UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/442,385	06/15/2021	11035885	160062.429C1	7220

500 7590 05/26/2021

SEED INTELLECTUAL PROPERTY LAW GROUP LLP
701 FIFTH AVE
SUITE 5400
SEATTLE, WA 98104

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 82 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

TECHNOPROBE S.P.A., Cernusco Lombardone, ITALY
Flavio MAGGIONI, Cernusco Lombardone, ITALY;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

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FormFactor v. Technoprobe
IPR2024-00933

Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
16442385	14-Jun-2019	Flavio MAGGIONI	160062.429C1	7220

TITLE OF INVENTION :

TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Regular Undiscounted	Utility under 35 USC 111(a)	2866	756010	TRUNG NGUYEN

Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
$1200	$0	$1200	18-May-2021	$0

1.Change of Correspondence Address and/or Indication Of Fee Address (37 CFR 1.33 & 1.363)

Current Correspondence Address:	Current Indicated Fee Address :
500 SEED INTELLECTUAL PROPERTY LAW GROUP LLP 701 FIFTH AVE SUITE 5400 SEATTLE WA 98104 UNITED STATES 206-622-4900 USPTOeAction@SeedIP.com	
☐ Change of correspondence address requested, system generated AIA/122-EFS form attached	☐ Fee Address indication requested, system generated SB/47-EFS form attached

2.Entity Status

Change in Entity Status

○ Applicant certifying micro entity status; system generated Micro Entity certification form attached. See 37 CFR 1.29.
Note: Absent a valid certification of micro entity status, issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. If this box is checked, you will be prompted to choose a micro entity status on the gross income basis (37 CFR 1.29(a)) or the institution of higher education basis (37 CFR 1.29(d)), and make the applicable certification online.

○ Applicant asserting small entity status. See 37 CFR 1.27.
Note: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

◉ Applicant changing to regular undiscounted fee status.
Note: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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FormFactor v. Technoprobe
IPR2024-00933

Doc Code: IFEE PTOL/85B-EFS

Document Description: Issue Fee Payment (PTO-85B)

3.The Following Fee(s) Are Submitted:

☒ Issue Fee

☐ I authorize USPTO to apply my previously paid issue fee to the current fees due

☐ Publication Fee

☐ The Director is hereby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number _____

☐ Advance Order - # of copies _____

☒ If **in addition to** the payment of the issue fee amount submitted with this form, there are any discrepancies in any amount(s) due, the Director is authorized to charge any deficiency, or credit any overpayment, to Deposit Account Number 191090 . The **issue fee must be submitted** with this form. **If payment of the issue fee does not accompany this form, checking this box and providing a deposit account number will NOT be effective to satisfy full payment of the fee(s) due.**

4.Firm and/or Attorney Names To Be Printed

NOTE: If no name is listed, no name will be printed
For printing on the patent front page, list to be displayed as entered

1. SEED INTELLECTUAL PROPERTY LAW GROUP LLP
2.
3.

5.Assignee Name(s) and Residence Data To Be Printed

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

Name	City	State	Country	Category
TECHNOPROBE S.P.A.	Cernusco Lombardone		italy	corporation

6.Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/Justin Coe/	**Date**	05-17-2021
Name	Justin Coe	**Registration Number**	67382

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Electronic Patent Application Fee Transmittal

Application Number:	16442385
Filing Date:	14-Jun-2019
Title of Invention:	TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES
First Named Inventor/Applicant Name:	Flavio MAGGIONI
Filer:	Justin E. Coe/Nick Brandt
Attorney Docket Number:	160062.429C1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1200**

Electronic Acknowledgement Receipt

EFS ID:	42734264
Application Number:	16442385
International Application Number:	
Confirmation Number:	7220
Title of Invention:	TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES
First Named Inventor/Applicant Name:	Flavio MAGGIONI
Customer Number:	500
Filer:	Justin E. Coe/Nick Brandt
Filer Authorized By:	Justin E. Coe
Attorney Docket Number:	160062.429C1
Receipt Date:	17-MAY-2021
Filing Date:	14-JUN-2019
Time Stamp:	17:22:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1200
RAM confirmation Number	E20215GH22353423
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	Web85b.pdf	46069 3d8a7736734c7b9320ad05d94fb72c97db1335fa	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32093 caa23a405464c5f6be51a816745bbb66f9ecf03b	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	78162		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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NOTICE OF ALLOWANCE AND FEE(S) DUE

500 7590 02/18/2021

SEED INTELLECTUAL PROPERTY LAW GROUP LLP
701 FIFTH AVE
SUITE 5400
SEATTLE, WA 98104

EXAMINER
NGUYEN, TRUNG Q

ART UNIT	PAPER NUMBER
2866	

DATE MAILED: 02/18/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/442,385	06/14/2019	Flavio MAGGIONI	160062.429C1	7220

TITLE OF INVENTION: TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	05/18/2021

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

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) 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. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

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

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including 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: Use Block 1 for any change of address)

500 7590 02/18/2021

SEED INTELLECTUAL PROPERTY LAW GROUP LLP
701 FIFTH AVE
SUITE 5400
SEATTLE, WA 98104

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) 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 or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/442,385	06/14/2019	Flavio MAGGIONI	160062.429C1	7220

TITLE OF INVENTION: TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	05/18/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TRUNG Q	2866	324-756010

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ 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; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

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 _____
2 _____
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. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/442,385	06/14/2019	Flavio MAGGIONI	160062.429C1	7220

500 7590 02/18/2021

SEED INTELLECTUAL PROPERTY LAW GROUP LLP
701 FIFTH AVE
SUITE 5400
SEATTLE, WA 98104

EXAMINER	
NGUYEN, TRUNG Q	

ART UNIT	PAPER NUMBER
2866	

DATE MAILED: 02/18/2021

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. 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.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/442,385	Applicant(s) MAGGIONI, Flavio	
	Examiner TRUNG Q NGUYEN	Art Unit 2866	AIA (FITF) Status Yes

-- 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 (PTOL-85) 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 Amendment filed on 02/04/2021.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-3,5-18 and 20-25 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

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

   Certified copies:

   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: _____ .

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.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/TRUNG Q NGUYEN/ Examiner, Art Unit 2866	/MELISSA J KOVAL/ Supervisory Patent Examiner, Art Unit 2866

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IPR2024-00933

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

EXAMINER'S STATEMENT OF REASONS FOR ALLOWANCE

2. Claims 1-3, 5-18 & 20-25 are allowed.

3. Claims 4 & 19 have been cancelled by Applicant in the Response of 02/04/2021.

The following is an examiner's statement of reasons for allowance:

4. Applicant's amendments & arguments including indicated allowable subject matters have overcome the rejections of the independent claim stated in the office action mailed on 11/04/2020. The limitations of previously objected to claim 4 & 19 are incorporated into independent claims 1, 17 & 20 and claims 4 & 19 are cancelled in independent form in applicant's response of 02/04/2021.

Conclusion

5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance." Any inquiry concerning this communication or

earlier communications from the examiner should be directed to TRUNG NGUYEN whose telephone number is (571)272-1966. The examiner can normally be reached on Mon- Friday 8AM - 4:00PM Eastern Time. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Melissa Koval can be reached on 571-272-2121. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: /Trung Nguyen/-Art 2866
February 9, 2021.

/MELISSA J KOVAL/
Supervisory Patent Examiner, Art Unit 2866

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/442,385	MAGGIONI, Flavio
	Examiner	Art Unit
	TRUNG Q NGUYEN	2866

CPC - Searched*		
Symbol	**Date**	**Examiner**
G01R1/06761	02/09/2021	TN
G01R1/07342	02/09/2021	TN
G01R31/2889	02/09/2021	TN
G01R1/0483	02/09/2021	TN
G01R1/06738	02/09/2021	TN
G01R31/304	02/09/2021	TN
G01R31/31905	02/09/2021	TN
G01N27/622	02/09/2021	TN
H01L29/161	02/09/2021	TN
H01L22/34	02/09/2021	TN

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
324	756.01,500,600,754.03,763.01,756.03,750.22-750.25,754.08,750.03,750.07,750.22,750.23,750.25, 755.01,756.07	02/09/2021	TN
438	17,130,455	02/09/2021	TN
257	775,204	02/09/2021	TN

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/Trung Nguyen/ Examiner Art 2866	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/442,385	MAGGIONI, Flavio
	Examiner	**Art Unit**
	TRUNG Q NGUYEN	2866

Search Notes		
Search Notes	**Date**	**Examiner**
Keywrods: contact$3 near7 element$1 and ((first second) near5 (portion end$1)) and guid$3 with holes and hous$3 and conduct$3 and connect$3	10/23/2020	TN
Keywords: (test$3 and head$3).ti,ab,clm.	10/23/2020	TN
Interference and Inventor searches checked and updated	10/23/2020	TN
Consulted with Vincent	10/23/2020	TN
Consulted with Farhana Hoque	10/22/2020	TN
CPC/East Searches attached	10/23/2020	TN
All searches updated	02/09/2021	TN

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
PG-PUB Searches	See attached searches	02/09/2021	TN

/Trung Nguyen/ Examiner Art 2866	

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IPR2024-00933

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/442,385	MAGGIONI, Flavio
	Examiner	**Art Unit**
	TRUNG Q NGUYEN	2866

CPC							
Symbol						**Type**	**Version**
G01R	/	1	/	07378		F	2013-01-01
G01R	/	1	/	06772		I	2013-01-01
G01R	/	1	/	07328		I	2013-01-01
G01R	/	1	/	07357		I	2013-01-01
G01R	/	1	/	07371		I	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

/TRUNG Q NGUYEN/ Examiner, Art Unit 2866	09 February 2021	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	23	
/MELISSA J KOVAL/ Supervisory Patent Examiner, Art Unit 2866	11 February 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2B

U.S. Patent and Trademark Office

Part of Paper No.: 20210208

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IPR2024-00933

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/442,385	MAGGIONI, Flavio
	Examiner	**Art Unit**
	TRUNG Q NGUYEN	2866

INTERNATIONAL CLASSIFICATION				
CLAIMED				
G01R1/073	/	1	/	073
G01R1/067	/	1	/	067

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
324	756.01

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

/TRUNG Q NGUYEN/ Examiner, Art Unit 2866	09 February 2021	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	23	
/MELISSA J KOVAL/ Supervisory Patent Examiner, Art Unit 2866	11 February 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2B

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/442,385	MAGGIONI, Flavio
	Examiner	**Art Unit**
	TRUNG Q NGUYEN	2866

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	9	10	-	19										
2	2	10	11	23	20										
3	3	11	12	18	21										
-	4	12	13	19	22										
4	5	13	14	20	23										
5	6	14	15	21	24										
6	7	15	16	22	25										
7	8	16	17												
8	9	17	18												

/TRUNG Q NGUYEN/ Examiner, Art Unit 2866 (Assistant Examiner)	09 February 2021 (Date)	**Total Claims Allowed:** 23	
/MELISSA J KOVAL/ Supervisory Patent Examiner, Art Unit 2866 (Primary Examiner)	11 February 2021 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 2B

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/442,385	MAGGIONI, Flavio
	Examiner	Art Unit
	TRUNG Q NGUYEN	2866

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/23/2020	02/09/2021							
1	1	✓	=							
2	2	✓	=							
3	3	✓	=							
-	4	O	-							
4	5	O	=							
5	6	O	=							
6	7	O	=							
7	8	O	=							
8	9	✓	=							
9	10	✓	=							
10	11	✓	=							
11	12	✓	=							
12	13	✓	=							
13	14	✓	=							
14	15	O	=							
15	16	✓	=							
16	17	✓	=							
17	18	✓	=							
-	19	O	-							
23	20	O	=							
18	21	O	=							
19	22	✓	=							
20	23	✓	=							
21	24	✓	=							
22	25	✓	=							

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FormFactor v. Technoprobe
IPR2024-00933

Bibliographic Data

Application No: 16/442,385

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /TRUNG Q NGUYEN/ (Examiner's Signature) TN (Initials)

Title: TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
06/14/2019	324	2866	160062.429C1
RULE			

APPLICANTS

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INVENTORS

Flavio MAGGIONI, Cernusco Lombardone, ITALY

CONTINUING DATA

This application is a CIP of PCT/EP2017/082180 12/11/2017

FOREIGN APPLICATIONS

ITALY IT102016000127581 12/16/2016

ITALY IT102017000021389 02/24/2017

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/20/2020

STATE OR COUNTRY

ITALY

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SEATTLE, WA 98104
UNITED STATES

FILING FEE RECEIVED

$2,380

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	207,590	(test$3 and head$3).ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 09:53
L2	11,830	438/17,130,455.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 09:53
L3	76	L2 and L1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 09:53
L4	12,646	324/756.01,500,600,754.03,763.01,756.03,750.22-750.25,754.08,750.03,750.07,750.22,750.23,750.25,755.01,756.07.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2021/02/09 09:53

			IBM_TDB			
L5	4,141	contact$3 near7 element$1 and ((first second) near5 (portion end$1)) and guid$3 with holes and hous$3 and conduct$3 and connect$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 09:53
L6	21	L5 and L4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 09:53
L8	18,581	carrier near7 concentrat$3 near15 semiconduct$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 09:57
L9	37,970	H01L29/161 H01L29/66795 H01L22/14 H01L29/0649 H01L21/30625 H01L29/0642 H01L22/34	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 09:57
L10	399	8 and 9	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2021/02/09 10:09

			EPO; JPO; DERWENT; IBM_TDB			
L11	13,944	G01R31/31905 G01R1/07371 G01R3/00 G01R1/07357 G01R1/07392 G01R1/07364 G01R1/18 G01R1/06772	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 10:09
L13	2,771	(intermediate upper) near7 guide and gap$3 and track$3 and insulat$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 10:09
L16	3,549	257/775,204,.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 10:59
L19	1	16 and 1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 10:59

L20	4,141	contact$3 near7 element$1 and ((first second) near5 (portion end$1)) and guid$3 with holes and hous$3 and conduct$3 and connect$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 10:59
L21	0	16 and L20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 10:59
L22	1	2 and L20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 10:59
L23	8	(test$3 with head$3) and (lower intermediate holes) near3 guid$3 and ((nonconductive non-conductive) near5 (area regions zone$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/09 11:05
S1	887	(TEST$3 NEAR5 HEAD$1) and (contact$3 with elements) and guid$3 and holes and signal$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/21 21:35

			DERWENT; IBM_TDB			
S2	197,671	(test$3 and head$3).ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 21:35
S3	222	S1 and S2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 21:44
S4	20	"9423421"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 21:44
S5	0	micostructure and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 21:45
S6	51	wafer and channels and S3	US-PGPUB; USPAT;	OR	ON	2020/10/21 21:47

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S7	1	16/442385	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 22:12
S8	40	"5519331"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:06
S9	3	"20080139017"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:08
S10	4	"20090085593"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2020/10/21 23:11

			IBM_TDB			
S11	2	"20120242360"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:14
S12	6	"20140091826"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:14
S13	3	"20140197860"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:14
S14	3	"20150309074"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:18
S15	6	"20180024167"	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2020/10/21 23:19

			EPO; JPO; DERWENT; IBM_TDB			
S16	132	"3,573,617"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:15
S17	3	testing adj head adj apt	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:18
S18	13	testing near3 head near7 apt	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:19
S19	0	testing near3 head with (automated near7 parametric near9 testing)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:23

S20	197,684	(test$3 and head$3).ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:24
S21	0	S20 and (automated near7 parametric near9 testing)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:24
S22	21	(automated near7 parametric near9 testing)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:24
S23	205	(automat$3 near7 parametric near9 test$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:24
S24	61	324/$.ccls. and S23	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/23 00:25

			DERWENT; IBM_TDB			
S25	0	(automat$3 near7 parametric near9 test$3) with APT	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:26
S26	516	flying near7 prob$3 near9 system	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:28
S27	36	324/$.ccls. and S26	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:28
S28	2	"20070216434"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:31
S29	211	(lower intermediate holes) near3 guid$3 and ((nonconductive non-conductive) near5 (area regions zone$1))	US-PGPUB; USPAT;	OR	ON	2020/10/23 13:22

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S30	30,255	G01R1/07378 G01R1/06772 G01R1/07328 G01R1/07357 G01R1/07371 G01R21/00 OR G01R27/06 OR G01R31/2805 OR G01R31/2829 OR G01R31/3025 OR G01R31/304 OR G01R31/31905 OR G01N27/622	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 13:33
S31	12	S29 and S30	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 13:33
S32	197,684	(test$3 and head$3).ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 14:49
S33	60	324/756.01 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2020/10/23 14:49

			IBM_TDB			
S34	37,704	G01R1/06761 OR G01R1/07342 OR G01R31/2889 OR G01R1/0483 OR G01R1/06738 OR G01R1/06755 OR G01R1/07314 OR G01R1/07328 OR G01R1/07364 OR G01R1/07378 OR G01R1/07392 OR G01R1/18 OR G01R21/00 OR G01R27/06 OR G01R31/2805 OR G01R31/2829 OR G01R31/3025 OR G01R31/304 OR G01R31/31905 OR G01N27/622	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 14:50
S35	4,556	438/17	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 14:57
S36	10,040	324/756.01,500,600,754.03,763.01,756.03,750.22-750.25,754.08.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 14:59
S37	512	S32 and S36	USPAT	OR	OFF	2020/10/23 14:59
S39	516	flying near7 prob$3 near9 system	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:00

S41	2	S39 and S37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:00
S42	80	(MAGGIONI with Flavio).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:01
S43	31	S32 and S42	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:01
S44	31	("20080139017" | "5519331" | "20090085593" | "20120242360" | "20140091826" | "20140197860" | "20150309074" | "20180024167").URPN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:03
S45	146	test$3 near3 head and microstructure and chip$3 and packag$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/23 15:04

			DERWENT; IBM_TDB			
S46	33	S45 and S34	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:05
S47	2,482	pair$3 with guid$3 and holes with conduct$3 and prob$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:05
S48	30	S36 and S45	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:06
S49	19	S47 and S34	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:06
S50	211	(lower intermediate holes) near3 guid$3 and ((nonconductive non-conductive) near5 (area regions zone$1))	US-PGPUB; USPAT;	OR	ON	2020/10/23 15:07

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S51	11	S50 and S34	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:07
S52	194	third with (group guid$3 holes) and gap$3 and contact$3 with (conduct$3 near7 track$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:10
S53	1	S35 and S52	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:10
S54	11,831	438/17,130,455.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2020/10/23 15:11

			IBM_TDB			
S55	3,549	257/775,204,.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:11
S59	1	S55 and S50	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:12
S60	1	S55 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:13
S61	76	S54 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:13
S62	4,048	contact$3 near7 element$1 and ((first second) near5 (portion end$1)) and guid$3 with holes and hous$3 and conduct$3 and connect$3	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2020/10/23 15:16

			EPO; JPO; DERWENT; IBM_TDB			
S63	47	S32 and S62	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:17
S64	17	S36 and S62	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:17
S65	42	prob$3 with (first second) with lateral with portion and guide with holes	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 15:55
S66	74	prob$3 with (first second) with lateral with guide with holes	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:01

S67	17	prob$3 with (first second) with lateral near5 portion and guide near7 holes	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:06
S68	1	16/442385	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:12
S69	12,652	324/756.01,500,600,754.03,763.01,756.03,750.22-750.25,754.08,750.03,750.07,750.22,750.23,750.25,755.01,756.07.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:22
S70	3	S69 and S66	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:22
S71	4,055	contact$3 near7 element$1 and ((first second) near5 (portion end$1)) and guid$3 with holes and hous$3 and conduct$3 and connect$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/30 16:22

			DERWENT; IBM_TDB			
S72	21	S71 and S69	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:22
S73	2,715	(intermediate upper) near7 guide and gap$3 and track$3 and insulat$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:24
S74	2,485	pair$3 with guid$3 and holes with conduct$3 and prob$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:27
S75	25	S74 and S69	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:27
S76	8	test$3 near15 head$3 and ((first second) near5 conduct$3) with hous$3 with ((ground$3 power$3) near5 signal$3)	US-PGPUB; USPAT;	OR	ON	2021/02/08 17:12

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S77	12,646	324/756.01,500,600,754.03,763.01,756.03,750.22-750.25,754.08,750.03,750.07,750.22,750.23,750.25,755.01,756.07.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/08 17:17
S80	1,046	test$3 near15 head$3 and ((first second) near9 conduct$3) and hous$3 and ((ground$3 power$3) near5 signal$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/08 17:22
S81	65	S77 and S80	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2021/02/08 17:23

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L24	7	(test$3 with head$3) and (lower intermediate holes) near3 guid$3 and ((nonconductive non-conductive) near5 (area regions zone$1))	US-PGPUB; USPAT	OR	ON	2021/02/09 11:05

2/9/2021 11:18:48 AM
C:\Users\tnguyen46\Documents\EAST\Workspaces\16442385.wsp

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	16/442,385	Examiner :	NGUYEN, TRUNG Q
Filed	:	June 14, 2019	Art Unit :	2866
Confirmation No.	:	7220		
Docket No.	:	160062.429C1		
First Named Inventor	:	Flavio MAGGIONI		
Title	:	TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES		

Date : February 4, 2021

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

REPLY TO OFFICE ACTION UNDER 37 CFR §1.111

Commissioner for Patents:

In response to the Office Action dated November 4, 2020, Applicant respectfully requests consideration of the present reply in the above-identified application.

