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(54) A flexible interconnect circuit for an ink jet print cartridge having a plurality of orifices.

(57) An ink jet printhead cartridge (10) comprising an enclosed cartridge body (12) for storing a liquid ink supply, a thin film resistor structure (24) having a plurality of resistive heater elements thereon in contact with the fluid ink supply, and a flexible interconnect circuit (58) having orifices (154, 156) formed therein attached to the resistor structure by means of a layer of conductive adhesive. The layer of conductive adhesive (72) is made of a polymeric compound having dispersed particulates of a conductive material therein to form a electrical connection between the flexible interconnect and the resistor structure when the flexible interconnect is brought into contact with the resistor structure. The conductive adhesive is cured under controlled temperature and pressure to form a permanent conductive bond between the resistor structure and the flexible interconnect circuit. The orifices are formed in the flexible interconnect circuit by laser milling the flexible interconnect material to conically shaped orifices in the flexible interconnect circuit aligned with the resistive heater elements, thereby eliminating a separate orifice plate.

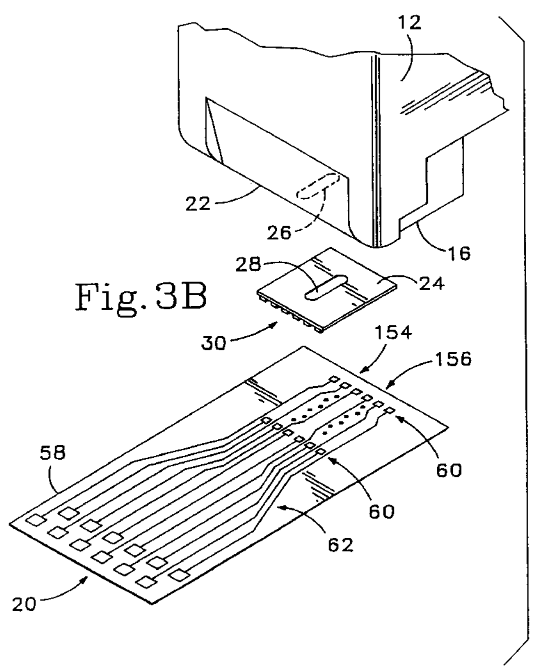

Fig. 3B

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BACKGROUND OF THE INVENTION

This invention relates generally to ink jet printers and more particularly to ink jet printhead cartridges and a method of fabricating the same.

Ink jet printers typically use disposable ink jet printhead cartridges to provide a replenishable supply of ink. Existing ink jet printhead cartridges, such as that shown in FIGS. 1 and 2, are typically fabricated using a method similar to that described in commonly assigned U.S. Patent No. 4,500,895 to Buck et al., entitled "Disposable Ink Jet Head," issued February 19, 1985.

The prior art printhead cartridges include a cartridge body for storing ink. A thin film resistor structure includes a plurality of resistive heater elements mounted on the cartridge body. The resistor structure typically has a central opening formed therein for supplying ink to the resistive heater elements. Channels are formed using a barrier layer on the resistor structure ink to disperse the liquid ink from the opening to the resistive heater elements. The ink is supplied to the opening in the resistor structure by an overlapping opening in the cartridge body opening.

The resistor structure has contact bonding pads arranged around the periphery of the resistor structure. The bonding pads provide a bonding site to connect conductors on a flexible interconnect circuit to the resistor structure. The conductors supply current from the ink jet printer to the individual heater elements. The heater elements dissipate heat when the current is supplied thereto. The resulting heat causes the ink to evaporate and thereby "jet" from the ink cartridge.

An orifice plate is then mounted on the resistor structure. The orifice plate includes a plurality of orifices which form ink jet nozzles when aligned with the corresponding heater element. The alignment of the orifice plate to the resistive elements requires precision alignment and requires an additional manufacturing step. The orifices provide shape and directionality to the ink droplets that are ejected from the cartridge when the nozzles are actuated.

The flexible interconnect circuit is attached to the cartridge body and to the resistor structure. The flexible interconnect conductors are bonded to a corresponding contact pad on the resistor structure by abrasion or thermosonic welding, as is known in the art. In order to weld the flexible interconnect conductors to the resistor structure pads, an opening is formed in the flexible interconnect circuit to expose the ends of the conductors. The opening exposes not only the conductor ends but also exposes the orifice plate so that the flexible interconnect does not cover the orifices.

After the conductors are welded to the contact pads, a resin is applied to the conductor ends to protect the conductor ends from the corrosive ink. The resin, however, forms bumps across the orifice surface which inhibits effective cleaning and maintenance of the orifice surface. The orifice surface is periodically cleaned by a wiper blade, i.e., a squeegee, in the printer to prevent ink buildup at the orifices. The resin bumps prevent the wiper blade from making contact continuous contact across the entire orifice surface. As a result, ink buildup occurs at some of the orifices which can eventually block the orifices. Blockage of the orifices results in lower print quality because not all of the ink drops are deposited on a print media.

Accordingly, a need remains for a method of fabricating an ink jet printhead cartridge with a planar orifice surface to promote cleaning of the orifices and thereby increase the print quality of the ink jet printer and the longevity of the printhead.

SUMMARY OF THE INVENTION

The above-described needs have been met herein by an ink jet cartridge having a substantially planar orifice surface which aids in the cleaning of the printhead nozzles.

