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PATENT APPLICATION



09310397

jc511 U.S. PTO

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INITIALS _____

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CONTENTS

	Date received (Incl. C. of M.) or Date Mailed	Date received (Incl. C. of M.) or Date Mailed
1. Application <u>3</u> papers.		42. _____
2. <u>IDS</u>	<u>5-12-99</u>	43. _____
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4. <u>Amended</u>	<u>9-11-00</u>	45. _____
5. <u>11/14 Power of Attorney</u>	<u>11-8-00</u>	46. _____
6. <u>Notice of Acceptance</u>	<u>11-14-00</u>	47. _____
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12. <u>1/16 NOA</u>	<u>7/16/01</u>	53. _____
13. <u>LOSS OF ENTITLEMENT</u>	<u>7-24-01</u>	54. _____
14. <u>9/13/01 Formal Drawings (3 shts) set</u>	<u>7/24/01</u>	55. _____
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ISSUE SLIP STAPLE AREA (for additional cross references)

POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION	D.B.	702005	5-21-99
O.I.P.E. CLASSIFIER		689048	6-1-99
FORMALITY REVIEW			6-9-99

INDEX OF CLAIMS

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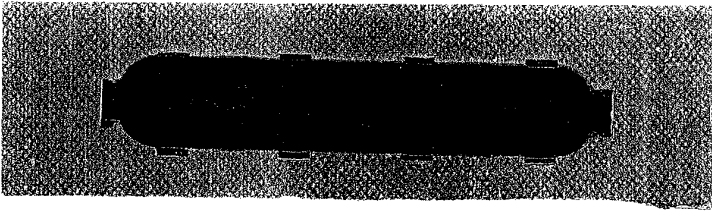
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SEARCHED			
Class	Sub.	Date	Exmr.
165	80.3 104.21 104.26 104.33 46 185	6/14/25	CR
361	700		
259	715		
Updated search		7/01	CR

INTERFERENCE SEARCHED			
Class	Sub.	Date	Exmr.
165	80.3 104.21 104.26 104.33 46 185	7/01	CR
361	299		
259	715		

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
NONE	Date	Exmr.
		CR

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US006302192B1

(12) **United States Patent**
Dussinger et al.

(10) **Patent No.:** **US 6,302,192 B1**
(45) **Date of Patent:** **Oct. 16, 2001**

(54) **INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES**

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6,082,443 * 7/2000 Yamamoto et al. 165/104.26
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(75) Inventors: **Peter M. Dussinger; Thomas L. Myers**, both of Lititz, PA (US)

(73) Assignee: **Thermal Corp.**, Georgetown, DE (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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1476297 * 4/1989 (SU) 165/104.26

(21) Appl. No.: **09/310,397**

(22) Filed: **May 12, 1999**

(51) **Int. Cl.**⁷ **F28D 15/00**

(52) **U.S. Cl.** **165/104.26; 165/104.21; 165/104.33**

(58) **Field of Search** 165/80.3, 104.21, 165/104.26, 104.33, 46, 185; 361/700; 257/715

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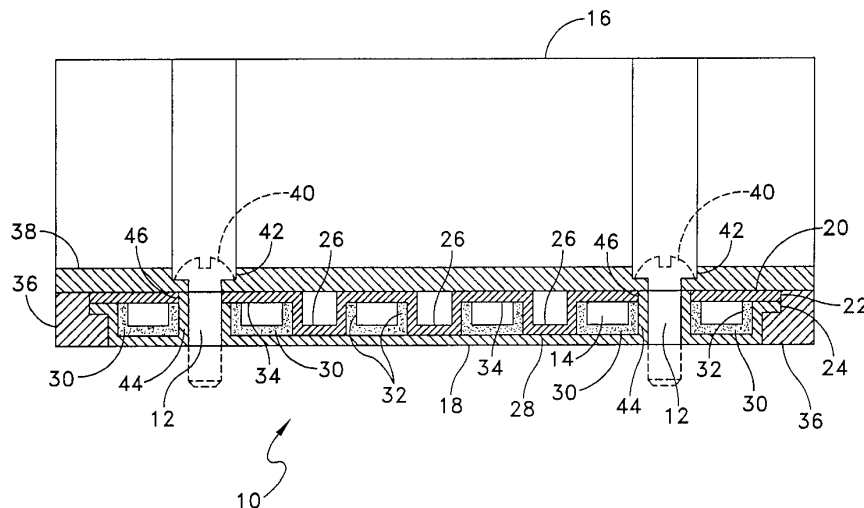
Primary Examiner—Christopher Atkinson

(74) *Attorney, Agent, or Firm*—Duane, Morris & Heckscher LLP

(57) **ABSTRACT**

The apparatus is a heat pipe with superior heat transfer between the heat pipe and the heat source and heat sink. The heat pipe is held tightly against the heat source by mounting holes which penetrate the structure of the heat pipe but are sealed off from the vapor chamber because they each are located within a sealed structure such as a pillar or the solid layers of the casing surrounding the vapor chamber. Another feature of the heat pipe is the use of more highly heat conductive material for only that part of the wick in the region which contacts the heat source, so that there is superior heat conductivity in that region.

9 Claims, 3 Drawing Sheets



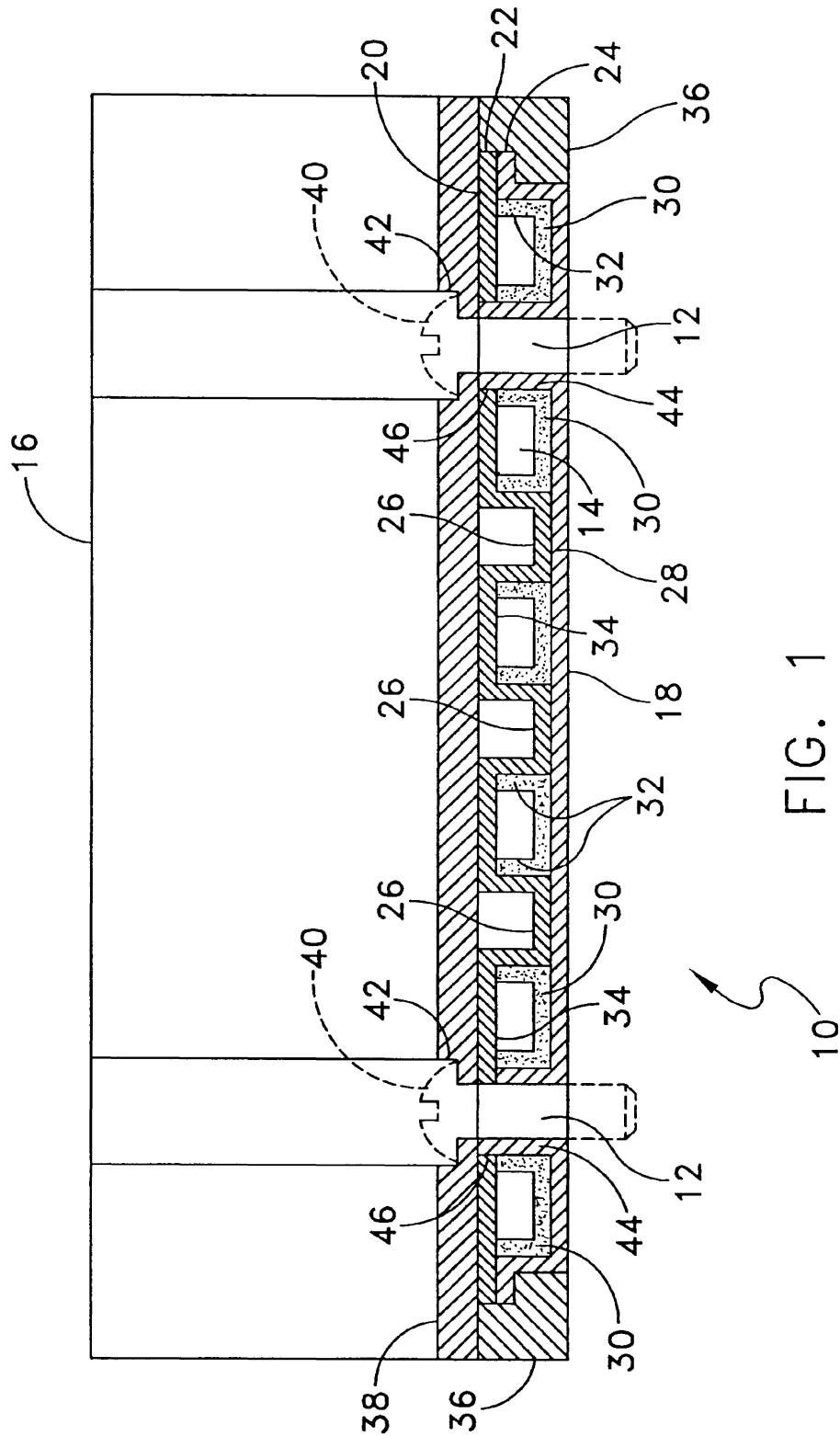


FIG. 1

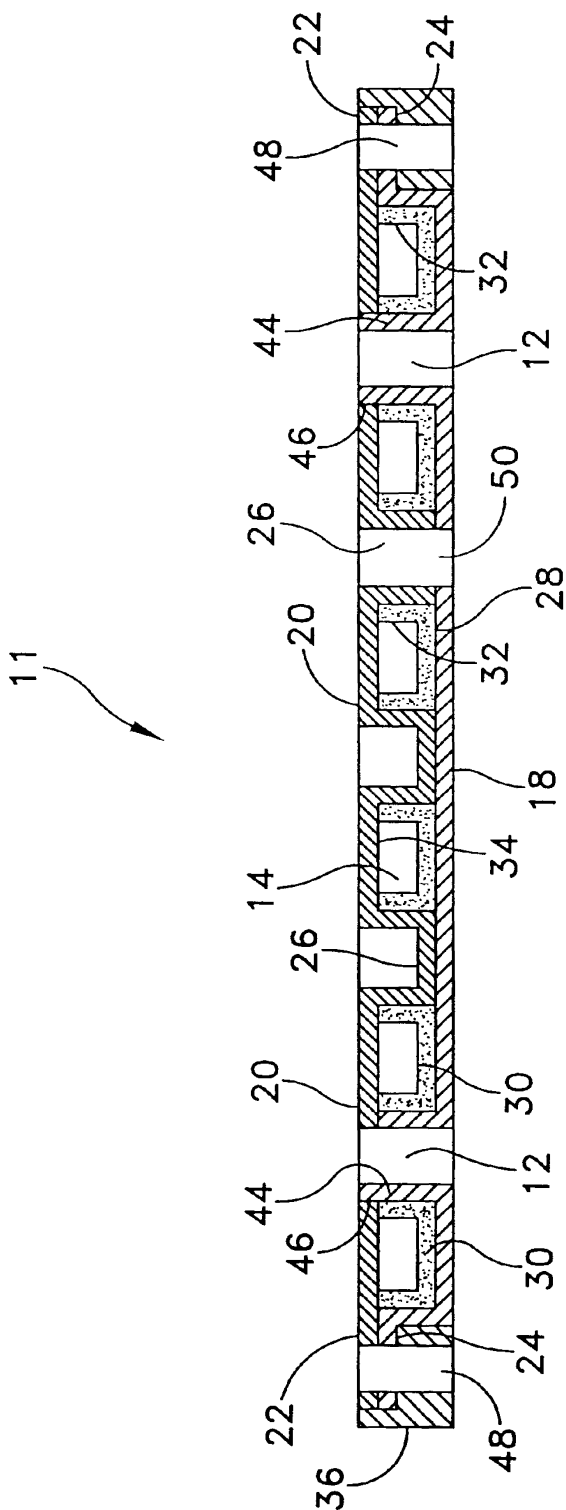


FIG. 2

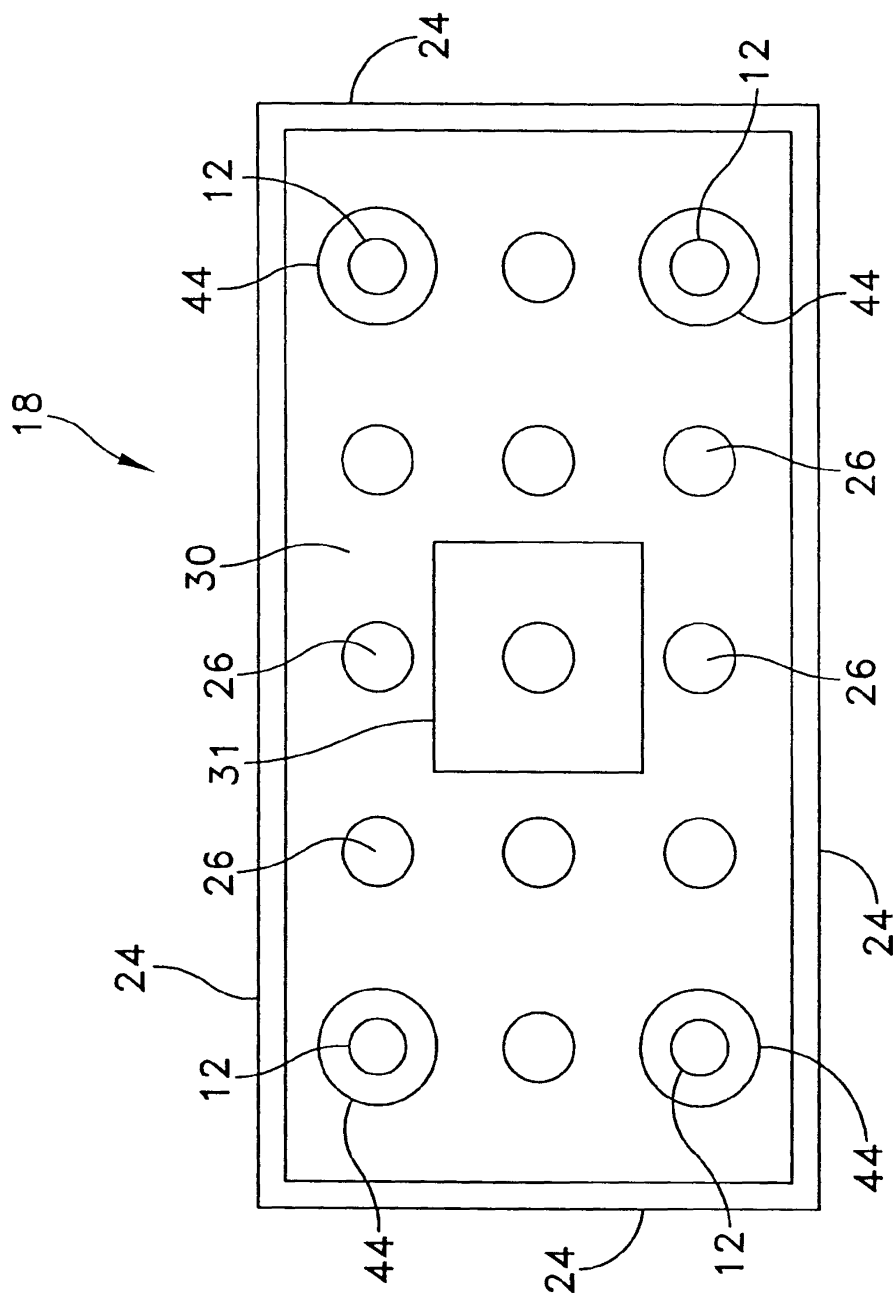


FIG. 3

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INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES

BACKGROUND OF THE INVENTION

This invention relates generally to active solid state devices, and more specifically to a heat pipe for cooling an integrated circuit chip, with the heat pipe designed to be held in direct contact with the integrated circuit.

As integrated circuit chips decrease in size and increase in power, the required heat sinks and heat spreaders have grown to be larger than the chips. Heat sinks are most effective when there is a uniform heat flux applied over the entire heat input surface. When a heat sink with a large heat input surface is attached to a heat source of much smaller contact area, there is significant resistance to the flow of heat along the heat input surface of the heat sink to the other portions of the heat sink surface which are not in direct contact with the contact area of the integrated circuit chip. Higher power and smaller heat sources, or heat sources which are off center from the heat sink, increase the resistance to heat flow to the balance of the heat sink. This phenomenon can cause great differences in the effectiveness of heat transfer from various parts of a heat sink. The effect of this unbalanced heat transfer is reduced performance of the integrated circuit chip and decreased reliability due to high operating temperatures.

The brute force approach to overcoming the resistance to heat flow within heat sinks which are larger than the device being cooled is to increase the size of the heat sink, increase the thickness of the heat sink surface which contacts the device to be cooled, increase the air flow which cools the heat sink, or reduce the temperature of the cooling air. However, these approaches increase weight, noise, system complexity, and expense.

It would be a great advantage to have a simple, light weight heat sink for an integrated circuit chip which includes an essentially isothermal surface even though only a part of the surface is in contact with the chip, and also includes a simple means for assuring intimate contact with the integrated circuit chip to provide good heat transfer between the chip and the heat sink.

SUMMARY OF THE INVENTION

The present invention is an inexpensive heat pipe heat spreader for integrated circuit chips which is of simple, light weight construction. It is easily manufactured, requires little additional space, and provides additional surface area for cooling the integrated circuit and for attachment to heat transfer devices for moving the heat away from the integrated circuit chip to a location from which the heat can be more easily disposed of. Furthermore, the heat pipe heat spreader is constructed to assure precise flatness and to maximize heat transfer from the heat source and to the heat sink, and has holes through its body to facilitate mounting.

The heat spreader of the present invention is a heat pipe which requires no significant modification of the circuit board or socket because it is held in intimate contact with the integrated circuit chip by conventional screws attached to the integrated circuit mounting board. This means that the invention uses a very minimum number of simple parts. Furthermore, the same screws which hold the heat spreader against the chip can also be used to clamp a finned heat sink to the opposite surface of the heat spreader.

The internal structure of the heat pipe is an evacuated vapor chamber with a limited amount of liquid and includes

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a pattern of spacers extending between and contacting the two plates or any other boundary structure forming the vapor chamber. The spacers prevent the plates from bowing inward, and therefore maintain the vital flat surface for contact with the integrated circuit chip. These spacers can be solid columns, embossed depressions formed in one of the plates, or a mixture of the two. Porous capillary wick material also covers the inside surfaces of the heat pipe and has a substantial thickness surrounding the surfaces of the spacers within the heat pipe, thus forming pillars of porous wick surrounding the supporting spacers. The wick material therefore spans the space between the plates in multiple locations.

The spacers thus serve important purposes. They support the flat plates and prevent them from deflecting inward and distorting the plates to deform the flat surfaces which are required for good heat transfer. The spacers also serve as critical support for the portions of the capillary wick which span the internal space between the plates. The capillary wick pillars which span the space between the plates provide a gravity independent characteristic to the heat spreader, and the spacers around which the wick pillars are located assure that the capillary wick is not subjected to destructive compression forces.

The spacers also make it possible to provide holes into and through the vapor chamber, an apparent inconsistency since a heat pipe vacuum chamber is supposed to be vacuum tight. This is accomplished by bonding the spacers, if they are solid, to both plates of the heat pipe, or, if they are embossed in one plate, bonding the portions of the depressions which contact the opposite plate to that opposite plate. With the spacer bonded to one or both plates, a through hole can be formed within the spacer and it has no effect on the vacuum integrity of the heat pipe vapor chamber, from which the hole is completely isolated.

An alternate embodiment of the invention provides the same provision for mounting the heat pipe heat spreader with simple screws even when the heat pipe is constructed without internal spacers. This embodiment forms the through holes in the solid boundary structure around the outside edges of the two plates. This region of the heat pipe is by its basic function already sealed off from the vapor chamber by the bond between the two plates, and the only additional requirement for forming a through hole within it is that the width of the bonded region be larger than the diameter of the hole. Clearly, with the holes located in the peripheral lips, the heat pipe boundary structure can be any shape.

Another alternate embodiment of the invention provides for improved heat transfer between the integrated circuit chip and the heat pipe heat spreader. This is accomplished by using a different capillary wick material within the heat pipe at the location which is directly in contact with the chip. Instead of using the same sintered copper powder wick which is used throughout the rest of the heat pipe, the part of the wick which is on the region of the heat pipe surface which is in contact with the chip is constructed of higher thermal conductivity sintered powder. Such powder can be silver, diamond, or many other materials well known in the art. This provides for significantly better heat transfer in the most critical heat transfer area, right at the integrated circuit chip.

The present invention thereby provides a heat pipe with superior heat transfer characteristics, and the simplest of all mounting devices, just several standard screws.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross section view of the preferred embodiment of the heat pipe of the invention with through holes through its vapor chamber and in contact with a finned heat sink.

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FIG. 2 is a cross section view of an alternate embodiment of the heat pipe of the invention with through holes in the peripheral lips and in a depression in one plate.

FIG. 3 is a plan view of an internal surface of the contact plate of the preferred embodiment of the invention showing the region of the capillary wick constructed of sintered higher heat conductivity powder.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 is a cross section view of the preferred embodiment of a flat plate heat pipe 10 of the invention with through holes 12 through its vapor chamber 14 and in contact with finned heat sink 16.

Heat pipe 10 is constructed by forming a boundary structure by sealing together two formed plates, contact plate 18 and cover plate 20. Contact plate 18 and cover plate 20 are sealed together at their peripheral lips 22 and 24 by conventional means, such as soldering or brazing, to form heat pipe 10. Heat pipe 10 is then evacuated to remove all non-condensable gases and a suitable quantity of heat transfer fluid is placed within it. This is the conventional method of constructing a heat pipe, and is well understood in the art of heat pipes.