Please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims beginning on page 2 of this paper.

Remarks begin on page 8 of this paper.

The Director is authorized to charge any additional fees due by way of this filing, or credit any overpayment, to our Deposit Account No. 19-1090.

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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. (Currently Amended) A testing head ~~apt~~ configured to verify the operation of a device under test integrated on a semiconductor wafer, ~~comprises~~the testing head comprising:

a plurality of contact elements, each comprising a body that extends between a first end portion and a second end portion, and

at least one guide provided with a plurality of guide holes ~~apt~~ configured to house the contact elements,

wherein the at least one guide comprises:

a first conductive portion that includes and electrically connects a first group of guide holes, of the plurality of guide holes, to each other and is ~~apt~~ configured to contact corresponding first contact elements, of the plurality of contact elements, ~~apt~~ configured to carry a first type of signal; and

a second conductive portion that includes and electrically connects the holes of a second group of the guide holes to each other, the second group housing second contact elements of the plurality of contact elements, the second contact elements being configured to carry a second type of signal, the first and second types of signals chosen between ground signals and power signals.

2. (Original) The testing head of claim 1, wherein the first conductive portion is locally interrupted by at least one non-conductive zone.

3. (Currently Amended) The testing head of ~~claim 4~~claim 1, wherein the at least one guide comprises at least one coating dielectric portion that covers the at least one non-conductive zone.

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4. (Canceled)

5. (Currently Amended) The testing head of ~~claim 4~~claim 1, wherein the first conductive portion is formed on a first face of the at least one guide, and the second conductive portion is formed on a second face of the at least one guide, the second face being opposite to the first face.

6. (Currently Amended) The testing head of ~~claim 4~~claim 1, wherein the at least one guide includes a lower guide, an intermediate guide, and an upper guide, the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap, each of the lower, intermediate and upper guides comprising respective guide holes for housing the contact elements, the first and second conductive portions being formed on respective faces of the upper, intermediate and lower guides.

7. (Currently Amended) The testing head of ~~claim 4~~claim 1, wherein the at least one guide includes a lower guide, an intermediate guide and an upper guide, the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap, each of the lower, intermediate and upper guides comprising respective guide holes for the housing the contact elements, the first and second conductive portions being formed on a same face of one of the upper, intermediate and lower guides and being physically and electrically separated from each other by at least one non-conductive zone.

8. (Currently Amended) The testing head of ~~claim 4~~claim 1, wherein the at least one guide includes at least one third conductive portion that includes and electrically connects a third group of the guide holes to each other and house third contact elements ~~apt~~ configured to carry input/output signals between the device under test and a test equipment.

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9. (Original) The testing head of claim 1, wherein the first conductive portion covers at least one portion of an inner surface of each guide hole of the first group of guide holes.

10. (Original) The testing head of claim 1, wherein the at least one guide comprises at least one common pad connected to the at least one conductive portion by a conductive track.

11. (Currently Amended) The testing head of claim 1, wherein the at least one guide comprises a further conductive portion at one of the guide holes that is ~~apt~~ configured to house a single contact element, the at least one guide comprising a common pad connected to the further conductive portion by a conductive track

12. (Currently Amended) The testing head of claim 1, wherein the at least one guide comprises a further conductive portion at one of the guide holes that is ~~apt~~ configured to house a single contact element, the at least one guide comprising a conductive track that connects the conductive portion to other conductive portions.

13. (Original) The testing head of claim 1, wherein the first conductive portion is embedded in the at least one guide.

14. (Original) The testing head of claim 1, wherein the first conductive portion is one of a plurality of conductive portions overlapped to and electrically insulated from each other.

15. (Currently Amended) The testing head of claim 1, ~~wherein the at least one guide includes a second conductive portion including and electrically connecting the holes of a second group of the guide holes to each other, the second group housing second contact elements of the plurality of contact elements, the testing head~~ further comprising at least one conductive track that electrically connects the first and second conductive portions including and electrically connecting the holes of the first and second groups of the guide holes to each other, the contact elements included in the second group being ~~apt~~ configured to carry the first type of signal.

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16. (Original) The testing head of claim 1, further comprising a circuit component, which is electrically connected at least to the first conductive portion of the at least one guide.

17. (Currently Amended) A testing head ~~apt~~ configured to verify the operation of a device under test integrated on a semiconductor wafer, the testing head comprising ~~comprises~~:

a plurality of contact elements, each comprising a body that extends between a first end portion and a second end portion; and

at least one guide provided with a plurality of guide holes ~~apt~~ configured to house the contact elements,

wherein the at least one guide comprises:

a first conductive portion including and electrically connecting holes of a first group of the guide holes to each other, the first group housing first contact elements; ~~and~~

a second conductive portion including and electrically connecting holes of a second group of the guide holes to each other, the second group housing second contact elements, the first and second contact elements being ~~apt~~ configured to carry respective same type of signal chosen between ground signals and power signals; and

a lower guide, an intermediate guide, and an upper guide, the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap, each of the lower, intermediate and upper guides comprising respective guide holes for housing the contact elements, the first and second conductive portions being formed on respective faces of the upper, intermediate and lower guides.

18. (Original) The testing head of claim 17, wherein the first conductive portion is formed on a first face of the at least one guide, and the second conductive portion is formed on a second face of the at least one guide, the second face being opposite to the first face.

19. (Canceled)

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20. (Currently Amended) ~~The testing head of claim 17,~~ A testing head configured to verify the operation of a device under test integrated on a semiconductor wafer, the testing head comprising:

a plurality of contact elements, each comprising a body that extends between a first end portion and a second end portion; and

at least one guide provided with a plurality of guide holes configured to house the contact elements,

wherein the at least one guide comprises:

a first conductive portion including and electrically connecting holes of a first group of the guide holes to each other, the first group housing first contact elements;

a second conductive portion including and electrically connecting holes of a second group of the guide holes to each other, the second group housing second contact elements, the first and second contact elements being configured to carry respective same type of signal chosen between ground signals and power signals; and

~~wherein the at least one guide includes~~ a lower guide, an intermediate guide and an upper guide, the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap, each of the lower, intermediate and upper guides comprising respective guide holes for the housing the contact elements, the first and second conductive portions being formed on a same face of one of the upper, intermediate and lower guides and being physically and electrically separated from each other by at least one non-conductive zone.

21. (Currently Amended) The testing head of claim 17, wherein the at least one guide includes at least one third conductive portion that includes and electrically connects holes of a third group of the guide holes to each other and house third contact elements, of the plurality of contact elements, ~~apt~~ configured to carry input/output signals between the device under test and a test equipment.

22. (Original) The testing head of claim 17, wherein the at least one guide comprises at least one common pad connected to the first conductive portion by a conductive track.

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23. (Currently Amended) The testing head of claim 17, wherein the at least one guide comprises a further conductive portion, which includes one of the guide holes ~~apt~~ configured to house a single contact element, the at least one guide comprising a common pad connected to the further conductive portion by a conductive track

24. (Original) The testing head of claim 17, wherein the first conductive portion is embedded in the at least one guide.

25. (Original) The testing head of claim 17, wherein the first and second conductive portions are overlapped to and electrically insulated from each other.

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REMARKS

Applicant respectfully requests reconsideration of this application in view of the above amendments and the following remarks. Claims 1-3, 5-18, and 20-25 will be pending upon entry of this amendment. Claims 1, 3, 5-8, 11, 12, 15, 17, 20, 21, and 23 have been amended. Claims 4 and 19 are canceled herein. No new matter has been added to the application.

Allowable Subject Matter

Claims 4-8, 15, and 19-21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicant notes, with thanks, the indicated allowability of claims 4-8, 15, and 19-21.

Independent claim 1 has been amended to incorporate the features of allowable claim 4, which has been canceled. Independent claim 17 has been amended to incorporate the features of allowable claim 19, which has been canceled. Allowable claim 20 has been rewritten in independent form including all of the limitations of independent claim 17 as previously pending.

Accordingly, it is respectfully submitted that independent claims 1, 17, and 20, as well as their respective dependent claims, are allowable as indicated by the Examiner. No specific discussion with respect to the prior art is therefore believed to be necessary.

Rejections Under 35 U.S.C. § 112

Claims 1-25 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Applicant respectfully submits that the claims, at least as presented herein, comply with the requirements of § 112 and overcome the rejections under § 112(b). In particular, Applicant notes that the claims have been amended for clarity, replacing the term "apt to" with "configured to."

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Rejections Under 35 U.S.C. § 102

Claims 1-3, 9-14, 16-18, and 22-25 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by US Patent Publication No. 2008/0139017 to Kiyofuji et al. ("Kiyofuji").

As discussed above, independent claim 1 has been amended to incorporate the features of allowable claim 4, which has been canceled. Independent claim 17 has been amended to incorporate the features of allowable claim 19, which has been canceled. Allowable claim 20 has been rewritten in independent form including all of the limitations of independent claim 17 as previously pending.

Accordingly, it is respectfully submitted that independent claims 1, 17, and 20, as well as their respective dependent claims, are allowable as indicated by the Examiner. No specific discussion with respect to the prior art is therefore believed to be necessary.

Conclusion

For at least these reasons, Applicant respectfully requests allowance of the pending claims. In the event the Examiner finds minor informalities that can be resolved by telephone conference or if the Examiner believes a telephone conference would facilitate prosecution of this application, the Examiner is urged to contact Applicant's undersigned representative by telephone at (206) 622-4900 in order to expeditiously resolve prosecution of this application.

Respectfully submitted,

Seed Intellectual Property Law Group LLP

/Justin Coe/
Justin Coe
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JEC:njb
7683133_1.DOCX

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Electronic Acknowledgement Receipt

EFS ID:	41841339
Application Number:	16442385
International Application Number:	
Confirmation Number:	7220
Title of Invention:	TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES
First Named Inventor/Applicant Name:	Flavio MAGGIONI
Customer Number:	500
Filer:	Justin E. Coe/Nick Brandt
Filer Authorized By:	Justin E. Coe
Attorney Docket Number:	160062.429C1
Receipt Date:	04-FEB-2021
Filing Date:	14-JUN-2019
Time Stamp:	18:14:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		429C1_Amendment.pdf	107880 af2acc7e519ec2c789258feb133ee27c0b495427	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	7
	Applicant Arguments/Remarks Made in an Amendment	8	9
Warnings:			
Information:			
	Total Files Size (in bytes):	107880	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/442,385	Filing Date 06/14/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	02/04/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 23	Minus	** 25	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/ANGELA S WHITE/
*** 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.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/442,385	06/14/2019	Flavio MAGGIONI	160062.429C1	7220

500 7590 11/04/2020

SEED INTELLECTUAL PROPERTY LAW GROUP LLP
701 FIFTH AVE
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EXAMINER	
NGUYEN, TRUNG Q	

ART UNIT	PAPER NUMBER
2866	

NOTIFICATION DATE	DELIVERY MODE
11/04/2020	ELECTRONIC

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

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

USPTOeAction@SeedIP.com
pairlinkdktg@seedip.com

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FormFactor v. Technoprobe
IPR2024-00933

Office Action Summary	Application No. 16/442,385	Applicant(s) MAGGIONI, Flavio	
	Examiner TRUNG Q NGUYEN	Art Unit 2866	AIA (FITF) Status Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS 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 NO period for reply is specified above, the maximum statutory period will apply and will 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). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 06/14/2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ 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*

5) ☑ Claim(s) 1-25 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-3,9-14,16-18 and 22-25 is/are rejected.

8) ☑ Claim(s) 4-8,15 and 19-21 is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 06/14/2019 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

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

Certified copies:

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)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date 20190614.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

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Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Priority

2. Receipt is acknowledged of certified copies of papers required by 37 CFR 1.55.

Information Disclosure Statement

3. The information disclosure statement (IDS) submitted on 06/14/2019 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 112

4. Claims 1-25 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 1, 4, 8, 11-12, 16-17, 21 & 23 recite "apt" or "test head apt" or "element apt" or "contact apt". it is unclear what the meaning of apt, it is well known in the semiconductor industry that apt can be understood as "*4-heads & 6 or flying probes" or "advance persistent threat" or "Atom-probe tomography" etc.*. Thus, it is unclear how or

what is the connection of apt to other elements of the claims such as disclose in claim 1 below and throughout claims 4, 8, 11-12, 16-17, 21 & 23.

Claim 1 recites "a first conductive portion that includes and electrically connects a first group of guide holes, of the plurality of guide holes, to each other *and is **apt** to contact* corresponding first contact elements, of the plurality of contact elements, ***apt** to carry a first type of signal*".

For examining purposes, the Examiner base on the specification filed on 06/14/2019, apt means "suitable or particularly appropriate", wherein it does not have any patentable weight.

Claim Rejections - 35 USC § 102

5. 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 –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention.

6. Claim(s) 1-3, 9-14, 16-18 & 22-25 is/are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Kiyofuji et al. (U.S. 2008/0139017 A1).

Regarding claim 1, Kiyofuji et al. disclose in Figs. 5-7 a testing head as seen in Fig. 5 to verify the operation of a device under test **12** integrated on a semiconductor wafer [*see par. 0045*] comprises: a plurality of contact elements **44 of Fig. 5**, each comprising a body **44** of Fig. 7 **(***body of probe contact 44 as seen in Fig. 7***)** that extends

between a first end portion **44c** and a second end portion **44b** [*see pars. 0063-0064, wherein the body **44** of the contact probe **52** is formed by at least one first and one second lateral portion, **44b and 44c** of Figs. 5 & 7*], and at least one guide 50b provided with a plurality of guide holes **42** of Fig. 7 to house the contact elements **52** (*or probe contact 44*), wherein the at least one guide via plate **40** [*see pars. 0054 & 0059*] including zone **50b** comprises a first conductive portion **48** [*see par. 0062*] that includes and electrically connects first group of guide holes **50a**, of the plurality of guide holes **50b**, to each other and corresponding first contact elements **44c**, of the plurality of contact elements to carry a first type of signal [*see pars. 0056 & 0082-0083*].

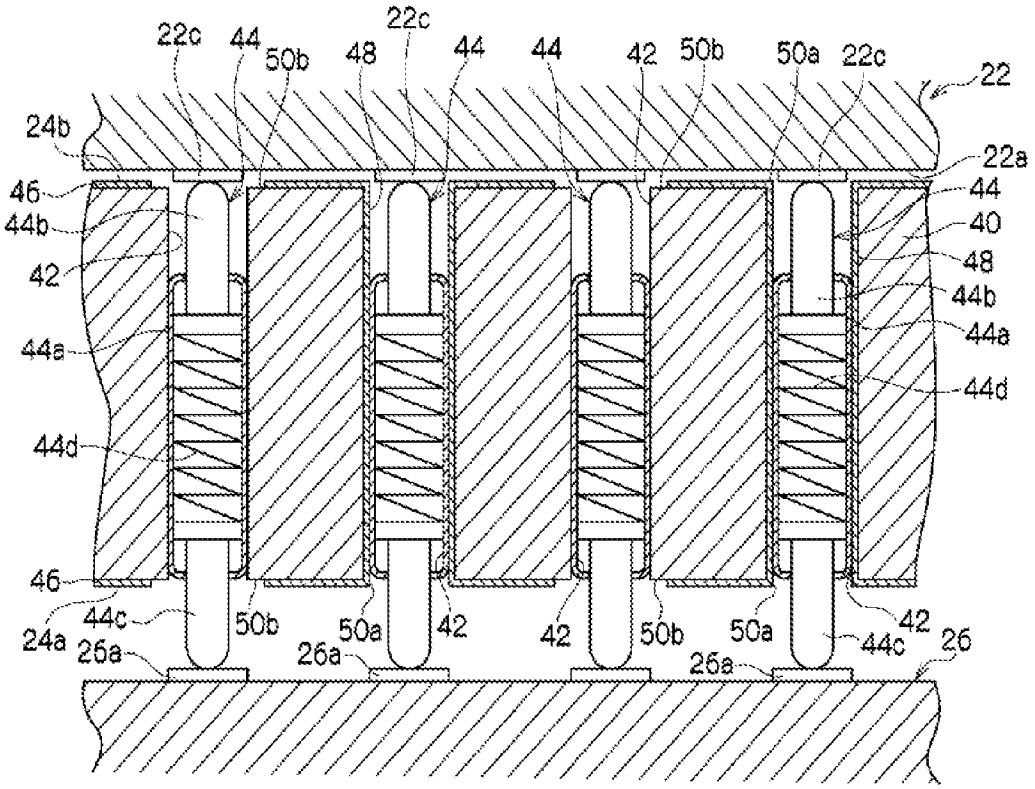


Fig. 7

As to claim 2, Kiyofuji et al. disclose wherein the first conductive portion **48** is locally interrupted by at least one non-conductive zone **50b** (*see Fig. 7, zone 50b belong to insulated/non-conductive plate 40 see par. 0059*).

As to claim 3, Kiyofuji et al. disclose wherein the at least one guide **40** comprises at least one coating dielectric portion (*dielectric portion is the same meaning as insulating portion*) that covers the at least one non-conductive zone [*see par. 0054, wherein coating dielectric portion via through holes 42 formed to penetrate the insulating plate 40 in its thickness direction and made to correspond to the respective connection terminals 22c of the circuit board 22*].