A thermal ink jet printhead cartridge for use in an ink jet printer having a carriage for receiving the ink jet printhead cartridge is described. The printhead cartridge includes an enclosed cartridge body for storing a liquid ink supply. The cartridge body having an opening in a bottom side for supplying ink. A thin film resistor structure is disposed in contact with the liquid ink supply. The thin film resistor structure includes a plurality of resistive heater elements thereon for evaporating the ink supplied thereto. The printhead cartridge further includes means for electrically selecting one or more of the resistive heater elements connected to the resistor structure by a layer of conductive adhesive formed between the thin film resistor structure and the selecting means to conduct current between the selecting means and the resistive heater elements. The layer of conductive adhesive is cured under controlled temperature and pressure to form a permanent conductive bond between the resistor structure and the selecting means.

Typically, the conductive adhesive comprises a polymeric compound having conductive particulates disbursed therein to unidirectionally conduct current between the selecting means and the resistive heater elements. Preferably, the polymeric compound includes an epoxy compound and disbursed conductive particulates of either one of gold and silver.

Preferably, the selecting means includes a flexible interconnect circuit. Typically, the flexible interconnect circuit includes a flexible interconnect substrate having a top side and a bottom side, a plurality of conductors mounted on the bottom side of the substrate, and a plurality of orifices formed in the substrate and spaced apart such that the orifices overlay the resistive heater elements when the flexible interconnect Preferably, the orifices are canonical shaped openings formed in the flexible interconnect substrate having a larger opening at the bottom side of the substrate than at the top of the substrate. The orifices are arranged in a first row and a second. row of orifices, the first row being offset from the second row and adjacent orifices in each row being offset from each other. The orifices can also be offset within each row.

An advantage of the present invention is that the fabrication of the ink jet printhead cartridge requires fewer steps.

Another advantage of the invention is the reduced the complexity of the fabrication process.

A further advantage of the invention is the elimination of a separate orifice plate in an ink jet printhead cartridge.

A further advantage of the present invention is that the conductors on the flexible interconnect are shorter and, therefore, have a lower inductance.

The foregoing and other objects, features and advantages of the invention will become more readily apparent from the following detailed description of a preferred embodiment of the invention which proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a prior art ink jet printhead cartridge.

FIG. 2 is an exploded view of the prior art ink jet printhead cartridge of FIG. 1.

FIG. 3A is an exploded view of a first embodiment of an ink jet printhead cartridge according to the invention.

FIG. 3B is an exploded view of a second embodiment of an ink jet printhead cartridge according to the invention.

FIG. 4A is a plan view of the assembled second embodiment of the ink jet printhead shown in FIG. 3B showing cut-away portions of the cartridge body and the resistor structure.

FIG. 4B is a cross sectional view taken along lines B-B in FIG. 4A.

DETAILED DESCRIPTION

Referring to FIG. 1, a prior art ink jet printer cartridge 10 is shown. The detailed described of the invention, described hereinafter, logically follows a description of the prior art since many of the components remain the same. As such, common components between the prior art cartridge and the invention, therefore, share common reference numerals. The printer cartridge 10 includes a cartridge body 12 which acts as an ink storage chamber. The body 12 is made of plastic by injection molding. Attached to an outer wall of the body is a flexible interconnect circuit 14. The flexible interconnect extends along the outer wall and wraps around to a bottom side 16 of the printer body 12. The interconnect 14 is therefore made of a flexible polymeric material in order to wrap onto the bottom side 16. The flexible interconnect is typically made of polyamide and manufactured by DuPont Corporation under the tradename Kapton.

The flexible interconnect 14 includes a plurality of conductors shown generally at 18 formed thereon to supply current from the printer (not shown) to a corresponding thermal resistive heater element (not visible). The conductors 18 are formed on a bottom side of the flexible interconnect 14 adjacent the printer body 12 by conventional printer circuit board techniques. In the preferred embodiment, the conductors 18 are formed of gold plated copper. The conductors have a width sufficient to conduct an amount of current necessary to actuate the heater elements. Each of the conductors 18 has a corresponding contact pad shown generally at 20 for contacting to a corresponding printer contact in the ink jet printer. Because the conductors are formed on the bottom side of the flexible interconnect, circular vias are formed in the flexible interconnect 14 opposite the contact pads in the printer. The vias therefore expose the printer contact pad to allow electrical contact between the contact pads and the flexible interconnect printer contact pads 20.

Referring now to FIG. 2, an exploded view of the printer cartridge 10 is shown. For illustrative purposes the flexible interconnect 14 is shown flattened out. However, as described above, the flexible interconnect has a 90 degree bend to wrap around onto the bottom side of the cartridge body.

Cartridge body 12 has a recess 22 (not visible) formed in the bottom side 16 to receive a thin-film resistor structure 24 having the resistive heater elements formed thereon. The recess 22 has an opening 26 formed therein to supply ink to the resistor structure 24. The resistor 24 has a corresponding opening 28 formed therein which overlaps the cartridge opening 26 to supply ink to the thin-film resistive elements.

The thin-film resistor structure 24 is a conventional thin-film integrated circuit formed on a glass or silicon substrate. A plurality of thin-film resistive heater elements are formed on the substrate using conventional integrated circuit fabrication techniques. The resistive elements (not visible) are coupled to corresponding conductors formed on the substrate by sputtering techniques for individually selecting at the least one of the resistive elements. The precise interconnect method between the conductors and the resistive elements varies; for example, each conductor can be coupled to a single corresponding resistive element, or alternatively, the conductors can be coupled to more than one resistive element and a multiplexing scheme used. The invention hereinafter described applies without regard to the precise interconnect method between the resistor structure conductors and the resistive elements.

Each of the resistive structure conductors (not visible) has a corresponding contact pad shown generally at 30 positioned at the periphery of the resistive structure. The contact pads 30 are typically square or rectangular pads of metal which form bonding sights. The method of forming such contact pads on an integrated circuit is well-known in the art. The contact pads 30 provide a sufficient area to form a bond between the flexible interconnect circuit conductors 18 and the corresponding resistive structure conductors, as described further below.