The interior of heat pipe 10 is, however, constructed unconventionally. While contact plate 18 is essentially flat with the exception of peripheral lip 24, cover plate 20 includes multiple depressions 26. Depressions 26 are formed and dimensioned so that, when contact plate 18 and cover plate 20 are joined, the flat portions of depressions 26 are in contact with inner surface 28 of contact plate 18. Depressions 26 thereby assure that the spacing between contact plate 18 and cover plate 20 will be maintained even though pressure differentials between the inside volume of heat pipe 10 and the surrounding environment might otherwise cause the plates to deflect toward each other.

Heat pipe 10 also includes internal sintered metal capillary wick 30 which covers the entire inside surface of contact plate 18. As is well understood in the art of heat pipes, a capillary wick provides the mechanism by which liquid condensed at the cooler condenser of a heat pipe is transported back to the hotter evaporator where it is evaporated. The vapor produced at the evaporator then moves to the condenser where it again condenses. The two changes of state, evaporation at the hotter locale and condensation at the cooler site, are what transport heat from the evaporator to the condenser.

In the present invention, heat pipe 10 also has capillary wick pillars 32 which bridge the space between contact plate 18 and cover plate 20. Pillars 32 thereby interconnect cover plate 20 and contact plate 14 with continuous capillary wick. This geometry assures that, even if heat pipe 10 is oriented so that cover plate 16 is lower than contact plate 18, liquid condensed upon inner surface 34 of cover plate 20 will still be in contact with capillary pillars 32. The liquid will therefore be moved back to inner surface 28 which functions as the evaporator because it is in contact with a heat generating integrated circuit (not shown). Capillary pillars 32 are wrapped around and supported by depressions 26, which prevents the structurally weaker capillary pillars 32 from suffering any damage.

FIG. 1 also shows frame 36 which is typically used to surround and protect heat pipe 10. Frame 34 completely surrounds heat pipe 10 and contacts lip 24 of contact plate 18. When heat pipe 10 is used to cool an integrated circuit chip (not shown) which is held against contact plate 18,

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cover plate 20 is held in intimate contact with fin plate 38, to which fins 16 are connected. The entire assembly of heat pipe 10, frame 34, and fin plate 38 is held together and contact plate 18 is held against an integrated circuit chip by conventional screws 40, shown in dashed lines, which are placed in holes 42 in fin plate 38 and through holes 12 in heat pipe 10, and are threaded into the mounting plate (not shown) for the integrated circuit chip.

Holes 12 penetrate heat pipe 10 without destroying its vacuum integrity because of their unique location. Holes 12 are located within sealed structures such as solid columns 44, and since columns 44 are bonded to cover plate 20 at locations 46, holes 12 passing through the interior of columns 44 have no effect on the interior of heat pipe 10.

The preferred embodiment of the invention has been constructed as heat pipe 10 as shown in FIG. 1. This heat pipe is approximately 3.0 inches by 3.5 inches with a total thickness of 0.200 inch. Cover plate 20 and contact plate 18 are constructed of OFHC copper 0.035 inch thick, and depressions 26 span the 0.100 inch height of the internal volume of heat pipe 10. The flat portions of depressions 26 are 0.060 inch in diameter. Capillary wick 30 is constructed of sintered copper powder and averages 0.040 inch thick. Columns 44 have a 0.250 inch outer diameter, and holes 12 are 0.210 in diameter.

FIG. 2 is a cross section view of an alternate embodiment of the flat plate heat pipe 11 of the invention with through holes 48 located within peripheral lips 22 and 24 of the heat pipe and hole 50 shown in another sealed structure, one of the depressions 26. The only requirement for forming hole 50 within a depression 26 is that the bottom of depression 26 must be bonded to inner surface 28 of contact plate 18 to prevent loss of vacuum within the heat pipe. Of course, the region of the peripheral edges is also a sealed structure since bonding between lips 22 and 24 is inherent because heat pipe 11 must be sealed at its edges to isolate the interior from the outside atmosphere.

The only differences between heat pipe 11 of FIG. 2 and heat pipe 10 of FIG. 1 are that finned heat sink 16 is not shown in FIG. 2, lips 22 and 24 are slightly longer in FIG. 2 to accommodate holes 48, and hole 50 is shown. In fact, through holes 12 shown in FIG. 1 are also included in FIG. 2. Although it is unlikely that holes 12, holes 48, and hole 50 would be used in the same assembly, manufacturing economies may make it desirable to produce all the holes in every heat pipe so that the same heat pipe heat spreader can be used with different configurations of finned heat sinks. The unused sets of holes have no effect on the operation or benefits of the invention.

FIG. 3 is a plan view of the internal surface of the contact plate 18 of heat pipe 10 of the invention showing region 31 of capillary wick 30. Region 31 is constructed of sintered silver powder. While the balance of capillary wick 30 is conventional sintered metal such as copper, region 31 of capillary wick 30, which is on the opposite surface of contact plate 18 from the integrated circuit chip (not shown), is formed of powdered silver. The higher thermal conductivity of silver yields significantly better heat conduction through region 31 of the wick 30, and thereby reduces the temperature difference between the integrated circuit chip and the vapor within heat pipe 10. This reduction of temperature difference directly affects the operation of heat pipe 10, and essentially results in a similar reduction in the operating temperature of the chip.

The invention thereby furnishes an efficient means for cooling an integrated circuit and does so without the need for

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larger heat spreaders which not only add weight but also do not transfer heat away from the integrated circuit as efficiently as does the heat pipe of the invention.

It is to be understood that the form of this invention as shown is merely a preferred embodiment. Various changes may be made in the function and arrangement of parts; equivalent means may be substituted for those illustrated and described; and certain features may be used independently from others without departing from the spirit and scope of the invention as defined in the following claims. For example, through holes could also penetrate heat pipe boundary structures with curved surfaces or heat pipe boundary structures with offset planes which create several different levels for contact with heat sources or heat sinks.

What is claimed as new and for which Letters Patent of the United States are desired to be secured is:

1. A system for dissipating heat comprising in combination:

a heat pipe for spreading heat comprising:

a first plate having an edge lip that bounds an outer surface and an inner surface and at least one depression which projects outwardly relative to said inner surface;

a second plate arranged in spaced apart confronting relation to said first plate having an edge lip that bounds an inner surface and at least one opening through said second plate, said edge lips of said first and second plates being bonded together so as to define a vapor chamber between said plates;

wherein said at least one depression formed in said first plate projects into said vapor chamber and is bonded to said second plate in aligned coaxial relation to said at least one opening through said second plate wherein said at least one opening is isolated from said vapor chamber; and

a heat sink having at least one mounting hole, said heat sink being mounted on said outer surface of said first plate so that said mounting hole is coaxially aligned with said at least one depression, and a fastener projecting through said at least one mounting hole, said at least one depression, and said at least one opening in said second plate.

2. A heat pipe for spreading heat according to claim 1 comprising at least one spacer positioned within said vapor chamber and extending between and contacting said first and second plates.

3. A heat pipe for spreading heat according to claim 1 wherein said spaced-apart first and second plates include confronting inner surfaces; and

a wick positioned upon said confronting inner surfaces including that portion of the inner surface of said first plate that forms a surface of said depression within said vapor chamber.

4. A heat pipe for spreading heat according to claim 3 wherein said wick is constructed with at least two separate sections of different materials, with one section being located on said first plate inner surface and being formed of a material with higher heat conductivity than sections located on said second plate inner surface.

5. A heat pipe for spreading heat according to claim 1 wherein said at least one depression in said first plate comprises an annular outer surface that is (i) spaced from said inner surface and (ii) sealingly bonded to a corresponding annular edge surface that bounds said at least one opening in said second plate.

6. A heat pipe for spreading heat according to claim 1 wherein said at least one depression formed in said second plate comprises a flat portion that is in contact with an inner surface of said first plate.

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7. A system for dissipating heat comprising in combination:

a heat pipe for spreading heat comprising:

a boundary structure including spaced-apart first and second plates that define an enclosed vapor chamber; at least one depression formed in said first plate which projects into said vapor chamber and is bonded to said second plate;

an opening defined through said first plate depression and said second plate wherein said opening is isolated from said vapor chamber; and

at least one depression formed in said second plate which projects into said vapor chamber and is bonded to said first plate; and

a heat sink having at least one mounting hole, said heat sink being mounted on said outer surface of said first plate so that said mounting hole is coaxially aligned with said opening defined through said first plate depression, and a fastener projecting through said at least one mounting hole, said first plate depression, and said opening defined through said second plate.

8. A system for dissipating heat comprising in combination:

a heat pipe for spreading heat comprising:

a boundary structure including spaced-apart first and second plates that define an enclosed vapor chamber; at least one hollow column positioned within said vapor chamber and sealingly bonded to said first and second plates, and including an open first end that opens through said first plate and an open second end that opens through said second plate so as to form at least one through-hole that is isolated from said vapor chamber; and

a heat sink having at least one mounting hole, said heat sink being mounted on said first plate so that said mounting hole is coaxially aligned with said at least one through-hole, and a fastener projecting through said at least one mounting hole, said at least one hollow column, and said open second end that opens through said second plate.

9. A system for dissipating heat comprising in combination:

a heat pipe for spreading heat comprising:

a boundary structure including spaced-apart first and second plates having confronting interior surfaces wherein said first and second plates define an enclosed vapor chamber;

at least one hollow column positioned within said vapor chamber and sealingly bonded to said first and second plates, and including (i) an open first end that opens through said first plate and an open second end that opens through said second plate so as to form at least one through-hole that is isolated from said vapor chamber, said second open end being bounded by a transverse flat surface, and (ii) an exterior surface positioned within said vapor chamber;

a wick positioned upon said confronting interior surfaces of said first and second plates and said exterior surface of said at least one hollow column; and

a heat sink having at least one mounting hole, said heat sink being mounted on said first plate so that said mounting hole is coaxially aligned with said at least one through-hole, and a fastener projecting through said at least one mounting hole, said at least one hollow column, and said open second end that opens through said second plate.

* * * * *

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

05/25/1999 VTOMLER 00000056 09310397

01 FC:201 380.00 GP

PTO-1556
(5/87)

*U.S. GPO: 1998-433-214/80404

ABSTRACT OF THE DISCLOSURE

SN#09310397

The apparatus is a heat pipe with superior heat transfer between the heat pipe and the heat source and heat sink. The heat pipe is held tightly against the heat source by mounting holes which penetrate the structure of the heat pipe but are sealed off from the vapor chamber because they each are located within a sealed structure such as a pillar or the solid layers of the casing surrounding the vapor chamber. Another feature of the heat pipe is the use of more highly heat conductive material for only that part of the wick in the region which contacts the heat source, so that there is superior heat conductivity in that region.

65-150-2646-60

APPLICATION FOR LETTERS PATENT

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT PETER M. DUSSINGER, a resident of Lititz, Pennsylvania, and THOMAS L. MYERS, a resident of Lititz, Pennsylvania, both citizens of the United States of America, have invented certain new and useful improvements in an

INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER

WITH THROUGH MOUNTING HOLES

of which the following is a specification:

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1 being cooled is to increase the size of the heat sink, increase
2 the thickness of the heat sink surface which contacts the
3 device to be cooled, increase the air flow which cools the heat
4 sink, or reduce the temperature of the cooling air. However,
5 these approaches increase weight, noise, system complexity, and
6 expense.

7 It would be a great advantage to have a simple, light
8 weight heat sink for an integrated circuit chip which includes
9 an essentially isothermal surface even though only a part of
10 the surface is in contact with the chip, and also includes a
11 simple means for assuring intimate contact with the integrated
12 circuit chip to provide good heat transfer between the chip and
13 the heat sink.

14 SUMMARY OF THE INVENTION

15 The present invention is an inexpensive heat pipe heat
16 spreader for integrated circuit chips which is of simple, light
17 weight construction. It is easily manufactured, requires
18 little additional space, and provides additional surface area
19 for cooling the integrated circuit and for attachment to heat
20 transfer devices for moving the heat away from the integrated
21 circuit chip to a location from which the heat can be more
22 easily disposed of. Furthermore, the heat pipe heat spreader
23 is constructed to assure precise flatness and to maximize heat
24 transfer from the heat source and to the heat sink, and has

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1 holes through its body to facilitate mounting.

2 The heat spreader of the present invention is a heat pipe
3 which requires no significant modification of the circuit board
4 or socket because it is held in intimate contact with the
5 integrated circuit chip by conventional screws attached to the
6 integrated circuit mounting board. This means that the
7 invention uses a very minimum number of simple parts.

8 Furthermore, the same screws which hold the heat spreader
9 against the chip can also be used to clamp a finned heat sink
10 to the opposite surface of the heat spreader.

11 The internal structure of the heat pipe is an evacuated
12 vapor chamber with a limited amount of liquid and includes a
13 pattern of spacers extending between and contacting the two
14 plates or any other boundary structure forming the vapor
15 chamber. The spacers prevent the plates from bowing inward,
16 and therefore maintain the vital flat surface for contact with
17 the integrated circuit chip. These spacers can be solid
18 columns, embossed depressions formed in one of the plates, or a
19 mixture of the two. Porous capillary wick material also covers
20 the inside surfaces of the heat pipe and has a substantial
21 thickness surrounding the surfaces of the spacers within the
22 heat pipe, thus forming pillars of porous wick surrounding the
23 supporting spacers. The wick material therefore spans the
24 space between the plates in multiple locations.

1 The spacers thus serve important purposes. They support
2 the flat plates and prevent them from deflecting inward and
3 distorting the plates to deform the flat surfaces which are
4 required for good heat transfer. The spacers also serve as
5 critical support for the portions of the capillary wick which
6 span the internal space between the plates. The capillary wick
7 pillars which span the space between the plates provide a
8 gravity independent characteristic to the heat spreader, and
9 the spacers around which the wick pillars are located assure
10 that the capillary wick is not subjected to destructive
11 compression forces.

12 The ~~spacers~~ also make it possible to provide holes into and
13 through the vapor chamber, an apparent inconsistency since a
14 heat pipe vacuum chamber is supposed to be vacuum tight. This
15 is accomplished by bonding the spacers, if they are solid, to
16 both plates of the heat pipe, or, if they are embossed in one
17 plate, bonding the portions of the depressions which contact
18 the opposite plate to that opposite plate. With the spacer
19 bonded to one or both plates, a through hole can be formed
20 within the spacer and it has no effect on the vacuum integrity
21 of the heat pipe vapor chamber, from which the hole is
22 completely isolated.

23 An alternate embodiment of the invention provides the same
24 provision for mounting the heat pipe heat spreader with simple

1 screws even when the heat pipe is constructed without internal
2 spacers. This embodiment forms the through holes in the solid
3 boundary structure around the outside edges of the two plates.
4 This region of the heat pipe is by its basic function already
5 sealed off from the vapor chamber by the bond between the two
6 plates, and the only additional requirement for forming a
7 through hole within it is that the width of the bonded region
8 be larger than the diameter of the hole. Clearly, with the
9 holes located in the peripheral lips, the heat pipe boundary
10 structure can be any shape.

11 Another alternate embodiment of the invention provides for
12 improved heat transfer between the integrated circuit chip and
13 the heat pipe heat spreader. This is accomplished by using a
14 different capillary wick material within the heat pipe at the
15 location which is directly in contact with the chip. Instead
16 of using the same sintered copper powder wick which is used
17 throughout the rest of the heat pipe, the part of the wick
18 which is on the region of the heat pipe surface which is in
19 contact with the chip is constructed of higher thermal
20 conductivity sintered powder. Such powder can be silver,
21 diamond, or many other materials well known in the art. This
22 provides for significantly better heat transfer in the most
23 critical heat transfer area, right at the integrated circuit
24 chip.

1 The present invention thereby provides a heat pipe with
2 superior heat transfer characteristics, and the simplest of all
3 mounting devices, just several standard screws.

4 BRIEF DESCRIPTION OF THE DRAWINGS

5 FIG. 1 is a cross section view of the preferred embodiment
6 of the heat pipe of the invention with through holes through
7 its vapor chamber and in contact with a finned heat sink.

8 FIG. 2 is a cross section view of an alternate embodiment
9 of the heat pipe of the invention with through holes in the
10 peripheral lips and in a depression in one plate.

11 FIG. 3 is a plan view of an internal surface ^{of} the contact
12 plate of the preferred embodiment of the invention showing the
13 region of the capillary wick constructed of sintered higher
14 heat conductivity powder.

15 DETAILED DESCRIPTION OF THE INVENTION

16 FIG. 1 is a cross section view of the preferred embodiment
17 of a flat plate heat pipe 10 of the invention with through
18 holes 12 through its vapor chamber 14 and in contact with
19 finned heat sink 16.

20 Heat pipe 10 is constructed by forming a boundary structure
21 by sealing together two formed plates, contact plate 18 and
22 cover plate 20. Contact plate 18 and cover plate 20 are sealed
23 together at their peripheral lips 22 and 24 by conventional
24 means, such as soldering or brazing, to form heat pipe 10.

1 Heat pipe 10 is then evacuated to remove all non-condensable
2 gases and a suitable quantity of heat transfer fluid is placed
3 within it. This is the conventional method of constructing a
4 heat pipe, and is well understood in the art of heat pipes.

5 The interior of heat pipe 10 is, however, constructed
6 unconventionally. While contact plate 18 is essentially flat
7 with the exception of peripheral lip 24, cover plate 20
8 includes multiple depressions 26. Depressions 26 are formed
9 and dimensioned so that, when contact plate 18 and cover plate
10 20 are joined, the flat portions of depressions 26 are in
11 contact with inner surface 28 of contact plate 18. Depressions
12 26 thereby assure that the spacing between contact plate 18 and
13 cover plate 20 will be maintained even though pressure
14 differentials between the inside volume of heat pipe 10 and the
15 surrounding environment might otherwise cause the plates to
16 deflect toward each other.

17 Heat pipe 10 also includes internal sintered metal
18 capillary wick 30 which covers the entire inside surface of
19 contact plate 18. As is well understood in the art of heat
20 pipes, a capillary wick provides the mechanism by which liquid
21 condensed at the cooler condenser of a heat pipe is transported
22 back to the hotter evaporator where it is evaporated. The
23 vapor produced at the evaporator then moves to the condenser
24 where it again condenses. The two changes of state, evaporation

1 at the hotter locale and condensation at the cooler site, are
2 what transport heat from the evaporator to the condenser.

3 In the present invention, heat pipe 10 also has capillary
4 wick pillars 32 which bridge the space between contact plate 18
5 and cover plate 20. Pillars 32 thereby interconnect cover
6 plate ~~16~~²⁰ and contact plate 14 with continuous capillary wick.
7 This geometry assures that, even if heat pipe 10 is oriented so
8 that cover plate 16 is lower than contact plate ~~14~~¹⁸, liquid
9 condensed upon inner surface 34 of cover plate 20 will still be
10 in contact with capillary pillars 32. The liquid will
11 therefore be moved back to ~~raised~~^{inner} surface 28 which functions as
12 the evaporator because it is in contact with a heat generating
13 integrated circuit (not shown). Capillary pillars 32 are
14 wrapped around and supported by depressions 26, which prevents
15 the structurally weaker capillary pillars 32 from suffering any
16 damage.

17 FIG. 1 also shows frame 36 which is typically used to
18 surround and protect heat pipe 10. Frame 34 completely
19 surrounds heat pipe 10 and contacts lip 24 of contact plate 18.
20 When heat pipe 10 is used to cool an integrated circuit chip
21 (not shown) which is held against contact plate 18, cover plate
22 20 is held in intimate contact with fin plate 38, to which fins
23 16 are connected. The entire assembly of heat pipe 10, frame
24 34, and fin plate 38 is held together and contact plate 18 is

1 held against an integrated circuit chip by conventional screws
2 40, shown in dashed lines, which are placed in holes 42 in fin
3 plate 38 and through holes 12 in heat pipe 10, and are threaded
4 into the mounting plate (not shown) for the integrated circuit
5 chip.

6 Holes 12 penetrate heat pipe 10 without destroying its
7 vacuum integrity because of their unique location. Holes 12
8 are located within sealed structures such as solid columns 44,
9 and since columns 44 are bonded to cover plate 20 at locations
10 46, holes 12 passing through the interior of columns 44 have no
11 affect on the interior of heat pipe 10.

12 The preferred embodiment of the invention has been
13 constructed as heat pipe 10 as shown in FIG. 1. This heat pipe
14 is approximately 3.0 inches by 3.5 inches with a total
15 thickness of .200 inch. Cover plate 20 and contact plate 18
16 are constructed of OFHC copper .035 inch thick, and depressions
17 26 span the .100 inch height of the internal volume of heat
18 pipe 10. The flat portions of depressions 26 are .060 inch in
19 diameter. Capillary wick 30 is constructed of sintered copper
20 powder and averages .040 inch thick. Columns 44 have a .250
21 inch outer diameter, and holes 12 are .210 in diameter.

22 FIG. 2 is a cross section view of an alternate embodiment
23 of the flat plate heat pipe 11 of the invention with through
24 holes 48 located within peripheral lips 22 and 24 of the heat

1 pipe and hole 50 shown in another sealed structure, one of the
2 depressions 26. The only requirement for forming hole 50
3 within a depression 26 is that the bottom of depression 26 must
4 be bonded to inner surface 28 of contact plate 18 to prevent
5 loss of vacuum within the heat pipe. Of course, the region of
6 the peripheral edges is also a sealed structure since bonding
7 between lips 22 and 24 is inherent because heat pipe 11 must be
8 sealed at its edges to isolate the interior from the outside
9 atmosphere.