As to claim 9, Kiyofuji et al. disclose wherein the first conductive portion **48** (*conductive layer 48 located in one side of the guides Left – right as seen in Fig. 7, Left side consider first portions & right side consider second portion*) covers at least one portion of an inner surface of each guide hole of the first group of guide holes 50a [see par. 0061].

As to claim 10, Kiyofuji et al. disclose wherein the at least one guide **40** comprises at least one common pad **22c or 26a** connected to the at least one conductive portion by a conductive track **26b** [*see par. 0068*].

As to claim 11, Kiyofuji et al. disclose wherein the at least one guide **40** comprises a further conductive portion **48** at one of the guide holes 42 that is apt to

house a single contact element **44**, the at least one guide **40** comprising a common pad **24b** connected to the further conductive portion by a conductive track **26** [*see par. 0057*].

As to claim 12, Kiyofuji et al. disclose wherein the at least one guide **40** comprises a further conductive portion **48** at one of the guide holes **42** that is apt to house a single contact element, the at least one guide comprising a conductive track that connects the conductive portion to other conductive portions **46, 22 & 24** [*see pars. 0057-0059*].

As to claim 13, Kiyofuji et al. disclose wherein the first conductive portion **48** is embedded in the at least one guide **40** [*see pars. 0061-0063*].

As to claim 14, Kiyofuji et al. disclose wherein the first conductive portion **48** is one of a plurality of conductive portions **50a** overlapped to and electrically insulated from each other [*see pars. 0067, 0070 & 0083*].

As to claim 16, Kiyofuji et al. disclose further comprising a circuit component **22**, which is electrically connected at least to the first conductive portion of the at least one guide [*see pars. 0084 & 0087*].

Regarding claim 17, Kiyofuji et al. disclose in Figs. 5-7 a testing head as seen in Fig. 5 to verify the operation of a device under test **12** integrated on a semiconductor wafer [*see par. 0045*] comprises: a plurality of contact elements **52 of Fig. 5**, each

comprising a body **44** of Fig. 7 **(***body of probe contact 44 as seen in Fig. 7***)** that extends between a first end portion **44c** and a second end portion **44b** [*see pars. 0063-0064, wherein the body **44** of the contact probe **52** is formed by at least one first and one second lateral portion, **44b and 44c** of Figs. 5 & 7*], and at least one guide 50b provided with a plurality of guide holes **42** of Fig. 7 to house the contact elements **52** (*or probe contact 44*), wherein and a second conductive portion **48** (*conductive layer 48 located in one side of the guides Left – right as seen in Fig. 7, Left side consider first portions & right side consider second portion*) covers at least one portion of an inner surface of each guide hole of the first group of guide holes **50a** [see par. 0061], the second group housing second contact elements 44b, the first and second contact elements **44c & 44b** carry respective same type of signal chosen between ground signals and power signals [*see pars. 0056 & 0082-0083*].

As to claim 18, Kiyofuji et al. disclose wherein the first conductive portion **48** (*conductive layer 48 located in one side of the guides Left – right as seen in Fig. 7, Left side consider first portions & right side consider second portion*) is formed on a first face of the at least one guide **40**, and the second conductive portion **48** (right) is formed on a second face (right side of 40) of the at least one guide 40, the second face being opposite to the first face [*see par. 0061*].

As to claim 22, Kiyofuji et al. disclose wherein the at least one guide **40** comprises at least one common pad **22c or 26a** connected to the at least one conductive portion by a conductive track **26b** [*see par. 0068*].

As to claim 23, Kiyofuji et al. disclose wherein the at least one guide **40** comprises a further conductive portion **48** at one of the guide holes 42 that is apt to house a single contact element **44**, the at least one guide **40** comprising a common pad **24b** connected to the further conductive portion by a conductive track **26** [*see par. 0057*].

As to claim 24, Kiyofuji et al. disclose wherein the first conductive portion **48** is embedded in the at least one guide **40** [*see pars. 0061-0063*].

As to claim 25, Kiyofuji et al. disclose wherein the first conductive portion **48** is one of a plurality of conductive portions **50a** overlapped to and electrically insulated from each other [*see pars. 0067, 0070 & 0083*].

Allowable Subject Matter

7. Claims 4-8, 15, 19-21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

In terms of claim 4, the prior art of record does not teach alone or in combination of "*wherein the at least one guide includes: a second conductive portion including and electrically connecting the holes of a second group of the guide holes to each other, the second group housing second contact elements of the plurality of*

contact elements, the second contact elements being to carry a second type of signal, the first and second types of signals chosen between ground signals and power signals" in combination with all elements of claim 1.

In terms of claim 15, the prior art of record does not teach alone or in combination of "*wherein the at least one guide includes a second conductive portion including and electrically connecting the holes of a second group of the guide holes to each other, the second group housing second contact elements of the plurality of contact elements, the testing head further comprising at least one conductive track that electrically connects the first and second conductive portions including and electrically connecting the holes of the first and second groups of the guide holes to each other, the contact elements included in the second group being apt to carry the first type of signal*" in combination with all elements of claim 1.

In terms of claim 19, the prior art of record does not teach alone or in combination of "*wherein the at least one guide includes a lower guide, an intermediate guide, and an upper guide, the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap, each of the lower, intermediate and upper guides comprising respective guide holes for housing the contact elements, the first and second conductive portions being formed on respective faces of the upper, intermediate and lower guides*" in combination with all elements of claim 17.

In terms of claim 20, the prior art of record does not teach alone or in combination of "*wherein the at least one guide includes a lower guide, an intermediate guide and an upper guide, the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap, each of the lower, intermediate and upper guides comprising respective guide holes for the housing the contact elements, the first and second conductive portions being formed on a same face of one of the upper, intermediate and lower guides and being physically and electrically separated from each other by at least one non-conductive zone*" in combination with all elements of claim 17.

In terms of claim 21, the prior art of record does not teach alone or in combination of "*wherein the at least one guide includes at least one third conductive portion that includes and electrically connects holes of a third group of the guide holes to each other and house third contact elements, of the plurality of contact elements, apt to carry input/output signals between the device under test and a test equipment*" in combination with all elements of claim 17.

Conclusion

8. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on

Statement of Reasons for Allowance." Any inquiry concerning this communication or earlier communications from the examiner should be directed to TRUNG NGUYEN whose telephone number is (571)272-1966. The examiner can normally be reached on Mon- Friday 8AM - 4:00PM Eastern Time. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Melissa Koval can be reached on 571-272-2121. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: /Trung Nguyen/-Art 2866
October 30, 2020.

/MELISSA J KOVAL/
Supervisory Patent Examiner, Art Unit 2866

Notice of References Cited	Application/Control No. 16/442,385	Applicant(s)/Patent Under Reexamination MAGGIONI, Flavio	
	Examiner TRUNG Q NGUYEN	Art Unit 2866	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20080139017-A1	06-2008	KIYOFUJI; Hidehiro	G01R1/07371	439/75
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/442,385	MAGGIONI, Flavio
	Examiner	Art Unit
	TRUNG Q NGUYEN	2866

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/23/2020								
	1	✓								
	2	✓								
	3	✓								
	4	O								
	5	O								
	6	O								
	7	O								
	8	O								
	9	✓								
	10	✓								
	11	✓								
	12	✓								
	13	✓								
	14	✓								
	15	O								
	16	✓								
	17	✓								
	18	✓								
	19	O								
	20	O								
	21	O								
	22	✓								
	23	✓								
	24	✓								
	25	✓								

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/442,385	MAGGIONI, Flavio
	Examiner	Art Unit
	TRUNG Q NGUYEN	2866

CPC - Searched*		
Symbol	**Date**	**Examiner**
G01R1/06761	10/23/2020	TN
G01R1/07342	10/23/2020	TN
G01R31/2889	10/23/2020	TN
G01R1/0483	10/23/2020	TN
G01R1/06738	10/23/2020	TN
G01R31/304	10/23/2020	TN
G01R31/31905	10/23/2020	TN
G01N27/622	10/23/2020	TN

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
324	756.01,500,600,754.03,763.01,756.03,750.22-750.25,754.08,750.03,750.07,750.22,750.23,750.25, 755.01,756.07	10/30/2020	TN
438	17,130,455	10/23/2020	TN
257	775,204	10/23/2020	TN

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

/Trung Nguyen/ Examiner Art 2866	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/442,385	MAGGIONI, Flavio
	Examiner	**Art Unit**
	TRUNG Q NGUYEN	2866

Search Notes		
Search Notes	**Date**	**Examiner**
Keywrods: contact$3 near7 element$1 and ((first second) near5 (portion end$1)) and guid$3 with holes and hous$3 and conduct$3 and connect$3	10/23/2020	TN
Keywords: (test$3 and head$3).ti,ab,clm.	10/23/2020	TN
Interference and Inventor searches checked and updated	10/23/2020	TN
Consulted with Vincent	10/23/2020	TN
Consulted with Farhana Hoque	10/22/2020	TN
CPC/East Searches attached	10/23/2020	TN
All searches updated	10/30/2020	TN

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
324, 327 & 438	See attached searches	10/23/2020	TN

/Trung Nguyen/ Examiner Art 2866	

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	42	prob$3 with (first second) with lateral with portion and guide with holes	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 15:55
L2	74	prob$3 with (first second) with lateral with guide with holes	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:01
L3	17	prob$3 with (first second) with lateral near5 portion and guide near7 holes	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:06
L4	1	16/442385	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2020/10/30 16:12

			IBM_TDB			
L5	12,652	324/756.01,500,600,754.03,763.01,756.03,750.22-750.25,754.08,750.03,750.07,750.22,750.23,750.25,755.01,756.07.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:22
L6	3	5 and 2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:22
L7	4,055	contact$3 near7 element$1 and ((first second) near5 (portion end$1)) and guid$3 with holes and hous$3 and conduct$3 and connect$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:22
L8	21	L7 and L5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:22
L9	2,715	(intermediate upper) near7 guide and gap$3 and track$3 and insulat$3	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2020/10/30 16:24

			EPO; JPO; DERWENT; IBM_TDB			
L10	2,485	pair$3 with guid$3 and holes with conduct$3 and prob$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:27
L11	25	L10 and L5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/30 16:27
S1	887	(TEST$3 NEAR5 HEAD$1) and (contact$3 with elements) and guid$3 and holes and signal$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 21:35
S2	197,671	(test$3 and head$3).ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 21:35

S3	222	S1 and S2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 21:44
S4	20	"9423421"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 21:44
S5	0	micostructure and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 21:45
S6	51	wafer and channels and S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 21:47
S7	1	16/442385	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/21 22:12

			DERWENT; IBM_TDB			
S8	40	"5519331"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:06
S9	3	"20080139017"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:08
S10	4	"20090085593"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:11
S11	2	"20120242360"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:14
S12	6	"20140091826"	US-PGPUB; USPAT;	OR	ON	2020/10/21 23:14

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S13	3	"20140197860"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:14
S14	3	"20150309074"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:18
S15	6	"20180024167"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/21 23:19
S16	132	"3,573,617"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2020/10/23 00:15

			IBM_TDB			
S17	3	testing adj head adj apt	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:18
S18	13	testing near3 head near7 apt	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:19
S19	0	testing near3 head with (automated near7 parametric near9 testing)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:23
S20	197,684	(test$3 and head$3).ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:24
S21	0	S20 and (automated near7 parametric near9 testing)	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2020/10/23 00:24

			EPO; JPO; DERWENT; IBM_TDB			
S22	21	(automated near7 parametric near9 testing)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:24
S23	205	(automat$3 near7 parametric near9 test$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:24
S24	61	324/$.ccls. and S23	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:25
S25	0	(automat$3 near7 parametric near9 test$3) with APT	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:26

S26	516	flying near7 prob$3 near9 system	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:28
S27	36	324/$.ccls. and S26	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:28
S28	2	"20070216434"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 00:31
S29	211	(lower intermediate holes) near3 guid$3 and ((nonconductive non-conductive) near5 (area regions zone$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 13:22
S30	30,255	G01R1/07378 G01R1/06772 G01R1/07328 G01R1/07357 G01R1/07371 G01R21/00 OR G01R27/06 OR G01R31/2805 OR G01R31/2829 OR G01R31/3025 OR G01R31/304 OR G01R31/31905 OR G01N27/622	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/23 13:33

			DERWENT; IBM_TDB			
S31	12	S29 and S30	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 13:33
S32	197,684	(test$3 and head$3).ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 14:49
S33	60	324/756.01 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 14:49
S34	37,704	G01R1/06761 OR G01R1/07342 OR G01R31/2889 OR G01R1/0483 OR G01R1/06738 OR G01R1/06755 OR G01R1/07314 OR G01R1/07328 OR G01R1/07364 OR G01R1/07378 OR G01R1/07392 OR G01R1/18 OR G01R21/00 OR G01R27/06 OR G01R31/2805 OR G01R31/2829 OR G01R31/3025 OR G01R31/304 OR G01R31/31905 OR G01N27/622	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 14:50
S35	4,556	438/17	US-PGPUB; USPAT;	OR	ON	2020/10/23 14:57

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S36	10,040	324/756.01,500,600,754.03,763.01,756.03,750.22-750.25,754.08.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 14:59
S37	512	S32 and S36	USPAT	OR	OFF	2020/10/23 14:59
S39	516	flying near7 prob$3 near9 system	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:00
S41	2	S39 and S37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:00
S42	80	(MAGGIONI with Flavio).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2020/10/23 15:01

			DERWENT; IBM_TDB			
S43	31	S32 and S42	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:01
S44	31	("20080139017" | "5519331" | "20090085593" | "20120242360" | "20140091826" | "20140197860" | "20150309074" | "20180024167").URPN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:03
S45	146	test$3 near3 head and microstructure and chip$3 and packag$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:04
S46	33	S45 and S34	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:05
S47	2,482	pair$3 with guid$3 and holes with conduct$3 and prob$3	US-PGPUB; USPAT;	OR	ON	2020/10/23 15:05

			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S48	30	S36 and S45	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:06
S49	19	S47 and S34	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:06
S50	211	(lower intermediate holes) near3 guid$3 and ((nonconductive non-conductive) near5 (area regions zone$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:07
S51	11	S50 and S34	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2020/10/23 15:07

			IBM_TDB			
S52	194	third with (group guid$3 holes) and gap$3 and contact$3 with (conduct$3 near7 track$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:10
S53	1	S35 and S52	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:10
S54	11,831	438/17,130,455.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:11
S55	3,549	257/775,204,.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:11
S59	1	S55 and S50	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2020/10/23 15:12

			EPO; JPO; DERWENT; IBM_TDB			
S60	1	S55 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:13
S61	76	S54 and S32	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:13
S62	4,048	contact$3 near7 element$1 and ((first second) near5 (portion end$1)) and guid$3 with holes and hous$3 and conduct$3 and connect$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:16
S63	47	S32 and S62	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:17

S64	17	S36 and S62	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/10/23 15:17

EAST Search History (Interference)

<This search history is empty>

10/30/2020 4:27:58 PM
C:\Users\tnguyen46\Documents\EAST\Workspaces\16442385.wsp

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.Q.N/

Sheet 1 of 1

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTY. DOCKET NO. 160062.429C1	APPLICATION NO.
INFORMATION DISCLOSURE STATEMENT (Use several sheets if necessary)	FIRST NAMED INVENTOR Flavio MAGGIONI	
	FILING DATE	GROUP ART UNIT

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	KIND CODE	DATE	NAME	FILING DATE IF APPROPRIATE
	1	5,519,331	A	05/21/1996	Cowart et al.	
	2	2008/0139017	A1	06/12/2008	Kiyofuji et al.	
	3	2009/0085593	A1	04/02/2009	Yoshida et al.	
	4	2012/0242360	A1	09/27/2012	Huang et al.	
	5	2014/0091826	A1	04/03/2014	Chui	
	6	2014/0197860	A1	07/17/2014	Hsu et al.	
	7	2015/0309074	A1	10/29/2015	Kuo et al.	
	8	2018/0024167	A1	01/25/2018	Maggioni	

FOREIGN PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	KIND CODE	DATE	COUNTRY	TRANSLATION YES	TRANSLATION NO
	1	102466739	B	04/09/2014	CN	X	
	2	10-1421051	B1	07/22/2014	KR	X	
	3	2012/106220	A1	08/09/2012	WO		

NON-PATENT LITERATURE DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	1		"rheophore," *Wiktionary*, edited March 17, 2019, retrieved from https://en.wiktionary.org/w/index.php?title=rheophore&oldid=51978536.

