Description

This invention relates to a thermal ink jet print head assembly and a method for making the same.

Thermal ink jet printing has been described in many technical publications, and one such publication relevant to this invention is the Hewlett Packard Journal, Volume 36, Number 5, May 1985.

In a known thermal print head assembly (US-A-4 500 895) a plurality of electrically resistive elements is provided on a common thin film substrate for the purpose of heating a corresponding plurality of adjacent ink reservoirs during the ink ejection and printing process. Using such an arrangement, the adjacent ink reservoirs are typically provided as cavities in a barrier layer above the substrate for properly concentrating thermal energy emanating from the resistive elements to predefined volumes of ink. Also, a plurality of ink ejection orifices are provided above these cavities and provide exit paths for ink during the printing process.

In constructing the above type of printhead assembly, one practice has been to drill vertical holes in a common substrate in order to provide ink flow paths from a common ink reservoir to the individual reservoir cavities within the barrier layer. However, the use of multiple holes (vertical cylindrical channels) in a single substrate possesses several disadvantages. One of these disadvantages is that the boring bit used for drilling holes in the substrate places a substantial pressure on the substrate material and thus can cause fracturing of this material. On the other hand, if laser drilling is utilized, the laser beam will leave channels with fractured side walls as a result of heating, and thus produce a weakened substrate structure.

The per se creation of mulitiple vertical channels in the silicon substrate weakens the printhead structure, and with some types of prior art printhead structures, these channels are used to provide ink flow to a plurality of resistive heater elements located at different distances from the channels. In such a structure, these varying inkflow distances produce corresponding different pressure drops in the ink flow paths. That is, the pressure drop along a liquid ink flow path is proportional to the cube of the distance of the path. This fact has sometimes resulted in pressure drops over large ink flow distances sufficiently great as to prevent adequate vaporization during ink jet propulsion from the ink jet orifice.

Another disadvantage of using small diameter vertical channels to supply ink to the ink reservoirs is that these channels simply do not have the capacity to adequately respond to certain ink volume demands at the required increasingly higher frequencies of operation.

A further disadvantage of using a plurality of ink flow channels in a common substrate is that they normally require a special routing of conductive leads on the substrate surface. In addition to the added costs associated with this special routing, this requirement also greatly reduces the achievable packing density because of the surface area required to accomodate such special routing schemes.

The general problem of this invention is to provide a new and improved ink jet printhead assembly and a method for fabricating the same, which eliminate the above problems associated with the use of drilled holes through a common printhead substrate member particularly to avoid different pressure drops in the ink flow paths.

This problem is solved by a printhead assembly of claim 1 and a method of claim 3.

In an assembly according to the invention a single elongated slot is cut in the substrate and provides ink flow to a plurality of ink reservoirs associated with resistive heater elements formed above the top surface of the substrate. These heater elements are spaced around the periphery of the slot at predetermined distances therefrom. Conductive leads are provided on the substrate between each resistive heater element and external electrical connections, and a barrier layer and orifice plate member covers all of the resistive heater elements and defines a plurality of individual ink reservoirs repectively above each of the resistive heater elements.

The above described slotted geometry structure greatly increases the packing density of heater resistors on the common printhead substrate. This increase in packing density is partially a result of the fact that, in the prior art multiple hole printhead structures, the conductive traces to the individual resistor elements had to be routed around the holes, thus increasing the required substrate area. Thus, by using the elongated slot arrangement of this invention instead of vertical holes in the prior art structures, a packing density increase of 8:1 to 10:1 may be achieved.

After the orifice plate and associated barrier layer member are secured to the thin film substrate, the substrate is die bonded to a header manifold member. This manifold member has an elongated slot therein for passing ink from a well section of the header manifold and through the substrate slot to the individual reservoirs of the barrier layer and orifice plate member.

An important advantage of a printhead assembly of the present invention is an improved packing density for the heater resistors and their associated ink jet orifices and reservoirs.

Another advantage is that according to the method of the invention the printhead assembly is realized by using latest state-of-the-art semicon-

ductor processing techniques.

Still a further advantage of this invention is the provision of improved control of ink flow pressures from a common ink supply source and through a single slot in a thin film resistor structure and then through a common ink flow path simultaneously to a plurality of ink reservoirs in the printhead assembly.

The invention will become more readily apparent from the following description of the accompanying drawing.