10 The only differences between heat pipe 11 of FIG. 2 and
11 heat pipe 10 of FIG. 1 are that finned heat sink 16 is not
12 shown in FIG. 2, lips 22 and 24 are slightly longer in FIG. 2
13 to accommodate holes 48, and hole 50 is shown. In fact,
14 through holes 12 shown in FIG. 1 are also included in FIG. 2.
15 Although it is unlikely that holes 12, holes 48, and hole 50
16 would be used in the same assembly, manufacturing economies may
17 make it desirable to produce all the holes in every heat pipe
18 so that the same heat pipe heat spreader can be used with
19 different configurations of finned heat sinks. The unused sets
20 of holes have no effect on the operation or benefits of the
21 invention.

22 FIG. 3 is a plan view of the internal surface of the
23 contact plate 18 of heat pipe 10 of the invention showing
24 region 31 of capillary wick 30. Region 31 is constructed of

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1 sintered silver powder. While the balance of capillary wick 30
2 is conventional sintered metal such as copper, region 31 of
3 capillary wick 30, which is on the opposite surface of contact
4 plate 18 from the integrated circuit chip (not shown), is
5 formed of powdered silver. The higher thermal conductivity of
6 silver yields significantly better heat conduction through
7 region 31 of the wick 30, and thereby reduces the temperature
8 difference between the integrated circuit chip and the vapor
9 within heat pipe 10. This reduction of temperature difference
10 directly affects the operation of heat pipe 10, and essentially
11 results in a similar reduction in the operating temperature of
12 the chip.

13 The invention thereby furnishes an efficient means for
14 cooling an integrated circuit and does so without the need for
15 larger heat spreaders which not only add weight but also do not
16 transfer heat away from the integrated circuit as efficiently
17 as does the heat pipe of the invention.

18 It is to be understood that the form of this invention
19 as shown is merely a preferred embodiment. Various changes
20 may be made in the function and arrangement of parts;
21 equivalent means may be substituted for those illustrated
22 and described; and certain features may be used
23 independently from others without departing from the spirit
24 and scope of the invention as defined in the following

1 claims. For example, through holes could also penetrate heat
2 pipe boundary structures with curved surfaces or heat pipe
3 boundary structures with offset planes which create several
4 different levels for contact with heat sources or heat sinks.

5 What is claimed as new and for which Letters patent of
6 the United States are desired to be secured is:

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1. In a heat pipe in which a boundary structure forms an enclosed vapor chamber, the improvement comprising: at least one mounting hole penetrating the heat pipe.
^(12, 48, 50)
2. In a heat pipe in which a boundary structure forms an enclosed vapor chamber, the improvement comprising: at least one mounting hole penetrating the heat pipe, with the mounting hole isolated from ⁴⁸ (the vapor ⁽¹⁴⁾ chamber) by being located within a sealed structure which is sealed to the boundary structure so that the mounting hole through the heat pipe has no access to the vapor chamber.
3. The heat pipe of claim 2 wherein the sealed structure is a column spanning the boundary structure.
4. The heat pipe of claim 2 wherein the sealed structure is a depression within one part of the boundary structure which contacts and is bonded to another part of the boundary structure.
5. The heat pipe of claim 2 wherein the sealed structure is a lip located at an edge of the boundary structure which is bonded to another lip at the edge of the boundary structure.
6. In a heat pipe in which a boundary structure forms an enclosed vapor chamber, with a capillary wick within the heat pipe attached to ¹⁴ (the part) ³⁰ of the heat pipe which is in contact with a ¹⁵ heat source, so that the capillary wick acts as the heat pipe evaporator, the improvement comprising: the capillary wick

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1 being constructed with at least two separate sections of
2 different materials and with a section located at (the part) of
3 the heat pipe which is in contact with the heat source being
4 formed of a material with higher heat conductivity than
5 sections located at parts of the heat pipe not in contact with
6 the heat source.

7 7. The heat pipe of claim 6 wherein the section of higher
8 heat conductivity is constructed of sintered silver powder.

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DECLARATION, POWER OF ATTORNEY, AND PETITION

We, Peter M. Dussinger and Thomas L. Myers the petitioners named herein, do declare that our citizenships and residences are as stated above our respective signatures; that we have reviewed and we understand the foregoing specification and claims; that we believe ourselves to be the joint, original, first and only inventors of the invention in the patent application titled INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES and described and claimed in the foregoing specification; that we do not know and do not believe that the same was ever known or used in the United States before our invention thereof, or patented or described in any printed publication in any country before our invention thereof, or more than one year prior to this application; or in public use or on sale in the United States more than one year prior to this application; that this invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States on an application filed by us or our legal representatives or assigns more than twelve months prior to this application; that we acknowledge the duty to disclose information we are aware of which is material to the examination of the application in accordance with 37 C.F.R. sec. 1.56(a); and that no application for patent or inventor's certificate on this invention has been filed by us or our representatives or assigns in any country foreign to the United States.

We declare further that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

And we hereby appoint:

Martin Fruitman
Registration No. 26,890
419 N. George St.
Millersville, PA 17551

our attorney with full power of substitution and revocation, to

prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

Wherefore, we pray that Letters Patent be granted to us for the invention or discovery described and claimed in the foregoing specification and claims, and we hereby subscribe our names to the foregoing specification and claims, declaration, power of attorney and this petition this 11th day of May 1999.

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Post Office Address: 8 Lindside Ct.
Lititz, PA 17543

Inventor's Signature: _____

Peter M. Dussinger

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Post Office Address: 44 Rolling Hill Dr.
Lititz, PA 17543

Inventor's Signature: _____

Thomas L. Myers

Applicant: Peter M. Dussinger and Thomas L. Myers

Serial No.:

Filed:

Title: INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
[37 CFR 1.9(f) and 1.27(c)] - SMALL BUSINESS CONCERN

I hereby declare that I am

[] the owner of the small business concern identified below:

[X] an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN: Thermal Corp.

ADDRESS OF CONCERN: Rt. 113 & Edward Street
Georgetown, DE 19947

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For the purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES

by inventor(s) Peter M. Dussinger and Thomas L. Myers

described in

☒ the specification filed herewith
☐ application serial no. , filed

The rights held by the above identified small business concern are exclusive.

I acknowledge the duty to file, in regard to this application or patent, notification of any change of status resulting in loss of entitlement to small business status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which this status as a small entity is no longer appropriate. [37 CFR 1.28(b)]

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING: DONALD M. ERNST

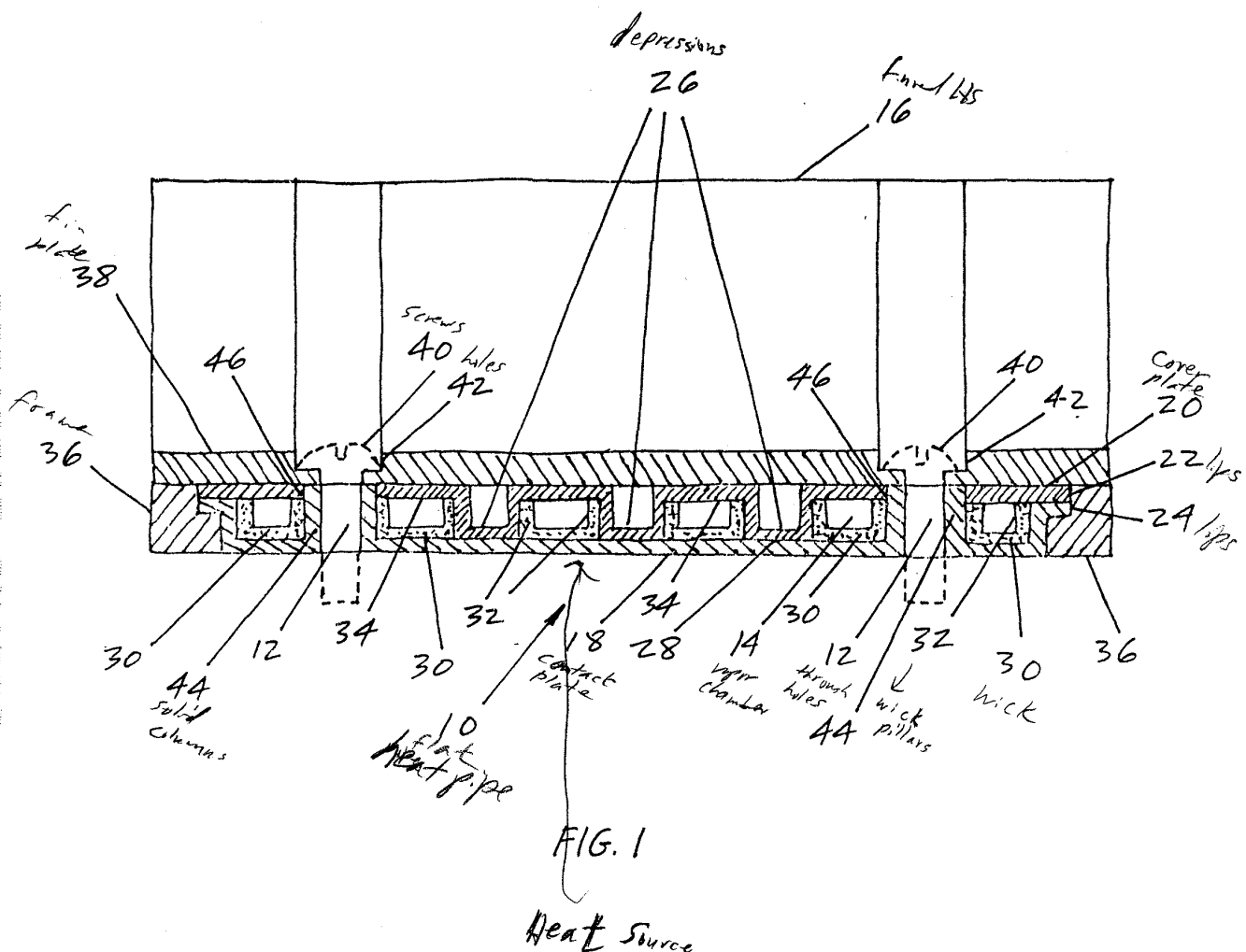
TITLE OF PERSON OTHER THAN OWNER: Vice President

ADDRESS OF PERSON SIGNING: 616 S. WEST END AVE, LANCASTER Pa
17603

SIGNATURE: Donald M. Ernst DATE May 11, 1989

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DT/KH/W



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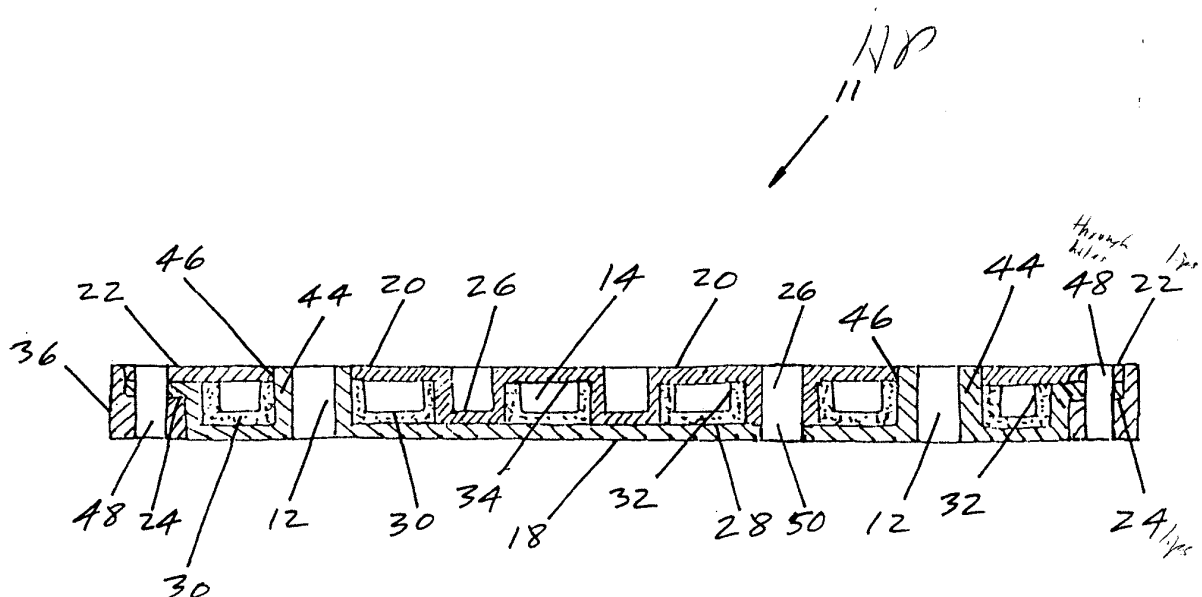


FIG. 2

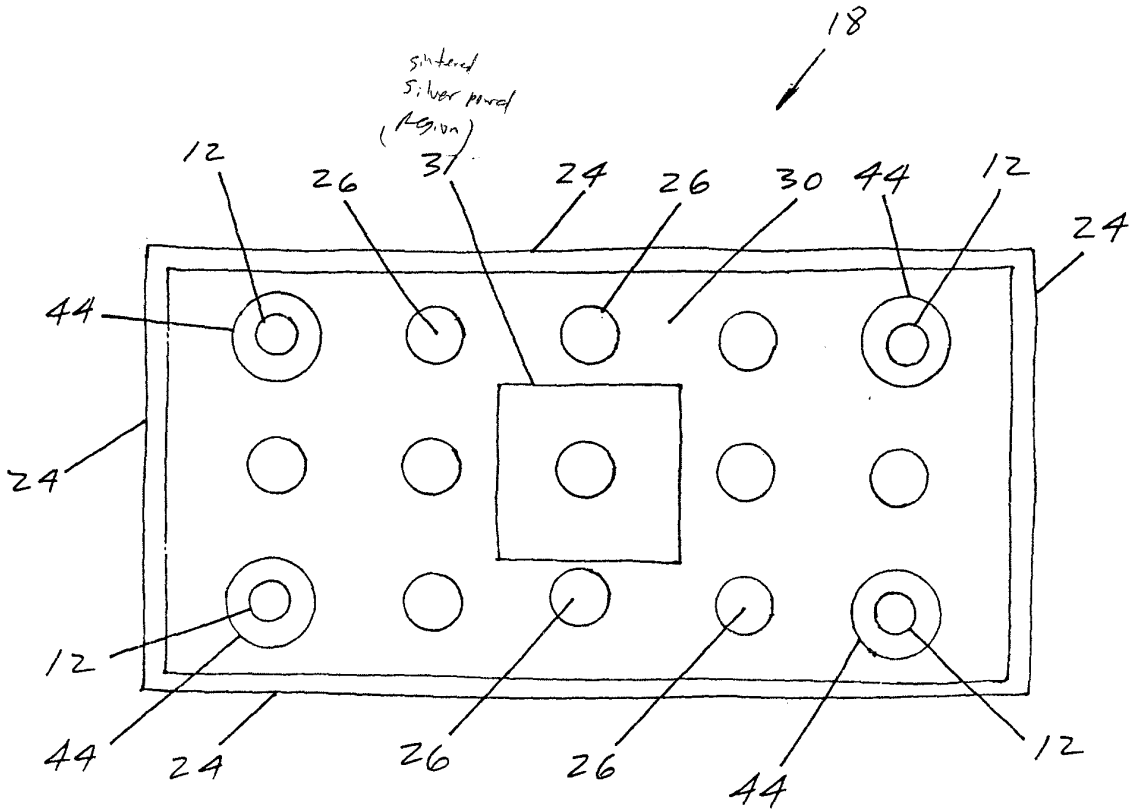


FIG. 3

Cooler Master's Exhibit No. 1012
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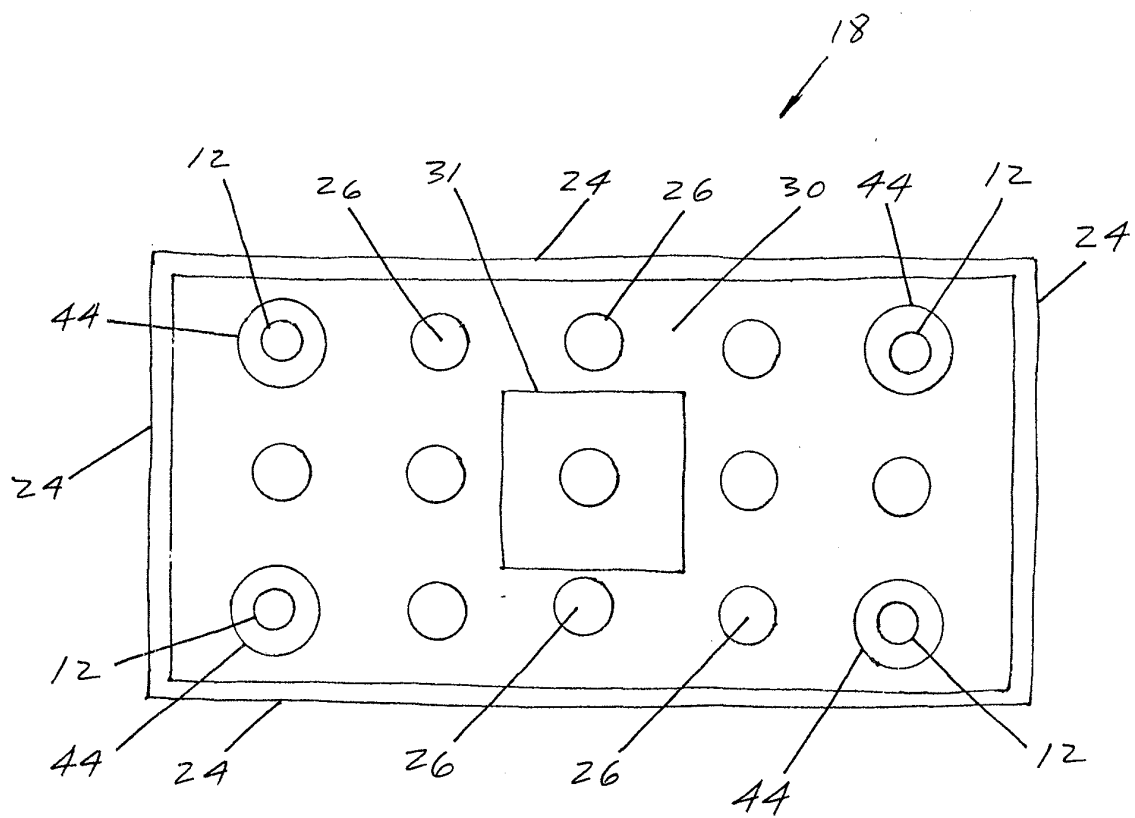


FIG. 3

PATENT APPLICATION FEE DETERMINATION RECORD					Application or Docket Number	
Effective November 10, 1998					510380	
CLAIMS AS FILED - PART I					SMALL ENTITY	
(Column 1) (Column 2)					TYPE <input type="checkbox"/> OR OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA			RATE	FEE
BASIC FEE						380.00
TOTAL CLAIMS	7	minus 20=	*		X\$ 9=	
INDEPENDENT CLAIMS	3	minus 3 =	*		X39=	
MULTIPLE DEPENDENT CLAIM PRESENT					+130=	
					TOTAL	380
* If the difference in column 1 is less than zero, enter "0" in column 2						
CLAIMS AS AMENDED - PART II					SMALL ENTITY	
(Column 1) (Column 2) (Column 3)					OR OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDITIONAL FEE
	Total	*	6	Minus	** 20	= 8
	Independent	*	3	Minus	*** 3	= 8
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDITIONAL FEE
	Total	*		Minus	**	=
	Independent	*		Minus	***	=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDITIONAL FEE
	Total	*	7	Minus	** 20	=
	Independent	*	3	Minus	*** 3	=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."						
***If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."						
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.						

PATENT APPLICATION FEE DETERMINATION RECORD Effective October 1, 1997					Application or Docket Number 09/310397					
CLAIMS AS FILED - PART I (Column 1) (Column 2)					SMALL ENTITY TYPE <input type="checkbox"/> OR OTHER THAN SMALL ENTITY					
FOR	NUMBER FILED	NUMBER EXTRA			RATE	FEE	RATE	FEE		
BASIC FEE					355.00					
					395.00			790.00		
TOTAL CLAIMS	6	minus 20 =	*	✓	x\$11=		OR	x\$22=		
INDEPENDENT CLAIMS	3	minus 3 =	*	✓	x41=		OR	x82=		
MULTIPLE DEPENDENT CLAIM PRESENT					+135=		OR	+270=		
					TOTAL	355.00	OR	TOTAL		
* If the difference in column 1 is less than zero, enter "0" in column 2										
CLAIMS AS AMENDED - PART II (Column 1) (Column 2) (Column 3)					SMALL ENTITY OR OTHER THAN SMALL ENTITY					
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDITIONAL FEE	RATE	ADDITIONAL FEE	
	Total	*	6	Minus	** 20	=	✓	x\$11=	OR	x\$22=
	Independent	*	8	Minus	*** 3	=	5	x41=	OR	x82=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					+135=		OR	+270=	
					TOTAL ADDIT. FEE	800	OR	TOTAL ADDIT. FEE		
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDITIONAL FEE	RATE	ADDITIONAL FEE	
	Total	*		Minus	**	=		x\$11=	OR	x\$22=
	Independent	*		Minus	***	=		x41=	OR	x82=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					+135=		OR	+270=	
					TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE		
AMENDMENT C		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDITIONAL FEE	RATE	ADDITIONAL FEE	
	Total	*		Minus	**	=		x\$11=	OR	x\$22=
	Independent	*		Minus	***	=		x41=	OR	x82=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					+135=		OR	+270=	
					TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20." *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3." The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.										

