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Matsuda

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(54) **SYSTEM FOR GENERATING PRINTED BOARD THREE-DIMENSIONAL SHAPE DATA**

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(58) **Field of Classification Search** 345/419, 345/420, 531, 532, 629
See application file for complete search history.

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(57) **ABSTRACT**

A system for generating three-dimensional shape data about a high precision printed board without considerable amount of time and efforts. The system comprises a first storage means for storing therein three-dimensional simple shape data about a printed board; a second storage means for storing therein detailed shape data an electronic component; a third storage means for storing therein wiring data; and a generation.

3 Claims, 12 Drawing Sheets

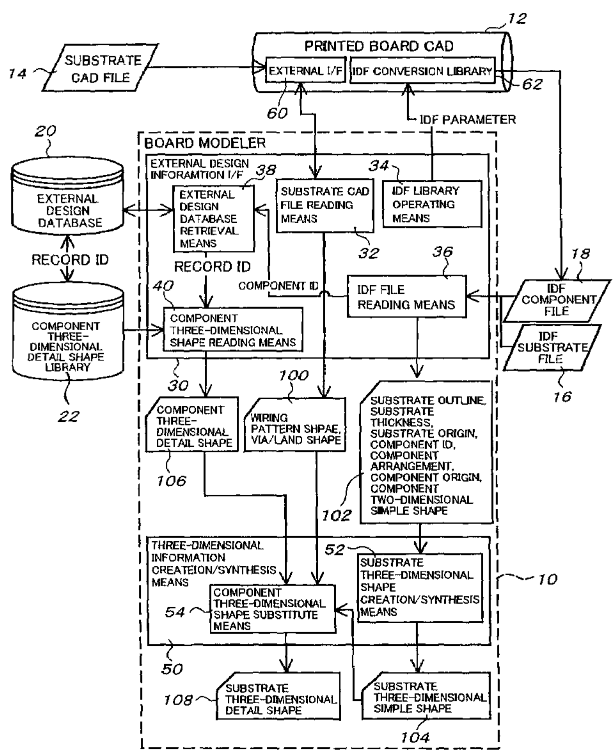


FIG. 1

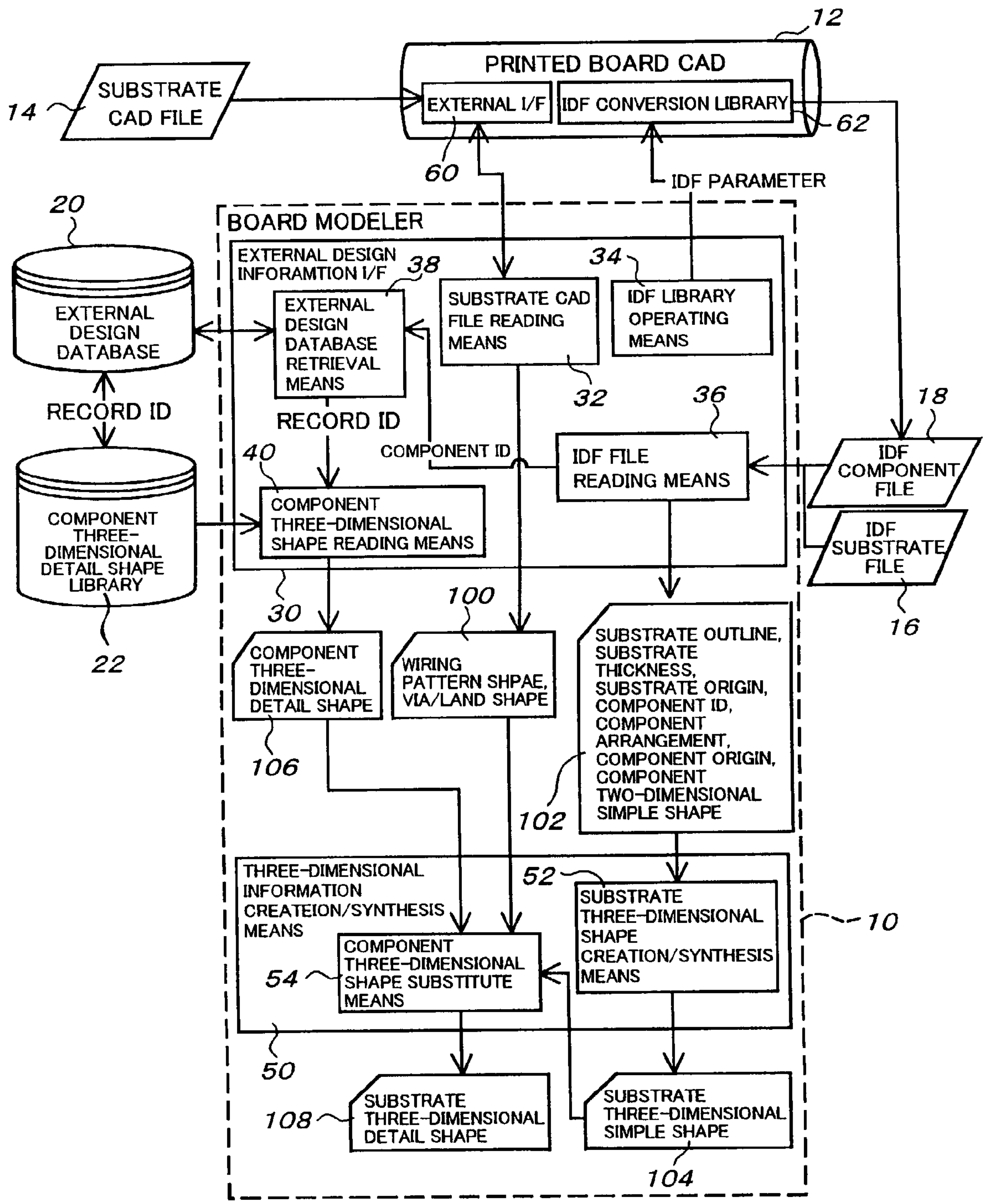

PRINTED BOARD CAD
12
SUBSTRATE CAD FILE
14
EXTERNAL I/F
IDF CONVERSION LIBRARY
62
60
IDF PARAMETER
20
BOARD MODELER
EXTERNAL DESIGN DATABASE
EXTERNAL DESIGN INFORAMTION I/F
38
EXTERNAL DESIGN DATABASE RETRIEVAL MEANS
SUBSTRATE CAD FILE READING MEANS
34
IDF LIBRARY OPERATING MEANS
32
RECORD ID
RECORD ID
36
18
COMPONENT ID
IDF FILE READING MEANS
IDF COMPONENT FILE
40
COMPONENT THREE-DIMENSIONAL DETAIL SHAPE LIBRARY
COMPONENT THREE-DIMENSIONAL SHAPE READING MEANS
IDF SUBSTRATE FILE
16
30
100
22
COMPONENT THREE-DIMENSIONAL DETAIL SHAPE
WIRING PATTERN SHPAE, VIA/LAND SHAPE
SUBSTRATE OUTLINE, SUBSTRATE THICKNESS, SUBSTRATE ORIGIN, COMPONENT ID, COMPONENT ARRANGEMENT, COMPONENT ORIGIN, COMPONENT TWO-DIMENSIONAL SIMPLE SHAPE
106
102
THREE-DIMENSIONAL INFORMATION CREATEION/SYNTHESIS MEANS
52
SUBSTRATE THREE-DIMENSIONAL SHAPE CREATION/SYNTHESIS MEANS
10
54
COMPONENT THREE-DIMENSIONAL SHAPE SUBSTITUTE MEANS
50
108
SUBSTRATE THREE-DIMENSIONAL DETAIL SHAPE
SUBSTRATE THREE-DIMENSIONAL SIMPLE SHAPE
104