EXAMINER /TRUNG Q NGUYEN/	DATE CONSIDERED 10/23/2020

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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IPR2024-00933

Bibliographic Data

Application No: 16/442,385

Foreign Priority claimed: (•) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /TRUNG Q NGUYEN/ (Examiner's Signature) TN (Initials)

Title: TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
06/14/2019	324	2866	160062.429C1
RULE			

APPLICANTS

TECHNOPROBE S.P.A., Cernusco Lombardone, ITALY

INVENTORS

Flavio MAGGIONI, Cernusco Lombardone, ITALY

CONTINUING DATA

This application is a CIP of PCT/EP2017/082180 12/11/2017

FOREIGN APPLICATIONS

ITALY IT102016000127581 12/16/2016

ITALY IT102017000021389 02/24/2017

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02/20/2020

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/442,385	06/14/2019	2867	2380	160062.429C1	25	2

CONFIRMATION NO. 7220

REPLACEMENT FILING RECEIPT

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701 FIFTH AVE
SUITE 5400
SEATTLE, WA 98104

OC000000114877668

Date Mailed: 02/24/2020

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Flavio MAGGIONI, Cernusco Lombardone, ITALY;

Applicant(s)

TECHNOPROBE S.P.A., Cernusco Lombardone, ITALY

Power of Attorney: The patent practitioners associated with Customer Number 00500

Domestic Priority data as claimed by applicant

This application is a CIP of PCT/EP2017/082180 12/11/2017

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
ITALY 102016000127581 12/16/2016
ITALY 102017000021389 02/24/2017

Permission to Access Application via Priority Document Exchange: Yes

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IPR2024-00933

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If Required, Foreign Filing License Granted: 02/20/2020

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/442,385**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES

Preliminary Class

324

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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International application number:		**PCT/EP2017/082180**
International filing date:		**11 December 2017 (11.12.2017)**
Document type:		**Certified copy of priority document**
Document details:	Country/Office:	**IT**
	Number:	**102016000127581**
	Filing date:	**16 December 2016 (16.12.2016)**
Date of receipt at the International Bureau:		**08 February 2018 (08.02.2018)**

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-*bis*)

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IPR2024-00933

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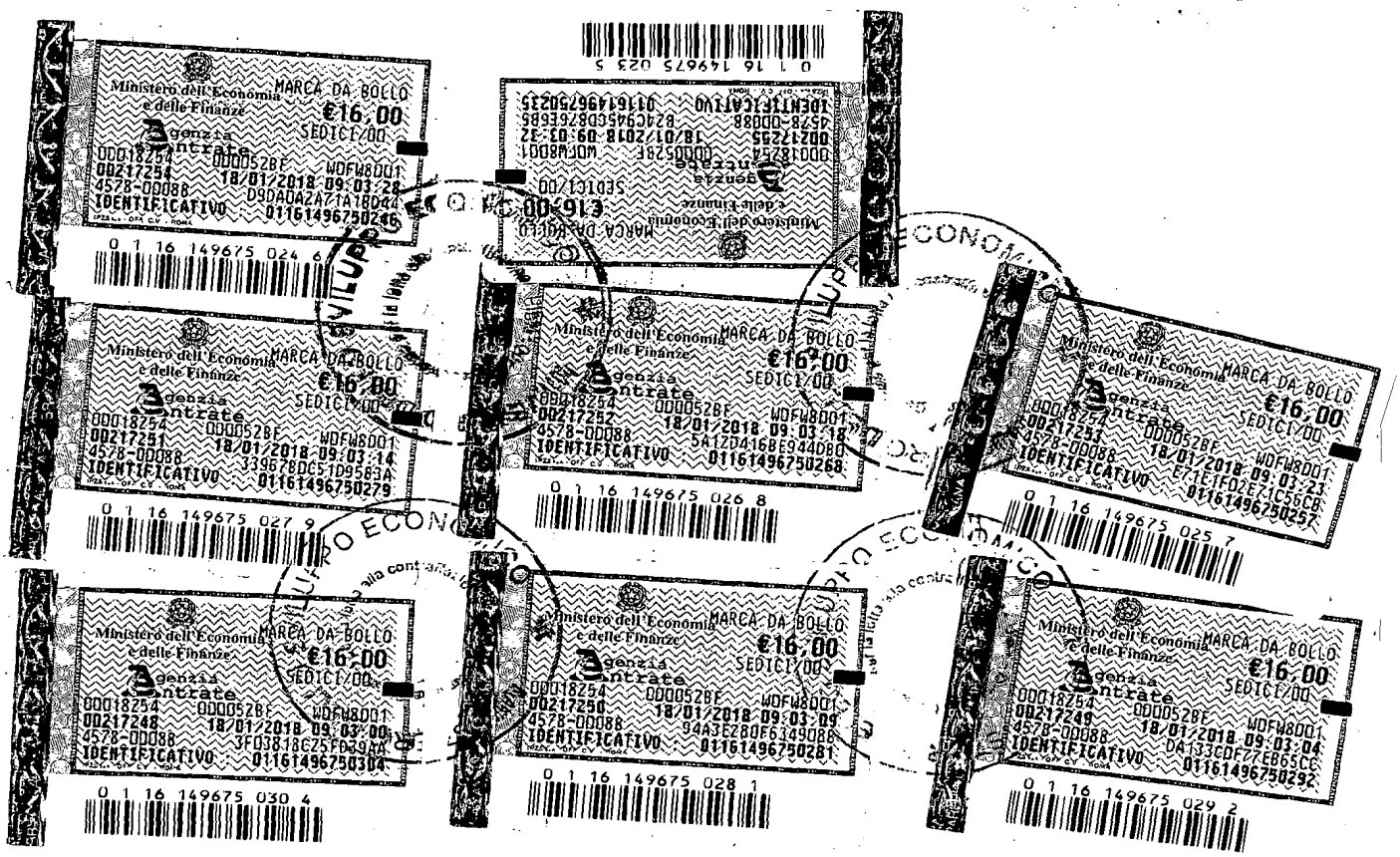
EP17/82180

Ministero dello Sviluppo Economico

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Ufficio Italiano Brevetti e Marchi – Divisione V

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ROMA li 18 GEN. 2018

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Dr.ssa Cristina Papadia

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UIBM

MINISTERO DELLO SVILUPPO ECONOMICO
Direzione Generale per la Lotta alla Contraffazione
Ufficio Italiano Brevetti e Marchi

Attestato di deposito

di

Invenzione industriale

Numero di domanda: 102016000127581

Data di deposito: 16/12/2016

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Ministero dello Sviluppo Economico

Ricevuta di presentazione

per

Brevetto per invenzione industriale

Domanda numero: 102016000127581

Data di presentazione: 16/12/2016

DATI IDENTIFICATIVI DEL DEPOSITO

Ruolo	Mandatario
Data di compilazione	16/12/2016
Titolo	Testa di misura per un'apparecchiatura di test di dispositivi elettronici con migliorate proprietà di filtraggio
Carattere domanda	Ordinaria
Esenzione	NO
Accessibilità al pubblico	NO
Numero rivendicazioni	27
Autorità depositaria	

RICHIEDENTE/I

Natura giuridica	Persona giuridica
Denominazione	TECHNOPROBE S.p.A.
Partita IVA	02272540135
Nazione sede legale	Italia
Tipo Società	societa' per azioni

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IPR2024-00933

Riferimento depositante	TEC078BIT

MANDATARI/RAPPRESENTANTI

Cognome	Nome
Botti	Mario
Ferreccio	Rinaldo
Ferrari	Barbara

INVENTORI

Cognome	Nome	Nazione residenza
MAGGIONI	Flavio	Italia

CLASSIFICAZIONI

Sezione	Classe	Sottoclasse	Gruppo	Sottogruppo
G	01	R	31	

NUMERO DOMANDE COLLEGATE

DOCUMENTAZIONE ALLEGATA

Tipo documento	Riserva	Documento
Descrizione in italiano*	NO	TEC078BIT-descrizione.pdf.p7m hash: 6938ad60375e13dd9b6923623a463dc1
Rivendicazioni	NO	TEC078BIT-rivendicazioni.pdf.p7m hash: 97bd51f43506111f2dc4ddb3a48b6385
Lettera di Incarico	NO	TEC078BIT-lettera d'incarico.pdf.p7m hash: 09c9e50131436ff4ec2545ca3a6eb08c

Riassunto	NO	TEC078BIT-riassunto.pdf.p7m hash: 0c9a19405421f98dee6d4cf336846725
Disegni	NO	TEC078BIT-figure.pdf.p7m hash: 5a5129345bb663d5ad2a7d8d53059fce
Rivendicazioni in inglese	SI	hash:

PAGAMENTI

Tipo	Identificativo	Data
Bollo	01150649525110	21/11/2016

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Domanda di brevetto per invenzione industriale dal titolo: "**Testa di misura per un'apparecchiatura di test di dispositivi elettronici con migliorate proprietà di filtraggio**"

a nome di: **TECHNOPROBE S.p.A.**

con sede in: **Cernusco Lombardone (Lecco)**

* * * * *

RIASSUNTO

Si descrive una testa di misura (20) comprendente una pluralità di sonde di contatto (21A, 21B, 21C) alloggiate in modo scorrevole in rispettive pluralità di fori guida (25A, 27A, 29A, 36A; 25B, 27B, 29B, 36B; 27C, 29C, 36C) realizzati in un supporto (22), piastriforme, la pluralità di sonde di contatto (21A, 21B, 21C) comprendendo almeno un primo gruppo di sonde di contatto (21A, 21B) che trasportano segnali di massa e di alimentazione (GND, PWR). Opportunamente, la testa di misura (20) comprende almeno un condensatore di filtraggio (30) avente almeno un reoforo (31) collegato elettricamente ad una porzione conduttiva (22A, 27A) realizzata sul supporto (22) ed includente almeno un foro guida di alloggiamento (25A, 29A) di una sonda di contatto (21A, 21B) del primo gruppo.

(Fig. 2A)

Ing. [illegible] FERRARI
N. Iscr. [illegible] 822 B

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DESCRIZIONE

Campo di applicazione

La presente invenzione fa riferimento ad una testa di misura per un'apparecchiatura di test di dispositivi elettronici.

L'invenzione riguarda in particolare, ma non esclusivamente, una testa di misura con migliorate prestazioni in frequenza e la descrizione che segue è fatta con riferimento a questo campo di applicazione con il solo scopo di semplificarne l'esposizione.

Arte nota

Come è ben noto, una testa di misura, nota anche come probe head, è essenzialmente un dispositivo atto a mettere in collegamento elettrico una pluralità di piazzole di contatto di una microstruttura, in particolare un dispositivo elettronico integrato su wafer, con corrispondenti canali di una apparecchiatura di test che ne esegue la verifica di funzionalità, in particolare elettrica, o genericamente il test.

Il test effettuato su dispositivi integrati serve in particolare a rilevare ed isolare dispositivi difettosi già in fase di produzione. Normalmente, le teste di misura vengono quindi utilizzate per il test elettrico dei dispositivi integrati su wafer prima del taglio o singolazione e del montaggio degli stessi all'interno di un package di contenimento di chip.

Una testa di misura include essenzialmente una pluralità di elementi di contatto mobili o sonde di contatto [contact probe] dotate di almeno una porzione di estremità o punta di contatto per una corrispondente pluralità di piazzole o pad di contatto di un dispositivo

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da testare, indicato anche come DUT (acronimo dall'inglese: "Device Under Test"). Con i termini estremità o punta si indica qui e nel seguito una porzione d'estremità, non necessariamente appuntita.

E' in particolare noto che l'efficacia e l'affidabilità di un test di misura dipende, tra gli altri fattori, anche dalla realizzazione di un buon collegamento elettrico tra dispositivo e apparecchiatura di test, e quindi, dallo stabilirsi di un ottimale contatto elettrico sonda/piazzola.

Tra le tipologie di teste di misura utilizzate nel settore della tecnica qui considerato per il test dei circuiti integrati, largamente diffuse sono le teste di misura denominate a sonde verticali ed indicate con il termine anglosassone "vertical probe head". Una testa di misura a sonde verticali comprende essenzialmente una pluralità di sonde di contatto trattenute da almeno una coppia di piastre o guide, sostanzialmente piastriformi e parallele tra loro. Tali guide sono dotate di appositi fori e poste ad una certa distanza fra loro in modo da lasciare una zona libera o zona d'aria per il movimento e l'eventuale deformazione delle sonde di contatto. La coppia di guide comprende in particolare una guida superiore [upper die] ed una guida inferiore [lower die], entrambe provviste di fori guida entro cui scorrono assialmente le sonde di contatto, normalmente formate da fili di leghe speciali con buone proprietà elettriche e meccaniche.

Il buon collegamento fra le sonde e le piazzole di contatto del dispositivo da testare è anche in tal caso assicurato dalla pressione della testa di misura sul dispositivo stesso, le sonde di contatto, mobili entro i fori guida realizzati nelle guide superiore ed inferiore, subendo in

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occasione di tale contatto premente una flessione, all'interno della zona d'aria tra le due guide, ed uno scorrimento all'interno di tali fori guida.

E' noto altresì utilizzare teste di misura con sonde non vincolate in maniera fissa, ma tenute interfacciate ad una interfaccia, a sua volta connessa all'apparecchiatura di test: si parla di teste di misura a sonde non bloccate.

In questo caso, le sonde di contatto presentano anche una ulteriore porzione di estremità o testa di contatto verso una pluralità di piazzole o pad di contatto di tale interfaccia. Il buon contatto elettrico tra sonde e interfaccia da viene assicurato in maniera analoga al contatto con il dispositivo da testare mediante la pressione delle sonde sulle piazzole di contatto della interfaccia.

Testa di misura ed interfaccia sono comprese in una cosiddetta scheda di misura [probe card] che costituisce la porzione terminale di una apparecchiatura di test di dispositivi integrati su wafer.

Nella sua forma più generale una scheda di misura, indicata complessivamente e schematicamente con 10 in Figura 1, comprende una testa di misura 1, nell'esempio di figura a sonde verticali non vincolate. La testa di misura 1 comprende una pluralità di sonde di contatto 2 contenute in un corpo 3, a sua volta usualmente comprendente almeno una coppia di supporti piastriformi o guide dotate di rispettivi fori guida in grado di alloggiare in modo scorrevole le sonde di contatto 2 e non illustrate in quanto convenzionali.

Ogni sonda di contatto 2 ha un'estremità o punta di contatto

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2A che va in battuta su una piazzola di contatto di un dispositivo da testare (non illustrato), in particolare integrato su un wafer semiconduttore, effettuando così il contatto meccanico ed elettrico con tale dispositivo.

Inoltre, ogni sonda di contatto 2 presenta un'ulteriore estremità, nella pratica indicata come testa di contatto 2B, verso una pluralità di piazzole di contatto 4A di una interfaccia 4. Il buon contatto elettrico tra sonde e interfaccia viene assicurato in maniera analoga al contatto con il dispositivo da testare mediante la pressione delle sonde, in particolare delle rispettive teste di contatto 2B, sulle piazzole di contatto 4A della interfaccia 4.

Più in particolare, l'interfaccia 4 è utilizzata anche per effettuare una trasformazione spaziale tra la distribuzione delle piazzole di contatto 4A disposte in corrispondenza di una sua prima faccia F4a, indicata anche come "probe side", su cui vanno in appoggio le teste di contatto 2B delle sonde di contatto 2 e corrispondenti piazzole di contatto 4B disposte in corrispondenza di una seconda e opposta faccia F4b, indicata anche come "tester side", dell'interfaccia 4, in particolare per il collegamento con la scheda stampata 5 o PCB (acronimo dall'inglese: "Printed Circuit Board") di collegamento con l'apparecchiatura di test.

In base alla sua precipua funzione di effettuare una trasformazione spaziale delle piazzole o pad di contatto, con in particolare un rilascio dei vincoli dimensionali legati alle distanze tra pad, indicata come pitch, delle più recenti tecnologie, l'interfaccia 4 è

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anche usualmente indicata come space trasformer. In altre parole, grazie all'utilizzo dell'interfaccia 4 è possibile realizzare piazzole di contatto 4B tester side con pitch maggiore delle piazzole di contatto 4A probe side.

L'operazione di trasformazione spaziale all'interno dell'interfaccia 4 viene effettuata utilizzando una pluralità di tracce o track conduttive 6, in particolare metalliche, in grado di effettuare il routing dei segnali dalle piazzole di contatto 4A probe side alle piazzole di contatto 4B tester side e da queste ultime, mediante opportune strutture di contatto elettrico 7, quali ball, pin o colonne (pillar) conduttivi, per citarne alcuni, di collegarsi alla scheda PCB 5. Anche all'interno della scheda PCB 5 viene effettuato il routing dei segnali, tramite ulteriori tracce o track conduttive 8, in particolare metalliche, per portare gli stessi all'esterno della scheda di misura 10 e quindi all'apparecchiatura di test. Le tracce o track conduttive 6 e 8 possono essere nella pratica anche interi piani conduttivi.

Le schede di misura note comprendono inoltre opportuni condensatori di filtraggio 9. Più in particolare, è noto utilizzare condensatori di filtraggio 9 di tipo ceramico, includenti un corpo isolante ceramico 9c ed opportuni reofori metallici 9r ai suoi lati, a costituire le armature dei condensatori stessi.

Tali condensatori di filtraggio sono comunemente posizionati sulla prima faccia F4a probe side della scheda di interfacciamento 4, all'esterno della testa di misura 1.

Per un miglior funzionamento dei condensatori di filtraggio 9,

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gli stessi devono essere posizionati il più vicino possibile alle sonde di contatto 2, in particolare alle sonde che portano i segnali di alimentazioni (Power) e di massa (Ground), a cui il filtraggio deve essere applicato, e più in particolare alle punte di contatto 2A di tali sonde.

Nelle più recenti tecnologie, alcuni condensatori di filtraggio 9 sono quindi disposti anche sulla seconda faccia F4b tester side, in porzioni opportunamente lasciate libere dalle strutture di contatto elettrico 7 in un'area Aph in corrispondenza della testa di misura 1.

In tal modo, i condensatori di filtraggio 9 sono maggiormente avvicinati alle sonde di contatto 2. Tale configurazione, tuttavia, impone un routing parallelo dei segnali di Power e Ground all'interno dell'interfaccia 4 che porti le stesse ai lati della stessa, al di fuori dell'area Aph corrispondente alla testa di misura 1.

Questo routing dei segnali di Power e Ground interno all'interfaccia 4 comporta la realizzazione di tracce o piani conduttivi 6 dall'area Aph ad una zona esterna o periferica dell'interfaccia 4, oltre alle tracce o piani conduttivi che portano i segnali di Power e Ground ai condensatori di filtraggio 9, disposti su diversi strati. Tutto ciò si traduce nella necessità di realizzare l'interfaccia 4 con un numero massiccio di strati, aumentandone lo spessore, con l'immediata ed ovvia conseguenza di allontanare i condensatori di filtraggio 9 stessi, disposti tester side, dalle relative sonde di contatto 2 di Power e Ground, in particolare dalle loro punte di contatto 2A, ed una riduzione delle relative capacità di filtraggio.

Quindi, anche le più recenti soluzioni per il posizionamento

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dei condensatori di filtraggio 9 tester side in un'area Aph corrispondente alla testa di misura 1, devono fare i conti con esigenze contrastanti e riescono ad ottenere solo un compromesso in termini di miglioramento prestazionale degli stessi.

Il problema tecnico che sta alla base della presente invenzione è quello di escogitare una testa di misura dotata di una pluralità di sonde di contatto per il collegamento con una apparecchiatura di test di dispositivi elettronici, in particolare integrati su wafer, avente caratteristiche strutturali e funzionali tali da consentire di superare le limitazioni e gli inconvenienti che tuttora affliggono le tecnologie note, in particolare permettendo di migliorare le prestazioni dei condensatori di filtraggio utilizzati per le sonde di contatto dei segnali di alimentazione e massa, posizionati in particolare all'interno della testa stessa.

Sommario dell'invenzione

L'idea di soluzione che sta alla base della presente invenzione è quella di realizzare su una o più guide opportune porzioni conduttive per il contatto con condensatori di filtraggio.

Sulla base di tale idea di soluzione il problema tecnico è risolto da una testa di misura comprendente una pluralità di sonde di contatto alloggiate in modo scorrevole in rispettive pluralità di fori guida realizzati in un supporto, piastriforme, tale pluralità di sonde di contatto comprendendo almeno un primo gruppo di sonde di contatto che trasportano segnali di massa e di alimentazione caratterizzata dal fatto di comprendere almeno un condensatore di filtraggio avente almeno un reoforo collegato elettricamente ad una porzione conduttiva

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realizzata sul supporto ed includente almeno un foro guida di alloggiamento di una sonda di contatto del primo gruppo.

Più in particolare, l'invenzione comprende le seguenti caratteristiche supplementari e facoltative, prese singolarmente o all'occorrenza in combinazione.

Secondo un altro aspetto dell'invenzione, la porzione conduttiva può essere collegata ad un primo riferimento di tensione scelto tra un riferimento di massa ed un riferimento di alimentazione, rispettivamente, ed il condensatore di filtraggio può comprendere un ulteriore reoforo connesso ad un secondo distinto riferimento di tensione, scelto tra un riferimento di alimentazione e di massa, rispettivamente.

Secondo un altro aspetto dell'invenzione, la porzione conduttiva può includere e mettere in collegamento elettrico una pluralità di fori guida di alloggiamento delle sonde di contatto del primo gruppo.

Ulteriormente, la porzione conduttiva può comprendere una porzione ortogonale che si estende almeno parzialmente all'interno dei fori guida di alloggiamento delle sonde di contatto del primo gruppo.