SERIAL NUMBER	FILING DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/310,397	05/12/99	361	2835	

APPLICANT	PETER M. DUSSINGER, LITITZ, PA.				
	CONTINUING DOMESTIC DATA*** VERIFIED <u>NONE CA</u>				
	371 (NAT'L STAGE) DATA*** VERIFIED <u>NONE CA</u>				
	FOREIGN APPLICATIONS*** VERIFIED <u>NONE CA</u>				
IF REQUIRED, FOREIGN FILING LICENSE GRANTED 06/09/99 ** SMALL ENTITY **					
Foreign Priority claimed <input type="checkbox"/> yes <input checked="" type="checkbox"/> no 35 USC 119 (a-d) conditions met <input type="checkbox"/> yes <input checked="" type="checkbox"/> no <input type="checkbox"/> Met after Allowance		STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
Verified and Acknowledged <u>CA</u> Examiner's Initials _____ Initials _____		PA	3	7	3

ADDRESS	MARTIN FRUITMAN 419 N GEORGE ST MILLERSVILLE PA 17551	

TITLE	INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES	

FILING FEE RECEIVED	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT NO. _____ for the following:	<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit _____
\$380		



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Bib Data Sheet

CONFIRMATION NO. 8761

SERIAL NUMBER 09/310,397	FILING DATE 05/12/1999 RULE	CLASS 165	GROUP ART UNIT 3743	ATTORNEY DOCKET NO.	
APPLICANTS PETER M. DUSSINGER, LITITZ, PA; THOMAS L. MYERS, LITITZ, PA; ** CONTINUING DATA ***** ** FOREIGN APPLICATIONS ***** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** SMALL ENTITY ** ** 06/09/1999					
Foreign Priority claimed <input type="checkbox"/> yes <input checked="" type="checkbox"/> no 35 USC 119 (a-d) conditions met <input type="checkbox"/> yes <input checked="" type="checkbox"/> no <input type="checkbox"/> Met after Allowance Verified and Acknowledged		STATE OR COUNTRY PA	SHEETS DRAWING 3	TOTAL CLAIMS 7	INDEPENDENT CLAIMS 3
ADDRESS SAMUEL W. APICELLI, ESQ. DUANE, MORRIS & HECKESCHER LLP 305 NORTH FRONT STREET, P.O. BOX 1003 HARRISBURG, PA 17108-1003					
TITLE INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES					
FILING FEE RECEIVED 580	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit		

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Patent and Trademark U.S. DEPARTMENT OF COMMERCE
it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.

Total Pages

1

First Named Inventor or Application Identifier

Peter M. Dussinger

Express Mail Label No.

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO:

Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. ☒ Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)
2. ☒ Specification [Total Pages 15]
(preferred arrangement set forth below)
- Descriptive title of the Invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
3. ☒ Drawing(s) (35 USC 113) [Total Sheets 3]
4. ☒ Oath or Declaration [Total Pages 2]
- a. ☒ Newly executed (original or copy)
- by from a prior application (37 CFR 1.63(d))
continuation/divisional with Box 17 completed)
(Note Box 5 below)
- i. ☐ DELETE the following inventor(s) named
in the prior application:
5. ☐ Incorporation By Reference (useable if Box 4b is checked)
The entire disclosure of prior application
No: _____/_____ is considered as being
part of the disclosure of the accompanying application
and is hereby incorporated by reference therein.

6. ☐ Microfiche Computer Program (Appendix)
7. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
- a. ☐ Computer Readable Copy
- b. ☐ Paper Copy (identical to computer copy)
- c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. ☒ Assignment Papers (cover sheet & document(s))
9. ☐ 37 CFR 3.73(b) Statement ☐ Power of Attorney
(when there is an assignee)
10. ☐ English Translation Document (if applicable)
11. ☒ Information Disclosure Statement (IDS)/PTO-1449 ☒ Copies of IDS Citations
12. ☐ Preliminary Amendment
13. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
14. ☒ Small Entity ☒ Statement filed in prior application,
Statement(s) ☒ Status still proper and desired
15. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
16. ☐ Other: _____

17. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: _____

18. CORRESPONDENCE ADDRESS

☐ Customer Number or Bar Code Label

or ☒ Correspondence address below

(Insert Customer No. or Attach bar code label here)

NAME

Martin Fruitman

ADDRESS

419 N. George St.

CITY

Millersville

STATE

PA

ZIP CODE

17551

COUNTRY

U.S.A.

TELEPHONE

(717)872-7234

-FAX

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

Attorney's Docket No. _____
Martin Fruitman
419 N. George St.
Millersville, PA 17551

COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, DC 20231



Sir:

Transmitted herewith for filing is the patent application of:

Inventor: Peter M. Dussinger et al

For: INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER
WITH THROUGH MOUNTING HOLES

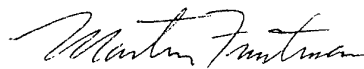
Enclosed are:

- [X] _____3_____ sheets of drawing
- [X] An assignment of the invention to Thermal Corp.
- [X] A verified statement to establish small entity status under
37 C.F.R. 1.9 and 37 C.F.R. 1.27.

The filing fee has been calculated as shown below:

		(Col. 1)	(Col. 2)	SMALL ENTITY		OTHER THAN SMALL ENTITY	
		NO.					
FOR:	NO. FILED	EXTRA		RATE	FEE	OR	RATE FEE
BASIC FEE	*****	*****		****	\$380	OR	**** \$760
TOTAL CLMS	7-20=	0		x9	\$ 0	OR	x18 \$
INDEP. CLMS	2-3=	0		x39	\$ 0	OR	x78 \$
[] MULTIPLE INDEPENDENT CLAIMS				x	\$ 0	OR	x \$
				TOTAL	\$380		TOTAL \$

- [X] A check in the amount of \$380.00 to cover the filing fee is enclosed.
- [X] A second check in the amount of \$ 40.00 to cover the fee for recording of the assignment is enclosed.
A duplicate copy of this sheet is enclosed.


Martin Fruitman
Attorney of Record
Reg. No. 26,890

jc490 U.S. PTO
05/12/99

Attorney's Docket No. _____
Martin Fruitman
419 N. George St.
Millersville, PA 17551

jc511 U.S. PTO
09/310397
05/12/99

COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, DC 20231

Sir:

Transmitted herewith for filing is the patent application of:

Inventor: Peter M. Dussinger et al

For: INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER
WITH THROUGH MOUNTING HOLES

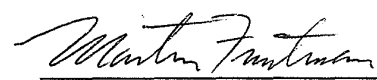
Enclosed are:

- [X] 3 sheets of drawing
- [X] An assignment of the invention to Thermal Corp.
- [X] A verified statement to establish small entity status under 37 C.F.R. 1.9 and 37 C.F.R. 1.27.

The filing fee has been calculated as shown below:

(Col. 1) (Col. 2) NO.			SMALL ENTITY		OTHER THAN SMALL ENTITY			
FOR:	NO. FILED	EXTRA	RATE	FEE	OR	RATE	FEE	
BASIC FEE	*****	*****	****	\$380	OR	****	\$760	
TOTAL CLMS	7-20=	0	x9	\$ 0	OR	x18	\$	
INDEP. CLMS	2-3=	0	x39	\$ 0	OR	x78	\$	
[] MULTIPLE INDEPENDENT CLAIMS			x	\$ 0	OR	x	\$	
TOTAL				\$380	TOTAL			\$

- [X] A check in the amount of \$380.00 to cover the filing fee is enclosed.
- [X] A second check in the amount of \$ 40.00 to cover the fee for recording of the assignment is enclosed.
A duplicate copy of this sheet is enclosed.


Martin Fruitman
Attorney of Record
Reg. No. 26,890

CERTIFICATE OF MAILING BY EXPRESS MAIL



Express Mail Label No.: EE283079580US

Date of Deposit: May 12, 1999

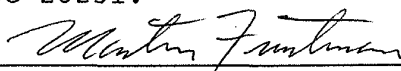
Paper: Patent Application

Title: INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER
WITH THROUGH MOUNTING HOLES

Serial No.:

Applicant: Peter M. Dussinger and Thomas L. Myers

I hereby certify that this paper is being deposited with the U.S. Postal Service "Express Mail, Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, DC 20231.



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MARTIN FRUITMAN P.C.

PATENT & TRADEMARK ATTORNEY

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MILLERSVILLE, PA 17551

PHONE (717) 872-7234

#2
IDS
Rages
7/1/8

jc511 U.S. PTO

09/310397



May 12, 1999

Commissioner of Patents and Trademarks
Washington, DC 20231

Sir:

PRIOR ART STATEMENT

Enclosed is the application of Peter M. Dussinger et al for United States Letters Patent for a INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES.

The prior art listed below, copies of which are enclosed, is the closest prior art of which I am aware.

5,694,295	12/2/97	Mochizuki et al
5,465,782	11/14/95	Sun et al
5,427,174	6/27/95	Lomolino, Sr. et al
3,834,457	9/10/74	Madsen
3,680,189	8/1/72	Noren
3,490,718	1/20/70	Vary
SU 407-160	4/2/74	Aleksandrov et al (Soviet patent)

Mochizuki shows a holding frame 17.

Sun and and Lomolino use supporting walls as spacers within flat heat pipes.

Madsen and Noren both use non-wick spacer structures to separate and support the plates of a flat heat pipe.

Vary and Aleksandrov show mating embossed depressions separating the flat plates of a heat pipe.

Respectfully submitted,

Martin Fruitman
Attorney of Record

FORM PTO-1449 (REV. 7-80) (Title Amended 3/83)		DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTY. DOCKET 		SERIAL NO. 09/310,397		
INFORMATION DISCLOSURE STATEMENT BY APPLICANT - <u>LIST OF ITEMS</u> (Use several sheets if necessary)				Applicant Peter M. Dussinger et al				
				Filing Date 5/12/99				Group 3143
U.S. PATENT DOCUMENTS								
EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE		
CK	AA	5,694,295	12/2/97	Mochizuki et al	361	699		
CK	AB	5,465,782	11/14/95	Sun	165	104.26		
CK	AC	5,427,174	6/27/95	Lomolino	165	104.26		
CK	AD	3,834,457	9/10/74	Madsen	165	104.26		
CK	AE	3,680,189	8/1/72	Noren	165	104.26		
CK	AF	3,490,718	1/20/70	Vary	165	104.26		
	AG							
	AH							
	AI							
	AJ							
	AK							
FOREIGN PATENT DOCUMENTS								
		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION	
							YES	NO
CK	AL	SU 407-160	4/2/74	Soviet Union	165	104.26		
	AM							
	AN							
	AO							
	AP							
OTHER INFORMATION (Including Author, Title, Date, Pertinent)								
	AR							
	AS							
	AT							
EXAMINER					DATE CONSIDERED			
Christopher A. K. Hearn					6/14/2k			
<small>*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not conformance and not considered. Include copy of this form with next communication to applicant.</small>								



**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
-----------------	-------------	----------------------	---------------------

09/310,397 05/12/99 DUSSINGER

P

MARTIN FRUITMAN
419 N GEORGE ST
MILLERSVILLE PA 17551

QM02/0623

EXAMINER

ATKINSON, C

ART UNIT

PAPER NUMBER

3743

DATE MAILED:

06/23/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/310,397

Applicant(s)

Dussinger et al.

Examiner

H. K. Hansen

Group Art Unit

3743

---The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address---

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

- ☐ Responsive to communication(s) filed on _____.
- ☐ This action is **FINAL**.
- ☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- ☒ Claim(s) 1-7 is/are pending in the application.
Of the above claim(s) _____ is/are withdrawn from consideration.
- ☐ Claim(s) _____ is/are allowed.
- ☒ Claim(s) 1-7 is/are rejected.
- ☐ Claim(s) _____ is/are objected to.
- ☐ Claim(s) _____ are subject to restriction or election requirement.

Application Papers

- ☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.
- ☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
- ☒ The drawing(s) filed on 5/12/99 is/are objected to by the Examiner.
- ☒ The specification is objected to by the Examiner.
- ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

- ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
 - ☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been received.
 - ☐ received in Application No. (Series Code/Serial Number) _____.
 - ☐ received in this national stage application from the International Bureau (PCT Rule 1.7.2(a)).

*Certified copies not received: _____

Attachment(s)

- ☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 2
- ☐ Interview Summary, PTO-413
- ☐ Notice of Reference(s) Cited, PTO-892
- ☐ Notice of Informal Patent Application, PTO-152
- ☒ Notice of Draftsperson's Patent Drawing Review, PTO-948
- ☐ Other _____

Office Action Summary

Art Unit: 3743

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the heat source must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "16" and "14" have both been used to designate a contact plate. Correction is required.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "14"; "16", etc. have been used to designate both a vapor channel and a contact plate; "a cover plate" and "a fin". Correction is required.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: Fig. 12. Correction is required.

Specification

The disclosure is objected to because of the following informalities. For example, there is no Fig. 12 illustrated in the drawings nor disclosure in the description section of the specification.

Claim Rejections - 35 USC § 112

Claims 2-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Regarding claim 2, the recitation "the vapor chamber" lacks antecedence.

Art Unit: 3743

Regarding claim 6, the recitation "the part" lacks antecedence.

In view of the plurality of drawing, specification and claim errors, the Examiner has only listed a few examples of these errors and it is requested applicant review the application and correct all drawing, specification and claim errors.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3 are rejected under 35 U.S.C. § 102(b) as being anticipated by Tajbl et al.

The document of Tajbl et al. in Figures 1-4 discloses a sealed heat pipe having electronic devices attached via holes and screws.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention

Art Unit: 3743

was made, owned by the same person or subject to an obligation of assignment to the same person.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103, the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 C.F.R. § 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of potential 35 U.S.C. § 102(f) or (g) prior art under 35 U.S.C. § 103.

Claim 4 is rejected under 35 U.S.C. § 103 as being unpatentable over Tajbl et al. in view of Evdokimov. The document of Tajbl et al. discloses all the claimed features of the invention with the exception of the depression bonded to another part of the structure.

The document of Evdokimov in Figures 1 and 2 discloses that it is known to have a heat pipe comprised of depressions bonded to another part of the heat pipe for the purpose of increasing the structural strength/rigidity of the heat pipe. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ in Tajbl et al. depressions bonded to another part of the heat pipe for the purpose of increasing the structural strength/rigidity of the heat pipe as disclosed in Evdokimov.

Claim 5 is rejected under 35 U.S.C. § 103 as being unpatentable over Tajbl et al. in view of Doriner Systems. The document of Tajbl et al. discloses all the claimed features of the invention with the exception of bonded lips.

The document of Doriner Systems in Figures 1 and 2 discloses that it is known to have a heat pipe comprised of plates with bonded lips for the purpose of making a heat pipe which

Art Unit: 3743

virtually isothermal conditions can be achieved with quite rapid exchange of energy. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ in Tajbl et al. plates with bonded lips for the purpose of making a heat pipe which virtually isothermal conditions can be achieved with quite rapid exchange of energy as disclosed in Doriner Systems.

Claims 6-7 are rejected under 35 U.S.C. § 103 as being unpatentable over Doriner Systems in view of ALIP. The document of Doriner Systems discloses all the claimed features of the invention with the exception of the wick having a higher thermal conductivity at one part than at another part.

The document of ALIP in the illustration discloses that it is known to have a wick which has a higher thermal conductivity at one part (i.e. heat receiving middle part) of the heat pipe than at another part of the heat pipe (i.e. part away from the heat source in the radial direction) for the purpose of increasing the heat transfer efficiency of the wick and removing a large amount of heat from a heat source. It has been held "that the use of a one piece construction instead of the structure disclosed in [the prior art] would be merely a matter of obvious engineering choice." In re Larson, 340 F.2d 965, 144 USPQ 347, 349 (CCPA 1965). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ in Doriner Systems the wick having a higher thermal conductivity at one part (i.e. heat receiving middle part) of the heat pipe than at another part of the heat pipe (i.e. part away from the heat source in the radial direction) for the purpose of increasing the heat transfer efficiency of the wick and

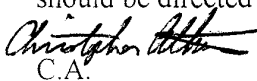
Art Unit: 3743

removing a large amount of heat from the heat source as disclosed in ALIP. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the wick out of silver powder, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Atkinson whose telephone number is (703) 308-2603.

 **CHRISTOPHER ATKINSON**
C.A. **PRIMARY EXAMINER**

June 14, 2000

Notice of References Cited

Application No. 09/310,397	Applicant(s) Dussinger et al.
Examiner Atkinson	Group Art Unit 3743
Page 1 of 1	

U.S. PATENT DOCUMENTS					
*	DOCUMENT NO.	DATE	NAME	CLASS	SUBCLASS
A	4,461,343	7/1984	Token et al.	165	104.33 X
B	3,209,062	9/1965	Scholz	165	104.33 X
C	4,118,756	10/1978	Nelson et al.	165	104.33 X
D	4,047,198	9/1977	Sekhon et al.	165	104.26 X
E	4,046,190	9/1977	Marcus et al.	165	104.26
F	5,323,292	6/1994	Brezinski	165	104.33 X
G	5,642,776	7/1997	Meyer, IV et al.	165	46 X
H					
I					
J					
K					
L					
M					

FOREIGN PATENT DOCUMENTS						
*	DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUBCLASS
N	0589531	1/1978	Soviet Union	Evdokimov	165	104.26
O	1476297	4/1989	Soviet Union	Alip	165	104.26
P	1284506	12/1968	Germany	Tajbl et al.	165	104.33
Q	1402509	8/1975	United Kingdom	Dorner Systems	165	104.26
R	0154277	12/1979	Japan	Sakata	165	104.33
S	2579371	9/1986	France	Carnevali	165	104.33
T	0987357	1/1983	Soviet Union	Gnilichenko	165	104.26

NON-PATENT DOCUMENTS	
*	DOCUMENT (Including Author, Title, Source, and Pertinent Pages)
U	Dombrowskas et al., Conduction Cooled Heat Plate for Modular Circuit Package, IBM TDB, p. 442.
V	Muccio, Low-Cost Cooling Package, IBM TDB, pp 3761-3762.
W	
X	

Christy Atkinson

* A copy of this reference is not being furnished with this Office action.
(See Manual of Patent Examining Procedure, Section 707.05(a).)

9/340397

NOTICE OF DRAFTSPERSON'S
PATENT DRAWING REVIEWThe drawing(s) filed (insert date) 5/12/99 are:A. ☐ approved by the Draftsperson under 37 CFR 1.84 or 1.152.B. ☒ objected to by the Draftsperson under 37 CFR 1.84 or 1.152 for the reasons indicated below. The Examiner will require submission of new, corrected drawings when necessary. Corrected drawing must be submitted according to the instructions on the back of this notice.

1. DRAWINGS. 37 CFR 1.84(a): Acceptable categories of drawings:

Black ink. Color.

☐ Color drawings are not acceptable until petition is granted.

Fig(s) _____

☐ Pencil and non black ink not permitted. Fig(s) _____

2. PHOTOGRAPHS. 37 CFR 1.84 (b)

☐ 1 full-tone set is required. Fig(s) _____☐ Photographs not properly mounted (must use bristol board or photographic double-weight paper). Fig(s) _____☐ Poor quality (half-tone). Fig(s) _____

3. TYPE OF PAPER. 37 CFR 1.84(e)

☐ Paper not flexible, strong, white, and durable.

Fig(s) _____

☐ Erasures, alterations, overwritings, interlineations,☐ folds, copy machine marks not accepted. Fig(s) _____☐ Mylar, velum paper is not acceptable (too thin).

Fig(s) _____

4. SIZE OF PAPER. 37 CFR 1.84(f): Acceptable sizes:

☐ 21.0 cm by 29.7 cm (DIN size A4)☐ 21.6 cm by 27.9 cm (8 1/2 x 11 inches)☐ All drawing sheets not the same size.

Sheet(s) _____

☐ Drawings sheets not an acceptable size. Fig(s) _____

5. MARGINS. 37 CFR 1.84(g): Acceptable margins:

Top 2.5 cm Left 2.5cm Right 1.5 cm Bottom 1.0 cm

SIZE: A4 Size

Top 2.5 cm Left 2.5 cm Right 1.5 cm Bottom 1.0 cm

SIZE: 8 1/2 x 11

Margins not acceptable. Fig(s) _____

Top (T) _____

Left (L) _____

Right (R) _____ Bottom (B) _____

6. VIEWS. 37 CFR 1.84(h)

REMINDER: Specification may require revision to correspond to drawing changes.

Partial views. 37 CFR 1.84(h)(2)

☐ Brackets needed to show figure as one entity.

Fig(s) _____

☐ Views not labeled separately or properly.

Fig(s) _____

☐ Enlarged view not labeled separately or properly.

Fig(s) _____

7. SECTIONAL VIEWS. 37 CFR 1.84 (h)(3)

☐ Hatching not indicated for sectional portions of an object.

Fig(s) _____

☐ Sectional designation should be noted with Arabic or

Roman numbers. Fig(s) _____

8. ARRANGEMENT OF VIEWS. 37 CFR 1.84(i)

☐ Words do not appear on a horizontal, left-to-right fashion when page is either upright or turned so that the top becomes the right side, except for graphs. Fig(s) _____

9. SCALE. 37 CFR 1.84(k)

☐ Scale not large enough to show mechanism without crowding when drawing is reduced in size to two-thirds in reproduction.