Brief Description of Drawings

Figure 1A is an isometric view of the slotted thin film resistor die (substrate) used in a preferred embodiment of the invention.

Figure 2 is an exploded view showing the die placement, the external lead attachment, and the orifice plate attachment steps used in fabricating the complete thermal ink jet printhead assembly in a preferred embodiment of the invention.

Figures 3A and 3B are fragmented and greatly enlarged plan and cross section views respectively, of the novel slot and lateral ink feed sections of the above printhead structure.

Best Mode for Carrying Out the Invention

Referring now to Figure 1, there is shown a thin film resistor substrate 10 for a thermal ink jet printer and including a metal orifice plate 12 thereon. The orifice plate 12 is typically constructed of nickel and includes a plurality of ink ejection openings or nozzles 14 spaced uniformly around the edges of an ink feed slot 16 indicated by the dotted lines in Figure 1.

Referring now Figure 2, the thin film resistor substrate 10 will be mounted on the top, I-beam shaped surface 18 of a header manifold 20. The header manifold 20 will include an ink reservoir (not shown) within the confines thereof which communicates with an ink feed slot 22. The slot 22 is aligned with the ink feed slot 16 in the thin film resistor substrate 10. The header manifold 20 further includes contoured walls 24 which have been shaped to match corresponding contoured walls of an ink jet printer carriage assembly (not shown) for receiving the printhead structure of Figure 2 when completely assembled.

When this printhead structure is completed and all the piece parts shown in Figure 2 brought together, the thin film resistor substrate 10 is positioned directly on the upper surface 18 of the header 20, and a flexible, tape automated bond (TAB) circuit 26 is brought into electrical contact with conductive traces on the top surface of the thin film resistor substrate 10. A plurality of thin conductive leads 28 overlie the contoured side walls 24 of the header 20, and the interior leads 30 of the tab bond flex circuit 26 are thermocompression bonded to conductive traces on the thin film resistor substrate 10.

In addition, the orifice plate 12 will be brought into alignment with the thin film resistor substrate 10 by means of an orifice plate and barrier layer manufacturing process.

Referring now to Figures 3A and 3B, the thin film resistor substrate 10 will typically include a silicon substrate 32 upon which is deposited a thin layer 34 of silicon dioxide for passivating and insulating the surface of the silicon substrate 32. A plurality of heater resistors 36 and 38 are formed on the upper surface of the silicon dioxide layer 34 and will typically be either tantalum aluminum or tantalum pentoxide and fabricated using known photolithographic masking and etching techniques. Aluminum trace conductors 40 make electrical contact to the heater resistors 36 and 38 for providing electrical pulses thereto during an ink jet printing operation, and these conductors are formed from a layer of aluminum previously evaporated on the upper surface of the silicon layer 34 using conventional metal evaporation processes.

After the formation of the aluminum conductors 40 is completed, a surface barrier layer 42, typically of silicon carbide or silicon nitride, is deposited over the upper surfaces of the conductors 40 and the heater resistors 36 and 38 to protect these members from cavitation wear and the ink corrosion which would otherwise be caused by the highly corrosive ink located in the reservoirs directly above these heater resistors. The silicon carbide layer 42, as well as the previously identified S_iO_2 surface layer 34, resistors 36 and 38 and aluminum conductors 40 are all formed using semiconductor processes well known to those skilled in thermal ink jet and semiconductor processing arts and for that reason are not described in detail herein. However, for a further detailed discussion of such processes, reference may be made to the above Hewlett Packard Journal, Volume 36, Number 5, May 1985.

A nickel orifice plate 44 is positioned as shown on top of the silicon carbide layer 42 and includes ink reservoir areas 46 and 48 located directly above the heater resistors 36 and 38 for receiving ink therein by way of the horizontal slot 16. These ink reservoirs 46 and 48 extend vertically upward of the substrate 10 as shown and merge into the output ink ejection orifices defined by the convergent contoured walls 50 and 52. These contoured walls 50 and 52 have been designed to reduce cavitational wear and prevent "gulping" during an ink jet printing operation as described in more detail in the above identified copending Chan et al.

application.