Secondo un altro aspetto ancora dell'invenzione, la testa di misura può comprendere distinte porzioni conduttive includenti distinte pluralità di fori guida di alloggiamento e collegate a distinti riferimenti di tensione, scelti tra riferimenti di alimentazione e di massa.

Ulteriormente, il supporto può comprendere almeno una sede di alloggiamento del condensatore di filtraggio, la porzione conduttiva

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estendendosi anche in corrispondenza di tale sede di alloggiamento per realizzare una connessione con l'almeno un reoforo del condensatore di filtraggio.

Più in particolare, la sede di alloggiamento del condensatore di filtraggio può estendersi nel supporto per una dimensione pari ad una corrispondente altezza del condensatore di filtraggio.

Secondo un altro aspetto dell'invenzione, il supporto può comprendere una prima porzione conduttiva realizzata in corrispondenza di una sua prima faccia ed una seconda porzione conduttiva realizzata in corrispondenza di una sua seconda ed opposta faccia, la sede di alloggiamento del condensatore di filtraggio essendo realizzata nel supporto in modo da mettere in comunicazione la prima e seconda faccia, il condensatore di filtraggio avendo un reoforo connesso alla prima porzione conduttiva ed un ulteriore reoforo connesso alla seconda porzione conduttiva, tali prima e seconda porzione conduttiva essendo connesse a rispettivi distinti riferimenti di tensione, scelti tra un riferimento di alimentazione e di massa.

Ulteriormente, la prima porzione conduttiva può includere almeno un primo foro guida di alloggiamento di una sonda di contatto del primo gruppo e la seconda porzione conduttiva può includere almeno un secondo foro guida di alloggiamento di una ulteriore sonda di contatto del primo gruppo, la prima porzione conduttiva essendo realizzata in modo tale da non contattare il secondo foro guida di alloggiamento essendo separata dallo stesso da un primo diaframma e la seconda porzione conduttiva essendo realizzata in modo tale da non

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contattare il primo foro guida di alloggiamento essendo separata dallo stesso da un secondo diaframma, tali primo e secondo diaframma garantendo l'isolamento della sonda di contatto (21A) e dell'ulteriore sonda di contatto dalla seconda e prima porzione conduttiva, rispettivamente.

Secondo un altro aspetto dell'invenzione, il supporto può comprendere almeno una coppia di guide, piastriformi e parallele tra loro, separate da una zona d'aria, ciascuna di tali guide essendo dotata di una pluralità di fori guida di alloggiamento delle sonde di contatto del primo gruppo ed una corrispondente pluralità di fori guida di passaggio di tali sonde di contatto, ciascuna delle guide avendo almeno porzione conduttiva includente almeno un foro guida di alloggiamento di una sonda di contatto del primo gruppo.

Più in particolare, le porzioni conduttive delle guide possono essere separate dai fori guida di passaggio delle sonde di contatto da diaframmi che garantiscono l'isolamento delle sonde di contatto dalle porzioni conduttive.

Ulteriormente, i fori guida di alloggiamento possono avere rispettivi primi diametri, preferibilmente uguali tra loro, e inferiori a rispettivi secondi diametri dei corrispondenti fori guida di passaggio, preferibilmente uguali tra loro, con il termine diametro intendendosi una dimensione trasversale massima di tali fori guida, anche di forma non circolare, in corrispondenza di una sezione trasversale presa in corrispondenza di un piano definito dalle guide.

Inoltre, le porzioni conduttive possono essere collegate ad un

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distinto riferimento di tensione scelto tra un riferimento di massa ed un riferimento di alimentazione.

Tali porzioni conduttive possono altresì essere realizzate su corrispondenti facce delle guide.

Secondo un altro aspetto dell'invenzione, almeno una porzione conduttiva può includere e mette in collegamento elettrico una pluralità di fori guida di alloggiamento delle sonde di contatto del primo gruppo.

Secondo un altro aspetto ancora dell'invenzione, una prima guida di tali guide può comprendere una sede di alloggiamento del condensatore di filtraggio, la porzione conduttiva della prima guida estendendosi anche in corrispondenza della sede di alloggiamento.

In particolare, il condensatore di filtraggio può essere inserito nella sede di alloggiamento ed in appoggio sulla porzione conduttiva della seconda guida.

Secondo un altro aspetto dell'invenzione, la prima e seconda guida possono comprendere ulteriormente una pluralità di fori guida di alloggiamento di sonde di contatto di un secondo gruppo di sonde di contatto che trasportano segnali operativi, le porzioni conduttive delle guide essendo separate dai fori guida di alloggiamento di sonde di contatto del secondo gruppo da opportuni diaframmi che garantiscono l'isolamento delle sonde di contatto del secondo gruppo dalle porzioni conduttive.

In particolare, le sonde di contatto del secondo gruppo possono essere parzialmente rivestite mediante materiale isolante, preferibilmente in una porzione in corrispondenza dei fori guida di

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alloggiamento.

Ulteriormente, le sonde di contatto del primo gruppo possono essere parzialmente rivestite mediante materiale isolante, preferibilmente in una porzione in corrispondenza dei fori guida di passaggio.

Secondo un altro aspetto dell'invenzione, il supporto può comprendere ulteriormente una guida intermedia inserita tra la coppia di guide occupando la zona d'aria, tale guida intermedia essendo dotata di una pluralità di fori guida di alloggiamento di sonde di contatto di un secondo gruppo di sonde di contatto che trasportano segnali operativi ed una corrispondente pluralità di fori guida di passaggio di sonde di contatto del primo gruppo, la guida intermedia essendo in contatto strisciante solamente con le sonde di contatto del secondo gruppo.

Più in particolare, i fori guida di alloggiamento delle sonde di contatto del secondo gruppo possono avere rispettivi primi diametri, preferibilmente uguali tra loro, e inferiori a rispettivi secondi diametri dei corrispondenti fori guida di passaggio, preferibilmente uguali tra loro, con il termine diametro intendendosi una dimensione trasversale massima di detti fori guida, anche di forma non circolare, in corrispondenza di una sezione trasversale presa in corrispondenza di un piano definito dalla guida intermedia.

Ulteriormente, la guida intermedia può comprendere una ulteriore sede di alloggiamento del condensatore di filtraggio, di dimensioni analoghe e posizionata in corrispondenza della sede di alloggiamento realizzata nella prima guida della coppia di guide.

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Secondo un altro aspetto dell'invenzione, il supporto è un supporto inferiore di una coppia di supporti di alloggiamento delle sonde di contatto, con inferiore intendendosi più vicino ad un dispositivo da testare integrato su wafer, il condensatore di filtraggio essendo così posizionato in prossimità di punte di contatto delle sonde di contatto atte ad andare in battuta su pad di contatto del dispositivo da testare.

Secondo un altro aspetto dell'invenzione, la testa di misura può comprendere una pluralità di condensatori di filtraggio.

Inoltre, secondo un altro aspetto ancora dell'invenzione, la porzione conduttiva può estendersi sostanzialmente su tutto il supporto e ricoprire una sua faccia, includendo e mettendo in collegamento un primo gruppo di fori guida di alloggiamento di sonde di contatto del primo gruppo, la porzione conduttiva comprendendo ulteriormente rispettive aree non conduttive in corrispondenza di fori guida di alloggiamento di sonde di contatto non appartenenti al primo gruppo.

Infine, secondo un ulteriore aspetto dell'invenzione, la testa di misura può comprendere sonde di contatto parzialmente rivestite mediante materiale isolante, preferibilmente in una porzione in corrispondenza di fori guida inclusi in porzioni conduttive a cui tali sonde di contatto non devono essere collegate elettricamente.

Le caratteristiche ed i vantaggi della testa di misura secondo l'invenzione risulteranno dalla descrizione, fatta qui di seguito, di un suo esempio di realizzazione dato a titolo indicativo e non limitativo con riferimento ai disegni allegati.

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Breve descrizione dei disegni

In tali disegni:

- la Figura 1 mostra schematicamente una scheda di misura dotata di condensatori di filtraggio ed atta a supportare una testa di misura a sonde verticali realizzata secondo la tecnica nota;
- la Figura 2A mostra schematicamente una testa di misura a sonde verticali realizzata secondo la presente invenzione;
- le Figure 2B e 2C mostrano schematicamente varianti di realizzazione della testa di misura di Figura 2A;
- le Figure 3A, 3B mostrano schematicamente una vista in pianta di varianti di realizzazione di un supporto della testa di misura delle Figure 2A-2C;
- la Figura 4 mostra schematicamente una ulteriore variante di realizzazione di una testa di misura a sonde verticali secondo la presente invenzione;
- le Figure 5A, 5B mostrano schematicamente una vista in pianta di un supporto della testa di misura di Figura 4;
- le Figure 6A-6C mostrano schematicamente ulteriori varianti di realizzazione di una testa di misura a sonde verticali secondo la presente invenzione; e
- la Figura 7 mostra schematicamente una vista in pianta di una variante di realizzazione del supporto della testa di misura di Figura 4.

Descrizione dettagliata

Con riferimento a tali figure, ed in particolare alla Figura 2A,

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con 20 è complessivamente indicata una testa di misura [probe head] dotata una pluralità di sonde di contatto per il test di dispositivi elettronici, in particolare integrati su wafer.

E' opportuno notare che le figure rappresentano viste schematiche della testa di misura secondo l'invenzione e non sono disegnate in scala, ma sono invece disegnate in modo da enfatizzare le caratteristiche importanti dell'invenzione.

Inoltre, i diversi aspetti dell'invenzione rappresentati a titolo esemplificativo nelle figure sono ovviamente combinabili tra loro ed intercambiabili da una forma di realizzazione ad un'altra.

In particolare, come illustrato in Figura 2A, la testa di misura 20 comprende una pluralità di sonde di contatto 21 di tipo verticale alloggiate in modo scorrevole in un supporto 22, sostanzialmente una scheda piastriforme. Più in particolare, la testa di misura 20 illustrata in Figura 2A comprende almeno un primo gruppo di sonde di contatto destinate a trasportare segnali di alimentazione e di massa verso un dispositivo da testare 23, in particolare integrato su wafer. Per semplicità di illustrazione, nella Figura 2A viene mostrata solo una sonda di contatto per ciascuna tipologia ed in particolare una sonda di massa 21A ed una sonda di alimentazione 21B.

Ogni sonda di contatto, in particolare la sonda di massa 21A e la sonda di alimentazione 21B illustrate, ha almeno un'estremità o punta di contatto, 24A e 24B, rispettivamente, che va in battuta su una corrispondente piazzola o pad di contatto 23A, 23B del dispositivo da testare 23, così da effettuare il contatto meccanico ed elettrico fra il

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dispositivo ed una apparecchiatura di test (non illustrata).

Come visto in relazione alla tecnica nota, ogni sonda di contatto può altresì comprendere un'ulteriore estremità o testa di contatto atta ad andare in battuta su una corrispondente piazzola o pad di contatto di una scheda di interfacciamento o space transformer, secondo una configurazione ben nota nel settore e non mostrata per semplicità di illustrazione.

Le sonde di contatto di massa 21A e di alimentazione 21B sono alloggiate in modo scorrevole in rispettivi fori guida di alloggiamento 25A, 25B realizzati nel supporto 22.

Come verrà descritto nel seguito, la testa di misura 20 comprende anche almeno un secondo gruppo di sonde di contatto, destinate a trasportare segnali operativi, in particolare segnali di ingresso/uscita tra l'apparecchiatura di test ed il dispositivo da testare 23.

È noto che la presenza di numerose sonde di contatto destinate al trasporto di segnali di massa, così come al trasporto di segnali di alimentazione, crea interferenze, causando quindi una rumorosità nei segnali di ingresso/uscita utilizzati per la verifica del dispositivo da testare, il che limita le prestazioni in frequenza della testa di misura.

Opportunamente, la testa di misura 20 è quindi dotata di elementi di filtraggio, in particolare condensatori di filtraggio 30, connessi a riferimenti di alimentazione di massa e di potenza.

Per ottimizzare l'effetto di filtraggio dei condensatori di

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filtraggio 30 e quindi ridurre al minimo le interferenze causate dalle sonde di contatto che trasportano i segnali di massa e di alimentazione, 21A e 21B, vantaggiosamente secondo la presente invenzione i condensatori di filtraggio 30 sono posizionati il più possibile vicino alle punte di contatto 24A, 24B di tali sonde, in particolare connessi ad almeno una porzione conduttiva realizzata direttamente sul supporto 22 delle sonde, in particolare una porzione conduttiva superficiale. In una forma preferita di realizzazione, la testa di misura 20 comprende una coppia di supporti per le sonde di contatto, come descritto in relazione alla tecnica nota, e tale supporto 22 è un supporto inferiore, ovvero è un supporto posizionato in prossimità del wafer comprendente il dispositivo da testare 23.

Il supporto 22, in particolare un suo core piastriforme 22C, è realizzato in un materiale non conduttivo, ad esempio in un materiale ceramico quale nitruro di silicio, oppure in un materiale vetroso o a base silicio, oppure in materiale poliammidico, oppure in qualunque altro materiale dielettrico adatto.

Vantaggiosamente secondo la presente invenzione, nella forma di realizzazione illustrata in Figura 2A, il supporto 22 presenta almeno una porzione conduttiva 22A opportunamente realizzata su un almeno una sua faccia Fa, ad esempio una sua faccia superiore con riferimento all'illustrazione di Figura. Tale porzione conduttiva può essere realizzata nella forma ad esempio di uno strato di metallizzazione depositato sul supporto 22 e definito fotolitograficamente oppure tramite laser. Inoltre, tale porzione conduttiva può essere fatta in un qualsiasi materiale

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conduttore, quale ad esempio metallico, in particolare scelto tra rame, oro, argento, palladio, rodio e loro leghe, per citarne alcuni.

Opportunamente, la porzione conduttiva 22A è realizzata in modo da includere almeno un foro guida di alloggiamento di una sonda di contatto, ad esempio un foro guida di alloggiamento 25A di una sonda di massa 21A, più preferibilmente una pluralità di fori guida di alloggiamento.

In sostanza, la porzione conduttiva 22A ricopre un'area del supporto 22 che include più fori guida di alloggiamento, in particolare fori guida di alloggiamento 25A delle sonde di massa 21A, tali fori guida di alloggiamento 25A essendo quindi messi in collegamento elettrico tra loro dalla porzione conduttiva 22A, che realizza così un piano conduttivo comune, in particolare un piano di massa comune, atto a collegare elettricamente i fori guida di alloggiamento 25A e quindi le sonde di massa 21A, tra loro e ad un riferimento di massa GND.

La porzione conduttiva 22A può estendersi anche all'interno dei fori guida di alloggiamento 25A delle sonde di massa 21A, in particolare presentando anche una porzione ortogonale 22Aw che riveste almeno parzialmente una parete interna di tali fori guida di alloggiamento 25A, come mostrato in figura. In tal modo, il collegamento elettrico tra la sonda di massa 21A e la porzione conduttiva 22A è realizzato anche tramite un contatto strisciante tra di essa e la porzione ortogonale 22Aw che riveste la parete interna dei fori guida di alloggiamento 25A in cui la sonda è alloggiata.

Vantaggiosamente secondo la presente invenzione, in

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corrispondenza di tale porzione conduttiva 22A è definita almeno una porzione di alloggiamento 33* per un condensatore di filtraggio 30.

Più in particolare, un tale condensatore di filtraggio 30 comprende un corpo, ad esempio di tipo ceramico, ed una coppia di reofori metallici disposti ai lati di tale corpo a realizzare le armature del condensatore. In alternativa, è altresì possibile utilizzare un condensatore a base silicio o un altro tipo di condensatore discreto di dimensioni adatte all'alloggiamento nella testa di misura 20.

Vantaggiosamente secondo la presente invenzione, almeno un reoforo 31 del condensatore di filtraggio 30 è connesso elettricamente alla porzione conduttiva 22A del supporto 22 e quindi al riferimento di massa GND.

Più in particolare, il condensatore di filtraggio 30 è alloggiato in corrispondenza della porzione di alloggiamento 33* definita nella porzione conduttiva 22A. Il condensatore di filtraggio 30 è in particolare appoggiato alla porzione conduttiva 22A in corrispondenza di tale porzione di alloggiamento 33*. Tale condensatore di filtraggio 30 presenta un ulteriore reoforo 32 opportunamente connesso ad un riferimento di alimentazione PWR.

Vantaggiosamente secondo la presente invenzione, il condensatore di filtraggio 30 è in collegamento elettrico con una pluralità di fori guida di alloggiamento di rispettive sonde di contatto, in particolare i fori guida di alloggiamento 25A delle sonde di massa 21A inclusi nella e messi in contatto dalla porzione conduttiva 22A.

In tal modo il condensatore di filtraggio 30 è in grado di

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filtrare il rumore per tutte le sonde di massa 21A connesse alla prima porzione conduttiva 22A.

Si sottolinea che il condensatore di filtraggio 30 è dimensionato in modo da essere alloggiato all'interno della testa di misura 20, in particolare appoggiato sul supporto 22, senza ostacolare il corretto funzionamento della stessa ed in particolare lo scorrimento delle sonde di contatto 21 nei rispettivi fori guida.

Più in particolare, è possibile utilizzare un condensatore di filtraggio discreto, di forma sostanzialmente parallelepipeda, come attualmente in commercio, ad esempio avente lunghezza e profondità comprese tra 0,1 mm e 0,4 mm, preferibilmente tra 0,125 mm e 0,3 mm e altezza compresa tra 0,2 mm e 0,7 mm, preferibilmente tra 0,25 mm e 0,6 mm.

E' ovviamente possibile realizzare la porzione conduttiva del supporto 22 in collegamento elettrico con un riferimento di potenza PWR, eventualmente comprendente una pluralità di fori guida di alloggiamento 25B di sonde di alimentazione 21B. Anche in tal caso, il condensatore di filtraggio 30 comprenderà un reoforo connesso elettricamente a tale porzione conduttiva e quindi al riferimento di potenza PWR ed un ulteriore reoforo in collegamento elettrico con un riferimento di massa GND.

Inoltre, è possibile realizzare nella testa di misura 20 una pluralità di condensatori di filtraggio 30 connessi a rispettive porzioni conduttive 22A realizzate sul supporto 20.

Secondo una variante di realizzazione illustrata

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schematicamente in Figura 2B, il supporto 22 comprende almeno una prima ed una seconda porzione conduttiva, 22A e 22B, rispettivamente, opportunamente realizzate su un almeno una sua faccia Fa, ad esempio una sua faccia superiore con riferimento all'illustrazione di Figura.

Anche in tal caso, le porzioni conduttive 22A e 22B possono essere realizzate nella forma ad esempio di strati di metallizzazione depositati sul supporto 22 e successivamente fotolitograficamente definiti e possono essere fatte in un qualsiasi materiale conduttore, quale ad esempio metallico, in particolare scelto tra rame, oro, argento, palladio, rodio e loro leghe, per citarne alcuni.

Più in particolare, il supporto 22 comprende almeno una prima porzione conduttiva 22A a sua volta includente almeno un foro guida di alloggiamento 25A di una sonda di massa 21A, ed una seconda porzione conduttiva 22B, a sua volta includente almeno un foro guida di alloggiamento 25B di una sonda di alimentazione 21B.