FIG. 2

AN EXAMPLE OF WIRING PATTERN SHAPE AND VIA/LAND SHAPE

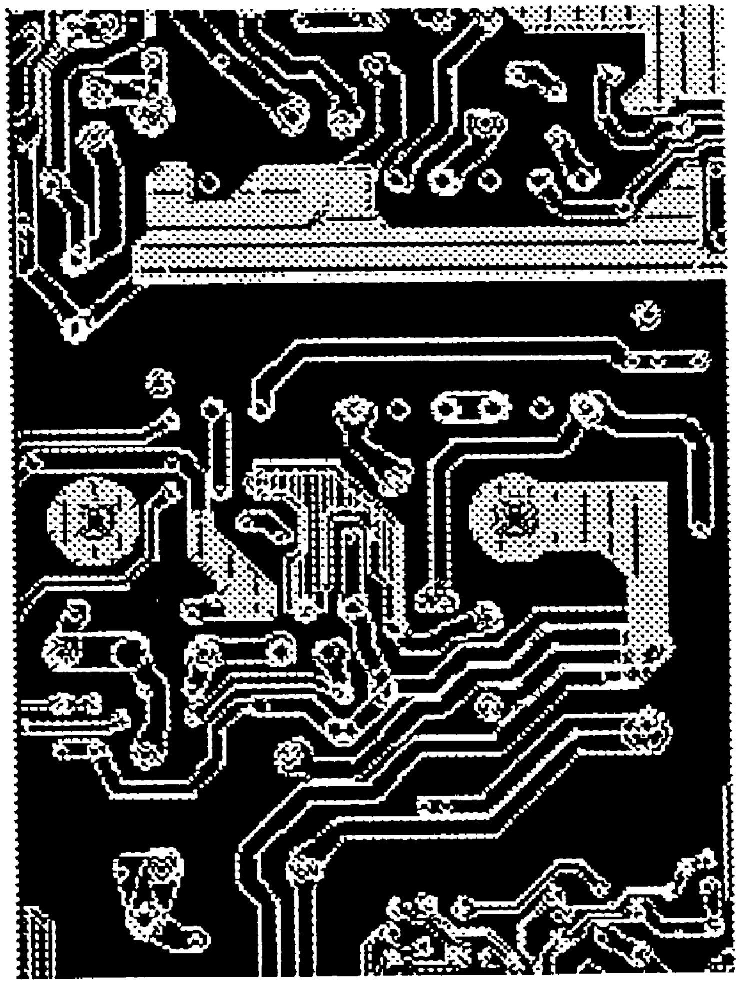


FIG. 3

AN EXAMPLE OF GUI OF IDF PARAMETER

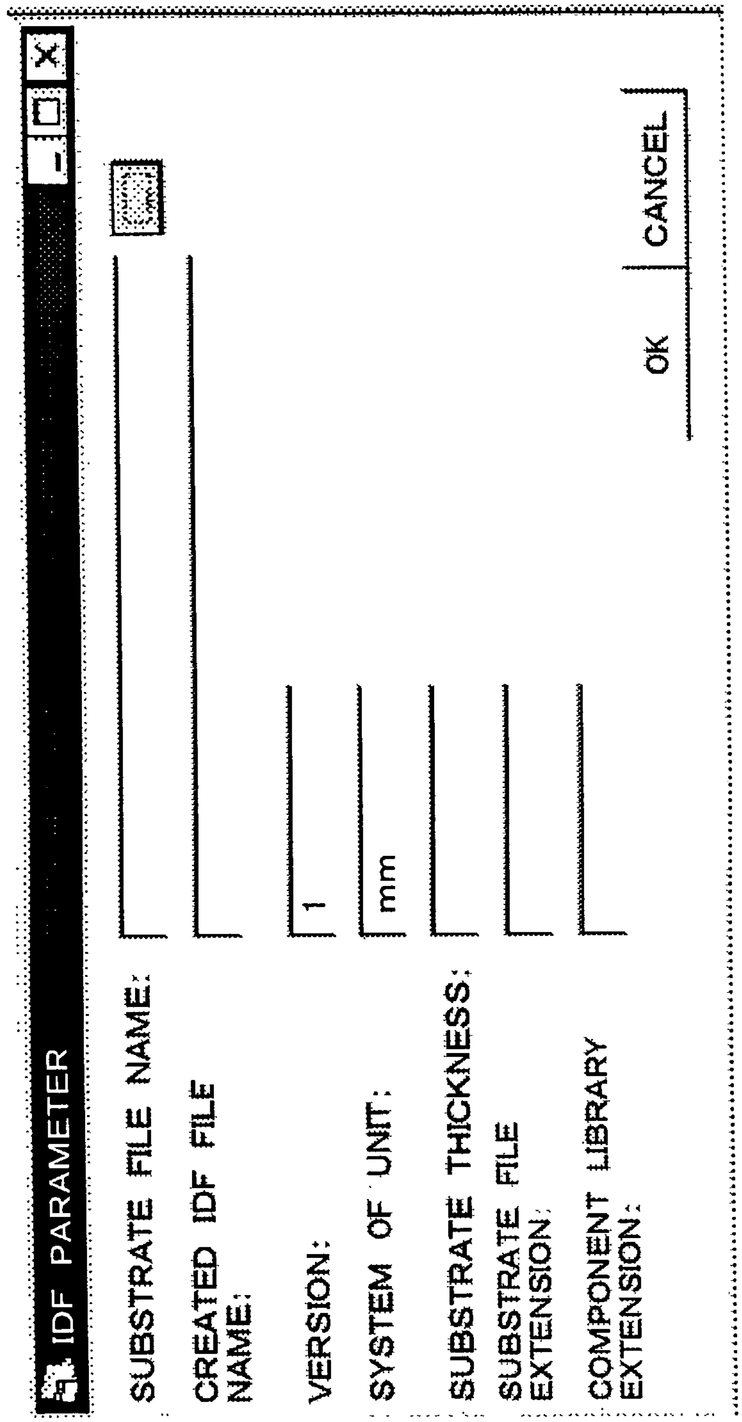


FIG. 4

AN EXAMPLE OF IDF SUBSTRATE FILE

```
.HEADER
BOARD_FILE 2.0 "CR-5000 Board Designer V4.030" 1999/02/04.10:48:20 1
sampleBoard.brd MM
.END_HEADER
.BOARD_OUTLINE
1.400000
0 0.000000 0.000000 0.00000
0 220.000000 0.000000 0.00000
.END_BOARD_OUTLINE
.ROUTE_OUTLINE
0 200.000000 150.000000 0.00000
0 0.000000 150.000000 0.00000
0 0.000000 125.000000 0.00000
.END_ROUTE_OUTLINE
.PLACE_OUTLINE
0 2.000000 95.000000 0.00000
0 0.000000 95.000000 0.00000
0 0.000000 0.000000 0.00000
0 220.000000 0.000000 0.00000
.END_PLACE_OUTLINE
.ROUTE_KEEPOUT
TOP
```

CONTINUED FROM FIG. 4

```
0 101.600000 0.000000 0.00000
0 101.600000 0.000000 0.00000
.END_ROUTE_KEEPOUT
.PLACE_REGION
BOTH ANALOG2
0 166.370000 85.090000 0.00000
0 166.370000 12.700000 0.00000
.END_PLACE_REGION
.DRILLED_HOLES
1.750000 100.000000 145.000000 NPTH BOARD
1.750000 195.000000 145.000000 NPTH BOARD
.END_DRILLED_HOLES
.PLACEMENT
1608Achip_80000 1608Achip_80000 C15
26.670000 107.950000 180.000000 BOTTOM PLACED
1608Achip_80000 1608Achip_80000 C16