During an ink jet printing operation, ink will flow along the path indicated by the arrow 54 and laterally along the path 56 and into the ink flow ports 58, 60, 62, 64, 66 and 68 as identified on the left-hand portion of the structure of Figures 3A and 3B. Likewise, ink will enter the ink flow ports 70 , 72, 74, 76, 78 and 80 on the right-hand portion of the structure of Figure 3B. By flowing ink form a common ink reservoir into the plurality of flow ports identified above, the pressure drops in the ink from the ink feed slot 16 to the individual heater resistors, such as 36 and 38, will be equal and thus insure proper ink bubble evaporation and firing during an ink jet printing operation. The advantages of this feature of the invention in contrast to the prior art have been previously discussed above.

Claims

1. A thermal ink jet print head assembly comprising:

(a) a substrate member (10;32) having an elongated slot (16) therein for receiving ink from a common reservoir, said substrate (10) mounted on a header (20) for providing a supply of ink and further having an ink feed slot (22) which is aligned with said elongated slot (16) on said substrate (10:32) for providing ink flow to said elongated slot (16),

(b) a plurality of resistive heater elements (36, 38) spaced around the periphery of said slot (16) at predetermined distances therefrom and connected to a corresponding plurality of conductors (40) atop the surface of said substrate member, and

(c) a barrier layer and orifice plate member (12; 44) mounted atop said conductors (40) and including corresponding plurality of ink jet reservoirs (46,48) for receiving ink from said elongated slot (16), said reservoirs (46,48) aligned with said resistive heater elements (36,38) and with a plurality of exit orifices (14;50,52) for receiving thermal energy from said heater elements (36,38) and ejecting ink onto a selected print medium, said reservoirs (46, 48) all being at predetermined ink flow path distances from said elongated slot (16), whereby the liquid pressure flow loss between said reservoirs (46,48) and said slot (16) is equalized.

2. Assembly, as claimed in claim 1, **characterized** in that

(a) said substrate member is a thin film resistor structure (10;32), the elongated slot (16) therein extending from one major surface to another and said resistive heater elements (36,38) being spaced uniformly around the periphery of said slot (16),

(b) a conductive lead frame member (26) is uniformly bonded to said thin film resistor structure (10;32) to make electrical connections by said resistive heater elements (36,38) and extends laterally away from said resistive heater elements (36,38) in the plane thereof,

(c) said orifice plate (12;44) is affixed atop said thin film resistor structure (10;32) and has said ink reservoir (46,48) and output orifices (14;50,52) aligned with said resistive heater elements (36,38) for receiving thermal energy therefrom during an ink jet printing operation, and

(d) said header comprises an insulating header member (20) the elongated slot (22) therein being of width and length dimensions equal to the width and length dimensions of said elongated slot (16) in said thin film resistor structure (10) and bonded thereto so that said elongated slots (16,22) in said thin film resistor structure and in said header are aligned and provide an ink flow path from a common source of ink to said reservoirs (46,48) in said orifice plate (12), and the conductive leads (30) of said conductive lead frame (26) are contoured to the shape of the surface of said header member (20), whereby the packing density of said resistive heater elements (36,38) on said thin film resistor structure is maximized.

3. A method for fabricating a thermal ink jet print head assembly comprising a thin film resistor structure (10) including a plurality of ink reservoirs (46, 48) and associated thin film resistor heater elements (36, 38) for thermally driving said reservoirs, and an orfice plate member (12), a top said structure (10) for ejecting ink therefrom upon receiving thermal energy from said resistor heater elements (36, 38) **characterized** by

providing an elongated slot (16) in said thin film resistor structure (10) and adjacent said reservoirs (46, 48) for

flowing ink from a common ink source (22) and through said slot (16) and over a common ink flow path (54, 56) to all of said reservoirs simultaneously.

4. The method as claimed in claim 3, **characterized** in that

said resistor heater elements (36, 38) are spaced uniformly at predetermined distances

application.

During an ink jet printing operation, ink will flow along the path indicated by the arrow 54 and laterally along the path 56 and into the ink flow ports 58, 60, 62, 64, 66 and 68 as identified on the left-hand portion of the structure of Figures 3A and 3B. Likewise, ink will enter the ink flow ports 70 , 72, 74, 76, 78 and 80 on the right-hand portion of the structure of Figure 3B. By flowing ink form a common ink reservoir into the plurality of flow ports identified above, the pressure drops in the ink from the ink feed slot 16 to the individual heater resistors, such as 36 and 38, will be equal and thus insure proper ink bubble evaporation and firing during an ink jet printing operation. The advantages of this feature of the invention in contrast to the prior art have been previously discussed above.