Fig(s) _____

10. CHARACTER OF LINES, NUMBERS, & LETTERS.

37 CFR 1.84(i)

☒ Lines, numbers & letters not uniformly thick and well defined, clean, durable, and black (poor line quality).Fig(s) 1-3

11. SHADING. 37 CFR 1.84(m)

☐ Solid black areas pale. Fig(s) _____☐ Solid black shading not permitted. Fig(s) _____☐ Shade lines, pale, rough and blurred. Fig(s) _____

12. NUMBERS, LETTERS, & REFERENCE CHARACTERS.

37 CFR 1.84(p)

☒ Numbers and reference characters not plain and legible.Fig(s) 1-3☐ Figure legends are poor. Fig(s) _____☐ Numbers and reference characters not oriented in the same direction as the view. 37 CFR 1.84(p)(1)

Fig(s) _____

☐ English alphabet not used. 37 CFR 1.84(p)(2)

Figs _____

☐ Numbers, letters and reference characters must be at least .32 cm (1/8 inch) in height. 37 CFR 1.84(p)(3)

Fig(s) _____

13. LEAD LINES. 37 CFR 1.84(q)

☐ Lead lines cross each other. Fig(s) _____☐ Lead lines missing. Fig(s) _____

14. NUMBERING OF SHEETS OF DRAWINGS. 37 CFR 1.84(i)

☐ Sheets not numbered consecutively, and in Arabic numerals beginning with number 1. Sheet(s) _____

15. NUMBERING OF VIEWS. 37 CFR 1.84(u)

☐ Views not numbered consecutively, and in Arabic numerals, beginning with number 1. Fig(s) _____

16. CORRECTIONS. 37 CFR 1.84(w)

☐ Corrections not made from prior PTO-948 dated _____

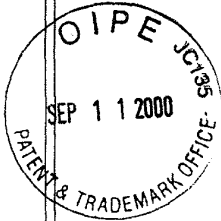
17. DESIGN DRAWINGS. 37 CFR 1.152

☐ Surface shading shown not appropriate. Fig(s) _____☐ Solid black shading not used for color contrast.

Fig(s) _____

COMMENTS

REVIEWER WJSDATE 6/11/99TELEPHONE NO. 9033058404ATTACHMENT TO PAPER NO. 3



4/a
ag
9/20/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:)

Peter M. Dussinger et al)

Serial No.: 09/310,397)

Filed: 5/12/99)

Title: INTEGRATED CIRCUIT)

HEAT PIPE HEAT SPREADER

WITH THROUGH MOUNTING HOLES

Art Unit 3743

Examiner Atkinson

TC 3700 MAIL ROOM

SEP 15 2000

RECEIVED

419 N. George St.
Millersville, PA 17551
September 7, 2000

AMENDMENT

Hon. Commissioner of Patents and Trademarks
Washington, DC 20231

Sir:

This Amendment is responsive to the Patent Office action
mailed June 23, 2000 (paper no. 3).

IN THE SPECIFICATION

Please amend the specification as indicated below.

On page 6, on line 11, please insert the word ... of...
between the words "surface" and "the".

On page 8, on line 6 and on line 8, please replace the
numeral "16" with the numeral ...20..., and replace the numeral
"14" with the numeral ...18... .

1 On page 8, on line 11, please replace the sixth word
2 "raised" with the word ...inner... .

3 On page 10, on line 14, please replace the designation
4 "FIG. 12" with the designation ... FIG. 1

5 IN THE CLAIMS

6 Please cancel claim 5.

7 Please amend the claims as indicated on the following page.

8 2. (Amended) In a heat pipe in which a boundary structure
9 forms an enclosed vapor chamber, the improvement comprising: at
10 least one mounting hole penetrating the heat pipe through a
11 vapor chamber enclosed by a boundary structure, with the
12 mounting hole isolated from the vapor chamber by being located
13 within a sealed structure which is sealed to the boundary
14 structure so that the mounting hole through the heat pipe has
15 no access to the vapor chamber.

16 6. (Amended) In a heat pipe in which a boundary structure
17 forms an enclosed vapor chamber, with a capillary wick within
18 the heat pipe attached to [the] a part of the heat pipe which
19 is [in] used for contact with a heat source, so that the
20 capillary wick acts as the heat pipe evaporator, the
21 improvement comprising: the capillary wick being constructed
22 with at least two separate sections of different materials and
23 with a section located at [the] a part of the heat pipe which
24 is [in] used for contact with [the] a heat source being formed

Q2 of a material with higher heat conductivity than sections located at parts of the heat pipe not [in] used for contact with [the] a heat source.

REMARKS

The drawings have been objected to because "the heat source" was not shown in the drawings but was specified in the claims. It is believed that this objection has been overcome by amending claim 6 to eliminate the specification of a heat source by using the phrase heat source only to describe a particular part of the heat pipe, as in "a part of the heat pipe which is used for contact with a heat source".

The drawings were also objected to because of the misuse of the numerals "14" and "16" and because of the use of the designation "FIG. 12". It is now believed that all these errors have been corrected and the objections are no longer required. Applicants' representative offers his sincere apologies for the confusion caused by these errors.

Claims 2-7 have been rejected under 35 U.S.C. 112 because, in claim 2 "the vapor chamber" and in claim 6 "the part" lacked antecedence. These claims have now been amended in a manner which is believed to furnish proper antecedents.

Claims 1-3 have been rejected under 35 U.S.C. sec. 102(b) as being anticipated by Tajbl et al. This rejection is respectfully traversed.

The Tajbl patent does indeed show a sealed heat pipe having electronic components attached by means of holes and screws as the Examiners notes. However, claim 1 of the application requires more than that. It specifies "at least one mounting hole penetrating the heat pipe", and Tajbl shows no such structure. Tajbl shows a supporting plate with several closed vapor canals with vaporizing and condensing liquid [heat pipes], but all the attachment holes are in spaces on the plate between the heat pipes, and none of the holes penetrate any of the heat pipes. As shown in FIG. 1 and specified in claim 1 of the present application, in the present application the holes for attachment penetrate through the heat pipe.

Claim 1-3 are believed to be allowable because they specify different structures from that of Tajbl, the structures function differently, and they provide the new and unusual result of not requiring mounting frames or other side structures in which to form holes to attach the heat pipe.

Claim 4 has been rejected under 35 U.S.C. sec. 103 as being unpatentable over Tajbl et al in view of Evdokimov. This rejection is respectfully traversed.

Since Tajbl does not actually disclose holes penetrating the heat pipes, the combination of Tajbl and Evdokimov does not gain anything. Evdokimov does show the depressions of one side of a heat pipe bonded to another part of the heat pipe, but

claim 4 of the application is dependent from claim 1 which requires holes penetrating the heat pipe, and Evdokimov does not even suggest the need for any screw holes for attachment. Claim 4 should be allowed as a variation of claim 1 which is believed to be allowable because Tajbl also shows no holes penetrating a heat pipe.

Rejected claim 5 has been cancelled.

Claims 6 and 7 have been rejected under 35 U.S.C. sec. 103 as being unpatentable over Doriner Systems in view of ALIP. This rejection is respectfully traversed.

ALIP apparently discloses a wick material with varying thermal conductivity so that the thermal conductivity increases as the wick material progresses toward the apex of a ribbed hemispherical evaporator surface. This differs substantially from the specification of claim 6.

Amended claim 6 specifies only two different materials, one with higher thermal conductivity, with the locations of the two materials determined by the location of the heat source with which the heat pipe is to be used. The higher thermal conductivity material is located at the part of the heat pipe which is used for contact with the heat source, and the lower conductivity material is used elsewhere.

ALIP makes no distinction for the thermal conductivity in regard to the location of the heat source, and in fact infers

that the heat source covers all of surface 2. ALIP states that superheating occurs at the periphery of the evaporator, at the heat pipe side walls, probably because that is the location of the shortest thermal path. That makes the wick near the wall closer to the heat source, and that is where the wick structure has the lowest thermal conductivity.

Claim 6 also specifies separate sections of wick, not just differences in thermal conductivity. ALIP actually discloses a single wick with continuously varying conductivity, not a wick with distinct and separate sections. Furthermore, the manufacture of a heat pipe with a wick of continually varying thermal conductivity is a difficult and expensive process, while a wick using only two types of material in distinct locations is quite simple to make.

The present invention also permits the use of the higher conductivity material offset from a central location of the heat pipe. All that is required for that use is to attach the higher thermal conductivity wick to the location used, whereas the ALIP wick structure requires placing the variable conductivity wick over the entire surface, and it is not at all clear if the ALIP wick can even be used in an asymmetrical location.

The wick of claim 6 is therefore structurally different and operates differently from ALIP. Moreover its simple structure

gives it a distinct manufacturing advantage over ALIP.

The Applicants have made a bona fide attempt to respond to the rejection set forth by the Patent Office. Accordingly, it is submitted that the case is now in condition for allowance, and early and favorable notice to this effect is respectfully solicited.

If an interview would facilitate disposal of the present application, it is suggested that the Examiner call the number noted below, at the Examiner's convenience, to discuss the matter.

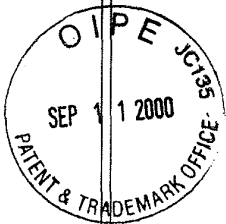
Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Martin Fruitman".

Martin Fruitman

Attorney of Record

Telephone (717) 872-7234



3743

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:)
Peter M. Dussinger et al)
Serial No.: 09/310,397) Art Unit 3743
Filed: 5/12/99)
Title: INTEGRATED CIRCUIT) Examiner Atkinson
HEAT PIPE HEAT SPREADER
WITH THROUGH MOUNTING HOLES

TC 3700 MAIL ROOM

SEP 15 2000

RECEIVED

419 N. George St.
Millersville, PA 17551

Hon. Commissioner of Patents and Trademarks
Washington, DC 20231

Sir:

CERTIFICATE OF MAILING

I hereby certify that this Amendment
is being deposited with the United States Postal Service as
first class mail with sufficient postage in an envelope
addressed to:
Commissioner of Patents and Trademarks, Washington, D.C. 20231,
on the date indicated below.

By: Martin Funtman
Date: 9/7/00

11-14-00
#5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Dussinger et al.

Serial No: 09/310,397

Examiner: Atkinson, C.

Filed: 05/12/1999

Group Art Unit: 3743

For: INTEGRATED CIRCUIT HEAT PIPE HEAT
SPREADER WITH THROUGH MOUNTING HOLES

CERTIFICATE UNDER 37 CFR 1.8(b)
I, SAMUEL W. APICELLI, REGISTRATION NO. 36,427, HEREBY CERTIFY
THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE
UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN
ENVELOPE ADDRESSED TO ASSISTANT COMMISSIONER FOR
PATENTS, WASHINGTON, D.C. 20231.

ON _____

SAMUEL W. APICELLI

Commissioner of Patents and Trademarks
Washington, D.C. 20231

FAX RECEIVED

NOV 8 - 2000

Sir:

POWER OF ATTORNEY

Group 3700

The undersigned, James E. Rothenberger, a representative of Assignee, Thermal Corp., in the above-identified patent application, revokes all powers of attorney previously granted, and appoints the following persons as his new attorneys, with full power of revocation and substitution, to act in his behalf in all matters affecting the above-identified patent application.

The undersigned hereby appoints the practitioners of Customer No. 08933, namely, Samuel W. Apicelli, Registration No. 36,427; William H. Murray, Registration No. 27,218; Lewis F. Gould, Jr., Registration No. 25,057; Stephan P. Gribok, Registration No. 29,643; Peter J. Cronk, Registration No. 32,021; Robert E. Rosenthal, Registration No. 33,450; Richard A. Paikoff, Registration No. 34,892;; Daniel S. Goldberg, Registration No. 39,689; N. Stephen Kinsella, Registration No. 37,657; Steven E. Koffs, Registration No. 37,163; Gail A. Dalickas, Registration No. 40,979; Darius C. Gambino, Registration No. 41,472; Anthony Colesanti, Registration No. 42,428, Joseph A. Powers, Registration No. P47,006; and Melanie S. Goddard, Registration No. P46,732, as his attorneys to prosecute this application for patent, with full power of substitution and revocation to amend or otherwise act relative to him as they may deem advisable, to transact all business in the Patent and Trademark Office

Attorney Docket No.: H1799-00025

NOV. -03' 00 (FRI) 11:20

DUANE, MORRIS & HECKSCHER

TEL: 717 232 4015

P. 004

in connection therewith and generally to do all matters and things needful in the premises and to receive the Letters Patent.

Correspondence should be directed to:

Samuel W. Apicelli, Esquire
Duane, Morris & Heckscher LLP
305 North Front Street, P.O. Box 1003
Harrisburg, PA 17108-1003

and address all telephone calls to: Samuel W. Apicelli, Esq.; (717) 237-5516.

Thermal Corp.

Date: 11/2/00


James E. Rothenberger
Treasurer

HPG164512.1

Attorney Docket No.: H1799-00025

-2-

NOV. -03' 00 (FRI) 11:19

DUANE, MORRIS & HECKSCHER

TEL: 717 232 4015

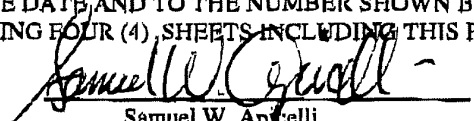
P. 001

CERTIFICATE OF FACSIMILE TRANSMISSION 37 C.F.R. 1.6 & 1.8

I CERTIFY THAT THIS CORRESPONDENCE IS BEING TRANSMITTED BY FACSIMILE TO THE PATENT AND TRADEMARK OFFICE ON THE DATE AND TO THE NUMBER SHOWN BELOW.

FAX NO. 703-308-7764 COMPRISING FOUR (4) SHEETS INCLUDING THIS PAGE.

Date: November 3, 2000


Samuel W. Apicelli
Reg. No. 36,427

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Dussinger et al.

Serial No: 09/310,397

Examiner: Atkinson, C.

Filed: 05/12/1999

Group Art Unit: 3743

For: INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES

Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

TRANSMITTAL LETTER

FAX RECEIVED

NOV 8 - 2000

Group 3700

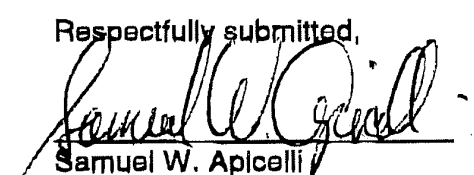
Please find enclosed for filing:

- ☒ Power of Attorney and Change of Correspondence
- ☒ Statement Under 37 CFR 3.73(b)
- ☒ If any fees are required, please debit the same from

Deposit Account No. 04-1679. This Transmittal Letter is submitted in duplicate.

Date: 11/3/00

Respectfully submitted,


Samuel W. Apicelli

Registration No.: 36,427

Customer Number 08933

DUANE, MORRIS & HECKSCHER, LLP

305 North Front Street, P.O. Box 1003

Harrisburg, PA 17108-1003

(717) 237-5516

Attorney Docket No.: H1799-00025

PTO/SB/96 (08-00)

Approved for use through 10/31/2002. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)Applicant/Patent Owner: Dussinger et al.Application No./Patent No.: 09/310,397 Filed/Issue Date: 05/12/1999Entitled: INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLESThermal Corp. a Delaware corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of less than the entire right, title and interest.
The extent (by, percentage) of its ownership interest is _____ %

in the patent application/patent identified above by virtue of either:

- A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 009961 Frame 0197, or for which a copy thereof is attached.

OR

- B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as shown below:

1. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.
2. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.
3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

[] Additional documents in the chain of title are listed on a supplemental sheet.

- [] Copies of assignments or other documents in the chain of title are attached.

[NOTE: A separate copy (i.e., the original assignment document or a true copy of the original document) must be submitted to Assignment Division in accordance with 37 CFR Part 3, if the assignment is to be recorded in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

November 3, 2000
Date

Samuel W. Apicelli Reg. No. 36,427
Typed or printed name

Samuel W. Apicelli
Signature

Attorney of Record
Title

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.



UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
09/310,397	05/12/1999	PETER M. DUSSINGER	

SAMUEL W. APICELLI, ESQ.
DUANE, MORRIS & HECKESCHER LLP
305 NORTH FRONT STREET,
P.O. BOX 1003
HARRISBURG, PA 17108-1003

OC000000005553191
OC000000005553191


6

Date Mailed: 11/14/2000

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/08/2000.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.


Customer Service Center
Initial Patent Examination Division (703) 308-1202

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UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
09/310,397	05/12/1999	PETER M. DUSSINGER	

MARTIN FRUITMAN
419 N GEORGE ST
MILLERSVILLE, PA 17551

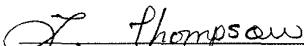
OC000000005553165
OC000000005553165

Date Mailed: 11/14/2000

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/08/2000.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).


Customer Service Center
Initial Patent Examination Division (703) 308-1202

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	FILE WRAPPER LOCATION
09/310,397	6302192	3743	9200 L 10012 1009 112

Change of Address/Power of Attorney

The following fields have been set to Customer Number 41396 on

- Correspondence Address
- Power of Attorney
- Maintenance Fee Address

The address of record for Customer Number 41396 is:

DUANE MORRIS LLP
P. O. BOX 1003
305 NORTH FRONT STREET, 5TH FLOOR
HARRISBURG, PA 17108-1003

The Practitioners of record for Customer Number 41396 are:

PTO INSTRUCTIONS:

Please take the following action when the correspondence address has been changed to a customer number:

- 1) Add 'ADDRESS CHANGE TO CUSTOMER NUMBER' on the next available content line of the File Jacket.
- 2) Put a line through the old address on the File Jacket and enter the Customer Number as the new address.
- 3) File this Notice in the File Jacket.

Please take the following action when the correspondence address has NOT been changed:

- 1) File this Notice in the File Jacket



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
-----------------	-------------	----------------------	---------------------

09/310,397 05/12/99 DUSSINGER

P

GM02/1204
SAMUEL W. APICELLI, ESQ.
DUANE, MORRIS & HECKESCHER LLP
305 NORTH FRONT STREET,
P.O. BOX 1003
HARRISBURG PA 17108-1003

EXAMINER

ATKINSON, C

ART UNIT

PAPER NUMBER

3743

DATE MAILED:

12/04/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/310,397	Dussinger et al	
	Examiner	Group Art Unit	
	Atkinson	3743	

---The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address---

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication .
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

☒ Responsive to communication(s) filed on 9/11/2000

☒ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 1 1; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 1-4 and 6-7 is/are pending in the application.

Of the above claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-4 and 6-7 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claim(s) _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☒ The drawing(s) filed on 5/12/99 is/are objected to by the Examiner.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 11 9(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 1 7.2(a)).

*Certified copies not received: _____.

Attachment(s)

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Reference(s) Cited, PTO-892

☐ Notice of Informal Patent Application, PTO-152

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Other _____

Office Action Summary

Art Unit: 3743

Response to Amendment

Applicant's arguments filed 9/11/2000 have been fully considered but they are not persuasive.

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "14"; "16", etc. have been used to designate both a vapor channel and a contact plate; "a cover plate" and "a fin" and "a finned heat sink". See at least pages 6-8. Correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. § 102(b) as being anticipated by Tajbl et al.

The document of Tajbl et al. in Figures 1-4 discloses a sealed heat pipe having electronic devices attached via holes and screws.

Claims 2-3 are rejected under 35 U.S.C. § 102(b) as being anticipated by the Doriner Systems reference. The Doriner Systems reference in Figures 1 and 2 discloses that it is known to have a heat pipe comprised of plates and a hole penetrating the heat pipe through a vapor chamber.

Art Unit: 3743

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103, the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 C.F.R. § 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of potential 35 U.S.C. § 102(f) or (g) prior art under 35 U.S.C. § 103.

Claim 4 is rejected under 35 U.S.C. § 103 as being unpatentable over the Doriner Systems reference in view of Evdokimov. The Doriner Systems reference discloses all the claimed features of the invention with the exception of the depression bonded to another part of the structure.

The document of Evdokimov in Figures 1 and 2 discloses that it is known to have a heat pipe comprised of depressions bonded to another part of the heat pipe for the purpose of increasing the structural strength/rigidity of the heat pipe. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ in the Doriner

Art Unit: 3743

Systems reference depressions bonded to another part of the heat pipe for the purpose of increasing the structural strength/rigidity of the heat pipe as disclosed in Evdokimov.

Claims 6-7 are rejected under 35 U.S.C. § 103 as being unpatentable over Doriner Systems in view of ALIP. The document of Doriner Systems discloses all the claimed features of the invention with the exception of the wick having a higher thermal conductivity at one part than at another part.

The document of ALIP in the illustration discloses that it is known to have a wick which has a higher thermal conductivity at one part (i.e. heat receiving middle part) of the heat pipe than at another part of the heat pipe (i.e. part away from the heat source in the radial direction) for the purpose of increasing the heat transfer efficiency of the wick and removing a large amount of heat from a heat source. It has been held "that the use of a one piece construction instead of the structure disclosed in [the prior art] would be merely a matter of obvious engineering choice." In re Larson, 340 F.2d 965, 144 USPQ 347, 349 (CCPA 1965). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ in Doriner Systems the wick having a higher thermal conductivity at one part (i.e. heat receiving middle part) of the heat pipe than at another part of the heat pipe (i.e. part away from the heat source in the radial direction) for the purpose of increasing the heat transfer efficiency of the wick and removing a large amount of heat from the heat source as disclosed in ALIP. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the wick out of silver powder, since it has been held to be within the general skill of a worker in the

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art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Response to Arguments

Applicant's concerns directed toward Tajbl et al. are not found persuasive. The entire device of Tajbl et al. is a heat pipe. Therefore, Tajbl et al., in Figures 2 and 4, illustrates holes passing entirely through the heat pipe and fastening devices within the holes. In claim 1, there is no limitation which requires the holes to pass through an open space of the heat pipe.