8.890000 125.730000 180.000000 BOTTOM PLACED
1608Achip_80000 1608Achip_80000 C17
29.210000 67.310000 90.000000 TOP PLACED
1608Achip_80000 1608Achip_80000 C18
57.150000 27.940000 90.000000 TOP PLACED
1608Achip_80000 1608Achip_80000 C19
78.740000 68.580000 0.000000 BOTTOM PLACED
.END_PLACEMENT
EOF
```

FIG. 5

AN EXAMPLE OF IDF COMPONENT FILE

```
. .HEADER
LIBRARY_FILE 2.0 "CR-5000 Board Designer V4.030" 1999/02/04.10:48:20 1
.END_HEADER
.ELECTRICAL
1608Achip_80000 1608Achip_80000 MM 0.800000
0 -2.000000 0.600000 0.00000
0 -2.000000 -0.600000 0.00000
0 2.000000 -0.600000 0.00000
0 2.000000 0.600000 0.00000
0 -2.000000 0.600000 0.00000
.END_ELECTRICAL
.ELECTRICAL
CRQ3smd_90000 CRQ3smd_90000 MM 0.900000
```

CONTINUED FROM FIG. 5

```
0 -1.800000 -2.000000 0.00000
0 1.800000 -2.000000 0.00000
0 1.800000 0.800000 0.00000
0 0.800000 0.800000 0.00000
0 0.800000 2.000000 0.00000
0 -0.800000 2.000000 0.00000
0 -0.800000 0.800000 0.00000
0 -1.800000 0.800000 0.00000
0 -1.800000 -2.000000 0.00000
.END_ELECTRICAL
.ELECTRICAL
CON10_1600000 CON10_1600000 MM 16.000000
0 -11.000000 5.500000 0.00000
0 -11.000000 -1.500000 0.00000
0 21.000000 -1.500000 0.00000
0 21.000000 5.500000 0.00000
0 -11.000000 5.500000 0.00000
.END_ELECTRICAL
EOF
```