The resistive structure 24 is seated in the recess 22 and secured to the bottom side of the printer body by an adhesive. In this configuration, ink stored in the printer body 12 is supplied through openings 26 and 28 to the surface of the resistive structure 24. Ink channels are formed on the surface of the resistive structure using a barrier layer to supply ink to the individual resistive heater elements. The method of forming said channels is described in, e.g., commonly assigned U.S. Pat. No. 4,694,308 to Chan et al., entitled "Barrier Layer and Orifice Plate for Thermal Ink Jet Printhead Assembly," issued Sep. 15, 1987, incorporated herein by reference. The ink supplied to the individual heater elements can thereafter be vaporized by supplying current to a desired heater element.

An orifice plate 32 is mounted on the resistor structure by means of an adhesive layer. In the preferred embodiment, the orifice plate is formed of gold plated copper. The orifice plate includes a first row of orifices 34 and a second row of orifices 36. The orifices are positioned directly over corresponding resistive heater elements. The orifices provide shape and directionality to the evaporated ink to form ink droplets. The layered combination of a resistive heater element, a corresponding ink supplying channel, and a corresponding orifice comprise an ink jet nozzle.

The flexible interconnect circuit 14, as shown in FIG. 2, has an opening 38 formed therein made slightly larger in size and shape than the resistor structure 24. The opening 38 is formed in the interconnect to expose contacts 40 formed at the distal ends of the flexible interconnect conductors. The contacts 40 are exposed in the prior art to permit ultrasonic abrasion welding of the resistor contacts 40 to the corresponding contact pads 30 on the resistor structure 24, as described in commonly assigned U.S. Pat. No. 4,635,073, to Hanson, entitled "Replaceable Thermal Ink Jet Component and Thermosonic Beam Bonding Process for Fabricating Same," issued January 6, 1987, incorporated herein by reference. The opening 38 also exposes the orifice plate 32. Once the opening 38 is formed, the contacts 40 are positioned over the corresponding contact pads 30 on the resistor structure 24 and the contact pads are welded together using above-mentioned abrasion welding technique.

The remainder of the flex circuit is secured to the cartridge body 12 by means of an adhesive strip (not shown). The contacts 40 are then covered with a resin (not shown) to avoid exposing the contact pads to the corrosive ink. The resin, however, produces a bump over the contacts 40 which compromises the planarity of the orifice surface. The bumps compromise the wiping of the orifice plate by the service station in the printer. Thus, the nozzles are more apt to clog, as described in the background of the invention.

Referring now to FIG.3A, an exploded view of a printhead cartridge 50 according to the invention is shown. Printhead cartridge 50 also includes the printer body 12 and the resistive structure 24, however, the orifice plate has been eliminated by forming orifices on a flexible interconnect circuit 52. The flexible interconnect 52 includes a first row of orifices 54 and a second row of orifices 56. The orifices are formed through the flexible interconnect 52 by laser machining conically shaped openings through the flexible interconnect 52. In the preferred embodiment, the diameter of the orifice is made decreasingly smaller moving away from the resistive structure 24, as shown in FIG. 4B. The first and second rows of orifices are formed on the flexible interconnect 52 such that the orifices align with the corresponding heater elements on the resistor structure 24 when the flexible interconnect is mounted on the resistor structure. Thus, the flexible interconnect circuit 52 eliminates a separate orifice plate, as required by the prior art.

The orifices are formed in an area on the flexible interconnect which used to be an opening to provide access to the flexible interconnect contacts 40. Rather than abrasive weld the flexible interconnect contacts 40 to the corresponding contacts on the resistive structure 24 as taught by the prior art, the flexible interconnect contacts 40 are connected to the corresponding resistor structure contacts 30 by means of a layer conductive adhesive formed between the flexible interconnect contacts 40 and the corresponding resistor structure contacts 30.

The conductive adhesive must conduct current only in a single direction, i.e., between the flexible interconnect contacts 40 and the corresponding resistor structure contacts 30. Otherwise, a short circuit results between adjacent resistor contacts. Unidirectional conductive adhesives are commercially available and are known as "Z-axis" conductive adhesives. The "Z-axis" conductive adhesives comprise a polymeric epoxy having conductive particulates suspended therein. In the preferred embodiment, the conductive adhesive contains suspended particulates of gold. Although particulates of silver or copper are suitable equivalents. An example of said "Z-axis" conductive adhesive is LZSP 8415-FP supplied by AI

Technologies, Inc. of Princeton, New Jersey. LZSP 8415 is a "B-stageable" Z-Axis conductive epoxy paste which is an anisotropic conductive adhesive.

The flexible interconnect 52 is connected to the resistive structure 24 using the conductive adhesive as follows. A strip of conductive adhesive is applied to either the resistor structure contacts 30 or, alternatively, to the flexible interconnect contacts 40. The conductive adhesive strip is then compressed between the resistor structure and the flexible interconnect by means of a compressive force. In the preferred embodiment, the cartridge body is supported in a fixture and the resistor structure 24 is mounted on the cartridge body and the flexible interconnect 52 is pressed against the bottom side of the cartridge body. The compressive forces applied for a predetermined amount of time depending upon the environmental conditions as prescribed by the conductive adhesive specifications. In the preferred embodiment, the conductive adhesive has a high boiling point to avoid liquefying due to the heat dissipation of the resistive elements when in use. During the curing process, an environmental temperature of between 200 to 250 degrees Centigrade while a compressive force of up to about 100 to 200 p.s.i. is applied, preferably a temperature of 220 degrees C and a pressure of 100 p.s.i. are used. The remainder of the flexible interconnect 52 is then attached to the cartridge body 12 by means of a conductive adhesive strip. Alternatively, the remainder of the flexible interconnect can be attached first to the pen body 12 and then the resistor contact pads can be connected to the corresponding resistor structure contacts 30.