Regarding applicant's concerns directed to amended claim 2, the Doriner Systems reference in Figures 1 and 2 discloses that it is known to have a heat pipe comprised of plates and a hole penetrating the heat pipe through a vapor chamber.

Applicant's concerns directed toward claim 6 are not found persuasive. First, the phrase "used for contact with a heat source" is considered to be an intended use statement and is not given any patentable weight. Also, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The Doriner Systems reference (see Figure 1) discloses two separate wicks.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is

Application/Control Number: 09/310,397

Page 6

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reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Atkinson whose telephone number is (703) 308-2603.


C.A.

CHRISTOPHER ATKINSON
PRIMARY EXAMINER

December 4, 2000



RCE/3743
PTO/SB/30 (08-00)
Approved for use through 10/31/2002. OMB 0651-0034
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
#3-5-01

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL Subsection (b) of 35 U.S.C. § 132, effective on May 29, 2000, provides for continued examination of an utility or plant application filed on or after June 8, 1995. See The American Inventors Protection Act of 1999 (AIPA).	Application Number	09/310,397
	Filing Date	05/12/1999
	First Named Inventor	Dussinger et al.
	Group Art Unit	3743
	Examiner Name	Atkinson, C.
	Attorney Docket Number	H1799-00025

This is a Request for Continued Examination (RCE) under 37 C.F.R. § 1.114 of the above-identified application.
NOTE: 37 C.F.R. § 1.114 is effective on May 29, 2000. If the above-identified application was filed prior to May 29, 2000, applicant may wish to consider filing a continued prosecution application (CPA) under 37 C.F.R. § 1.53 (d) (PTO/SB/29) instead of a RCE to be eligible for the patent term adjustment provisions of the AIPA. See Changes to Application Examination and Provisional Application Practice, Final Rule, 65 Fed. Reg. 50092 (Aug. 16, 2000); Interim Rule, 65 Fed. Reg. 14865 (Mar. 20, 2000), 1233 Off. Gaz. Pat. Office 47 (Apr. 11, 2000), which established RCE practice.

1. **Submission required under 37 C.F.R. § 1.114**

a. ☒ Previously submitted
i. ☒ Consider the amendment(s)/reply under 37 C.F.R. § 1.116 previously filed on 09/07/2000
(Any unentered amendment(s) referred to above will be entered).
ii. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on
iii. ☐ Other
b. ☒ Enclosed
i. ☒ Amendment/Reply
ii. ☐ Affidavit(s)/Declaration(s)
iii. ☐ Information Disclosure Statement (IDS)
iv. ☒ Other English translations of foreign language references

2. **Miscellaneous**

a. ☐ Suspension of action on the above-identified application is requested under 37 C.F.R. § 1.103(c) for a period of months. (Period of suspension shall not exceed 3 months; Fee under 37 C.F.R. § 1.17(i) required)
b. ☐ Other

3. **Fees** The RCE fee under 37 C.F.R. § 1.17(e) is required by 37 C.F.R. § 1.114 when the RCE is filed.

a. ☒ The Director is hereby authorized to charge the following fees, or credit any overpayments, to Deposit Account No. 04-1679
i. ☒ RCE fee required under 37 C.F.R. § 1.17(e) 02/27/2001 GTEFFERA 00000009 09310397
ii. ☒ Extension of time fee (37 C.F.R. §§ 1.136 and 1.17) 01 FC:279 355.00 OP
iii. ☐ Other
b. ☒ Check in the amount of \$ 355 enclosed
c. ☐ Payment by credit card (Form PTO-2038 enclosed)

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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED			
Name (Print/Type)	SAMUEL W. APICELLI	Registration No. (Attorney/Agent)	36,427
Signature	Samuel W. Apicelli	Date	02/21/2001

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Auslegeschrift DE 1 284 506

**SUPPORTING PLATE FOR TEMPERATURE-SENSITIVE
ELECTRIC COMPONENTS**

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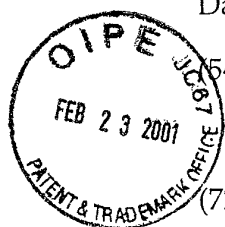
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Federal Republic of Germany
German Patent Office

Auslegeschrift [preliminary published patent] 1 284 506

File number: P 12 84 506.6-34 (G 41859)
Date of application: 24 October 1964
Date of publication: 5 December 1968



(54) Applicant: Linde AG, Höllriegelskreuth;
Standard Electric Lorenz AG, Stuttgart;
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(72) Inventors: Franz Vinzenz Tajbl, Pullach;
Karl Regner, Nürnberg;
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**SUPPORTING PLATE FOR TEMPERATURE-SENSITIVE
ELECTRIC COMPONENTS**

Description

The invention concerns a supporting plate for electrical circuit parts such as electronic tubes, resistors, condensers and semiconductor components. Such supporting plates are installed, for example, in almost every radio or television apparatus. But semiconductor rectifier devices for high currents, so called power rectifiers, e.g., for welding purposes, also contain such supporting plates, to cite another example. Many of these circuit parts are temperature sensitive. Their operating characteristic varies with temperature. There are also many circuit parts which suffer damage when overheated. The upper temperature limits therefore should not be exceeded, and frequently the temperature should not go below a lower limit. The tendency of arranging circuit parts increasingly closer together in order to keep the dimensions of the apparatus small therefore has necessitated the cooling of the devices. In addition to the widely used measure of having the walls of the housing of the devices perforated in order to allow air to flow freely to the circuit parts, it is known that the individual circuit parts such

as electronic tubes, semiconductor diodes or transistors can be provided with cooling plates in order to carry off heat better. Fans are also used in order to cool the interior of the devices. Thus small blowers may even be arranged in the devices directly next to the especially temperature-sensitive power rectifiers in order to cool them. However, artificially moved cooling air carries dust into the apparatus. In highly dust-laden industrial air, the devices employing this solution must therefore be additionally maintained. Another disadvantage in many cases is also the use of electrical energy for driving the fans.

The invention has the objective of making the cooling power of the supporting plate for temperature-sensitive electrical circuit parts better than could be accomplished previously by heat conduction in the plate, but especially to distribute the locally limited quantities of heat arising or to carry them off to a place where they are no longer disturbing. According to the invention the supporting plate contains channels which are closed to the outside air in which evaporable and condensable liquids are contained. Since heat transfer by evaporation and condensation is very good, temperature differences of only a few degrees prevail in a supporting plate containing such channels even if locally nearby relatively large quantities of heat are given off to the supporting plate. The outer surface of the entire supporting plate and the part of the surface exposed to the outside air is utilized to emit heat to the ambient air and not only to the immediate vicinity of the mounting parts of the heat emitting circuit part as is the case with the simple supporting plates presently used.

It is also known that liquids can be evaporated in U shaped plates and thereby cool them. Almost all refrigerators contain U plates as evaporators. Usually U plates are produced by flat welding or soldering two previously stamped sheets together. Sometimes flat sheets are also joined together and only then the U channels are inflated with liquid or gas. A U plate can also be ob-

tained by soldering suitably bent pipe segments onto flat plates or merely clamping them. The known U plates preferably consist of aluminum, iron or copper or their alloys with other metals. All U plates have the common feature that they are considerably stiffer than plates of the same thickness without U channels. U-channelled plates therefore at the same stiffness can be made considerably thinner and therefore lighter than channel-free plates. This advantage is inherent in the supporting plate according to the invention.

It is also already known that the hot junctions of thermocouple batteries in refrigerators can be cooled by using U channelled plates in the channels of which an evaporating and condensing liquid is contained. Here also the channels are closed against the outside air. The U channelled plates, however, in this case only have the task of acting as cooling fins, i.e. of carrying heat off from a single flat surface and transferring it to the ambient air. Therefore they do not simultaneously act as a supporting part for a large number of electrical circuit parts and do not have to serve as means for carrying heat out of the interior of the housing. Finally in the case of thermocouple cooling the problem exists of keeping the temperature of the hot junctions as low as possible and not of maintaining a certain temperature range above room temperature such as is advisable, for example, in the case of semiconductor power rectifiers.

If only those temperature-sensitive parts which operate especially advantageously in the same temperature range are positioned under the electrical circuit parts mounted on the supporting plate according to the invention, then it is sufficient to combine all channels in the supporting plate into a channel system. On the other hand, if locally different temperatures should prevail, then the channels will advisably form several channel systems closed in themselves. Now since on the one hand the saturation pressures of boiling liquids depend greatly on temperature, and on the other, since the channel walls should be as thin as possible

for reasons of weight, it is advantageous if the same supporting plates in the single channel systems contain different liquids with saturation pressures deviating from one another at the same temperature.

In order to facilitate the backflow of condensing vapor in the supporting plate, at least part of it should be slanted relative to the horizontal. The channels then do not need to have such a large open width as if the supporting plate were flat and lying horizontally. Apparently a vertical arrangement of the entire plate offers special advantages if the temperature-sensitive circuit parts are only affixed to the bottom part into which the condensate flows back while the vapor condenses in the upper part. However, such an arrangement cannot always be chosen. In order to be able to maintain temperature differences between the individual parts of the supporting plate, especially if several channel systems independent of each other are present, the heat conduction in the plate can be interrupted in places by slots.

The passage of heat from the heat-emitting temperature-sensitive electrical circuit parts to the liquid boiling in the channels is very good. On the other hand, the passage of heat from the condensing vapor to the outside air is poor especially if the outside air is not artificially moved by a blower. This disadvantage can be prevented by enlarging parts of the outer surface of the supporting plate with sheet metal fins. Such sheet metal fins can be clamped on, soldered on, welded on, glued on by known methods or stamped out of the channel-free parts of the supporting plate. The heat of condensation is carried off especially effectively if a cooling liquid such as water is available. Then a special channel system must be contained for the cooling liquid in the supporting plate. Since heat transfer from the inner wall of the channel to the boiling liquid is considerably better than to the flowing liquid, such a supporting plate can offer advantages, compared to the well-known arrangement in which cooling water exclu-

sively flows through the supporting plate, in special cases when the electrical circuit parts are to be arranged very close together. Because the channels in the supporting plate do not have to be as close together where the circuit parts are affixed when liquid evaporates in them as when liquid only flows in them. Therefore in the first case more channel-free sheet metal parts are available for fixation than in the latter case.

If the supporting plate forms totally or in part one or more housing walls, then the electrical components enclosed by the housing can not only be extremely effectively cooled but also simultaneously protected against dust. With such a design of the supporting plate its advantages become especially clear. Finally it can be advantageous if the supporting plate is coated on one or both sides with a film of a metal which is a better electrical conductor than the supporting plate itself. For example it can be mentioned that aluminum channeled plates which are plated on one side with a thin film of silver are especially suitable for conducting strong high frequency currents essentially without losses and simultaneously carrying off the waste heat. It is also known that channel-free aluminum sheets can be plated with silver for high frequency engineering purposes. However, silver-plated channeled sheets are new.

The invention is illustrated by the figures. The same parts are denoted by the same numbers.

Figure 1 shows in perspective view a bent supporting plate with a horizontal part on which temperature-sensitive electrical circuit parts are mounted and a vertical part which forms a housing wall or can be adjacent to it;

Figure 2 shows a section along A-A and

Figure 3 a section along B-B in Figure 1;

Figure 4 shows a section through a vertically standing supporting plate on which a large number of identical electrical circuit parts are positioned;

Figures 5 and 6 show in perspective view examples of fin shapes such as can be additionally mounted on the supporting plates in order to force heat transfer from the supporting plate to nonmoving or artificially moving cooling air.

The bent supporting plate in Figure 1 contains two self-enclosed channel systems with channels 1 and 2 which are partially filled with an evaporating and condensing liquid through the channel ends 3 and 4 which are open before filling and then sealed, e.g., welded shut. As liquids, for example, CFCI_3 ("R 11") or $\text{C}_2\text{F}_3\text{Cl}_3$ ("R 113") can be selected which display saturation pressures deviating from one another at room temperature. Depending on the magnitude of heat emission by the circuit parts and the size of the supporting plate parts containing the two channels 1 and 2, in each of the two corresponding supporting plate parts almost the same temperatures prevail, but between the two a temperature difference prevails. The choice of two different liquids permits the pressure in the two supporting plate parts to be maintained below an upper limit which is set by the mechanical strength of the channel walls. The slot 5 in the supporting plate interrupts heat conduction in the plate itself and prevents temperature equalization between the two supporting plate parts, which are at different temperatures. The electron tubes 6 and the power transistors 7 represent, only as an indication, examples of temperature-sensitive electrical circuit parts. The slot 8 thermally insulates one channel in which the condensate can flow back more easily than in the other channels in which backflow is prevented by the ascending vapor. In the case of the supporting plate shown in Figure 1 the upper surface of the horizontal part is flat, the channels are embossed only on one side of the plate, i.e. the bottom side. Such a configuration can be favorable for fixation of circuit parts. The channels in the vertical part, conversely, are embossed on both sides, as Figures 2 and 3 show. Each of the two channel systems with the channels 1 and 2 is now only partially filled with liquid which in the state of rest

collects in the horizontal part of the supporting plate. If the electrical circuit parts supply heat, then the liquid evaporates. The vapor is condensed in the vertical part and runs back into the horizontal part. The heat is therefore transported out of the horizontal part into the vertical part. Naturally the supporting plate may also be differently configured, e.g. – disregarding the channel walls – it may be flat and stand vertically. The heat-sensitive circuit parts must then be affixed at the bottom of the supporting plate so that the evaporating liquid can cool them. The expert in the field can always easily choose the most favorable external configuration of the supporting plate and the channel guidance most suitable for it.

In the example shown in Figure 4 identically dimensioned electrical circuit parts, i.e. semiconductor rectifiers 9, are located on a supporting plate according to the invention. The supporting plate simultaneously forms an electrical conductor. The fixation screws 10 are insulated electrically against the supporting plate, which is not shown. The arrows indicate that the arrangement can be cooled by artificially moving air.

In Figure 5 fins 11 are pressed out of the channel-free parts of the supporting plate, e.g. by profiled rolls, which are supposed to be present especially where liquid vapor condenses. According to Figure 6 U shaped sheet metal fins 12 are welded onto channel-free parts of the supporting plate. Naturally instead of these, the sheet metal fins may also be stamped or drawn.

Claims

1. Supporting plate for temperature-sensitive electrical circuit parts especially for semiconductor elements, characterized by the fact that it contains channels closed to the outside air, which channels contain a liquid capable of evaporating and condensing.

2. Supporting plate as in claim 1, characterized by the fact that the channels are combined to form a single channel system.

3. Supporting plate as in Claim 1, characterized by the fact that the channels form several self-enclosed channel systems.

4. Supporting plate as in Claim 3, characterized by the fact that different liquids with saturation pressures deviating from one another at the same temperature are contained in the channel system.

5. Supporting plate as in Claims 1 to 4, characterized by the fact that at least one of the channels is slanted toward the horizontal.

6. Supporting plate as in Claims ..., characterized by the fact that the heat flux in the sheet metal is interrupted in places by slots.

7. Supporting plate as in Claims ..., characterized by the fact that parts of its outer surface are enlarged by sheet metal fins.

8. Supporting plate as in Claims ..., characterized by the fact that it contains a special channel system for a cooling liquid such as water.

9. Supporting plate as in Claims ..., characterized by the fact that it forms totally or in part one or more housing walls.

10. Supporting plate as in Claims ..., characterized by the fact that it is coated on one or both sides with a film of a metal which is a better electrical conductor than the supporting plate itself, e.g. silver.

One page of drawings appended



PATENT

THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Dussinger et al.

Serial No.: 09/310,397 Examiner: Atkinson, C.

Filing Date: 05/12/1999 Group Art Unit: 3743

CERTIFICATE UNDER 37 CFR 1.8(a)
I, SAMUEL W. APICELLI, REGISTRATION NO. 36,427, HEREBY CERTIFY
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ON February 21, 2001

Samuel W. Apicelli

SAMUEL W. APICELLI

For: INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER
WITH THROUGH MOUNTING HOLES

Box RCE
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

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Please find enclosed for filing:

- ☒ Request for Continued Examination (RCE) transmittal
- ☒ Preliminary Amendment
- ☒ English translations of 3 foreign language references
- ☒ Fee Transmittal Form for FY 2001
- ☒ Transmittal form SB21
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Samuel W. Apicelli

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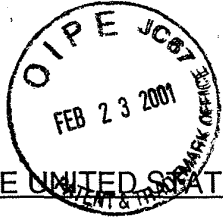
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Harrisburg, PA 17108-1003

(717) 237-5516

Date: February 21, 2001

Docket No. H1799-00025



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Dussinger et al.

Serial No.: 09/310,397 Examiner: Atkinson, C.

Filing Date: 05/12/1999 Group Art Unit: 3743

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Assistant Commissioner for Patents
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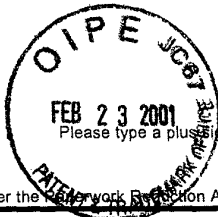
Respectfully submitted,

Date: February 21, 2001


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	Filing Date	05/12/1999
	First Named Inventor	Dussinger et al.
	Group Art Unit	3743
	Examiner Name	Atkinson, C.
	Total Number of Pages in This Submission	Attorney Docket Number

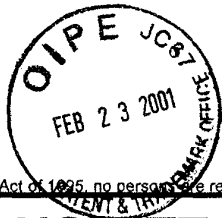
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Signature	<i>Samuel W. Apicelli</i>
Date	02/21/2001

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Patent fees are subject to annual revision.		Application Number	09/310,397
		Filing Date	05/12/1999
		First Named Inventor	Dussinger et al.
		Examiner Name	Atkinson, C.
		Group Art Unit	3743
		Attorney Docket No.	H1799-00025
TOTAL AMOUNT OF PAYMENT	(\$)	355	

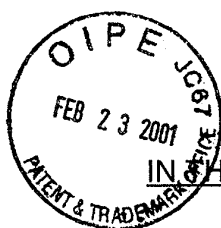
METHOD OF PAYMENT		FEE CALCULATION (continued)																																																										
1. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to: Deposit Account Number: 04-1679 Deposit Account Name: DuaneMorris&HeckscherLLP <input checked="" type="checkbox"/> Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17 <input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27		3. ADDITIONAL FEES																																																										
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SUBTOTAL (3)		(\$)		355																																																								

SUBMITTED BY		Complete (if applicable)	
Name (Print/Type)	Samuel W. Apicelli	Registration No. (Attorney/Agent)	36,427
Signature	<i>Samuel W. Apicelli</i>	Telephone	717-237-5516
		Date	02/21/2001

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Dussinger et al.

Serial No: 09/310,397

Examiner: Atkinson, C.

Filed: 05/12/1999

Group Art Unit: 3743

For: INTEGRATED CIRCUIT HEAT PIPE
HEAT SPREADER WITH
THROUGH MOUNTING HOLES

CERTIFICATE UNDER 37 CFR 1.8(a)
I, SAMUEL W. APICELLI, REGISTRATION NO. 36,427, HEREBY CERTIFY
THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE
UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN
ENVELOPE ADDRESSED TO ASSISTANT COMMISSIONER FOR
PATENTS, WASHINGTON, D.C. 20231.
ON February 21, 2001
Samuel W. Apicelli
SAMUEL W. APICELLI

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

PRELIMINARY AMENDMENT

Preliminary to the examination of the above-identified Continuing Examination

Application, please amend the claims as follows:

Cancel claims 1 -7 without prejudice.

Add new claims 8-23 as follows:

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MAR 1 - 2001

TECHNOLOGY CENTER R3700

8. (New Claim) A heat pipe for spreading heat comprising:
- a boundary structure including spaced-apart first and second plates that define an enclosed vapor chamber;
 - at least one depression formed in said first plate which projects into said vapor chamber and is bonded to said second plate; and
 - an opening defined through said at least one depression and said second plate wherein said opening is isolated from said vapor chamber.

9. (New Claim) A heat pipe for spreading heat according to claim 8 comprising at least one spacer positioned within said vapor chamber and extending between and contacting said first and second plates.

10. (New Claim) A heat pipe for spreading heat according to claim 8 wherein said spaced-apart first and second plates include confronting interior surfaces; and a wick positioned upon said confronting interior surfaces including that portion of the interior surface of said first plate that forms a surface of said depression within said vapor chamber.

Q1 11. (New Claim) A heat pipe for spreading heat according to claim 10 wherein said wick is constructed with at least two separate sections of different materials, with one section being located on said first plate interior surface and being formed of a material with higher heat conductivity than sections located on said second plate interior surface.

12. (New Claim) A heat pipe for spreading heat according to claim 8 wherein said depression comprises an annular outer surface that is bonded to a corresponding annular edge surface in said second plate.

13. (New Claim) A heat pipe for spreading heat according to claim 8 wherein said first and second plates each include a peripheral lip located at an edge of said boundary structure which are bonded together.

14. (New Claim) A heat pipe for spreading heat comprising:
a boundary structure including spaced-apart first and second plates that define an enclosed vapor chamber;
at least one depression formed in said first plate which projects into said vapor chamber and is bonded to said second plate;
an opening defined through said first plate depression and said second plate wherein said opening is isolated from said vapor chamber; and
at least one depression formed in said second plate which projects into said vapor chamber and is bonded to said first plate.