FIG. 6

〈IDF SUBSTRATE FILE〉

DESCRIPTION INSIDE IDF FILE				
SECTION	RECORD	FIELD	CONTENTS	VALUE
Header	1	1	SECTION KEYWORD	.HEADER
	2	1	FIELD TYPE	BOARD_FILE
	2	2	IDF VERSION	1.0 or 2.0
	2	3	IDENTIFICATION NAME OF SOURCE SYSTEM	ARBITRARY
	2	4	DATA	Yyyy/mm/dd.hh.ss
	2	5	VERSION NUMBER OF BOARD FILE	ARBITRARY
	3	1	BOARD NAME	ARBITRARY
	3	2	SYSTEM OF UNIT	MM、TNM、THOU
	4	1	SECTION END KEYWORD	.END_HEADER
Board Outline	1	1	SECTION KEYWORD	.BOARD_OUTLINE
	2	1	BOARD THICKNESS	ARBITRARY
	3	1	LOOP LABEL	0 or 1
	3	2	X COORDINATE	ARBITRARY
	3	3	Y COORDINATE	ARBITRARY
	3	4	MOUNTING ANGLE	0 DRAW ARC FROM (Xn-1,Yn-1) TO (Xn,Yn) WHEN OTHER THAN 0
	4	1	SECTION END KEYWORD	.END_BOARD_OUTLINE
Other Outline	1	1	SECTION KEYWORD	.OTHER_OUTLINE
	2	1	OUTLINE IDENTIFICATION NAME	UNIQUE NAME OF OUTLINE
	2	2	EXTRUSION THICKNESS	ARBITRARY
	3	1	LOOP LABEL	0 or 1
	3	2	X COORDINATE	ARBITRARY
	3	3	Y COORDINATE	ARBITRARY
	3	4	MOUNTING ANGLE	0 DRAW ARC FROM (Xn-1,Yn-1) TO (Xn,Yn) WHEN OTHER THAN 0
	4	1	SECTION END KEYWORD	.END_BOARD_OUTLINE
Drilled Holes	1	1	SECTION KEYWORD	.DRILLED_HOLES
	2	1	HOLE DIAMETER	ARBITRARY
	2	2	X COORDINATE OF CENTER	ARBITRARY
	2	3	Y COORDINATE OF CENTER	ARBITRARY
	3	1	SECTION END KEYWORD	.END_DRILLED_HOLES
Component Placement	1	1	SECTION KEYWORD	.PLACEMENT
	2	1	PACKAGE NAME	COMPONENT NAME OF PACKAGE GEOMETRY
	2	2	COMPONENT NUMBER	NUMBER OF COMPONENT
	3	1	X COORDINATE POSITION	ARBITRARY
	3	2	Y COORDINATE POSITION	ARBITRARY
	3	3	ROTATION ANGLE	ARBITRARY
	3	4	BOARD SURFACE	TOP、BOTTOM
	3	5	ARRANGEMENT STATUS	FIXED、UNPLACED、PLACED
	4	1	SECTION END KEYWORD	.END_PLACEMENT

FIG. 7

〈IDF COMPONENT FILE〉

DESCRIPTION INSIDE IDF FILE				
SECTION	RECORD	FIELD	CONTENTS	VALUE
Header	1	1	SECTION KEYWORD	.HEADER
	2	1	FIELD TYPE	LIBRARY_FILE
	2	2	IDF VERSION	1.0 or 2.0
	2	3	IDENTIFICATION NAME OF SOURCE SYSTEM	ARBITRARY
	2	4	DATA	Yyyy/mm/dd.hh.ss
	2	5	VERSION NUMBER OF LIBRARY FILE	ARBITRARY
	3	1	SECTION END KEYWORD	.END_HEADER
Electrical	1	1	SECTION KEYWORD	.ELECTRICAL
	2	1	GEOMETRY NAME	ARBITRARY
	2	2	COMPONENT NUMBER	ARBITRARY
	2	3	SYSTEM OF UNIT	MM、TNM、THOU
	2	4	COMPONENT HEIGHT	ARBITRARY
	3	1	LOOP LABEL	0 or 1
	3	2	POINT OF X COORDINATE	ARBITRARY
	3	3	POINT OF Y COORDINATE	ARBITRARY
	3	4	MOUNTING ANGLE	0 DRAW ARC FROM (Xn−1,Yn−1) TO (Xn,Yn) WHEN OTHER THAN 0
	4	1	SECTION END KEYWORD	.END_ELECTRICAL

