and 27 and in contact with the porous or ink absorbing deflection electrode 22.

- 5 As illustrated best in Fig. 2, the tunnel shape is such that a cross section through any portion of the tunnel 20 (perpendicular to the central axis of the tunnel) results in a substantially constant cross sectional area. This is desirable to maintain uniformity of air velocity. Inasmuch as the ink drops
10 are deflected in a vertical plane (in the present instance) the outlet 20b of the tunnel has a greater vertical extent than does the inlet 20a, the height of the tunnel gradually increasing (inlet to outlet) in longitudinal cross section (see Fig. 1) so as to diverge from the inlet to the outlet. Accordingly,
15 the electrical conductive continuations 26 and 27 are preferably also made diverging from the inlet to the outlet so that the space between the upper or vertical terminal edge 26a, 27a of the electrically conductive continuations and the upper deflection electrode 21 is uniform across the longitudinal section.
- 20 It should be recognized (see Fig. 3) that a cross section taken along any part of the tunnel (once again perpendicular to the central axis of the tunnel 20, and again considering the preferred embodiment) will give the lower channel a substantially U-shaped or trough like appearance in cross section.
- 25 In operation, upon start up or shut down of the printer, stray drops will tend to impact the electrically conductive continuations 26 and 27, and if they are composed of the same material as the lower electrode, for example a porous stainless steel, that will tend to absorb the ink. Moreover, even if the ink
30 dries on the electrically conductive continuation, such as if the electrically conductive continuations are painted or deposited, because the continuation is conductive the field formed between the upper electrode 21 and the lower electrode 22 and electrically conductive continuations 26, 27 will remain substantially
35 unchanged regardless of the contamination of the continuations resulting in lower maintenance time (down time of the machine)

and permitting of longer distortion free printing.

Although the invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way example and that numerous
5 changes in the details of construction and the combination and arrangement of parts may be made without departing from the spirit and scope of the invention as hereinafter claimed.

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CLAIMS

1. Deflection electrode arrangement (10) for an aspirated, ink jet printer wherein charged ink drops are deflected by charge deflection electrodes to effect printing, including means defining a tunnel (20) for passage therethrough of
5 air and said stream of ink, and first (21) and second (22) longitudinally extending deflection electrodes in spaced apart confronting relation in said tunnel (20) for effecting deflection of charged drops in said ink stream passing therebetween ; said arrangement being characterized in that
10 it comprises :
 - electrically conductive continuations 26, 27 of at least one of said deflection electrodes (22) extending toward said other electrode (21) and along the interior of
15 said ink stream, misdirection from the stream direction of a drop which would tend to impact the sidewall of the tunnel will strike said electrically conductive continuations thereby inhibiting ink drop contamination of said tunnel interior.
- 20 2. Arrangement in accordance with Claim 1 wherein said continuations (26, 27) and said one electrode (22) form a deflection electrode substantially U-shaped in cross section.
3. Arrangement in accordance with Claim 2 wherein said U-shaped electrode (22) is the lower electrode.
- 25 4. Arrangement in accordance with Claims 1, 2 or 3 wherein said electrically conductive continuations (26, 27) are formed of an ink absorbing material.
5. Arrangement in accordance with any one of Claims 1 to 4
30 wherein said tunnel (20) has substantially the same cross sectional area throughout its longitudinal extent, said tunnel (20) diverging in longitudinal section, said electrically conductive continuations (26, 27) also diverging whereby the height thereof increases along the length of

said tunnel (20).

6. Arrangement in accordance with Claim 5 wherein said electrically conductive continuations (26, 27) have a terminal edge 26a, 27a substantially uniformly spaced from said confronting deflection electrode (21) along the length of said electrical continuations.



European Patent
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EUROPEAN SEARCH REPORT

0042049

EP 81102746.5

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	No. relevant documents have been disclosed.		B 41 J 3/04// G 01 D 15/18
			TECHNICAL FIELDS SEARCHED (Int. Cl.)
			B 41 J 3/00 G 01 D 15/00 G 06 K 15/00
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
X	The present search report has been drawn up for all claims		&: member of the same patent family, corresponding document
Place of search: VIENNA		Date of completion of the search 04-09-1981	Examiner KIENAST