In an alternative embodiment of the invention, the conductive adhesive is replaced with a selectively applied, low melting point, electrically conductive solder between the resistor structure contacts 30 and the flexible interconnect contacts 40. The solder, typically formed of tin and lead, is selectively applied to resistor structure contacts 30 or to the flexible interconnect contacts 40. The structure contacts 30 are aligned with the corresponding flexible interconnect contacts and heat is applied. The heat causes the solder to reflow, forming a conductive bond between the resistor structure contacts 30 and the flexible interconnect contacts 40. The boiling point of the solder is necessarily lower than the melting point of the flexible interconnect circuit to avoid melting the flexible interconnect when the heat is applied.

An exploded view of a second embodiment of a flexible interconnect 58 is shown in FIG. 3B. The flexible interconnect 58 has contact pads 60 rotated by 90 degrees from the contacts 40 shown in FIG. 3A. The arrangement of the flexible interconnect contacts shown in FIG.3B allows conductors 62 to be substantially linear, which reduces the inductance of the conductors caused by sharp angles in the conductors. Also, conductors 62 are shorter than the corresponding conductors 18 of FIG. 3A, which further reduces the inductance and reduces the electromagnetic emissions and propagation delays due to the conductors. Moreover, conductor 62 does not require sharp angles which can further increase the inductance of the conductors.

Referring now to FIG.4A, a plan view of the assembled cartridge of FIG. 3B is shown. The plan view shown in FIG. 4A shows a portion of the bottom side 16 of the cartridge body cut away to expose the resistor structure 24, a portion of which is cut away. The resistor structure 24 is connected to the flexible interconnect 58 by conductive adhesive layers 72 and 73 which are formed over the contact pads 90. The opening 28 supplies ink to the first and second row of orifices 54 and 56, respectively, by channel means formed on the resistor structure (not visible). The conductive adhesive layers connect the resistor structure contacts 30 (not visible) to the corresponding contact pads 60.

The first and second row of orifices 154 and 156, respectively, are shown in greater detail. The orifices in each row are horizontally offset from each other to form two parallel rows of orifices, as shown in FIG.4A. The orifices are offset within the rows to allow the orifices to be spaced closer together to increase the resolution of the printhead. The rows 154 and 156 are further vertically offset from each other so that the orifices in of one row are spaced between the orifices in the other row. By vertically offsetting the rows the effective resolution of the printhead is increased.

A cross-sectional view taken along lines B-B in FIG.4A is shown in FIG. 4B. Lines B-B are formed along a flexible interconnect contact pad 66 and a corresponding orifice 68. The cross-sectional view shows the flexible interconnect 58 have a conically shaped orifice 68 formed therein. The orifice, in the preferred embodiment, is formed by a precision milling technique which forms a gradually smaller opening moving away from the resistor structure, as described above. The orifice 68 is formed directly opposite a thin film resistor 78 formed on the silicon substrate 76 of the resistor structure using conventional integrated circuit fabrication techniques. A barrier layer 70 is formed on the substrate 24 which protects the underlying integrated circuit from the corrosive ink as well as defining channels for dispersing the liquid ink across the surface of the resistor structure. The combination of the orifice 66, the thin film resistor 78, and surrounding barrier layer form an ink jet nozzle.

Connected to the flexible interconnect 58 is a conductor 64 formed of gold plated copper. The flexible interconnect contact pad 66 is formed at a distal end thereof. The contact pad 66 is formed directly opposite a corresponding thin-film resistor contact pad 74 formed on the substrate 76 using conventional sputtering techniques, as is known in the art of integrated circuit fabrication. Formed between the resistor contact pad 66 and the corresponding thin-film contact pad 74 is the conductive adhesive layer 72. The conductive adhesive includes disbursed particulates of a conductive material. The particulates are sufficiently disbursed so as to avoid making a short between adjacent conductors, but dense enough to ensure an adequate contact between the resistor contact pad 66 and the corresponding thin-film contact pad 74.

As is apparent from FIG. 4B, the orifice surface is substantially planar. The barrier layer, in the preferred embodiment, is made of sufficient height so that the flexible interconnect 58 is substantially planar. Alternatively, the height of the barrier layer 70 can be made approximately equal to the combined height of the thin-film contact pad 74 plus the adhesive layer 72. This results in a slight slope in the flexible interconnect 58, however, the slope is significantly less than caused by the resin used in the prior art. Thus, the substantially planar orifice surface, as described herein, permits effective cleaning of the nozzles to increase the print quality and longevity of the ink jet cartridge.

In use, the above-described printhead is inserted into a printer carriage (not shown) which has printer contact pads corresponding to the contact pads 20. The printer contact pads are connected to printer drive electronics which provide actuation signals to the printer contact pads. The circular vias formed in the flexible interconnect expose the contact pads 20 to the corresponding printer contact pads. The printer contact pads and the corresponding contact pads 20 are placed in physical contact by inserting the printhead into the carriage. An electrical connection between the printer drive electronics and the resistive heater elements is thus formed.

The actuation signals generated by the printer drive electronics are then supplied to the resistive heater elements by means of the flexible interconnect. The actuation signals thus supplied cause the resistive elements to dissipate thermal energy which evaporates the liquid ink disposed in contact with the selected resistive heater element. The evaporated ink is then shaped and directed by the corresponding orifice to form an ink droplet.

Having described and illustrated the principles of the invention in a preferred embodiment thereof, it should be apparent that the invention can be modified in arrangement and detail without departing from such principles. I claim all modifications and variation coming within the spirit and scope of the following claims.