FIG. 8

AN EXAMPLE OF THREE-DIMENSIONAL SIMPLE SHAPE OF PRINTED BOARD

FIG. 9

AN EXAMPLE OF THREE—DIMENSIONAL DETAIL SHAPE OF ELECTRONIC COMPONENT

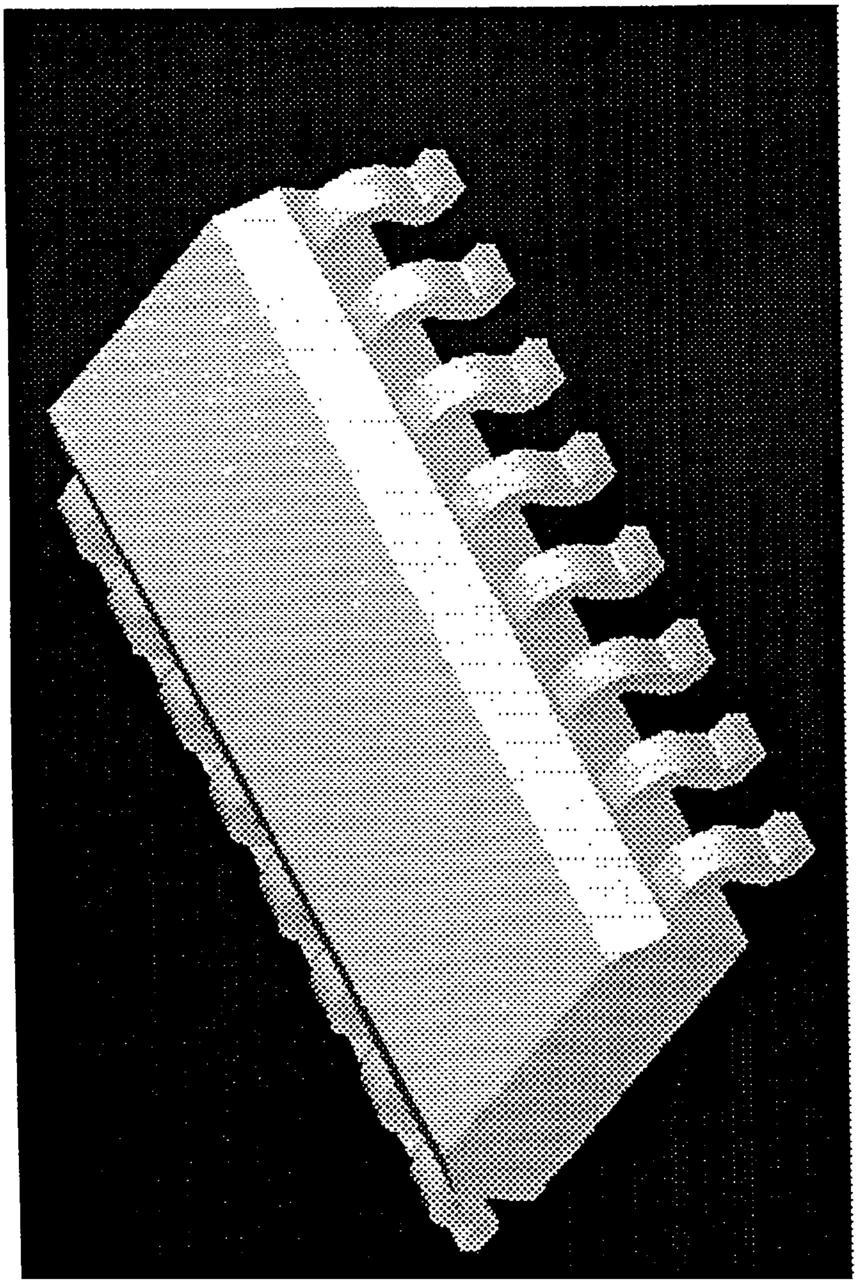
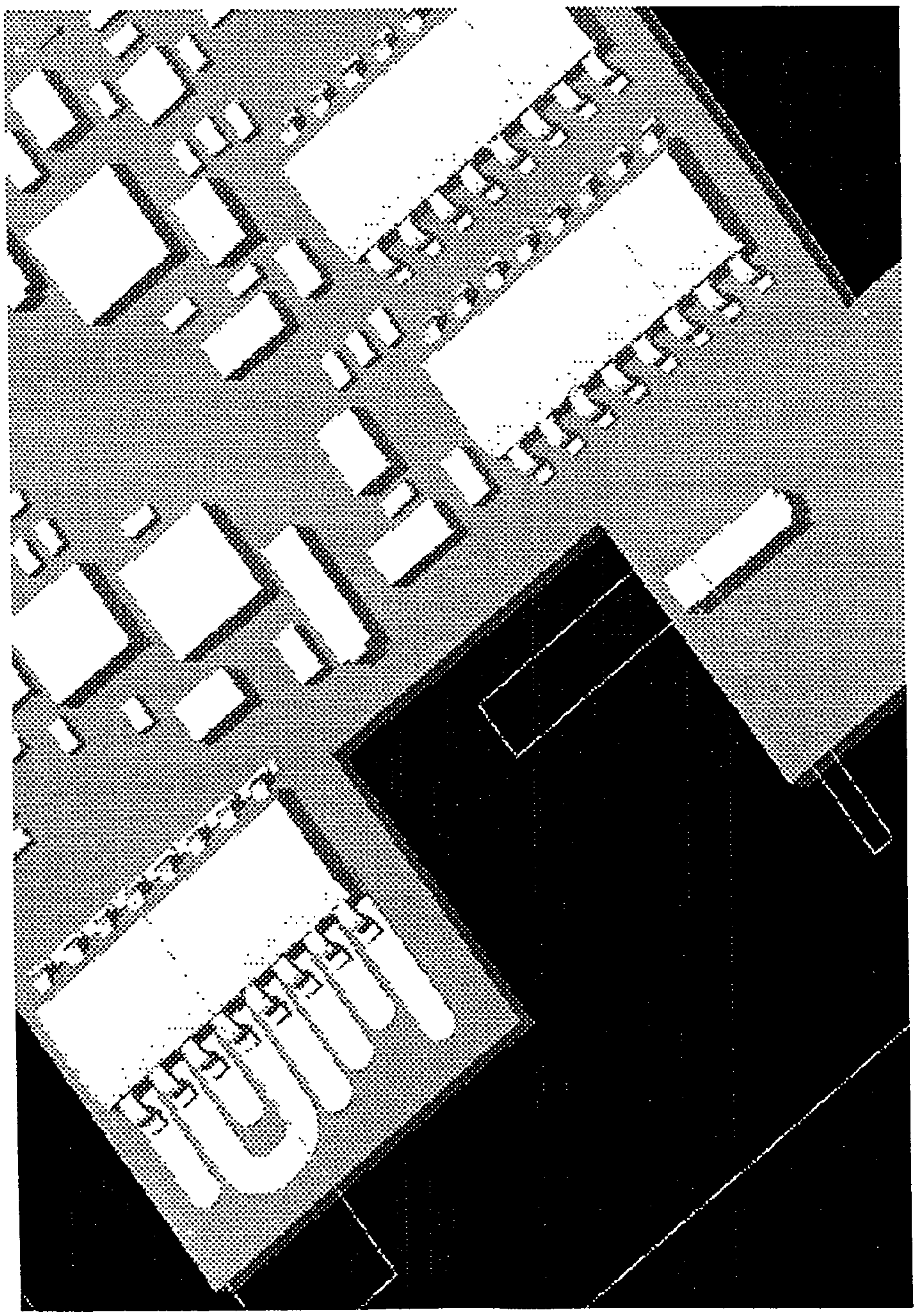


FIG. 10

AN EXAMPLE OF THREE-DIMENSIONAL SHAPE OF PRINTED BOARD



SYSTEM FOR GENERATING PRINTED BOARD THREE-DIMENSIONAL SHAPE DATA

This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/JP00/08845 which has an International filing date of Dec. 14, 2000, which designated the United States of America.