Claims

1. A thermal ink jet print head assembly comprising:
   (a) a substrate member (10;32) having an elongated slot (16) therein for receiving ink from a common reservoir, said substrate (10) mounted on a header (20) for providing a supply of ink and further having an ink feed slot (22) which is aligned with said elongated slot (16) on said substrate (10:32) for providing ink flow to said elongated slot (16),
   (b) a plurality of resistive heater elements (36, 38) spaced around the periphery of said slot (16) at predetermined distances therefrom and connected to a corresponding plurality of conductors (40) atop the surface of said substrate member, and
   (c) a barrier layer and orifice plate member (12; 44) mounted atop said conductors (40) and including corresponding plurality of ink jet reservoirs (46,48) for receiving ink from said elongated slot (16), said reservoirs (46,48) aligned with said resistive heater elements (36,38) and with a plurality of exit orifices (14;50,52) for receiving thermal energy from said heater elements (36,38) and ejecting ink onto a selected print medium, said reservoirs (46, 48) all being at predetermined ink flow path distances from said elongated slot (16), whereby the liquid pressure flow loss between said reservoirs (46,48) and said slot (16) is equalized.

2. Assembly, as claimed in claim 1, **characterized** in that
   (a) said substrate member is a thin film resistor structure (10;32), the elongated slot (16) therein extending from one major surface to another and said resistive heater elements (36,38) being spaced uniformly around the periphery of said slot (16),
   (b) a conductive lead frame member (26) is uniformly bonded to said thin film resistor structure (10;32) to make electrical connections by said resistive heater elements (36,38) and extends laterally away from said resistive heater elements (36,38) in the plane thereof,
   (c) said orifice plate (12;44) is affixed atop said thin film resistor structure (10;32) and has said ink reservoir (46,48) and output orifices (14;50,52) aligned with said resistive heater elements (36,38) for receiving thermal energy therefrom during an ink jet printing operation, and
   (d) said header comprises an insulating header member (20) the elongated slot (22) therein being of width and length dimensions equal to the width and length dimensions of said elongated slot (16) in said thin film resistor structure (10) and bonded thereto so that said elongated slots (16,22) in said thin film resistor structure and in said header are aligned and provide an ink flow path from a common source of ink to said reservoirs (46,48) in said orifice plate (12), and the conductive leads (30) of said conductive lead frame (26) are contoured to the shape of the surface of said header member (20), whereby the packing density of said resistive heater elements (36,38) on said thin film resistor structure is maximized.

3. A method for fabricating a thermal ink jet print head assembly comprising a thin film resistor structure (10) including a plurality of ink reservoirs (46, 48) and associated thin film resistor heater elements (36, 38) for thermally driving said reservoirs, and an orfice plate member (12), a top said structure (10) for ejecting ink therefrom upon receiving thermal energy from said resistor heater elements (36, 38) **characterized** by
   providing an elongated slot (16) in said thin film resistor structure (10) and adjacent said reservoirs (46, 48) for
   flowing ink from a common ink source (22) and through said slot (16) and over a common ink flow path (54, 56) to all of said reservoirs simultaneously.

4. The method as claimed in claim 3, **characterized** in that
   said resistor heater elements (36, 38) are spaced uniformly at predetermined distances

* C L M S *

around said elongated slot (16),

electrical contacts are made to said resistor heater elements (36, 38), and

said thin film resistor structure (10) is affixed to an insulating header (20) having a matching ink feed slot (22) therein for providing ink to said elongated slot (16) in said thin film resistor structure (10).

5. The method as claimed in claim 4 **characterized** in that

electrical contacts are made by bonding a plurality of conductive leads (28) into electrical contact with said resistive heater elements (36, 38) and in the plane of said elements at the surface of said thin film resistor structure (10), and

said thin film resistor structure (10) is bonded to said insulating header (20), the ink feed elongated slot (22) therein having width and length dimensions equal to the width and length dimensions of said elongated slot (16) in said thin film resistor structure (10).

6. The method as claimed in claim 5, **characterized** in that

said conductive leads (28) are extended along sloped surfaces of said insulating header (20).

7. The method as claimed in one of claims 3 to 6, **characterized** in that

said slot (16) is formed by cutting a silicon substrate (10) with a diamond saw blade.