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15. (New Claim) A heat pipe for spreading heat according to claim 14 wherein said at least one depression formed in said second plate comprises a flat portion that is in contact with an inner surface of said first plate.

16. (New Claim) A heat pipe for spreading heat according to claim 14 wherein said spaced-apart first and second plates include confronting interior surfaces; and
a wick positioned upon said confronting interior surfaces including that portion of the interior surface of said first plate that forms a surface of said depression within said vapor chamber.

17. (New Claim) A heat pipe for spreading heat comprising:
a boundary structure including spaced-apart first and second plates that define an enclosed vapor chamber;

at least one hollow column positioned within said vapor chamber and sealingly bonded to said first and second plates, having an open first end that opens through said first plate and an open second end that opens through said second plate so as to form at least one mounting hole that is isolated from said vapor chamber.

18. (New Claim) A heat pipe for spreading heat according to claim 17 wherein said spaced-apart first and second plates include confronting interior surfaces; and a wick positioned upon said confronting interior surfaces of said first and second plates the exterior surface of said at least one hollow column disposed within said vapor chamber.

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19. (New Claim) A heat pipe for spreading heat comprising:
a boundary structure including a first plate and a second plate arranged in spaced apart relation, each of said plates including interior confronting surfaces and a peripheral lip located at an edge of said boundary structure which are bonded together so as to define an enclosed vapor chamber;

at least one depression formed in said first plate which projects into said vapor chamber, is spaced from said peripheral lip, and is bonded to said second plate;

an opening defined through said first plate depression and said second plate wherein said depression comprises an annular outer surface that is bonded to a corresponding annular edge surface in said second plate and further wherein said opening is isolated from said vapor chamber;

at least one spacer extending between and contacting said first and second plates; and

a wick positioned upon said confronting interior surfaces including that portion of the interior surface of said first plate that forms a surface of said depression within said vapor chamber.

20. (New Claim) A heat pipe for spreading heat comprising:

a first plate having a circumferential edge lip bounding an inner surface and at least one hollow column that is integral with said first plate and which projects outwardly relative to said inner surface;

B₁ a second plate arranged in spaced apart confronting relation to said first plate and including a circumferential edge lip bounding an inner surface and at least one opening through said second plate, said edge lips of said first and second plates being bonded together so as to define a vapor chamber; wherein

said at least one hollow column being bonded at one end to said second plate so as to coaxially align said at least one hollow column with said at least one opening in said second plate thereby to form a mounting hole that extends through said first plate and said second plate and is isolated from said vapor chamber.

21. (New Claim) A heat pipe for spreading heat comprising:

a first plate having a circumferential edge lip bounding an inner surface and at least one depression which projects outwardly relative to said inner surface;;

a second plate arranged in spaced apart confronting relation to said first plate and including a circumferential edge lip bounding an inner surface and at least one opening through said second plate, said edge lips of said first and second plates being bonded together so as to define a vapor chamber; wherein

said at least one depression has an open ended tubular cross-section and an outer surface, a portion of which outer surface is bonded to said second plate so as to coaxially align said at least one depression with said at least one opening in said second plate thereby to form a mounting hole that extends through said first plate depression and said second plate and is isolated from said vapor chamber.

22. (New Claim) A heat pipe for spreading heat comprising:

B1 a first plate having a circumferential edge lip bounding an inner surface and at least one depression which projects outwardly relative to said inner surface;

a second plate arranged in spaced apart confronting relation to said first plate and including (i) a circumferential edge lip bounding an inner surface, (ii) at least one depression which projects into said vapor chamber and that is bonded to said inner surface of said first plate, and (iii) at least one opening through said second plate, said edge lips of said first and second plates being bonded together so as to define a vapor chamber; wherein

said at least one depression in said first plate has a tubular cross-section that opens at a first end and a second end and is bonded to said second plate at said second end so as to coaxially align said at least one first plate depression with said at least one opening in said second plate thereby to form a mounting hole that extends

through said first plate depression and said second plate and is isolated from said vapor chamber.

23. (New Claim) A system for dissipating heat comprising in combination:
a heat pipe for spreading heat comprising:
a first plate having an edge lip that bounds an outer surface and an inner surface and at least one depression which projects outwardly relative to said inner surface;
a second plate arranged in spaced apart confronting relation to said first plate having an edge lip that bounds an inner surface and at least one opening through said second plate, said edge lips of said first and second plates being bonded together so as to define a vapor chamber between said plates;
at least one depression formed in said first plate which projects into said vapor chamber and is bonded to said second plate in aligned coaxial relation to said at least one opening through said second plate wherein said at least one opening is isolated from said vapor chamber; and
a heat sink having at least one mounting hole, said heat sink being mounted on said outer surface of said first plate so that said mounting hole is coaxially aligned with said at least one depression, and a fastener projecting through said at least one mounting hole, said at least one depression, and said at least one opening in said second plate.

REMARKS

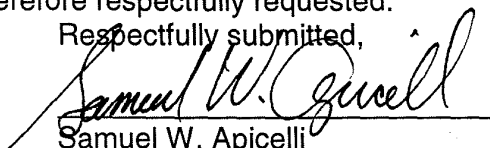
Upon entry of this Preliminary Amendment into the above-identified Continuing Examination Application, claims 1-7 will be canceled without prejudice, and new claims 8-23 will be under active consideration in the case. The present Continuing Examination Application has been filed in response to the Final Official Action mailed on December 4, 2000. This preliminary Amendment cancels all of the finally rejected claims, and enters new claims 8-23 into the application. No new matter is introduced into the application as a result of the addition of new claims 8-23, which are allowable over all of the prior art of record.

In the Final Official Action mailed 12/4/00, the Examiner cited several non-English references, namely, German Patent No. DE 1 284 506 (the "Tajbl reference"), Russian Patent No. SU 589531 (the "Evdokhimov reference"), and Russian Patent No. SU 1476297 A2 (the "ALIP reference"). Applicants have obtained translations of those references into English, and are submitting those translations to the Examiner with this Preliminary Amendment. As these references are already of record in the case, no Form 1449 appears to be necessary. Applicants request that the enclosed translations be entered into the application file and made of record in the case.

Applicants respectfully submit that claims 8-23 are in condition for allowance. Favorable consideration is therefore respectfully requested.

Dated: 2/21/01

Respectfully submitted,



Samuel W. Apicelli

Registration No. 36,427

Customer No. 08933

DUANE, MORRIS & HECKSCHER LLP

305 North Front Street, P.O. Box 1003

Harrisburg, PA 17108-1003

(717)237-5516

HBG\69504.1

Docket No.: H1799-00025

-8-



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/310,397 05/12/99 DUSSINGER

P

EXAMINER

QM02/0427

SAMUEL W. APICELLI, ESQ.
DUANE, MORRIS & HECKESCHER LLP
305 NORTH FRONT STREET,
P.O. BOX 1003
HARRISBURG PA 17108-1003

ATKINSON, C

ART UNIT

PAPER NUMBER

3743

DATE MAILED:

04/27/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No.	Applicant(s)	
	09/310,397	Dussinger et al.	
	Examiner	Group Art Unit	
	Atkinson	3743	

---The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address---

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 01-2 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication .
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

☒ Responsive to communication(s) filed on 2/23/01

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 1 1; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 8-23 is/are pending in the application.

Of the above claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☐ Claim(s) _____ is/are rejected.

☐ Claim(s) _____ is/are objected to.

☒ Claim(s) 8-23 are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 1 7.2(a)).

*Certified copies not received: _____.

Attachment(s)

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Reference(s) Cited, PTO-892

☐ Notice of Informal Patent Application, PTO-152

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Other _____

Office Action Summary

Art Unit: 3743

Election/Restriction

This application contains claims directed to the following patentably distinct species of the claimed invention:

- A) The species as illustrated in Figure 1
- B) The species as illustrated in Figure 2

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, no claim appears to be generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission

Application/Control Number: 09/310,397

Page 3


Art Unit: 3743

may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

Applicant is advised that the reply to this requirement to be complete must include an election of the invention to be examined even though the requirement be traversed (37 CFR 1.143).

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Atkinson whose telephone number is (703) 308-2603.



C.A.
April 26, 2001

CHRISTOPHER ATKINSON
PRIMARY EXAMINER

MAY. -01' 01 (TUE) 09:42

DUANE, MORRIS & HECKSCHER

TEL: 717 232 4015

P. 001

CERTIFICATE OF FACSIMILE TRANSMISSION 37 C.F.R. 1.6 & 1.8

I CERTIFY THAT THIS CORRESPONDENCE IS BEING TRANSMITTED BY FACSIMILE TO THE PATENT AND TRADEMARK OFFICE ON THE DATE AND TO THE NUMBER SHOWN BELOW.

FAX NO. 703-305-3463 COMPRISING SEVEN (7) SHEETS INCLUDING THIS PAGE.

Date: 5/1/01

Samuel W. Apicelli
Samuel W. Apicelli
Reg. No. 36,427

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Dussinger et al.

Serial No: 09/310,397

Examiner: Atkinson, C.

Filed: 05/12/1999

Group Art Unit: 3743

For: INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER
WITH THROUGH MOUNTING HOLES

Assistant Commissioner for Patents
Washington, D.C. 20231

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MAY 1 - 2001

Group 3700

Sir:

RESPONSE TO ELECTION OF SPECIES AND AMENDMENT

This is in response to the Official Action issued April 27, 2001, in the above-identified patent application. Please amend the application as follows:

IN THE CLAIMS

Please cancel claims 8-22 without prejudice.

Please amend claim 23 as follows:

23. (Amended) A system for dissipating heat comprising in combination:

a heat pipe for spreading heat comprising:

a first plate having an edge lip that bounds an outer surface and an inner surface and at least one depression which projects outwardly relative to said inner surface;

Docket No.: H1799-00025

a second plate arranged in spaced apart confronting relation to said first plate having an edge lip that bounds an inner surface and at least one opening through said second plate, said edge lips of said first and second plates being bonded together so as to define a vapor chamber between said plates;

wherein said at least one depression formed in said first plate projects into said vapor chamber and is bonded to said second plate in aligned coaxial relation to said at least one opening through said second plate wherein said at least one opening is isolated from said vapor chamber; and

a heat sink having at least one mounting hole, said heat sink being mounted on said outer surface of said first plate so that said mounting hole is coaxially aligned with said at least one depression, and a fastener projecting through said at least one mounting hole, said at least one depression, and said at least one opening in said second plate.

Please add new claims 24 -31 as follows:

24. (New Claim) A heat pipe for spreading heat according to claim 23 comprising at least one spacer positioned within said vapor chamber and extending between and contacting said first and second plates.

25. (New Claim) A heat pipe for spreading heat according to claim 23 wherein said spaced-apart first and second plates include confronting inner surfaces; and
a wick positioned upon said confronting inner surfaces including that portion of the inner surface of said first plate that forms a surface of said depression within said vapor chamber.

Docket No.: H1799-00025

-2-

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Grown 3700

26. (New Claim) A heat pipe for spreading heat according to claim 25 wherein said wick is constructed with at least two separate sections of different materials, with one section being located on said first plate inner surface and being formed of a material with higher heat conductivity than sections located on said second plate inner surface.

27. (New Claim) A heat pipe for spreading heat according to claim 26 wherein said at least one depression in said first plate comprises an annular outer surface that is (i) spaced from said inner surface and (ii) sealingly bonded to a corresponding annular edge surface that bounds said at least one opening in said second plate.

28. (New Claim) A heat pipe for spreading heat according to claim 26 wherein said at least one depression formed in said second plate comprises a flat portion that is in contact with an inner surface of said first plate.

29. (New Claim) A system for dissipating heat comprising in combination:
a heat pipe for spreading heat comprising:
a boundary structure including spaced-apart first and second plates that define an enclosed vapor chamber;
at least one depression formed in said first plate which projects into said vapor chamber and is bonded to said second plate;
an opening defined through said first plate depression and said second plate wherein said opening is isolated from said vapor chamber; and
at least one depression formed in said second plate which projects into said vapor chamber and is bonded to said first plate; and

a heat sink having at least one mounting hole, said heat sink being mounted on said outer surface of said first plate so that said mounting hole is coaxially aligned with said opening defined through said first plate depression, and a fastener projecting through said at least one mounting hole, said first plate depression, and said opening defined through said second plate.

30. (New Claim) A system for dissipating heat comprising in combination:
a heat pipe for spreading heat comprising:
a boundary structure including spaced-apart first and second plates that define an enclosed vapor chamber;
at least one hollow column positioned within said vapor chamber and sealingly bonded to said first and second plates, and including an open first end that opens through said first plate and an open second end that opens through said second plate so as to form at least one through-hole that is isolated from said vapor chamber; and
a heat sink having at least one mounting hole, said heat sink being mounted on said first plate so that said mounting hole is coaxially aligned with said at least one through-hole, and a fastener projecting through said at least one mounting hole, said at least one hollow column, and said open second end that opens through said second plate.

31. (New Claim) A system for dissipating heat comprising in combination:
a heat pipe for spreading heat comprising:
a boundary structure including spaced-apart first and second plates having confronting interior surfaces wherein said first and second plates define an enclosed vapor chamber;
at least one hollow column positioned within said vapor chamber and sealingly bonded to said first and second plates, and including (i) an open first end that opens through said first

plate and an open second end that opens through said second plate so as to form at least one through-hole that is isolated from said vapor chamber, said second open end being bounded by a transverse flat surface, and (ii) an exterior surface positioned within said vapor chamber;

a wick positioned upon said confronting interior surfaces of said first and second plates and said exterior surface of said at least one hollow column; and

a heat sink having at least one mounting hole, said heat sink being mounted on said first plate so that said mounting hole is coaxially aligned with said at least one through-hole, and a fastener projecting through said at least one mounting hole, said at least one hollow column, and said open second end that opens through said second plate.

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C

REMARKS

In the Official Action, claims 8 - 23 stand subject to an election of species requirement under 35 USC 121, as follows:

- A) an alleged species illustrated by Figure 1; and
- B) an alleged species illustrated by Figure 2.

In response, Applicants elect the alleged species of Figure 1. Applicants expressly reserve the right to prosecute the non-elected subject matter in related applications.

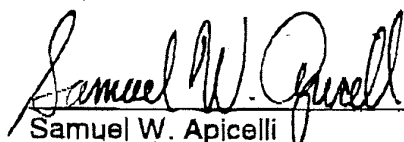
As a result of this Response and Amendment, claims 8 - 22 have been cancelled without prejudice, and claims 23 - 31 are under active consideration in the subject patent application.

Applicants have amended claim 23 so as to better clarify the relationship between the defined structures. These changes to claim 23 have not been made for a reason substantially related to patentability, but rather so as to better define the subject matter of Applicant's invention. New claims 24-31 have been added to the application in light of the Examiner's imposition of a requirement to elect species related to the figures. Claims 24-31 read on the elected species of the invention as illustrated in Figure 1. No new matter has been added to the application as a result of the addition of these new claims. Also, no new claim fees are believed to be incurred by the addition of new claims 24-31. However, if the Examiner disagrees, he is hereby authorized to charge any additional fees to Deposit Account No. 04-1679. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

In view of the foregoing, Applicants respectfully submit that claims 23-31 are in condition for allowance. Favorable consideration is therefore requested.

Respectfully submitted,

Dated: 5/1/01



Samuel W. Apicelli
Registration No. 36,427
Customer No. 08933
DUANE, MORRIS & HECKSCHER LLP
305 North Front Street, P.O. Box 1003
Harrisburg, PA 17108-1003
(717)237-5516

Docket No.: H1799-00025

-6-

Appl. No. 09/310,397

Version with markings to show changes made

IN THE CLAIMS

Claims 8 - 22 have been cancelled without prejudice.

New claims 24 - 31 have been added.

Claim 23 has been amended as follows:

23. (Amended) A system for dissipating heat comprising in combination:

a heat pipe for spreading heat comprising:

a first plate having an edge lip that bounds an outer surface and an inner surface and at least one depression which projects outwardly relative to said inner surface;

a second plate arranged in spaced apart confronting relation to said first plate having an edge lip that bounds an inner surface and at least one opening through said second plate, said edge lips of said first and second plates being bonded together so as to define a vapor chamber between said plates;

wherein said at least one depression formed in said first plate [which] projects into said vapor chamber and is bonded to said second plate in aligned coaxial relation to said at least one opening through said second plate wherein said at least one opening is isolated from said vapor chamber; and

a heat sink having at least one mounting hole, said heat sink being mounted on said outer surface of said first plate so that said mounting hole is coaxially aligned with said at least one depression, and a fastener projecting through said at least one mounting hole, said at least one depression, and said at least one opening in said second plate.

HGG\74715.1

Docket No.: H1799-00025

-7-

Notice of Allowability	Application No. <u>09/310,397</u>	Applicant(s) <u>Dussinger et al.</u>	
	Examiner <u>Atkinson</u>	Art Unit <u>3743</u>	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--
 All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Electron/Amend. C f. 1/5/01
2. ☒ The allowed claim(s) is/are 23-31
3. ☐ The drawings filed on _____ are acceptable as formal drawings.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____

5. ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE FOR SUBMITTING NEW FORMAL DRAWINGS, OR A SUBSTITUTE OATH OR DECLARATION.** This three-month period for complying with the REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL is extendable under 37 CFR 1.136(a).

6. ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
7. ☒ Applicant MUST submit NEW FORMAL DRAWINGS
 - (a) ☒ including changes required by the Notice of Draftsperson's Patent Drawing Review(PTO-948) attached
 - 1) ☐ hereto or 2) ☒ Paper No. 3
 - (b) ☐ including changes required by the proposed drawing correction filed _____, which has been approved by the examiner.
 - (c) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No. _____

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

8. ☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any reply to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE / SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

Attachment(s)

- 1 ☒ Notice of References Cited (PTO-892)
- 3 ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 5 ☐ Information Disclosure Statements (PTO-1449), Paper No. _____
- 7 ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

- 2 ☐ Notice of Informal Patent Application (PTO-152)
- 4 ☐ Interview Summary (PTO-413), Paper No. _____
- 6 ☐ Examiner's Amendment/Comment
- 8 ☐ Examiner's Statement of Reasons for Allowance
- 9 ☐ Other

CHRISTOPHER ATKINSON
 PRIMARY EXAMINER

Notice of References Cited			Application No.	Applicant(s)		
			09/310,397	Dussinger et al.		
			Examiner	Group Art Unit	Page	
			Atkinson	3743	1 of 1	
U.S. PATENT DOCUMENTS						
*		DOCUMENT NO.	DATE	NAME	CLASS	SUBCLASS
X	A	3,934,643	1/1976	Laing	165	104.26
X	B	6,085,831	7/2000	D. Giacomo et al.	165	104.26
X	C	6,082,443	7/2000	Yamamoto et al.	165	104.26
X	D	3,519,063	7/1970	Schmidt	165	104.26
	E					
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	J					
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FOREIGN PATENT DOCUMENTS						
*		DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS
	N					
	O					
	P					
	Q					
	R					
	S					
	T					
NON-PATENT DOCUMENTS						
*		DOCUMENT (Including Author, Title, Source, and Pertinent Pages)				DATE
	U					
	V					
	W					
	X	C. Atkinson 7/15/01				



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

NOTICE OF ALLOWANCE AND ISSUE FEE DUE

DM02/0716

SAMUEL W. APICELLI, ESQ.
DUANE, MORRIS & HECKESCHER LLP
305 NORTH FRONT STREET,
P.O. BOX 1003
HARRISBURG PA 17108-1003

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/310,397	05/12/99	009	ATKINSON, C	3743 07/16/01
First Named Applicant	DUSSINGER,	35 USC 154(b) term ext. = 0 Days.		

TITLE OF INVENTION INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2	165-104.260	J15	UTILITY	YES	\$620.00	10/16/01

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT.
PROSECUTION ON THE MERITS IS CLOSED.

THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

HOW TO RESPOND TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.
If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

- A. If the status is changed, pay twice the amount of the FEE DUE shown above and notify the Patent and Trademark Office of the change in status, or
- B. If the status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:

- A. Pay FEE DUE shown above, or
- B. File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above.

II. Part B-Issue Fee Transmittal should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by charge to deposit account, Part B Issue Fee Transmittal should be completed and returned. If you are charging the ISSUE FEE to your deposit account, section "4b" of Part B-Issue Fee Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give application number and batch number.
Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

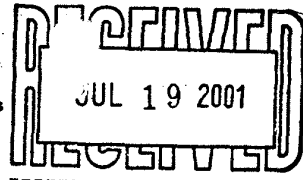
PATENT AND TRADEMARK OFFICE COPY

PTOL-85 (REV. 10-96) Approved for use through 06/30/99. (0651-0033)

ART B—ISSUE FEE TRANSMITTAL

Complete and mail this form, together with applicable fees, to:

Box ISSUE FEE
Assistant Commissioner for Patents
Washington, D.C. 20231



MAILING INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE. Blocks 1 through 4 should be completed where appropriate. All further correspondence including the Issue Fee Receipt, the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Legibly mark-up with any corrections or use Block 1)

SAMUEL W. APICELLI, ESQ.
DUANE, MORRIS & HECKESCHER LLP
305 NORTH FRONT STREET,
P.O. BOX 1003
HARRISBURG PA 17108-1003

QM02/0716

Note: The certificate of mailing below can only be used for domestic mailings of the Issue Fee Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing.

Certificate of Mailing

I hereby certify that this Issue Fee Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Box Issue Fee address above on the date indicated below.