TECHNICAL FIELD

The present invention relates to a system for creating three-dimensional shape data of a printed board, and more particularly, it relates to a system for creating three-dimensional shape data of a printed board, which is preferable when used for design negotiation performed between electric packaging-design process and device sheathing design process in a three-dimensional product design performed in product development process in an electronic products manufacturing corporation, for example.

BACKGROUND ART

Conventionally, to create the three-dimensional shape data of the printed board, data such as a substrate outline, substrate thickness, electronic component ID, a rectangular electronic component field, an electronic component height, and arrangement information of electronic component has been output from a substrate CAD system on the file format of IDF (Intermediate Data Format), the above-mentioned IDF file output from the concerned substrate CAD system has been input into a three-dimensional CAD system via an interface, and a three-dimensional shape data of the printed board, where an electronic component shape was expressed as a rectangular parallelepiped-like shape, has been created based on the IDF file input in the concerned three-dimensional CAD system.

Specifically, in the three-dimensional shape data of the printed board, which has been created based on the IDF file output from the above-mentioned substrate CAD system, since only data of a rectangular electronic component field (that is, two-dimensional shape showing the base of electronic component) and the electronic component height regarding the electronic component is given, each electronic component shape is expressed in a rectangular parallelepiped-like shape different from life shape, and furthermore, since there is a case where, regarding the base shape of the electronic component as the rectangular electronic component field, a foot pin nose of the concerned electronic component is made to be an end line, there existed a problem that the use of the created three-dimensional shape data of the printed board as simulation data for highly precise fitting check and strength analysis is limited.

On the other hand, in the case of creating the three-dimensional shape data of the highly precise printed board by the above-mentioned conventional technique, there existed a problem that a great amount of time and labor are needed because each designer needed to perform data editing of the three-dimensional shape data of the printed board, which has been obtained by the IDF format, with manual operation.

The present invention is created in view of the above-mentioned problems that the prior art has, and its object is to provide the system for creating the three-dimensional shape data of the printed board, which can create the three-dimensional shape data of the highly precise printed board without needing a great amount of time and labor.

DISCLOSURE OF THE INVENTION

To attain the above-mentioned object, the present invention is one that has: first storage means that stores printed board three-dimensional simple shape data showing a three-dimensional simple shape of a printed board; second storage means that stores electronic component three-dimensional detail shape data showing a three-dimensional detail shape of electronic component; third storage means that stores wiring data showing a wiring pattern shape and via/land shape of the printed board; and generation means that reads out the printed board three-dimensional simple shape data stored in the above-mentioned first storage means, the electronic component three dimensional detail shape data stored in the above-mentioned second storage means, and the wiring data stored in the above-mentioned third storage means, and generates printed board three-dimensional detail shape data showing a three-dimensional detail shape of the printed board, where the wiring pattern shape and the via/land shape that the wiring data shows are synthesized with a three-dimensional shape of the printed board, in which the electronic component shape constituting the three-dimensional simple shape of the printed board that the printed board three-dimensional simple shape data shows is substituted for the electronic component shape that the electronic component three dimensional detail shape data shows.

Herein, the above-mentioned first storage means is equivalent to a 'substrate three dimensional simple shape storage region **104**' in the section of 'Best mode for implementing the invention' which is described later, the above-mentioned second storage means is equivalent to a 'component three-dimensional detail shape storage region **106**' in the section of 'Best mode for implementing the invention' which is described later, the above-mentioned third storage means is equivalent to a 'wiring pattern shape/via-land shape storage region **100**' in the section of 'Best mode for implementing the invention' which is described later, and the above-mentioned generation means is equivalent to 'component three-dimensional shape substitute means **54**' in the section of 'Best mode for implementing the invention' which is described later.

Further, the present invention may have read-out means that reads out the electronic component three dimensional detail shape data of electronic component, which the printed board three-dimensional simple shape data stored in the above-mentioned first storage means shows, from an external database for the second storage means.

Herein, the above-mentioned external database is equivalent to a 'component three-dimensional detail shape library **22**' in the section of 'Best mode for implementing the invention'which is described later, and the above-mentioned read-out means is equivalent to 'component three-dimensional shape reading means **40**' in the section of 'Best mode for implementing the invention' which is described later.

Furthermore, the present invention has processing means that reads out predetermined data from a second external database, generates the printed board three-dimensional simple shape data based on the data read out and stores it in the above-mentioned first storage means, and the above-mentioned read-out means is one that reads out the electronic component three-dimensional detail shape data from the above-mentioned external database according to electronic component that the predetermined data, which the above-mentioned processing means read out, shows.

Herein, the above-mentioned second external database is equivalent to an 'IDF substrate file **16**' and an 'IDF component file **18**' in the section of 'Best mode for implementing the invention' which is described later, and the above-mentioned read-out means is equivalent to 'IDF file reading means **36**' and 'substrate three-dimensional shape creation/synthesis means **52**' in the section of 'Best mode for implementing the invention' which is described later.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block configuration view that shows an example of an embodiment of the three-dimensional shape data creation system of the printed board according to the present invention.

FIG. **2** is an explanatory view that shows an example of the wiring pattern shape and the via/land shape.

FIG. **3** is an explanatory view that shows an example of a user graphic interface (GUI) of an IDF parameter.