Claims

1. A thermal ink jet printhead cartridge (10) for use in an ink jet printer having a carriage for receiving the ink jet printhead cartridge comprising:

   an enclosed cartridge body (12) for storing a liquid ink supply, the cartridge bodyhaving an opening (26) in a bottom side (16) for supplying ink;

   a thin film resistor structure (24) having a plurality of resistive heater elements thereon disposed in contact with the liquid ink supply;

   means for electrically selecting (58) one or more of the resistive heater elements, wherein the selected resistive heater element dissipates thermal energy to evaporate the liquid ink disposed in contact with the selected resistive heater element; and

   a layer of conductive adhesive (72) formed between the thin film resistor structure and the selecting means to conduct current between the selecting means and the resistive heater elements.

2. A printhead cartridge according to claim 1, wherein the layer of conductive adhesive includes a polymeric compound (72) comprising:

   an epoxy compound; and

   disbursed conductive particulates comprising either one of gold and silver.

3. A printhead cartridge according to claim 1 wherein the thin film resistor structure comprises:

   a substrate (24) having a fluid channels formed therein for supplying ink from the ink supply to the resistive heater elements, the substrate mounted on the cartridge body (12) such that the fluid channels contact the ink supply; and

   a plurality of conductors coupled to the resistive heater elements for conducting the current to the resistive heater elements, wherein the conductors are connected to the selecting means by the conductive adhesive.

4. A printhead cartridge according to claim 1 wherein the selecting means comprises:

   a flexible interconnect circuit (58) having a top side and a bottom side; and

   a plurality of conductors (62) mounted on the bottom side of the flexible interconnect circuit, wherein each flexible interconnect conductor is electrically connected to a corresponding resistor structure conductor by the conductive adhesive.

5. A printhead cartridge according to claim 1 wherein the selecting means further includes a plurality of orifices (154, 156) for directing ink evaporated by a corresponding resistive heater element.

6. A method for fabricating a thermal ink jet printhead cartridge comprising:

providing an enclosed cartridge body for storing a liquid ink supply having an opening in a bottom side for supplying ink;

providing a thin film resistor structure having a plurality of resistive heater elements thereon being in contact with the liquid ink supply;

mounting the thin film resistor structure on the bottom side of the cartridge body such that the liquid ink is supplied to the resistive heater elements through the cartridge body opening;

providing a flexible interconnect circuit having a plurality of conductors forming a layer of conductive adhesive between the thin film resistor structure and the flexible interconnect conductors to electrically connect the flexible interconnect conductors to the resistive heater elements; and

curing the conductive adhesive under predetermined temperature and pressure conditions.

7. A method for fabricating a thermal ink jet printhead cartridge according to claim 6 further comprising forming a plurality of orifices in the flexible interconnect, wherein each orifice is formed over a corresponding resistive heater element.

8. A method for fabricating a thermal ink jet printhead cartridge according to claim 7 wherein the step of forming a plurality of orifices includes laser machining orifices in the flexible interconnect to produce orifices having a conical shape.

9. A method for fabricating a thermal ink jet printhead cartridge according to claim 6, wherein curing the conductive adhesive is conducted at a temperature of up to about 250 degrees Centigrade.

10. A method for fabricating a thermal ink jet printhead cartridge according to claim 20, wherein curing the conductive adhesive is conducted at a pressure of up to about 200 pounds per square inch.

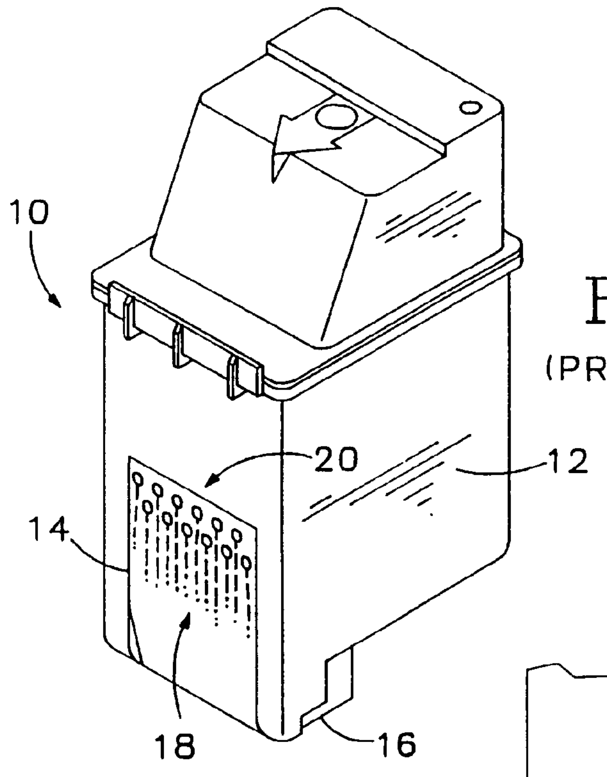

Fig. 1
(PRIOR ART)