In una forma di realizzazione preferita, la prima porzione conduttiva 22A include una pluralità di fori guida di alloggiamento 25A di una pluralità di sonde di massa 21A e la seconda porzione conduttiva 22B include una pluralità di fori guida di alloggiamento 25B di una pluralità di sonde di alimentazione 21B.

In tal caso, la prima porzione conduttiva 22A ricopre un'area del supporto 22 che include più fori guida di alloggiamento 25A delle sonde di massa 21A, tali fori guida di alloggiamento 25A essendo quindi messi in collegamento elettrico tra loro dalla prima porzione conduttiva 22A, che realizza così un piano conduttivo comune, in particolare un

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piano di massa comune, atto a collegare elettricamente i fori guida di alloggiamento 25A e quindi le sonde di massa 21A, tra loro e ad un riferimento di massa GND.

Analogamente, la seconda porzione conduttiva 22B ricopre un'area del supporto 22 che include più fori guida di alloggiamento 25B delle sonde di alimentazione 21B, tali fori guida di alloggiamento 25B essendo così messi in collegamento elettrico tra loro dalla seconda porzione conduttiva 22B, che realizza così un piano conduttivo comune, in particolare un piano di alimentazione comune, atto a collegare elettricamente i fori guida di alloggiamento 25B e quindi le sonde di alimentazione 21B, tra loro e ad un riferimento di alimentazione PWR.

In una variante di realizzazione, tutte le sonde di massa 21A o di alimentazione 21B della testa di misura 20 sono collegate elettricamente tramite una stessa porzione conduttiva 22A, 22B. E' altresì possibile considerare il caso in cui distinte porzioni conduttive 22A e/o 22B sono collegate a diversi riferimenti di massa e/o alimentazione.

Opportunamente, la prima porzione conduttiva 22A può estendersi anche all'interno dei fori guida di alloggiamento 25A delle sonde di massa 21A, in particolare presentando anche una porzione ortogonale 22Aw che riveste almeno parzialmente una parete interna di tali fori guida di alloggiamento 25A. Analogamente, la seconda porzione conduttiva 22B può estendersi anche all'interno dei fori guida di alloggiamento 25B delle sonde di alimentazione 21B, in particolare presentando anche una porzione ortogonale 22Bw che riveste almeno

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parzialmente una parete interna di tali fori guida di alloggiamento 25B. In tal modo, il collegamento elettrico tra le sonde di massa 21A e di alimentazione 21B e la rispettiva porzione conduttiva 22A, 22B è realizzato anche tramite un contatto strisciante tra di esse e la rispettiva porzione ortogonale 22Aw e 22Bw che riveste la parete interna dei fori guida di alloggiamento 25A, 25B in cui le sonde sono alloggiate.

Si sottolinea tuttavia che, anche nel caso in cui le porzioni conduttive 22A, 22B non rivestano una tale parete interna dei fori guida 25A, 25B, il contatto elettrico è comunque garantito dallo spessore della porzione conduttiva 22A, 22B stessa, realizzata anche solo superficialmente sul supporto 22 su cui le sonde di massa 21A e di alimentazione 21B comunque strisciano durante il normale funzionamento della testa di misura 20, in particolare in occasione del contatto premente delle loro punte di contatto 24A, 24B sui pad di contatto 23A, 23B del dispositivo da testare 23.

Vantaggiosamente secondo la presente invenzione, la testa di misura 20 comprende inoltre almeno un condensatore di filtraggio 30 avente rispettivi reofori 31, 32 connessi ad una rispettiva porzione conduttiva 22A, 22B del supporto 22 e quindi in collegamento elettrico con i riferimenti di massa ed alimentazione.

Più in particolare, il condensatore di filtraggio 30 è alloggiato in corrispondenza di una porzione di alloggiamento 33* definita sul supporto 22 in modo da consentire il collegamento di un reoforo 31 alla prima porzione conduttiva 22A e quindi al riferimento di massa GND ed di un ulteriore reoforo 32 alla seconda porzione conduttiva 22B e quindi

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al riferimento di alimentazione PWR.

Opportunamente, nel caso di porzioni conduttive 22A, 22B che includono una pluralità di fori guida 25A, 25B che alloggiano una pluralità di sonde di massa 21A e di alimentazione 21B, il condensatore di filtraggio 30 è in grado di filtrare il rumore per tutte tali sonde di massa 21A e alimentazione 21B connesse alla prima ed alla seconda porzione conduttiva 22A, 22B. E' così possibile utilizzare un numero minore di condensatori e distribuirli più facilmente sul supporto 22; inoltre, si sottolinea che tali condensatori di filtraggio 30 sono realizzati in prossimità delle punte di contatto 24A, 24B delle sonde di contatto 21A e 21B, tale supporto 22 essendo opportunamente un supporto inferiore della testa di misura 20.

Secondo una ulteriore variante di realizzazione della testa di misura 20, il supporto 22 comprende una sede di alloggiamento 33 per il condensatore di filtraggio 30 ricavata nel suo corpo 22C, come schematicamente illustrato in Figura 2C. In tal caso, la prima porzione conduttiva 22A e la seconda porzione conduttiva 22B si estendono anche all'interno di tale sede di alloggiamento 33 per realizzare il collegamento con i reofori 31 e 32 del condensatore di filtraggio 30.

Opportunamente, la sede di alloggiamento 33 si estende nel supporto 22 per una prima dimensione H1 pari al 20-80% di uno spessore totale Sp del supporto 22. In una forma preferita di realizzazione, la prima dimensione H1 ha un valore compreso tra 100 μm e 300 μm, più preferibilmente pari a 200 μm mentre lo spessore totale Sp del supporto 22 ha un valore compreso tra 400 μm e 600 μm,

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più preferibilmente pari a 500 µm.

Opportunamente, la sede di alloggiamento 33 si estende nel supporto 22 per una dimensione almeno uguale ad una corrispondente dimensione del condensatore di filtraggio 30 in essa alloggiato, così che tale condensatore non sporga rispetto al supporto 22, in particolare dalla sua faccia superiore Fa.

Si sottolinea che la prima porzione conduttiva 22A e la seconda porzione conduttiva 22B rivestono comunque solamente una porzione superficiale del supporto 22, in particolare solo una parte della sua faccia superiore Fa, non estendendosi per tutta l'area di tale supporto, come schematicamente illustrato in Figura 3A. Questo permette il posizionamento e l'isolamento delle sonde di contatto per il trasporto dei segnali di ingresso/uscita, in particolare in aree del supporto 22 non rivestite dalle porzioni conduttive, come sarà spiegato nel seguito.

Più in particolare, la Figura 3A mostra una vista in pianta del supporto 22, in particolare della sua faccia Fa, in cui la prima porzione conduttiva 22A include e mette in collegamento elettrico una pluralità di fori guida 25A che alloggiano una pluralità di sonde di massa 21A ed una seconda porzione conduttiva 22B, la quale include mette in collegamento elettrico una pluralità di fori guida 25B, che alloggiano una pluralità di sonde di alimentazione 21B, ed è separata fisicamente ed elettronicamente dalla prima porzione conduttiva 22A da almeno un'area A del supporto 22, realizzato in materiale non conduttivo, dove è possibile realizzare ulteriori fori guida 25C per l'alloggiamento di

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sonde di contatto atte a trasportare segnali di ingresso/uscita. La prima porzione conduttiva 22A è in questo caso connessa ad un riferimento di massa GND mentre la secondo porzione conduttiva 22B è connessa ad un riferimento di alimentazione PWR.

Come già indicato, sia la prima porzione conduttiva 22A sia la seconda porzione conduttiva 22B rivestono solamente una porzione superficiale del supporto 22, in particolare solo una porzione della sua faccia Fa, avendo un'area inferiore ad un'area complessiva di tale faccia Fa. In tal modo, il supporto 22 non è rivestito interamente dalle porzioni conduttive 22A e 22B, ed è sempre presente almeno un'area non conduttiva A che separa tali porzioni conduttive e dove è possibile realizzare i fori guida 25C che alloggiano sonde di contatto di trasporto di segnali di ingresso/uscita, indicate anche come sonde di segnale.

È ovviamente possibile realizzare solamente una porzione conduttiva 22A o 22B sulla faccia Fa del supporto 22 oppure un numero maggiore di due di porzioni conduttive includenti rispettive pluralità di fori guida, che risultano così messi in contatto elettrico dalle rispettive porzioni conduttive. Analogamente, è possibile realizzare le porzioni conduttive in modo da comprendere tutte le sonde di contatto di un certo tipo, ad esempio una porzione conduttiva che includa tutte le sonde di massa 21A.

Alternativamente, in un'ulteriore forma di realizzazione della presente invenzione, una porzione conduttiva ricopre interamente il supporto 22 e include e mette in collegamento fori guida atti all'alloggiamento di sonde di contatto di un certo tipo, ad esempio sonde

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di massa, ad eccezione di opportune aree in cui sono realizzati fori guida atti all'alloggiamento di sonde di contatto di altro tipo, ad esempio sonde di alimentazione o sonde di segnale. In sostanza, tali aree sono ricavate per rimozione della porzione conduttiva di copertura del supporto 22 e sono quindi aree non conduttive.

In particolare, come illustrato schematicamente in Figura 3B, la prima porzione conduttiva 22A ricopre interamente la faccia Fa del supporto 22, ad eccezione di rispettive aree non conduttive A1 e A2 in cui sono realizzati i fori guida 25B e 25C di alloggiamento delle sonde di alimentazione 21B e delle sonde di segnale, rispettivamente. Come in precedenza, la prima porzione conduttiva 22A è quindi collegata ad un riferimento di massa GND. E' inoltre possibile realizzare, in corrispondenza di un'area non conduttiva A2, una seconda porzione conduttiva 22B che include e mette in contatto fori guida 25B di alloggiamento delle sonde di alimentazione 21B, tale seconda porzione conduttiva 22B essendo collegata ad un riferimento di alimentazione PWR.

Si sottolinea che le aree non conduttive possono anche essere nella forma di una pluralità di aree distinte, ciascuna realizzata solamente in corrispondenza di un foro guida che si desidera isolare elettricamente.

Secondo una variante di realizzazione, schematicamente illustrata in Figura 4, la prima porzione conduttiva 22A è realizzata in corrispondenza di una prima faccia Fa del supporto 22, in particolare una faccia superiore secondo il riferimento locale della figura, mentre la

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seconda porzione conduttiva 22B è realizzata in corrispondenza di una seconda ed opposta faccia Fb del supporto 22, in particolare una faccia inferiore secondo il riferimento locale della figura.

Opportunamente, il supporto 22 comprende in tal caso una sede di alloggiamento 33 del condensatore di filtraggio 30 che si estende lungo tutto lo spessore Sp del supporto 22 così da mettere in comunicazione le opposte facce Fa, Fb del supporto 22 stesso, consentendo in particolare un alloggiamento del condensatore di filtraggio 30 in verticale, sempre considerando il riferimento locale della Figura 4. In tal caso, la sede di alloggiamento 33 del condensatore di filtraggio 30 presenta una seconda dimensione H2 sostanzialmente pari allo spessore Sp del supporto 22. E' così possibile alloggiare in tale sede di alloggiamento 33 un condensatore di filtraggio 30 avente una corrispondente dimensione sostanzialmente uguale alla seconda dimensione H2 della sede di alloggiamento 33 oppure avente una dimensione inferiore a tale seconda dimensione H2, un opportuno materiale di riempimento conduttivo, quale una pasta conduttiva, essendo utilizzato per collegare tale condensatore di filtraggio 30 alla prima ed alla seconda porzione conduttiva 22A, 22B.

Più in particolare, come nell'esempio illustrato in Figura 4, il supporto 22 comprende la prima porzione conduttiva 22A realizzata sulla prima faccia Fa del supporto 22 in modo da comprendere anche una porzione ortogonale 22Aw che si estende all'interno dei fori guida di alloggiamento 25A di sonde di massa 21A, così connesse tra loro e ad un riferimento di massa GND e la seconda porzione conduttiva 22B

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realizzata sulla seconda faccia Fb del supporto 22 in modo da comprendere anche una porzione ortogonale 22Bw che si estende all'interno dei fori guida di alloggiamento 25B di sonde di alimentazione 21B, così connesse tra loro e ad un riferimento di alimentazione PWR. Tali prima e seconda porzione conduttiva 22A, 22B si estendono anche in corrispondenza della sede di alloggiamento 33 del condensatore di filtraggio 30, in particolare in contatto con rispettivi reofori 31 e 32 dello stesso.

Inoltre, opportunamente, la prima porzione conduttiva 22A è realizzata sulla prima faccia Fa in modo tale da non contattare i fori guida 25B di alloggiamento delle sonde di alimentazione 21B, più in particolare in modo da essere separata da tali fori guida 25B da un primo diaframma Df1, in particolare avente dimensioni maggiori di 5 μm. Analogamente, la seconda porzione conduttiva 22B è realizzata sulla seconda faccia Fb in modo tale da non contattare i fori guida 25A di alloggiamento delle sonde di massa 21A, più in particolare in modo da essere separata da tali fori guida 25A da un secondo diaframma Df2 avente dimensioni analoghe al primo diaframma Df1, ed in particolare avente dimensioni maggiori di 5 μm.

In una forma preferita di realizzazione, come illustrato schematicamente nelle Figure 5A e 5B, il supporto 22 è realizzato in modo da comprendere la prima porzione conduttiva 22A che ricopre interamente la prima faccia Fa del supporto 22, ad eccezione di rispettive aree non conduttive A1 e A2 in cui sono realizzati i fori guida 25B e 25C di alloggiamento delle sonde di alimentazione 21B e delle

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sonde di segnale, rispettivamente ed una seconda porzione conduttiva 22B che ricopre interamente la seconda faccia Fb del supporto 22, ad eccezione di rispettive aree non conduttive B1 e B2 in cui sono realizzati i fori guida 25A e 25C di alloggiamento delle sonde di massa 21A e delle sonde di segnale, rispettivamente. La prima porzione conduttiva 22A è quindi collegata ad un riferimento di massa GND mentre la seconda porzione conduttiva 22B è collegata ad un riferimento di alimentazione PWR.

Secondo una variante preferita di realizzazione, schematicamente illustrata in Figura 6A, il supporto 22 comprende una coppia di guide, piastriformi e parallele tra loro, in particolare una prima guida o guida inferiore 26 ed una seconda guida o guida superiore 27, i termini inferiore e superiore essendo utilizzati con riferimento alla rappresentazione in Figura, la guida superiore 27 essendo più distante dal dispositivo da testare 23 rispetto alla guida inferiore 26.

Il supporto 22 è in particolare realizzato in modo che la coppia di guide superiore 27 ed inferiore 26 siano separate da una zona d'aria 34 avente una altezza H3 pari al 10-40% dello spessore totale Sp del supporto 22 nel suo complesso, inteso in questa forma di realizzazione come l'assieme della coppia di guide superiore e inferiore, 27 e 26, e della zona d'aria 34. In una forma preferita di realizzazione, l'altezza H3 della zona d'aria 34 ha un valore compreso tra 80 μm e 500 μm, più preferibilmente pari a 250 μm mentre lo spessore totale Sp del supporto 22 ha un valore compreso tra 750 μm e 1250 μm, più preferibilmente

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pari a 800 μm. Le guide superiore e inferiore, 27 e 26, hanno rispettivi spessori Sp1, Sp2 con valore compreso tra 80 μm e 300 μm, più preferibilmente pari a 250 μm.

Tali guide superiore e inferiore, 27 e 26, comprendono ciascuna un core piastriforme in cui sono realizzate rispettive pluralità di fori guida per il passaggio o l'alloggiamento in modo scorrevole delle sonde di massa 21A e di alimentazione 21B. Più in particolare, nell'esempio dato a titolo illustrativo e non limitativo nella Figura 6A, la guida inferiore 26 comprende un core piastriforme 26C in cui è realizzata almeno una prima pluralità di fori guida 28A di passaggio delle sonde di massa 21A ed una seconda pluralità di fori guida 28B di alloggiamento delle sonde di alimentazione 21B. Analogamente, la guida superiore 27 comprende un core piastriforme 27C in cui è realizzata almeno una prima pluralità di fori guida 29A di alloggiamento delle sonde di massa 21A ed una seconda pluralità di fori guida 29B di passaggio delle sonde di alimentazione 21B.

Opportunamente, i fori guida 29A e 28B di alloggiamento delle sonde di massa 21A e di alimentazione 21B hanno rispettivi diametri D1A e D1B con valori compresi tra 20 μm e 70 μm, preferibilmente tra 30 μm e 40 μm, mentre i fori guida 29B e 28A di passaggio delle sonde di massa 21A e di alimentazione 21B hanno rispettivi diametri D2A e D2B, maggiori dei diametri D1A e D1B, rispettivamente, e in particolare con valori compresi tra 40 μm e 100 μm, preferibilmente tra 40 μm e 70 μm. Con il termine diametro si intende una dimensione trasversale massima di tali fori guida, anche di forma non circolare, in

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corrispondenza di una sezione trasversale dei fori presa in corrispondenza di un piano definito dalle guide. Preferibilmente, i diametri D1A e D1B dei fori guida 29A e 28B di alloggiamento sono sostanzialmente uguali tra loro; analogamente, come i diametri D2A e D2B dei fori guida 28A e 29B di passaggio sono sostanzialmente uguali tra loro.

Per semplicità di esposizione, si parlerà nel seguito di fori guida di alloggiamento, in particolare i fori guida 29A e 28B, e di fori guida di passaggio, in particolare i fori guida 29B e 28A.

Si sottolinea che il dimensionamento dei fori guida di alloggiamento e di passaggio garantisce che ogni sonda di contatto 21 sia in contatto con una sola porzione conduttiva realizzata su una guida, come nei precedenti esempi di realizzazione.

Le guide superiore e inferiore, 27 e 26, in particolare i loro core piastriformi 27C e 26C, sono realizzati in un materiale non conduttivo, ad esempio in un materiale ceramico quale nitruro di silicio, oppure in un materiale vetroso o a base silicio, oppure in materiale poliammidico, oppure in qualunque altro materiale dielettrico adatto.

Ulteriormente, la guida superiore 27 e la guida inferiore 26 presentano rispettive porzioni conduttive, realizzate su almeno una faccia di tali guide, ad esempio una rispettiva faccia superiore sempre con riferimento all'illustrazione di Figura 6A; le porzioni conduttive possono essere realizzate, ad esempio, nella forma di metallizzazioni opportunamente depositate e definite fotolitograficamente o mediante laser. Tali porzioni conduttive possono essere fatte in un qualsiasi

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materiale conduttore, quale ad esempio metallico, in particolare scelto tra rame, oro, argento, palladio, rodio e loro leghe, per citarne alcuni.

Più in particolare, la guida superiore 27 comprende almeno una prima porzione conduttiva 27A che include e mette in collegamento i fori guida 29A di alloggiamento delle sonde di massa 21A, che risultano in tal modo connesse tra loro e ad un riferimento di massa GND; in sostanza, la prima porzione conduttiva 27A realizza un piano conduttivo comune, in particolare un piano di massa comune atto a collegare elettricamente i fori guida 29A e quindi le sonde di massa 21A.