Revendications

1. Ensemble tête d'impression à jet d'encre thermique comprenant :

(a) un élément formant substrat (10 ; 32) présentant intérieurement une fente allongée (16) destinée à recevoir l'encre arrivant d'un réservoir commun, ledit substrat (10) étant monté sur un collecteur (20) servant à former une alimentation en encre et présentant aussi une fente (22) d'acheminement de l'encre qui est alignée sur ladite fente allongée (16) dudit substrat (10 ; 32) pour assurer l'écoulement de l'encre vers ladite fente allongée (16) ;

(b) une pluralité d'éléments chauffants résistants (36, 38) espacés sur le tour de la périphérie de ladite fente (16), à des distances prédéterminées de cette fente, et reliés à une pluralité correspondante de conducteurs (40) prévus sur la surface dudit élément substrat ; et

(c) un élément formant couche barrière et plaque à orifices (12 ; 44) monté au-dessus desdits conducteurs (40) et comprenant une pluralité correspondante de réservoirs de jets d'encre (46, 48) destinés à recevoir de l'encre en provenance de ladite fente allongée (16), lesdits réservoirs (46, 48) étant alignés sur lesdits éléments chauffants résistants (36, 38) et sur une pluralité d'orifices de sortie (14 ; 50, 52) pour recevoir une énergie thermique desdits éléments chauffants (36, 38) et éjecter l'encre sur un milieu d'impression choisi, lesdits réservoirs (46, 48) étant tous placés à des distances prédéterminées d'écoulement de l'encre de ladite fente allongée (16), de sorte que la perte de charge due à l'écoulement du liquide entre lesdits réservoirs (46, 48) et ladite fente (16) est rendue égale pour tous.

2. Ensemble selon la revendication 1, caractérisé en ce que :

(a) ledit élément formant substrat est une structure de résistances à film mince (10 ; 32), la fente allongée (16) prévue dans ce substrat s'étendant d'une grande face à l'autre, et lesdits éléments chauffants résistants (36, 38) étant espacés uniformément autour de la périphérie de ladite fente (16) ;

(b) un élément (26) formant cadre de conducteurs est uniformément fixé à ladite structure de résistances à film mince (10 ; 32) pour établir des connexions électriques avec lesdits éléments chauffants résistants (36, 38) et s'étend latéralement dans le sens qui s'éloigne desdits éléments chauffants résistants (38, 38) dans le plan de ces éléments ;

(c) ladite plaque à orifices (12 ; 44) est fixée sur ladite structure de résistances à film mince (10 ; 32) et possède ledit réservoir d'encre (46, 48), ainsi que des orifices de sortie (14 ; 50, 52) alignés sur lesdits éléments chauffants résistants (36, 38) pour recevoir de l'énergie thermique en provenance de ces éléments pendant une opération d'impression à jet d'encre ; et

(d) ledit collecteur comprend un élément de collecteur isolant (20) dont la fente allongée (22) posséde des dimensions en largeur et longueur égales aux dimensions en largeur et longueur de ladite fente allongée (16) de ladite structure de résistances à film mince (10) et qui est fixé à cette structure de manière que lesdites fentes allongées (16, 22) de ladite structure de résistances à film mince et dudit collecteur soient alignées et forment un trajet d'écoulement de l'encre allant d'une source d'encre commune aux-

* C L M S *

dits réservoirs (46, 48) de ladite plaque à orifices (12), et les conducteurs (30) dudit cadre de conducteur (26) sont profilés à la forme de la surface dudit élément de collecteur (20), de sorte que la densité de groupement desdits éléments chauffants (36, 38) sur ladite structure de résistances à film mince est portée au maximum.

3. Procédé de fabrication d'un ensemble tête d'impression à jet d'encre thermique comprenant une structure de résistances à film mince (10) comprenant elle-même une pluralité de réservoirs d'encres (46, 48) et des éléments chauffants résistants à film mince (36, 38) qui leur sont respectivement associés, pour activer thermiquement lesdits réservoirs, et un élément formant plaque à orifices (12) placé au-dessus de ladite structure (10) pour en éjecter l'encre en réponse à la réception d'une énergie thermique en provenance desdits éléments chauffants résistants (36, 38), caractérisé

en ce qu'on forme une fente allongée (16) dans ladite structure de résistances à film mince (10) et dans la région adjacente auxdits réservoirs (46, 48) pour amener l'encre à s'écouler à partir d'une source d'encre commune (22), à travers ladite fente (16) et sur un trajet commun (54, 56) d'écoulement de l'encre, de façon qu'elle atteigne simultanément tous lesdits réservoirs.