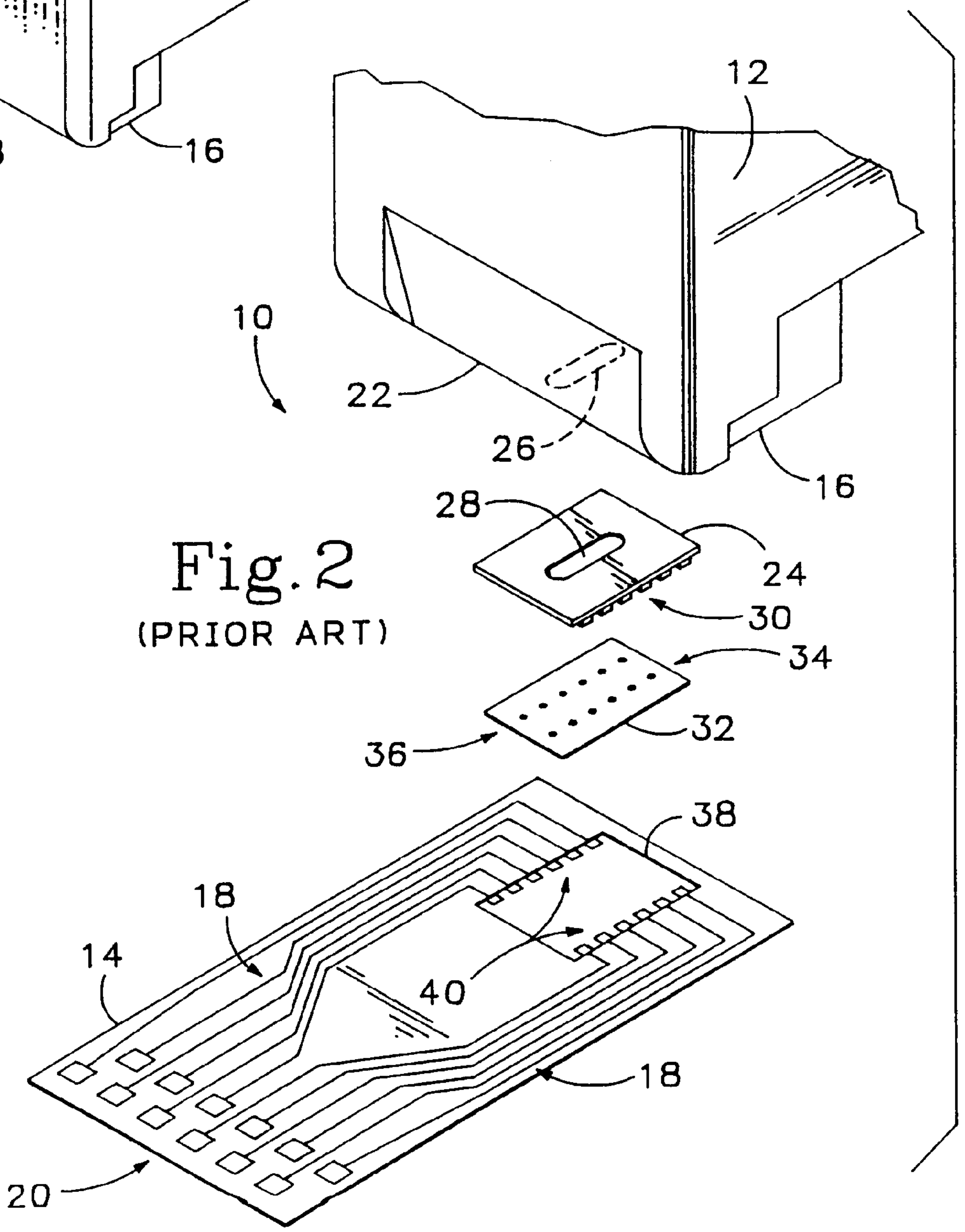

Fig. 2
(PRIOR ART)