Samuel W. Apicelli

(Depositor's name)

Samuel W. Apicelli

(Signature)

7/20/2001

(Date)

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/310,397	05/12/99	009	ATKINSON, C	3743 07/16/01
First Named Applicant	DUSSINGER,	35 USC 154(b) term ext. =	0 Days.	

TITLE OF INVENTION INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER WITH THROUGH MOUNTING HOLES

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2	165-104.260	J15	UTILITY	YES	\$620.00	10/16/01

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). Use of PTO form(s) and Customer Number are recommended, but not required.

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47) attached.

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents. OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Duane, Morris &

2 Heckscher LLP

3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type).
PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE Thermal Corp.

(B) RESIDENCE: (CITY & STATE OR COUNTRY)

Georgetown, DE

Please check the appropriate assignee category indicated below (will not be printed on the patent)

☐ Individual ☒ corporation or other private group entity ☐ government

4a. The following fees are enclosed (make check payable to Commissioner of Patents and Trademarks):

☒ Issue Fee

☒ Advance Order - # of Copies 5

add'l fees

4b. The following fees or deficiency in these fees should be charged to:

DEPOSIT ACCOUNT NUMBER 04-1679

(ENCLOSE AN EXTRA COPY OF THIS FORM)

☒ Issue Fee

☒ Advance Order - # of Copies 5

The COMMISSIONER OF PATENTS AND TRADEMARKS IS requested to apply the Issue Fee to the application identified above.

(Authorized Signature)

Samuel W. Apicelli

(Date)

07/20/01

NOTE: The Issue Fee will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the Patent and Trademark Office.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending on the needs of the individual case. Any comments on the amount of time required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND FEES AND THIS FORM TO: Box Issue Fee, Assistant Commissioner for Patents, Washington D.C. 20231

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

07/27/2001 TBESHAHE 00000064 09310397

01 FC:142

1240.00 DP

02 FC:561

15.00 DP

TRANSMIT THIS FORM WITH FEE

PTOL-85B (REV.10-96) Approved for use through 06/30/99. OMB 0651-0033

Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE



PATENT

THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Dussinger et al.

Serial No.: 09/310,397 Examiner: Atkinson, C.

Filing Date: 05/12/1999 Group Art Unit: 3743

For: INTEGRATED CIRCUIT HEAT PIPE HEAT SPREADER
WITH THROUGH MOUNTING HOLES

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:


Notification of Loss of Entitlement
to Small Entity Status under 37 CFR 1.27(g)(2)

As required under 37 CFR 1.27(g)(2), Applicants hereby advise that they have lost their entitlement to small entity status. This Notification is being filed at the time of payment of the issue fee. The Loss of Entitlement to Small Entity Status occurred on in or around January 1, 2001.

Applicants respectfully submit that this Notification fulfills the requirements set forth in 37 CFR 1.27(g)(2).

Respectfully submitted,

Dated: 07/20/2001


Samuel W. Apicelli
Registration No. 36,427
Customer No. 08933
DUANE, MORRIS & HECKSCHER LLP
305 North Front Street, P.O. Box 1003
Harrisburg, PA 17108-1003
(717)237-5516

HBG\79733.1

Docket No. : H1799-00025

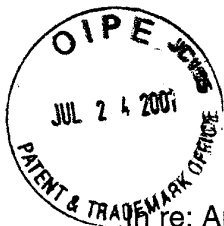
CERTIFICATE UNDER 37 CFR 1.8(a)
I, SAMUEL W. APICELLI, REGISTRATION NO. 36,427, HEREBY CERTIFY
THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE
UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN
ENVELOPE ADDRESSED TO ASSISTANT COMMISSIONER FOR
PATENTS, WASHINGTON, D.C. 20231


SAMUEL W. APICELLI

#13

EP

9-12-01



OK to Enter *BLS*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Application of: Dussinger et al.

Serial No.: 09/310,397 Examiner: Atkinson, C.

Filed: 05/12/1999 Group Art Unit: 3743

For: INTEGRATED CIRCUIT HEAT PIPE HEAT
SPREADER WITH THROUGH MOUNTING HOLES

CERTIFICATE UNDER 37 CFR 1.8(a)
I, SAMUEL W. APICELLI, REGISTRATION NO. 36,427, HEREBY CERTIFY
THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE
UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN
ENVELOPE ADDRESSED TO ASSISTANT COMMISSIONER FOR
PATENTS, WASHINGTON, D.C. 20231

ON

July 29, 2001
Samuel W. Apicelli
SAMUEL W. APICELLI

TRANSMITTAL LETTER

BOX ISSUE FEE

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Please find enclosed for filing:

- ☒ Issue Fee Transmittal Form Part B (2)
- ☒ Notification of Loss of Entitlement to Small Entity Status
- ☒ Communication re Submission of Formal Drawings.
- ☒ Three (3) Sets of Formal Drawings
- ☒ Check # 5885 in the amount of \$1255 for issue fee and copies
- ☒ Please charge any additional fees, or credit any overpayment, to
Deposit Account No.04-1679. This Transmittal Letter is submitted in duplicate.
- ☒ Return postcard

Respectfully submitted,

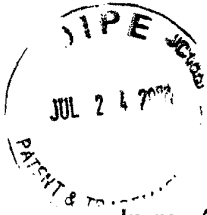
Date: 07/20/2001

Samuel W. Apicelli

Samuel W. Apicelli
Registration No. 36,427
Customer No. 08933
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HBG\79741.1

Docket No.: H1799-00025



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Application of: Dussinger et al.

Serial No.: 09/310,397 Examiner: Atkinson, C.

Filed: 05/12/1999 Group Art Unit: 3743

For: INTEGRATED CIRCUIT HEAT PIPE HEAT
SPREADER WITH THROUGH MOUNTING HOLES

CERTIFICATE UNDER 37 CFR 1.8(a)
I, SAMUEL W. APICELLI, REGISTRATION NO. 36,427, HEREBY CERTIFY
THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE
UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN
ENVELOPE ADDRESSED TO ASSISTANT COMMISSIONER FOR
PATENTS, WASHINGTON, D.C. 20231

ON

July 29 2001
Samuel W. Apicelli
SAMUEL W. APICELLI

TRANSMITTAL LETTER

BOX ISSUE FEE

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Please find enclosed for filing:

- ☒ Issue Fee Transmittal Form Part B (2)
- ☒ Notification of Loss of Entitlement to Small Entity Status
- ☒ Communication re Submission of Formal Drawings.
- ☒ Three (3) Sets of Formal Drawings
- ☒ Check # 5885 in the amount of \$1255 for issue fee and copies
- ☒ Please charge any additional fees, or credit any overpayment, to
Deposit Account No.04-1679. This Transmittal Letter is submitted in duplicate.
- ☒ Return postcard

Respectfully submitted,

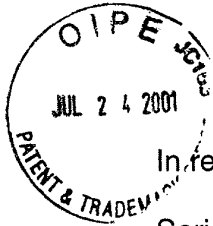
Date: 07/20/2001

Samuel W. Apicelli

Samuel W. Apicelli
Registration No. 36,427
Customer No. 08933
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305 North Front Street, P.O. Box 1003
Harrisburg, PA 17108-1003
(717) 237-5516

HBG179741.1

Docket No.: H1799-00025



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

MA
#14

In re: Application of: Dussinger et al.

Serial No.: 09/310,397 Examiner: Atkinson, C.

Filed: 05/12/1999 Group Art Unit: 3743

For: INTEGRATED CIRCUIT HEAT PIPE HEAT
SPREADER WITH THROUGH MOUNTING HOLES

CERTIFICATE UNDER 37 CFR 1.8(a)
I, SAMUEL W. APICELLI, REGISTRATION NO. 36,427, HEREBY CERTIFY
THAT THIS CORRESPONDENCE IS BEING DEPOSITED WITH THE
UNITED STATES POSTAL SERVICE AS FIRST CLASS MAIL IN AN
ENVELOPE ADDRESSED TO ASSISTANT COMMISSIONER FOR
PATENTS, WASHINGTON, D.C. 20231

July 20, 2001
Samuel W. Apicelli
SAMUEL W. APICELLI

SUBMISSION OF FORMAL DRAWINGS

BOX ISSUE FEE
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Formal Drawings were required by form PTOL-37 attached to the Notice of Allowance, including changes required by the Notice of Draftsperson's patent Drawing Review, PTO-948.

Applicants herewith submit corrected, formal drawings that are believed to satisfy all requirements. These drawings are direct copies of the drawings of record. No new matter is presented.

Should the attached drawings not be found fully in compliance with all requirements, Applicants respectfully request prompt notice by telephone in order to accomplish expeditious correction within the term allotted.

Respectfully submitted,

Date: 07/20/2001

Samuel W. Apicelli

Samuel W. Apicelli

Registration No. 36,427
Customer No. 08933
DUANE, MORRIS & HECKSCHER LLP
305 North Front Street, P.O. Box 1003
Harrisburg, PA 17108-1003
(717) 237-5516

Docket No.: H1799-00025

6302192

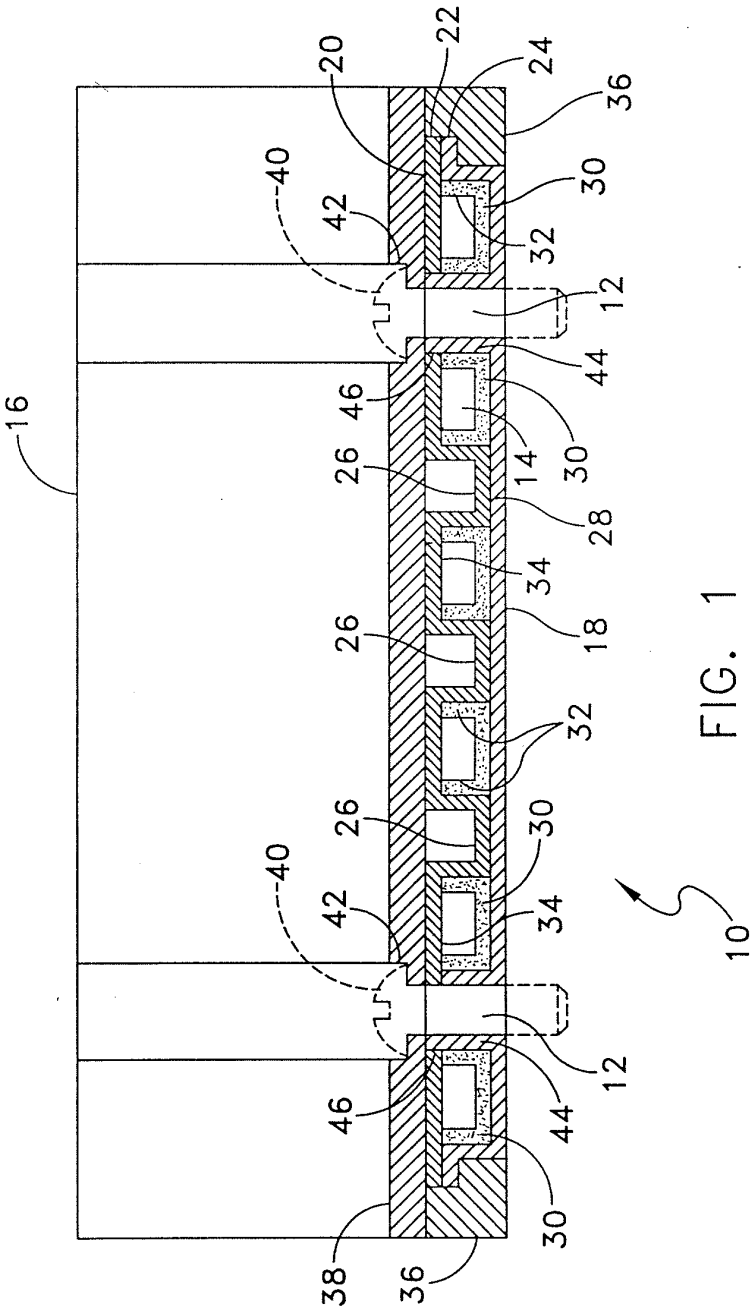


FIG. 1

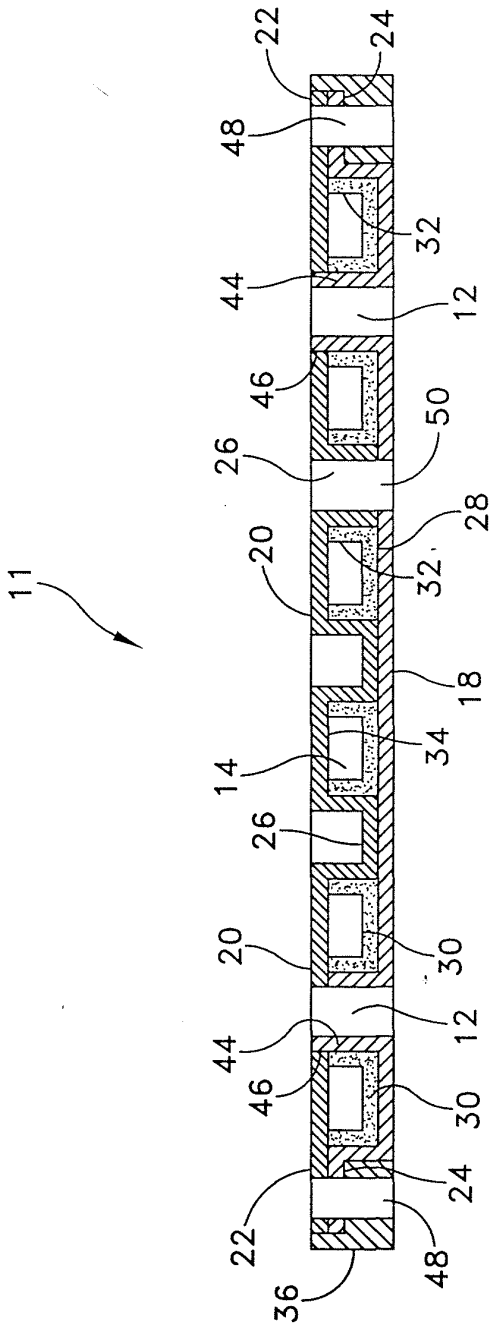


FIG. 2

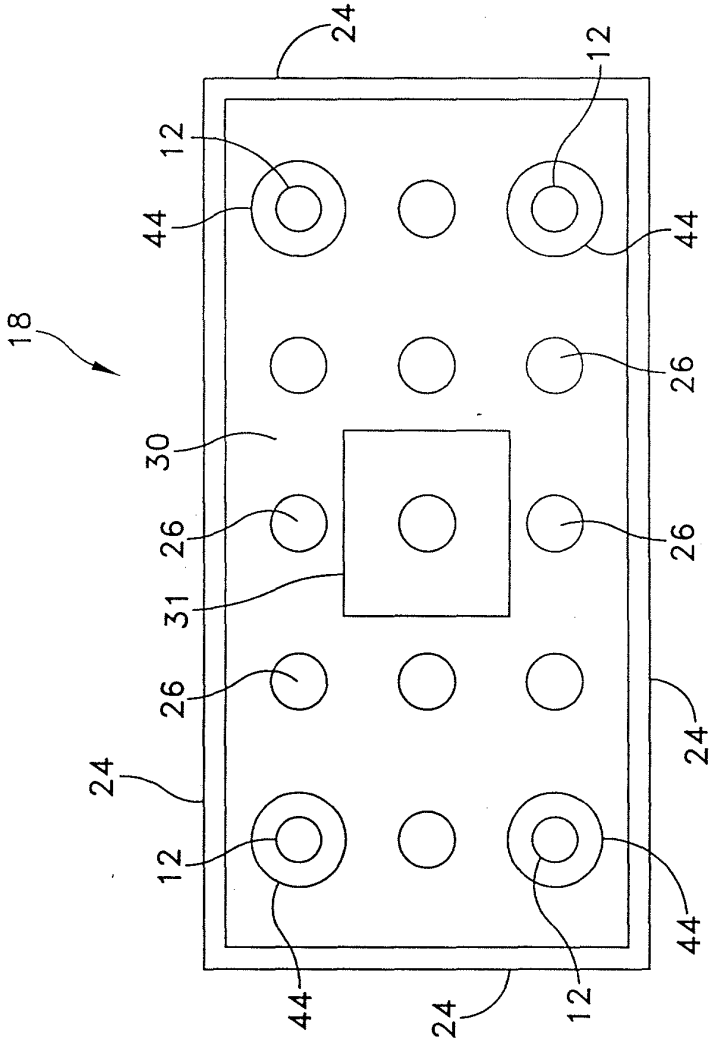


FIG. 3

10/03/06 16:43 FAX 2159791020

Duane Morris 11

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007/021

OCT 03 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Assignee: THERMAL CORP.

Patent No: 6,302,192

Serial No.: 09/310,397

Issue Date: 10/16/2001

Filed: 5/12/1999

Atty. Dkt. H1799-00025

For: INTEGRATED CIRCUIT HEAT PIPE
HEAT SPREADER WITH THROUGH
MOUNTING HOLES

Date: 3 October 2006

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**REQUEST FOR WITHDRAWAL AS ATTORNEY OR AGENT AND
CHANGE OF CORRESPONDENCE ADDRESS**

Dear Sir:

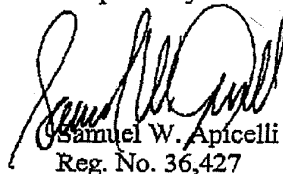
The undersigned Attorney of Record on behalf of himself and all Partners and associates of Duane Morris LLP, and the attorneys/agents associated with Customer number 41396 or Customer number 08933, hereby applies to withdraw as attorney(s) of record, and requests approval and acknowledgment by the Office.

The reason for this request is that the assignee of record has requested that the file be transferred to the below-named attorney and law firm. All related property concerning the subject patent has been delivered to this alternate counsel. Due notice to the Assignee has been provided, by copy of this Request, mailed concurrently to the address of the assignee as stated hereinafter. To the best of my knowledge and belief, there is no near or impending response period applicable to the matter and the Applicant has obtained other representation.

Please change the correspondence address and direct all future correspondence to:

Christopher B. Austin
Michael Best & Friedrich, LLP
100 E. Wisconsin Avenue, Suite 3300
Milwaukee, WI 53202.

Respectfully submitted,



Samuel W. Apicelli
Reg. No. 36,427
Duane Morris LLP
30 S. 17th Street
Philadelphia, PA 19103-4196
215-979-1255

10/03/2006 16:57 FAX 215405

Duane Morris LLP

RECEIVED
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OCT 03 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Assignee: THERMAL CORP.

Patent No. ~~6,302,192~~

Serial No.: 09/310,397

Issue Date: 10/16/2001

Filed: 5/12/1999

Atty. Dkt. H1799-00025

For: INTEGRATED CIRCUIT HEAT PIPE
HEAT SPREADER WITH THROUGH
MOUNTING HOLES.

Date: 3 October 2006

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

**REQUEST FOR WITHDRAWAL AS ATTORNEY OR AGENT AND
CHANGE OF CORRESPONDENCE ADDRESS**

Dear Sir:

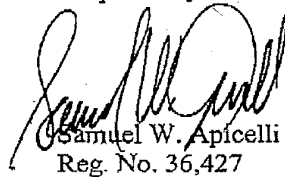
The undersigned Attorney of Record on behalf of himself and all Partners and associates of Duane Morris LLP, and the attorneys/agents associated with Customer number 41396 or Customer number 08933, hereby applies to withdraw as attorney(s) of record, and requests approval and acknowledgment by the Office.

The reason for this request is that the assignee of record has requested that the file be transferred to the below-named attorney and law firm. All related property concerning the subject patent has been delivered to this alternate counsel. Due notice to the Assignee has been provided, by copy of this Request, mailed concurrently to the address of the assignee as stated hereinafter. To the best of my knowledge and belief, there is no near or impending response period applicable to the matter and the Applicant has obtained other representation.

Please change the correspondence address and direct all future correspondence to:

Christopher B. Austin
Michael Best & Friedrich, LLP
100 E. Wisconsin Avenue, Suite 3300
Milwaukee, WI 53202.

Respectfully submitted,



Samuel W. Apicelli
Reg. No. 36,427
Duane Morris LLP
30 S. 17th Street
Philadelphia, PA 19103-4196
215-979-1255

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Duane Morris LLP

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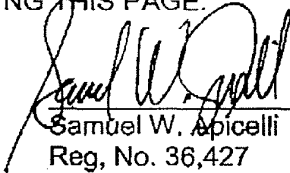
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Samuel W. Apicelli
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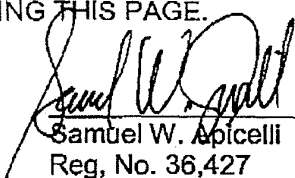
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Samuel W. Apicelli
Reg. No. 36,427

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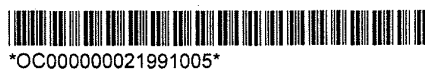
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APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
09/310,397	05/12/1999	PETER M. DUSSINGER	

41396
DUANE MORRIS LLP
IP DEPARTMENT
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103-4196

CONFIRMATION NO. 8761



OC000000021991005

Date Mailed: 01/16/2007

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 10/03/2006.

- The withdrawal as attorney in this application has been accepted. Future correspondence will be mailed to the new address of record. 37 CFR 1.33.

ANITA C GREENE
OIPE (703) 308-9010 EXT 159

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APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
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CONFIRMATION NO. 8761



OC000000021991074

Date Mailed: 01/16/2007

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 10/03/2006.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

ANITA C GREENE
OIPE (703) 308-9010 EXT 159

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