4. Procédé selon la revendication 3, caractérisé en ce que

lesdits éléments chauffants résistants (36, 38) sont espacés uniformément tout autour de ladite fente allongée (16), à des distances prédéterminées,

des contacts électriques sont établis sur lesdits éléments chauffants résistants (36, 38), et

ladite structure de résistances à film mince (10) est fixée à un collecteur isolant (20) qui présente intérieurement une fente (22) d'alimentation en encre correspondante, pour fournir de l'encre à ladite fente allongée (16) de ladite structure de résistances à film mince (10).

5. Procédé selon la revendication 4, caractérisé en ce que

les contacts électriques sont formés en fixant une pluralité de conducteurs (28), en contact électrique avec lesdits éléments chauffants résistants (36, 38) et dans le plan desdits éléments, à la surface de ladite structure de résistances à film mince (10), et

ladite structure de résistances à film mince (10) est fixée audit collecteur isolant (20), la fente allongée (22) d'alimentation en encre qui y est formée ayant des dimensions en largeur et longueur égales aux dimensions en largeur et longueur de ladite fente allongée (16) de ladite structure de résistances à film mince (10).

6. Procédé selon la revendication 5, caractérisé en ce que

lesdits conducteurs (28) sont prolongés le long de surfaces inclinées dudit collecteur isolant (20).

7. Procédé selon une quelconque des revendications 3 à 6, caractérisé en ce que

ladite fente (16) est formée en découpant un substrat de silicium (10) à l'aide d'une lame de scie diamantée.

Patentansprüche

1. Dynamische Tintenstrahldruckkopf-Anordnung mit

a) einem Unterlagenteil (10; 32) mit einem langgestreckten Schlitz (16) zum Aufnehmen von Tinte über ein gemeinsames Tintenreservoir, wobei das Unterlagenelement (10) zum Schaffen einer Tintenspeisung an einem Kopfteil (20) mit einem Tintenspeiseschlitz (22) angebracht ist, der mit dem langgestreckten Schlitz (16) des Unterlagenteiles (10; 32) zum Schaffen einer Tintenströmung zum langgestreckten Schlitz (16) ausgerichtet ist,
b) mehreren Widerstandsheizelementen (36, 38), die um den Umfang des langgestreckten Schlitzes (16) in vorbestimmten Abständen davon gruppiert und mit einer entsprechenden Zahl von Leitern (40) oberhalb der Oberfläche des Unterlagenteils verbunden sind, und
c) einer Sperrschicht- und Düsenöffnungs-Platte (12; 44), welche oberhalb der Leiter (40) angeordnet ist und eine Vielzahl von Tintenstrahlreservoiren (46, 48) zum Aufnehmen von Tinte aus dem langgestreckten Schlitz (16) aufweist, wobei die Reservoire (46, 48) auf die Widerstandsheizelemente (36, 38) ausgerichtet und mit einer Vielzahl von Düsenaustrittsöffnungen (14; 50, 52) versehen sind, welche Wärmeenergie aus den Heizelementen (36, 38) aufnehmen und Tinte auf ein gewähltes Druckmedium aussprühen, wobei die Reservoire (46, 48) sämtlich um vorbestimmte Tintenströmungsweg-Abstände von dem

* C L M S *

langgestreckten Schlitz (16) entfernt gelegen sind, wodurch die Druckverluste der Flüssigkeitsströmung zwischen den Reservoiren (46, 48) und dem Schlitz (16) ausgeglichen werden.