Analogamente, la guida inferiore 26 comprende almeno una seconda porzione conduttiva 26A che include e mette in collegamento i fori guida 28B di alloggiamento delle sonde di alimentazione 21B, che risultano in tal modo connesse tra loro e ad un riferimento di alimentazione PWR; anche in tal caso, la seconda porzione conduttiva 26A realizza così un piano conduttivo comune, in particolare un piano di alimentazione comune atto a collegare elettricamente i fori guida 28B e quindi le sonde di alimentazione 21B.

Si sottolinea nuovamente che, grazie al dimensionamento dei fori guida di alloggiamento e di passaggio, la sonda di massa 21A è in contatto solo con la prima porzione conduttiva 27A realizzata sulla guida superiore 27 e la sonda di alimentazione 21B è in contatto solamente con la seconda porzione conduttiva 26A realizzata sulla guida inferiore 26.

Inoltre, le porzioni conduttive 27A e 26A sono realizzate sulle rispettive guide 27 e 26 in modo tale da non contattare i fori guida 29B

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e 28A di alloggiamento delle sonde di alimentazione 21B e di massa 21A, rispettivamente, più in particolare in modo da essere separate da tali fori guida 29B, 28A da rispettivi diaframmi Dfa1, Dfa2, Dfb1, Dfb2, aventi in particolare dimensioni maggiori di 5 μm

E' altresì possibile utilizzare sonde di contatto 21A e 21B almeno parzialmente isolate, ad esempio mediante rivestimento in un materiale isolante, in particolare in una porzione delle stesse in corrispondenza dei fori guida di passaggio 28A e 29B, così da evitare collegamenti elettrici indesiderati tra tali sonde di contatto 21A e 21B e le porzioni conduttive 27A e 26A, rispettivamente. In tal caso, la presenza di diaframmi tra una porzione conduttiva ed i fori guida che non deve mettere in contatto potrebbe non essere necessaria.

In una forma di realizzazione, tutte le sonde di massa 21A o di alimentazione 21B della testa di misura 20 sono collegate elettricamente tramite una stessa porzione conduttiva 27A, 26A; in alternativa, solamente una parte di tali sonde di massa 21A o di alimentazione 21B possono essere collegate alla prima o alla seconda porzione conduttiva 27A, 26A, rispettivamente. E' inoltre possibile considerare il caso in cui distinte prime porzioni conduttive 27A e/o distinte seconde porzioni conduttive 26A sono collegate a distinti riferimenti di massa e/o alimentazione.

Anche in questa forma di realizzazione, sia la prima porzione conduttiva 27A della guida superiore 27 sia la seconda porzione conduttiva 26A della guida inferiore 26 rivestono solamente una porzione superficiale di tali guide, in particolare solo una porzione delle

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rispettive facce superiori, non estendendosi per tutta l'area di tali guide. Questo permette il posizionamento e l'isolamento delle sonde di contatto per il trasposto dei segnali di ingresso/uscita in aree del supporto 22, in particolare delle sue guide 26 e 27, non rivestite dalle porzioni conduttive.

Ulteriormente, il supporto 22 comprende almeno un condensatore di filtraggio 30 alloggiato in una sede di alloggiamento in esso sono realizzata e montato in configurazione verticale in modo da contattare la prima porzione conduttiva 27A della guida superiore 27 e la seconda porzione conduttiva 26A della guida inferiore 26, rispettivamente.

Nella forma di realizzazione illustrata in Figura 6A, il supporto 22 comprende un primo ed un secondo condensatore di filtraggio 30A e 30B alloggiati in rispettive sedi di alloggiamento 33A e 33B. Più in particolare, le sedi di alloggiamento 33A e 33B sono realizzate nel core 27C della guida superiore 27 e i condensatori di filtraggio 30A, 30B sono alloggiati in modo da appoggiare con uno dei loro reofori sulla seconda porzione conduttiva 26A della guida inferiore 26, in corrispondenza di rispettive porzioni di alloggiamento 33A* e 33B*, un ulteriore reoforo essendo in contatto con la prima porzione conduttiva 27A della guida superiore 27.

In una forma di realizzazione, tali sedi di alloggiamento 33A, 33B sono dimensionate in modo da alloggiare condensatori discreti disponibili in commercio ed occupano un'area approssimativamente quadrata in corrispondenza delle guide superiore 27 e inferiore 26, in

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particolare di lato compreso tra 0,1 mm e 0,4 mm, preferibilmente tra 0,125 mm e 0,3 mm.

La somma dell'altezza delle sedi di alloggiamento 33A, 33B, corrispondente allo spessore della guida superiore 27, e dell'altezza della zona d'aria 34 preferibilmente è uguale alla corrispondente dimensione H2 dei condensatori di filtraggio 30A, 30B che devono essere alloggiati tra le guide, ed ha un valore compreso tra 0,2 mm e 0,7 mm, preferibilmente tra 0,25 mm e 0,6 mm. In tal modo, i condensatori di filtraggio 30A, 30B, in appoggio sulla guida inferiore 26, non sporgono dalla faccia superiore della guida superiore 27.

In una forma preferita di realizzazione, la prima e la seconda porzione conduttiva 27A, 26A comprendono anche una porzione ortogonale 27Aw, 26Aw che riveste almeno parzialmente una parete interna dei fori guida 29A, 28B di alloggiamento delle sonde di massa 21A e delle sonde di alimentazione 21B, rispettivamente. In tal modo, il collegamento elettrico tra le sonde di massa 21A e di alimentazione 21B e la rispettiva prima o seconda porzione conduttiva 27A, 26A è realizzato tramite un contatto strisciante tra di esse e la porzione ortogonale 27Aw, 26Aw della corrispondente porzione conduttiva 27A, 26A che ricopre le pareti dei fori guida 29A, 28B in cui le sonde sono alloggiate.

Si sottolinea tuttavia che, anche nel caso di porzioni conduttive 27A, 26A che non rivestono una tale parete interna dei fori guida 29A, 28B, il contatto è comunque garantito dallo spessore di tali porzioni conduttive su cui le rispettive sonde di contatto comunque

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strisciano in occasione del loro movimento durante le operazioni di testing effettuate mediante la testa di misura 20.

Come già indicato, la testa di misura 20 comprende usualmente anche ulteriori sonde di contatto, in particolare sonde destinate a trasportare segnali operativi, in particolare segnali di ingresso/uscita tra l'apparecchiatura di test e il dispositivo da testare 23, indicate anche come sonde di segnale.. Negli esempi delle Figure 6B e 6C è illustrata a titolo di esempio una sola di queste sonde, indicata nel seguito come sonda di segnale 21C.

In tal caso, come nell'esempio di illustrato in Figura 6B, la guida superiore 27 e la guida inferiore 26 comprendono rispettivi fori guida di alloggiamento 29C e 28C di tali sonde di segnale 21C, aventi rispettivi diametri D1C con valori analoghi ai valori dei diametri D1A, D1C dei fori guida 29A e 28B di alloggiamento delle sonde di massa 21A e di alimentazione 21B ed in particolare con valori compresi tra 20 μm e 70 μm, preferibilmente tra 30 μm e 40 μm. Inoltre, come in precedenza, la prima e la seconda porzione conduttiva 27A, 26A sono realizzate sulla guida superiore 27 e sulla guida inferiore 26, rispettivamente, in modo da essere separate da tali fori guida di alloggiamento 29C, 28C delle sonde di segnale 21C da opportuni diaframmi Dfc1, Dfc2, in particolare aventi dimensioni maggiori di 5 μm.

E' altresì possibile utilizzare sonde di segnale 21C almeno parzialmente isolate, ad esempio mediante rivestimento in un materiale isolante, in particolare in una porzione delle stesse in corrispondenza dei fori guida di alloggiamento 29C, 28C, così da evitare collegamenti

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elettrici indesiderati tra tali sonde di segnale 21C e le porzioni conduttive 27A e 26A, rispettivamente. In tal caso, la presenza di diaframmi tra una porzione conduttiva ed i fori guida di passaggio potrebbe non essere necessaria.

In una variante di realizzazione illustrata in Figura 6C, il supporto 22 può comprendere altresì una guida intermedia 35, inserita tra la guida superiore 27 e la guida inferiore 26, e preferibilmente in contatto con esse. In sostanza, la guida intermedia 35 occupa la zona d'aria 34 tra le guide superiore 27 ed inferiore 26. In particolare, nella guida intermedia 35 sono realizzate una prima pluralità di fori guida 36A di passaggio delle sonde di massa 21A, una seconda pluralità di fori guida 36B di passaggio delle sonde di alimentazione 21B ed una terza pluralità di fori guida 36C di alloggiamento delle sonde di segnale 21C. Saranno ulteriormente previste corrispondenti pluralità di fori guida 29*C, 28*C di passaggio delle sonde di segnale 21C realizzate nella guida superiore 27 e nella guida inferiore 26, rispettivamente.

Come in precedenza, i fori guida 36C di alloggiamento delle sonda di contatto 21 hanno diametri D1C con valori analoghi ai valori dei diametri D1A, D1C dei fori guida 29A e 28B di alloggiamento delle sonde di massa 21A e di alimentazione 21B ed in particolare con valori compresi tra 20 μm e 70 μm, preferibilmente tra 30 μm e 40 μm, mentre i fori guida 36A, 36B di passaggio delle sonde di massa 21A e di alimentazione 21B hanno rispettivi diametri D2A e D2B, maggiori dei diametri D1A, D1B e D1C, e in particolare con valori compresi tra 40 μm e 100 μm, preferibilmente tra 40 μm e 70 μm. Ulteriormente, i fori

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guida 29*C, 28*C di passaggio delle sonde di segnale 21C realizzati nella guida superiore 27 e nella guida inferiore 26, rispettivamente, hanno diametri D2C sostanzialmente uguali tra loro ed ai diametri D2A e D2B degli altri fori guida di passaggio realizzati nelle guide superiore 27 e inferiore 26, in particolare con valori compresi tra 40 μm e 100 μm, preferibilmente tra 40 μm e 70 μm.

Come in precedenza, tale dimensionamento dei fori guida di alloggiamento e di passaggio garantisce che solo le sonde di massa 21A e le sonde di alimentazione 21B siano in contatto con una porzione conduttiva realizzata su una rispettiva guida, le sonde di segnale 21C essendo in contatto solamente con la guida intermedia 35, opportunamente realizzata in un materiale non conduttivo, ad esempio in un materiale ceramico quale nitruro di silicio, oppure in un materiale vetroso o a base silicio, oppure in materiale poliammidico, oppure in qualunque altro materiale dielettrico adatto.

In tal modo, le sonde di segnale 21C risultano isolate rispetto ai riferimenti di alimentazione e massa, in contatto strisciante solo con la guida intermedia 35 che non viene dotata di alcuna porzione conduttiva.

Come in precedenza, la guida superiore 27 e la guida inferiore 26 presentano rispettive porzioni conduttive, realizzate su un almeno una faccia di tali guide, ad esempio una rispettiva faccia superiore, atte a realizzare il contatto con i condensatori di filtraggio 30A, 30B, come spiegato in relazione alla Figura 6A.

Inoltre, nella guida intermedia 35 sono realizzate rispettive

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ulteriori sedi di alloggiamento 37A e 37B di tali condensatori di filtraggio 30A, 30B, di dimensioni analoghe alle e posizionate in corrispondenza delle sedi di alloggiamento 33A e 33B predisposte nella guida superiore 27. In particolare, la somma dell'altezza delle sedi di alloggiamento 33A, 33B e delle ulteriori sedi di alloggiamento 37A e 37B, corrispondente alla somma di uno spessore Sp1 della guida superiore 27 e di uno spessore Sp3 della guida intermedia 35 è preferibilmente uguale alla corrispondente dimensione H2 dei condensatori di filtraggio 30A, 30B che devono essere alloggiati tra le guide, ed ha un valore compreso tra 250 μm e 600 μm, preferibilmente 400 μm. In tal modo, i condensatori di filtraggio 30A, 30B, in appoggio sulla guida inferiore 26, non sporgono dalla faccia superiore della guida superiore 27.

Come in precedenza, i condensatori di filtraggio 30A, 30B sono in particolare in appoggio sulla guida inferiore 26, in corrispondenza di rispettive porzioni di alloggiamento 33A*, 33B* realizzate sulla seconda porzione conduttiva 26A, rispettivamente.

La guida inferiore 26 ha a sua volta uno spessore Sp2 con valore compreso tra 80 μm e 500 μm, più preferibilmente pari a 250 μm.

Inoltre, come in precedenza, la prima porzione conduttiva 27A è realizzata sulla prima guida 27 in modo tale da non contattare i fori guida 29B di passaggio delle sonde di alimentazione 21B ed i fori guida 29C di passaggio delle sonde di segnale 21C, più in particolare in modo da essere separata da tali fori guida da rispettivi diaframmi; analogamente, la seconda porzione conduttiva 26A è realizzata sulla

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seconda guida 26 in modo tale da non contattare i fori guida 28A di passaggio delle sonde di massa 21A ed i fori guida 28C di passaggio delle sonde di segnale 21C, più in particolare in modo da essere separata da tali fori guida da rispettivi diaframmi.

Anche in tal caso è possibile utilizzare sonde di contatto 21A, 21B e 21C almeno parzialmente isolate, in particolare in una porzione delle stesse in corrispondenza dei rispettivi fori guida di alloggiamento 28A, 29B, 28*C e 29*C, così da evitare collegamenti elettrici indesiderati tra tali sonde di contatto 21A, 21B e 21C e le porzioni conduttive 27A e 26A, rispettivamente. In tal caso, la presenza di diaframmi tra una porzione conduttiva ed i fori guida di passaggio potrebbe non essere necessaria.

E' opportuno sottolineare che, nelle applicazioni pratiche, il supporto 22 comprende numerosi fori guida che devono essere collegati mediante pattern complessi, i fori guida di alloggiamento delle sonde di massa e di alimentazione essendo spesso alternati. Opportunamente, utilizzando le porzioni conduttive realizzate sulle superfici di tale supporto 22, o di sue rispettive guide 26 e 27, è possibile realizzare tali collegamenti e consentire l'alloggiamento dei condensatori di filtraggio 30.

Più in particolare, con riferimento alla Figura 7, è schematicamente illustrato un supporto 22 comprendente una pluralità di fori guida di alloggiamento di sonde di contatto. Più in particolare, il supporto 22 comprende almeno un primo gruppo di fori guida, ad esempio fori guida 25A di alloggiamento di sonde di massa 21A,

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distribuiti secondo un primo pattern P1, nonché almeno un secondo gruppo di fori guida, ad esempio fori guida 25B di alloggiamento di sonde di alimentazione 21B, distribuiti secondo un secondo pattern P2.

Nella forma di realizzazione della Figura 7, il supporto 22 comprende una prima porzione conduttiva 22A realizzata su una sua prima faccia Fa, che include e mette in collegamento il primo gruppo di fori guida 25A del primo pattern P1 e comprende rispettive aree non conduttive A1, A2, A3 realizzate in corrispondenza di fori guida che non appartengono a tale primo pattern P1. Analogamente, il supporto 22 comprende una seconda porzione conduttiva 22B realizzata su una sua seconda faccia Fb, mostrata in trasparenza in figura, tale seconda porzione conduttiva 22B includendo e mettendo in collegamento il secondo gruppo di fori guida 25B del primo pattern P2 e comprendendo rispettive aree non conduttive B1, B2 realizzate in corrispondenza di fori guida che non appartengono a tale secondo pattern P2. La prima porzione conduttiva 22A è quindi in tal caso connessa ad un riferimento di massa GND e la seconda porzione conduttiva 22B ad un riferimento di alimentazione PWR.

Il supporto 22 comprende inoltre almeno un condensatore di filtraggio 30 disposto in modo da aver rispettivi reofori in contatto con la prima e la seconda porzione conduttiva 22A e 22B, rispettivamente.

Anche in tal caso, la testa di misura 20 può comprendere sonde di contatto parzialmente rivestite mediante materiale isolante, preferibilmente in una porzione in corrispondenza di fori guida inclusi in porzioni conduttive a cui tali sonde di contatto non devono essere

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collegate elettricamente.

In conclusione, vantaggiosamente secondo l'invenzione, si ottiene una testa di misura con migliorate prestazioni in termini di filtraggio dei segnali, in particolare dei segnali di alimentazioni (PWR) e massa (GND) e come tale in grado di migliorare le prestazioni in frequenza della scheda che la comprende, riducendone l'impedenza ad alta frequenza.

Si è in particolare potuto verificare che una scheda di misura comprendente la testa di misura secondo la presente invenzione consente di più che raddoppiare le prestazioni in frequenza rispetto alle soluzioni note.

Opportunamente, la testa di misura secondo la presente invenzione consente di alloggiare condensatori discreti disponibili sul mercato. Inoltre, la presenza di porzioni conduttive che connettono elettricamente gruppi di fori guida e quindi di sonde di contatto in essi inserite consente di diminuire il numero complessivo di condensatori necessario, e quindi la necessità di prevedere corrispondenti aree delle guide per l'inserimento di tali condensatori, aree che devono essere prive di fori guida.

Ovviamente alla testa di misura sopra descritta un tecnico del ramo, allo scopo di soddisfare esigenze contingenti e specifiche, potrà apportare numerose modifiche e varianti, tutte comprese nell'ambito di protezione dell'invenzione quale definito dalle seguenti rivendicazioni.

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RIVENDICAZIONI

1. Testa di misura (20) comprendente una pluralità di sonde di contatto (21A, 21B, 21C) alloggiate in modo scorrevole in rispettive pluralità di fori guida (25A, 27A, 29A, 36A; 25B, 27B, 29B, 36B; 28C, 29C, 36C) realizzati in un supporto (22), piastriforme, detta pluralità di sonde di contatto (21A, 21B, 21C) comprendendo almeno un primo gruppo di sonde di contatto (21A, 21B) che trasportano segnali di massa e di alimentazione (GND, PWR) caratterizzata dal fatto di comprendere almeno un condensatore di filtraggio (30) avente almeno un reoforo (31) collegato elettricamente ad una porzione conduttiva (22A, 27A; 22B, 26A) realizzata su detto supporto (22) ed includente almeno un foro guida di alloggiamento (25A, 29A; 25B, 28B) di una sonda di contatto (21A, 21B) di detto primo gruppo.

2. Testa di misura (20) secondo la rivendicazione 1, caratterizzata dal fatto che detta porzione conduttiva (22A, 27A; 22B, 26A) è collegata ad un primo riferimento di tensione scelto tra un riferimento di massa ed un riferimento di alimentazione (GND, PWR), rispettivamente, e dal fatto che detto condensatore di filtraggio (30) comprende un ulteriore reoforo (32) connesso ad un secondo distinto riferimento di tensione, scelto tra un riferimento di alimentazione e di massa (PWR, GND), rispettivamente.

3. Testa di misura (20) secondo la rivendicazione 1 o 2, caratterizzata dal fatto che detta porzione conduttiva (22A, 27A; 22B, 26A) include e mette in collegamento elettrico una pluralità di fori guida di alloggiamento (25A, 29A; 25B, 28B) di dette sonde di contatto (21A,

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21B) di detto primo gruppo.