FIG. **4** is a data list that shows an example of the IDF substrate file.

FIG. **5** is a data list that shows an example of the IDF component file.

FIG. **6** is a chart that shows the specification of the substrate by the IDF substrate file.

FIG. **7** is a chart that shows the specification of the electronic component by the IDF component file.

FIG. **8** is an explanatory view that shows an example of the three-dimensional simple shape of the printed board.

FIG. **9** is an explanatory view that shows an example of the three-dimensional detail shape of electronic component.

FIG. **10** is an explanatory view that shows an example of the three-dimensional shape of the printed board.

EXPLANATION OF REFERENCE NUMERALS

10. Board modeler (Board Modelar)
12. Printed board CAD
14. Substrate CAD file
16. IDF substrate file
18. IDF component file
20. External design database
22. Component three-dimensional detail shape library
30. External design information interface (External design information I/F)
32. Substrate CAD file reading means
34. IDF library operating means
36. IDF file reading means
38. External design database retrieval means
40. Component three-dimensional shape reading means
50. Three-dimensional information creation/synthesis means
52. Substrate three-dimensional shape creation/synthesis means
54. Component three-dimensional shape substitute means
60. External interface (External I/F)
62. IDF conversion library
100. Wiring pattern shape/via-land shape storage region
102. Storage region of substrate outline and the like
104. Substrate three-dimensional simple shape storage region
106. Component three-dimensional detail shape storage region
108. Substrate three-dimensional detail shape storage region

BEST MODE FOR IMPLEMENTING THE INVENTION

Hereinafter, an example of the embodiment of the three-dimensional shape data creation system of the printed board according to the present invention will be described with reference to the accompanying drawings.

FIG. **1** shows the block configuration view showing an example of the embodiment of the three-dimensional shape data creation system of the printed board according to the present invention.

This three-dimensional shape data creation system of the printed board (hereinafter, referred to as 'this system') is one where control of operation is realized by a micro computer and its software, which is constituted by having: the board modeler (Board Modelar) **10** that forms a principal portion of the present invention; the printed board CAD **12** connected with the board modeler **10**; the substrate CAD file **14** connected with the printed board CAD **12**; the IDF substrate file **16** output from the printed board CAD **12** and connected with the board modeler **10**; the IDF component file **18** output from the printed board CAD **12** and connected with the board modeler **10**; the external design database **20** connected with the board modeler **10**; and component three-dimensional detail shape library **22** connected with the board modeler **10**.

Herein, the board modeler **10** is constituted by having: the external design information interface (external design information I/F) **30**; and the three-dimensional information creation/synthesis means **50**.

And, the external design information I/F **30** has: the substrate CAD file reading means **32**; the IDF library operating means **34**; the IDF file reading means **36**; the external design database retrieval means **38**; and the component three-dimensional shape reading means **40**.

Further, the three-dimensional information creation/synthesis means **50** is constituted by having: the substrate three-dimensional shape creation/synthesis means **53**; and the component three-dimensional substitute means **54**.

Note that the printed board CAD **12** includes the external interface (external I/F) **60** and the IDF conversion library **62**.

In the above-mentioned configuration, in this three-dimensional shape data creation system of the printed board, substance file selection means (not shown) such as file dialog selects an object substrate file first and the full path of the object substrate is obtained by the substrate CAD file reading means **32**.

Next, the substrate CAD file reading means **32** is one that passes the full path obtained in the foregoing manner to the external I/F **60** of the printed board CAD **12** as a parameter, and accesses the substrate CAD file **14** using the function of external operation command (ASCII I/F, OLE communication or the like, for example) of the printed board CAD **12**.

And, the substrate CAD file reading means **32**, using the function of the external operation command similarly to the above-mentioned processing, obtains the two kinds of two-dimensional shape data of the wiring pattern shape and the via/land shape as the wiring data from the substrate CAD file **14** accessed, and stores them to the wiring pattern shape/via-land shape storage region **100** that consists of a random access memory (RAM).

Note that FIG. **2** shows an example of the wiring pattern shape and the via/land shape.

Next, as mentioned above, the substance file selection means (not shown) such as the file dialog selects the object substrate file first and the full path of the object substrate is obtained by the substrate CAD file reading means **32**, the full path obtained is passed to the external I/F **60** of the printed board CAD **12** as a parameter, the IDF library operating means **34** enters an IDF parameter where entry is urged according to the user graphic interface (GUI) using the function of external operation command (ASCII I/F, OLE communication or the like, for example) of the printed board CAD **12** in the state where the substrate CAD file **14** is accessed, and the IDF conversion library of the printed board CAD **12** is activated.

Herein, as the IDF parameter where entry is urged according to GUI, a 'substrate file name', a 'created IDF file name', a 'version', a 'system of unit', a 'substrate thickness', a 'substrate file extension', and a 'component library extension' are set.

And, in the IDF conversion library **62** of the printed board CAD **12**, the printed board CAD **12** obtains a 'substrate outline', a 'substrate origin', a 'component ID', a 'component arrangement', and a 'component origin' from the substrate CAD file **14** being accessed, and it further creates the IDF substrate file **16** regarding the substrate and the IDF component file **18** for component based on the IDF parameter entered and outputs them to a predetermined bus.

Herein, FIG. **4** shows an example of the IDF substrate file **16**, and FIG. **5** shows an example of the IDF component file **18**.

Next, the IDF file reading means **36** obtains the value of each element of the 'substrate outline', the 'substrate thickness' and the 'substrate origin' based on the specification shown in the chart of FIG. **6** for example, from the IDF substrate file **16**, which has been created as mentioned above and output to the predetermined bus, obtains the value of each element of the 'component ID', the 'component arrangement', the 'component, origin', and a 'component two-dimensional simple shape' based on the specification shown in the chart of FIG. **7** for example, from the IDF component file **18**, which has been created as mentioned above and output to the predetermined bus, and stores the values obtained in the storage region of substrate outline and the like **102**.