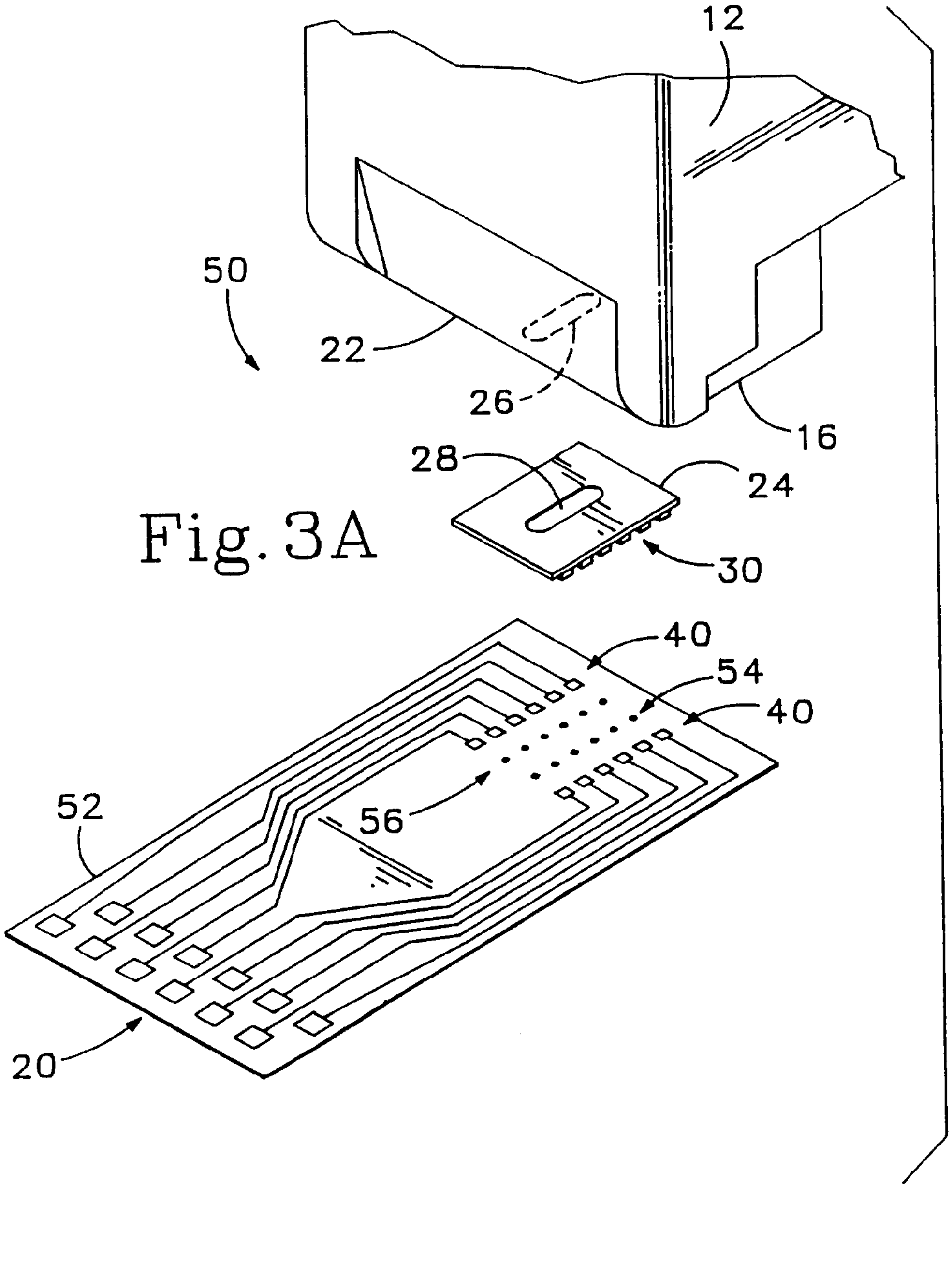

Fig. 3A

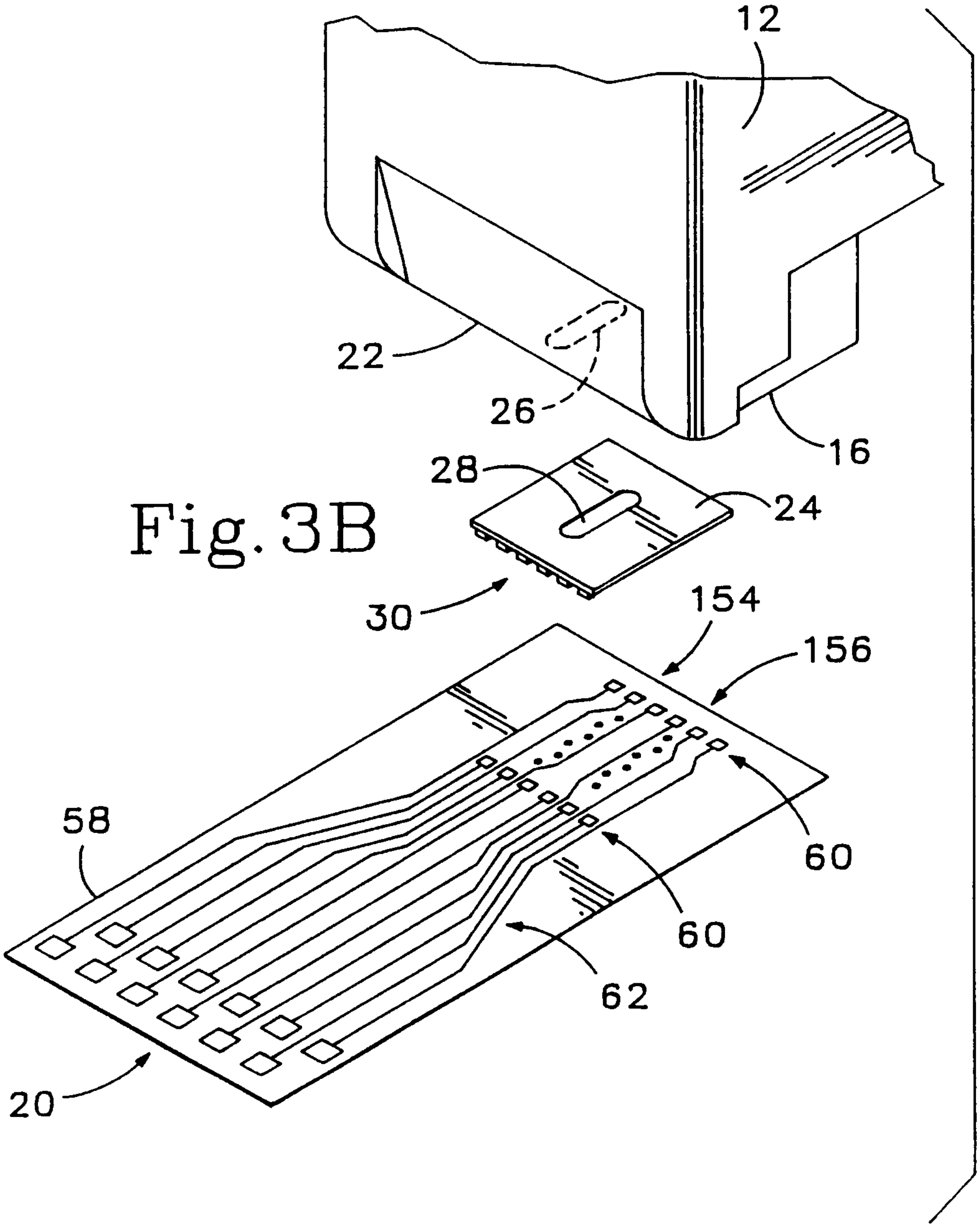

Fig. 3B

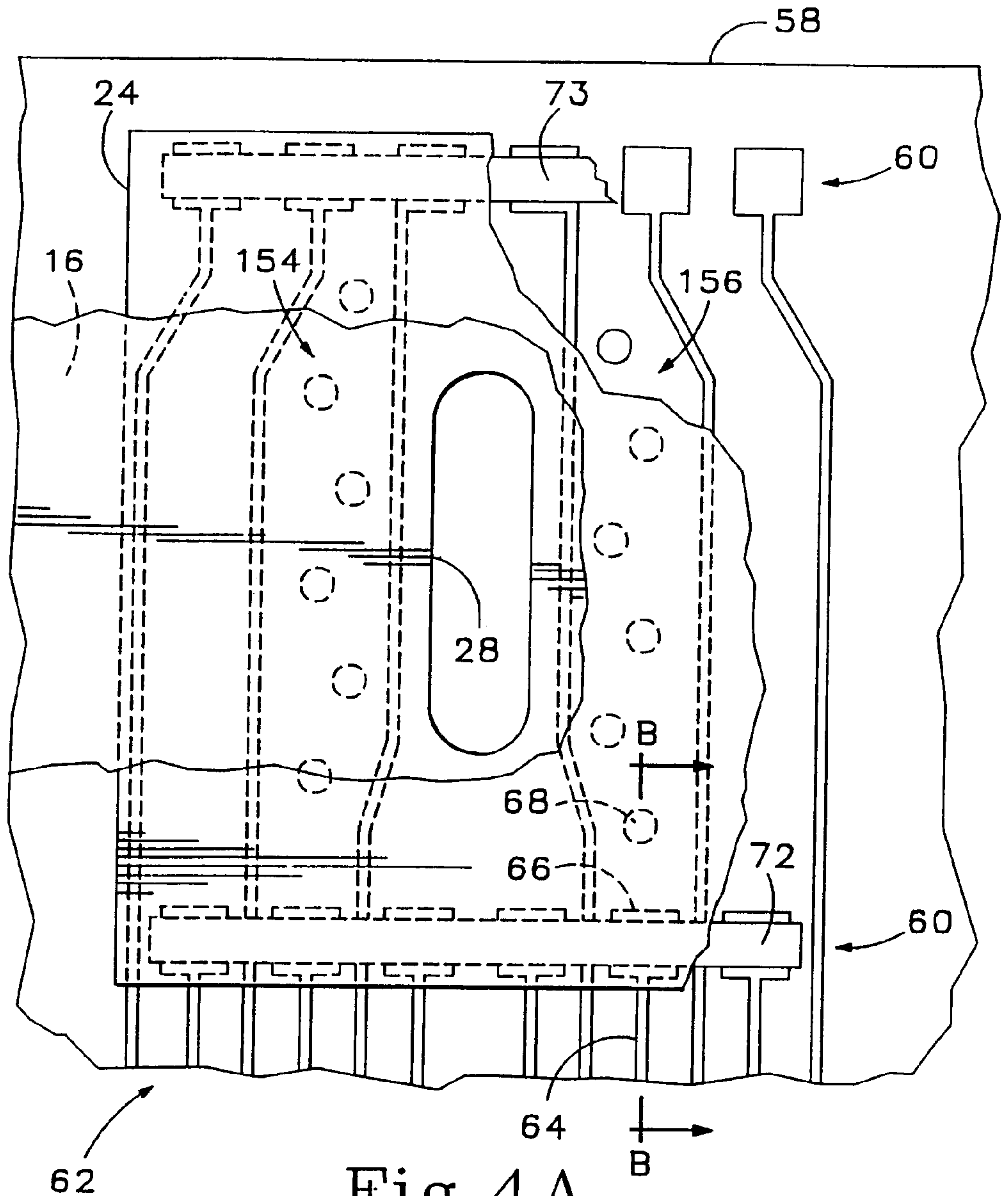
58
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Fig. 4A

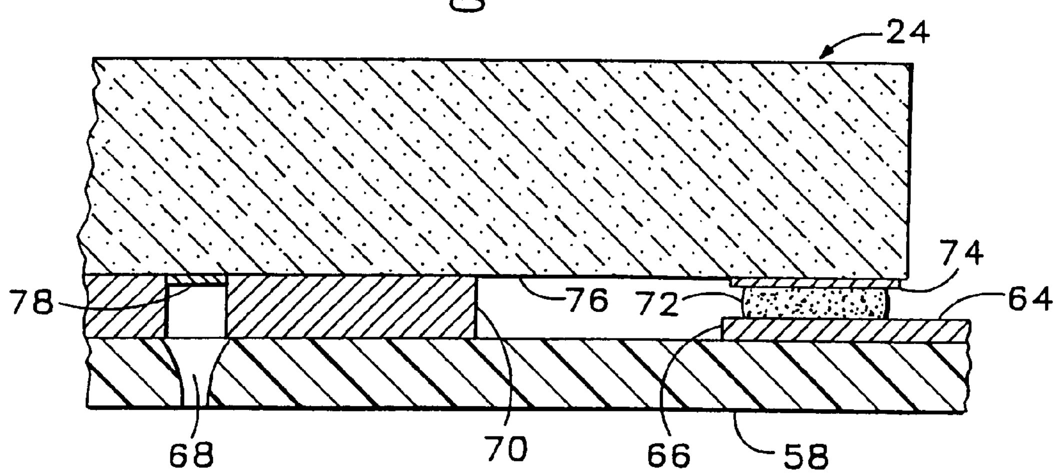
24
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Fig. 4B

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94306092.1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
Y,P	EP - A - 0 564 072 (HEWLETT-PACKARD) * Column 5, line 39; claims *	1,3-8	B 41 J 2/16 B 41 J 2/05
Y,P	EP - A - 0 564 069 (HEWLETT-PACKARD) * Column 3, lines 41-55; column 8, lines 50-52 *	1,3-8	
A	EP - A - 0 442 706 (CANON) * Totality *	1,2	
A	WO - A - 90/12 692 (EASTMAN KODAK) * Totality *	1,3-6	

TECHNICAL FIELDS SEARCHED (Int. Cl.6)

B 41 J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	06-12-1994	WITTMANN

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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