2. Anordnung nach Anspruch 1, dadurch **gekennzeichnet,** daß

a) das Unterlagenteil als Dünnfilm-Widerstandselement (10; 32) gestaltet ist, wobei sich der langgestreckte Schlitz (16) darin von einer Hauptfläche zur anderen erstreckt und die Widerstandsheizelemente (36, 38) gleichförmig um den Umfang des langgestreckten Schlitzes (16) erstrecken;
b) ein leitendes Leiterrahmenteil (26) gleichförmig auf das Dünnfilm-Widerstandselement (10; 32) gebondet ist, um elektrische Verbindungen zu den Widerstandsheizelementen (36, 38) herzustellen, wobei sich das Leiterrahmenteil seitlich von den Widerstandsheizelementen (36, 38) in gleicher Ebene weg erstreckt,
c) die Düsenöffnungsplatte (12; 44) auf dem Dünnfilmwiderstandselement (10; 32) befestigt ist, wobei die Tintenreservoire (46, 48) und Düsenaustrittsöffnungen (14; 50, 52) mit den Widerstandsheizelementen (36, 38) zur Aufnahme von Wärmeenergie von diesen bei einem Tintenstrahldruckvorgang ausgerichtet sind, und
d) das Kopfteil ein isolierendes Kopfelement (20) aufweist, wobei der darin vorgesehene langgestreckte Schlitz (22) gleiche Breiten- und Längenabmessungen wie diejenigen des langgestreckten Schlitzes (16) im Dünnfilmwiderstandselement (10) aufweist, wobei die genannten Elemente so miteinander verklebt sind daß die langgestreckten Schlitze (16, 22) im Dünnfilm-Widerstandselement und im Kopfelement aufeinander ausgerichtet sind und einen Tintenströmungsweg von einer gemeinsamen Tintenquelle zu den Reservoiren (46, 48) in der Düsenöffnungsplatte (12) schaffen und die leitenden Leiterbahnen (30) des Leiterrahmens (26) entsprechend der Oberflächengestalt des Kopfteiles (20) konturiert sind wodurch die Pakkungsdichte der Widerstandsheizelemente (36, 38) auf dem Dünnfilm-Widerstandselement maximiert ist.

3. Verfahren zum Herstellen einer thermischen Tintenstrahldruckkopfanordnung mit einem Dünnfilm-Widerstandselement (10) enthaltend mehrere Tintenreservoire (46, 48) und zugeordnete Dünnfilm-Widerstandsheizelementen (36, 38) zum thermischen Treiben der Reservoire sowie einer Düsenöffnungsplatte (12) auf dem genannten Element (10) zum Austreiben von Tinte bei Aufnahme von Wärmeenergie von den Widerstandsheizelementen (36, 38), dadurch **gekennzeichnet,** daß ein langgestreckter Schlitz (16) in dem Dünnfilm-Widerstandselement (10) benachbart den Reservoiren (46, 48) eingebracht wird, um Tinte von einer gemeinsamen Tintenquelle (22) und durch den Schlitz (16) sowie über einen gemeinsamen Tintenströmungsweg (54, 56) zu allen Reservoiren gleichzeitig strömen zu lassen.

4. Verfahren nach Anspruch 3, dadurch **gekennzeichnet,** daß
die besagten Widerstandsheizelemente (36, 38) gleichförmig mit vorbestimmten Abständen um den langgestreckten Schlitz (16) gruppiert werden,

elektrische Kontakte zu den Widerstandsheizelementen (36, 38) hergestellt werden und

das Dünnfilm-Widerstandselement (10) auf einem isolierenden Kopfteil (20) mit einem fluchtenden Tintenspeiseschlitz (22) befestigt ist, um Tinte zu dem langgestreckten Schlitz (16) in dem Dünnfilm-Widerstandselement (10) zu speisen.

5. Verfahren nach Anspruch 4, dadurch **gekennzeichnet,** daß

elektrische Kontakte durch Bonden mehrerer leitender Leiterbahnen (28) in elektrischem Kontakt mit den Widerstandsheizelementen (36, 38) in der Ebene der Elemente an der Oberfläche des Dünnfilm-Widerstandselementes (10) hergestellt werden, und

das Dünnfilm-Widerstandselement (10) auf das isolierende Kopfteil (20) gebondet wird, wobei der Tintenspeiseschlitz (22) Breiten- und Längenabmessungen gleich denjenigen des langgestreckten Schlitzes (16) in dem Dünnfilm-Widerstandselement (10) aufweist.

6. Verfahren nach Anspruch 5, dadurch **gekennzeichnet,** daß die leitenden Leiterbahnen (28) längs abfallender Oberflächen des isolierenden Kopfteils (20) weitergeführt werden.

7. Verfahren nach einem der Ansprüche 3 bis 6, dadurch **gekennzeichnet,** daß der Schlitz (16) durch Schneiden eines Siliziumsubstrates (10) mittels eines Diamantsägeblattes hergestellt

* C L M S *

wird.