Then, the substrate three-dimensional shape creation/synthesis means **52**, based on the values stored in the storage region of substrate outline and the like **102**, creates and synthesizes the printed board three-dimensional simple shape data showing the three-dimensional simple shape of the printed board as shown in FIG. **8** for example, in which the electronic component shape is expressed as the rectangular parallelepiped-like shape.

Note that the printed board three-dimensional simple shape data created and synthesized by the substrate three-dimensional shape creation/synthesis means **52** is stored in the substrate three-dimensional simple shape storage region **104**.

Incidentally, the external design database retrieval means **38** uses the component ID obtained by the IDF file reading means **36** as a key, and if the external design database **20** is an RDB mode, it obtains its corresponding record ID.

And, in the block configuration view shown in FIG. **1**, the external design database **20** is the RDB mode, and the case is shown where the external design database retrieval means **38** obtains the record ID.

Note that, if the external design database **20** is a substance file management mode such as a file server, the external design database retrieval means **38** obtains a corresponding full path.

Consequently, the component three-dimensional shape reading means **40** reads the electronic component three-dimensional detail shape data showing the three-dimensional detail shape of the electronic component as shown in FIG. **9** for example, where the electronic component shape is expressed as a life shape, from the component three-dimensional detail shape library **22** which is related with the record ID obtained by the external design database retrieval means **38**, and stores the electronic component three-dimensional detail shape data read in the component three-dimensional detail shape storage region **106**.

Then, the component three-dimensional shape substitute means **54** reads the electronic component three-dimensional detail shape data stored in the component three-dimensional detail shape storage region **106** based on the arrangement information of each electronic component that the printed board three-dimensional simple shape data stored in the substrate three-dimensional simple shape storage region **104** shows, and synthesizes the detail shape of electronic component using the concerned electronic component three-dimensional detail shape data, substitutes the simple shape of electronic component for the detail shape of the concerned electronic component substituted, and creates the three-dimensional shape of the printed board as shown in FIG. **10**, for example.

Moreover, it is one that, regarding the wiring pattern shape and the via/land shape stored in the wiring pattern shape/via-land shape storage region **100**, inputs thickness information of the wiring pattern to the wiring pattern shape and inputs thickness information of the substrate to the via/land shape, creates the wiring pattern shape and the via/land shape as three-dimensional shape information, resynthesizes the substrate origin as arrangement information with the above-mentioned printed board three-dimensional detail shape, and completes the three-dimensional detail shape of the printed board.

Then, the printed board three-dimensional detail shape data showing the three-dimensional detail shape of the printed board, which has been created as mentioned above by the component three-dimensional shape substitute means **54**, is stored in a substrate three-dimensional detail shape storage region **108**.

Therefore, since the printed board three-dimensional detail shape data stored in the substrate three-dimensional detail shape storage region **108** is one that expresses the three-dimensional shape of the printed board in detail, it can be fully used as simulation data such as highly precise fitting check and strength analysis.

Further, according to this system, since each designer does not need to perform data editing of the three-dimensional data of the printed board obtained by the IDF format with manual operation, labor can be significantly reduced and the processing time can be sharply shortened.

Note that the above-mentioned embodiments may be modified into (1) to (3) shown below.

(1) In the above-mentioned embodiments, although description has been made for the case where the IDF format was used as data format, it is not limited to this, of course, and any format can be used as the data format.

(2) In the above-mentioned embodiments, although the printed board three-dimensional simple shape data has been created in this system, it is not limited to this, of course, and an interface function that can enter the printed board three-dimensional simple shape data created in an external system is provided, and the printed board three-dimensional detail shape data may be created using the printed board three-dimensional simple shape data created in the external system.

(3) The above-mentioned embodiments and modification examples shown in the above-mentioned (1) to (2) may be appropriately combined.

INDUSTRIAL APPLICABILITY

Since the present invention is constituted as descried above, it exerts excellent effects that the three-dimensional shape data of the highly precise printed board can be created without needing a great amount of time and labor.

What is claimed is:

1. A system for creating three-dimensional shape data of a printed board, comprising:

first storage means storing printed board three-dimensional simple shape data, each of the printed board three-dimensional simple shape data showing a three-dimensional simple shape of the printed board;

second storage means storing electronic component three-dimensional detail shape data, each of the electronic component three-dimensional detail shape data showing a detailed perspective view of a three-dimensional detail shape of the electronic component;

third storage means storing wiring data, the wiring data showing a two-dimensional wiring pattern shape and a two-dimensional via/land shape of the printed board; and

generation means reading out the printed board three-dimensional simple shape data stored in said first storage means, the electronic component three dimensional detail shape data stored in said second storage means, and the wiring data stored in said third storage means, said generation means generating printed board three-dimensional detail shape data showing a three-dimensional detail shape of the printed board, where the two-dimensional wiring pattern shape and the two-dimensional via/land shape are three-dimensionalized by the generation means, the three-dimensionalized wiring pattern shape and the three-dimensionalized via/land shape being synthesized with a three-dimensional shape of the printed board, in which the electronic component shape constituting the three-dimensional simple shape of the printed board that the printed board three-dimensional simple shape data shows is replaced by the electronic component shape that the electronic component three dimensional detail data shows.

2. The system for creating three-dimensional shape data of a printed board according to said claim **1**, further comprising:

read-out means that reads out the electronic component three dimensional detail shape data of electronic component, which the printed board three-dimensional simple shape data stored in said first storage means shows, from an external database for the second storage means.

3. The system for creating three-dimensional shape data of a printed board according to claim **2**, further comprising:

processing means that reads out predetermined data from a second external database, generates the printed board three-dimensional simple shape data based on the data read out, and stores in said first storage means, wherein

said read-out means is one that reads out the electronic component three-dimensional detail shape data from said external database in accordance with the electronic component that the predetermined data, which said processing means has read out, shows.

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