4. Testa di misura (20) secondo una delle rivendicazioni precedenti, caratterizzata dal fatto che detta porzione conduttiva (22A, 27A; 22B, 26A) comprende una porzione ortogonale (22Aw, 27Aw; 22Bw, 26Aw) che si estende almeno parzialmente all'interno di detti fori guida di alloggiamento (25A, 29A; 25B, 28B) di dette sonde di contatto (21A, 21B) di detto primo gruppo.

5. Testa di misura (20) secondo una delle rivendicazioni precedenti, caratterizzata dal fatto di comprendere distinte porzioni conduttive includenti distinte pluralità di fori guida di alloggiamento e collegate a distinti riferimenti di tensione, scelti tra riferimenti di alimentazione e di massa (PWR, GND).

6. Testa di misura (20) secondo una qualsiasi delle rivendicazioni precedenti, caratterizzata dal fatto che detto supporto (22) comprende almeno una sede di alloggiamento (33) di detto condensatore di filtraggio (30), detta porzione conduttiva (22A, 22B) estendendosi anche in corrispondenza di detta sede di alloggiamento (33) per realizzare una connessione con detto almeno un reoforo (31) di detto condensatore di filtraggio (30).

7. Testa di misura (20) secondo la rivendicazione 6, caratterizzata dal fatto che detta sede di alloggiamento (33) di detto condensatore di filtraggio (30) si estende in detto supporto (22) per una dimensione (H1, H2) pari ad una corrispondente altezza di detto condensatore di filtraggio (30).

8. Testa di misura (20) secondo una delle rivendicazioni

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precedenti, caratterizzata dal fatto che detto supporto (22) comprende una prima porzione conduttiva (22A) realizzata in corrispondenza di una sua prima faccia (Fa) ed una seconda porzione conduttiva (22B) realizzata in corrispondenza di una sua seconda ed opposta faccia (Fb), detta sede di alloggiamento (33) di detto condensatore di filtraggio (30) essendo realizzata in detto supporto (22) in modo da mettere in comunicazione dette prima e seconda faccia (Fa, Fb), detto condensatore di filtraggio (30) avendo un reoforo (31) connesso a detta prima porzione conduttiva (22A) ed un ulteriore reoforo (32) connesso a detta seconda porzione conduttiva (22B), dette prima e seconda porzione conduttiva (22A, 22B) essendo connesse a rispettivi distinti riferimenti di tensione, scelti tra un riferimento di alimentazione e di massa (PWR, GND).

9. Testa di misura (20) secondo la rivendicazione 8, caratterizzata dal fatto che detta prima porzione conduttiva (22A) include almeno un primo foro guida di alloggiamento (25A) di una sonda di contatto (21A) di detto primo gruppo e detta seconda porzione conduttiva (22B) include almeno un secondo foro guida di alloggiamento (25B) di una ulteriore sonda di contatto (21B) di detto primo gruppo, detta prima porzione conduttiva (22A) essendo realizzata in modo tale da non contattare detto secondo foro guida di alloggiamento (25B) essendo separata dallo stesso da un primo diaframma (Df1) e detta seconda porzione conduttiva (22B) essendo realizzata in modo tale da non contattare detto primo foro guida di alloggiamento (25A) essendo separata dallo stesso da un secondo diaframma (Df2), detti primo e

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secondo diaframma (Df1, Df2) garantendo l'isolamento di detta sonda di contatto (21A) e detta ulteriore sonda di contatto (21B) da dette seconda e prima porzione conduttiva (22B, 22A), rispettivamente.

10. Testa di misura (20) secondo una delle rivendicazioni precedenti, caratterizzata dal fatto che detto supporto (22) comprende almeno una coppia di guide (27, 26), piastriformi e parallele tra loro, separate da una zona d'aria (34), ciascuna di dette guide (27, 26) essendo dotata di una pluralità di fori guida di alloggiamento (29A, 28B) di dette sonde di contatto (21A, 21B) di detto primo gruppo ed una corrispondente pluralità di fori guida di passaggio (29B, 28A) di dette sonde di contatto (21B, 21A), ciascuna di dette guide (27, 26) avendo almeno porzione conduttiva (27A, 26A) includente almeno un foro guida di alloggiamento (29A, 28B) di una sonda di contatto (21A, 21B) di detto primo gruppo.

11. Testa di misura (20) secondo la rivendicazione 10, caratterizzata dal fatto che dette porzioni conduttive (27A, 26A) di dette guide (27, 26) sono separate da detti fori guida di passaggio (29B, 28A) di dette sonde di contatto (21B, 21A) da diaframmi (Dfa1, Dfa2, Dfb1, Dfb2) che garantiscono l'isolamento di dette sonde di contatto (21B, 21A) da dette porzioni conduttive (27A, 26A).

12. Testa di misura (20) secondo la rivendicazione 10 o 11, caratterizzata dal fatto che detti fori guida di alloggiamento (29A, 28B) hanno rispettivi primi diametri (D1A, D1B), preferibilmente uguali tra loro, e inferiori a rispettivi secondi diametri (D2A, D2B) di detti corrispondenti fori guida di passaggio (28A, 29B), preferibilmente uguali

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tra loro, con il termine diametro intendendosi una dimensione trasversale massima di detti fori guida, anche di forma non circolare, in corrispondenza di una sezione trasversale presa in corrispondenza di un piano definito da dette guide (27, 26).

13. Testa di misura (20) secondo una delle rivendicazioni da 10 a 12, caratterizzata dal fatto che dette porzioni conduttive (27A, 26A) sono collegate ad un distinto riferimento di tensione scelto tra un riferimento di massa ed un riferimento di alimentazione (GND, PWR).

14. Testa di misura (20) secondo una delle rivendicazioni da 10 a 13, caratterizzata dal fatto che dette porzioni conduttive (27A, 26A) sono realizzate su corrispondenti facce di dette guide (27, 26).

15. Testa di misura (20) secondo una delle rivendicazioni da 10 a 14, caratterizzata dal fatto che almeno una porzione conduttiva (27A; 26A) include e mette in collegamento elettrico una pluralità di fori guida di alloggiamento (29A; 28B) di dette sonde di contatto (21A, 21B) di detto primo gruppo.

16. Testa di misura (20) secondo una delle rivendicazioni da 10 a 15, caratterizzata dal fatto che una prima guida (27) di dette guide (27, 26) comprende una sede di alloggiamento (33A; 33B) di detto condensatore di filtraggio (30A, 30B), detta porzione conduttiva (27A) di detta prima guida (27) estendendosi anche in corrispondenza di detta sede di alloggiamento (37A; 37B).

17. Testa di misura (20) secondo la rivendicazione 16, caratterizzata dal fatto che detto condensatore di filtraggio (30A, 30B) è inserito in detta sede di alloggiamento (37A; 37B) ed in appoggio su

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detta porzione conduttiva (26A) di detta seconda guida (26).

18. Testa di misura (20) secondo una delle rivendicazioni da 10 a 17, caratterizzata dal fatto che dette prima e seconda guida (27, 26) comprendono ulteriormente una pluralità di fori guida di alloggiamento (29C, 28C) di sonde di contatto (21C) di un secondo gruppo di sonde di contatto che trasportano segnali operativi, dette porzioni conduttive (27A, 26A) di dette guide (27, 26) essendo separate da detti fori guida di alloggiamento (29C, 28C) di sonde di contatto (21C) di detto secondo gruppo da opportuni diaframmi (Dfc1, Dfc2) che garantiscono l'isolamento di dette sonde di contatto (21C) di detto secondo gruppo da dette porzioni conduttive (27A, 26A).

19. Testa di misura (20) secondo la rivendicazione 18, caratterizzata dal fatto che dette sonde di contatto (21C) di detto secondo gruppo sono parzialmente rivestite mediante materiale isolante, preferibilmente in una porzione in corrispondenza di detti fori guida di alloggiamento (29C, 28C).

20. Testa di misura (20) secondo una delle rivendicazioni da 10 a 19, caratterizzata dal fatto che dette sonde di contatto (21A, 21B) di detto primo gruppo sono parzialmente rivestite mediante materiale isolante, preferibilmente in una porzione in corrispondenza di detti fori guida di passaggio (29B, 28A).

21. Testa di misura (20) secondo una delle rivendicazioni da 10 a 20, caratterizzata dal fatto che detto supporto (22) comprende ulteriormente una guida intermedia (35) inserita tra detta coppia di guide (27, 26) occupando detta zona d'aria (34), detta guida intermedia

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(35) essendo dotata di una pluralità di fori guida di alloggiamento (36C) di sonde di contatto (21C) di un secondo gruppo di sonde di contatto che trasportano segnali operativi ed una corrispondente pluralità di fori guida di passaggio (36A, 36B) di sonde di contatto (21A, 21B) di detto primo gruppo, detta guida intermedia (35) essendo in contatto strisciante solamente con dette sonde di contatto (21C) di detto secondo gruppo.

22. Testa di misura (20) secondo la rivendicazione 21, caratterizzata dal fatto che detti fori guida di alloggiamento (36C) di dette sonde di contatto (21C) di detto secondo gruppo hanno rispettivi primi diametri (D1C), preferibilmente uguali tra loro, e inferiori a rispettivi secondi diametri (D2C) di detti corrispondenti fori guida di passaggio (36A, 36B), preferibilmente uguali tra loro, con il termine diametro intendendosi una dimensione trasversale massima di detti fori guida, anche di forma non circolare, in corrispondenza di una sezione trasversale presa in corrispondenza di un piano definito da detta guida intermedia (35).

23. Testa di misura (20) secondo la rivendicazione 21 o 22, caratterizzata dal fatto che detta guida intermedia (35) comprende una ulteriore sede di alloggiamento (37A, 37B) di detto condensatore di filtraggio (30A, 30B), di dimensioni analoghe e posizionata in corrispondenza di detta sede di alloggiamento (33A, 33B) realizzata in detta prima guida (27) di detta coppia di guide (27, 26).

24. Testa di misura (20) secondo una qualsiasi delle rivendicazioni precedenti, caratterizzata dal fatto che detto supporto

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(22) è un supporto inferiore di una coppia di supporti di alloggiamento di dette sonde di contatto (21A, 21B, 21C), con inferiore intendendosi più vicino ad un dispositivo da testare (23) integrato su wafer, detto condensatore di filtraggio (30) essendo così posizionato in prossimità di punte di contatto di dette sonde di contatto (21A, 21B, 21C) atte ad andare in battuta su pad di contatto (23A, 23B) di detto dispositivo da testare (23).

25. Testa di misura (20) secondo una delle rivendicazioni precedenti, caratterizzata dal fatto di comprendere una pluralità di condensatori di filtraggio (30, 30A, 30B).

26. Testa di misura (20) secondo una delle rivendicazioni precedenti, caratterizzata dal fatto che detta porzione conduttiva (22A, 22B) si estende sostanzialmente su tutto detto supporto (22) e ricopre una sua faccia (Fa, Fb), includendo e mettendo in collegamento un primo gruppo di fori guida (25A, 25B) di alloggiamento di sonde di contatto (21A, 21B) di detto primo gruppo, detta porzione conduttiva (22A, 22B) comprendendo ulteriormente rispettive aree non conduttive (A1, A2, A3, B1, B2) in corrispondenza di fori guida di alloggiamento di sonde di contatto (21A, 21B, 21C) non appartenenti a detto primo gruppo.

27. Testa di misura (20) secondo una delle rivendicazioni precedenti, caratterizzata dal fatto di comprendere sonde di contatto (21A, 21B, 21B) parzialmente rivestite mediante materiale isolante, preferibilmente in una porzione in corrispondenza di fori guida inclusi in porzioni conduttive a cui dette sonde di contatto (21A, 21B, 21C) non

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devono essere collegate elettricamente.

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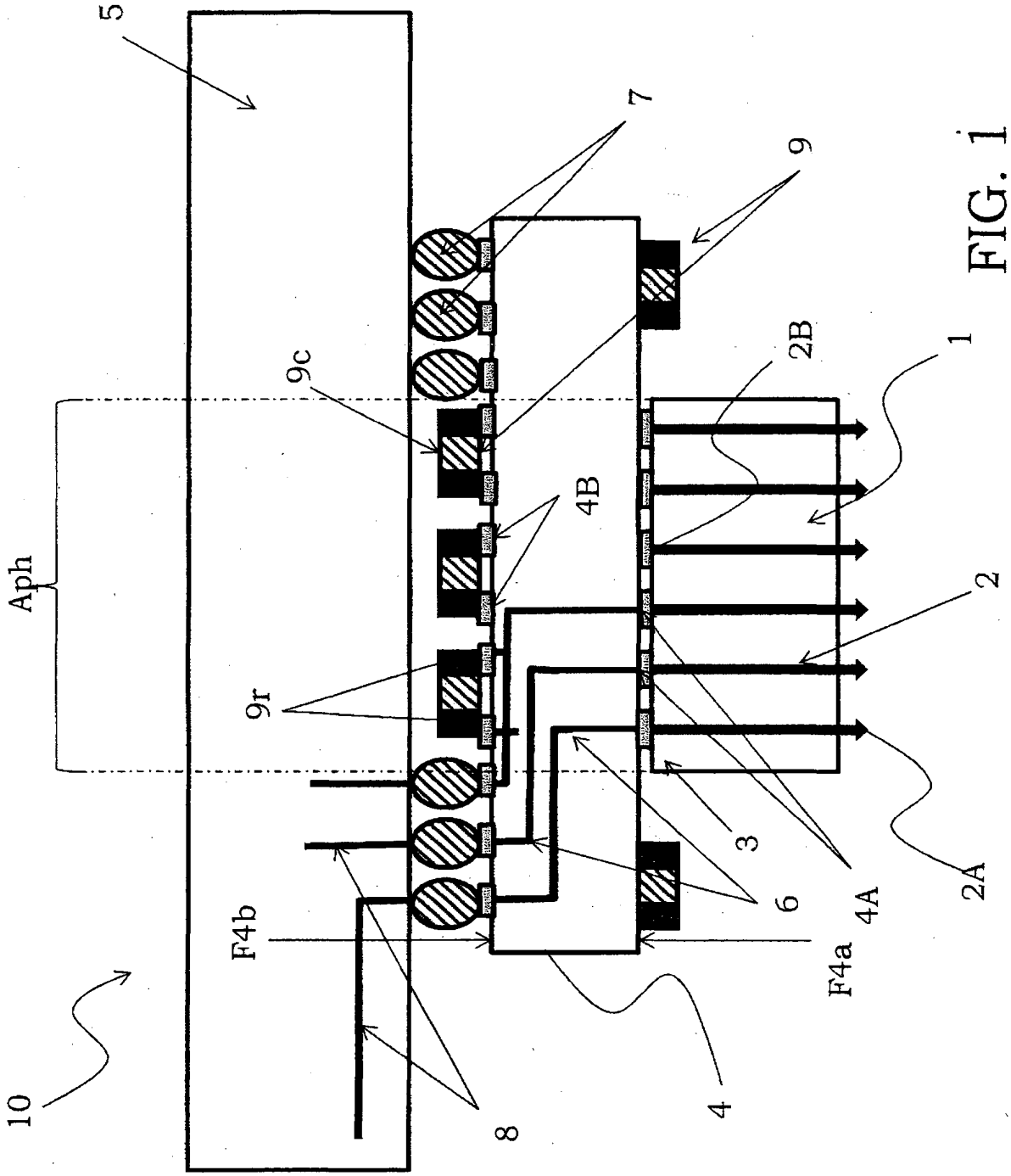


FIG. 1
ARTE NOTA

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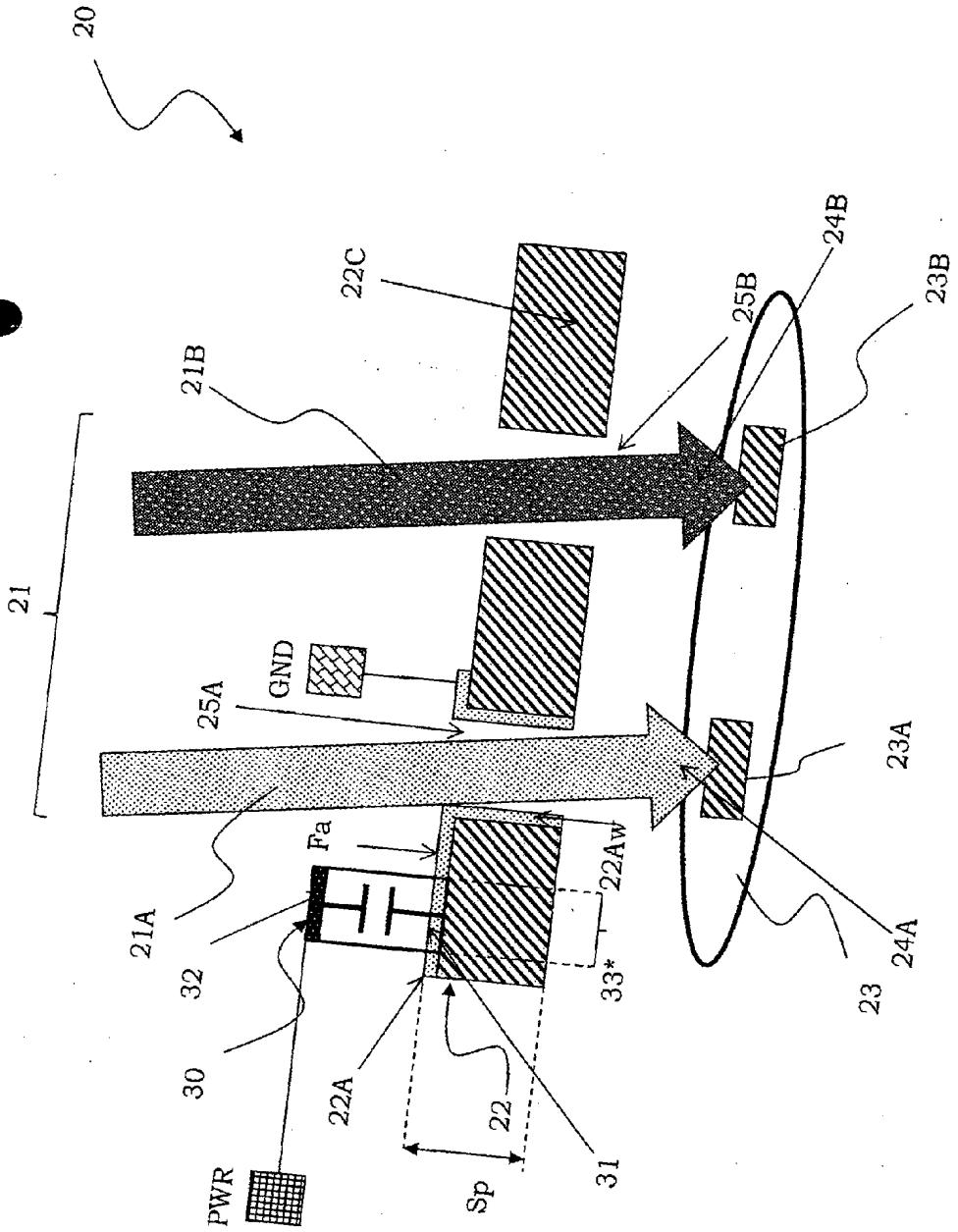


FIG. 2A

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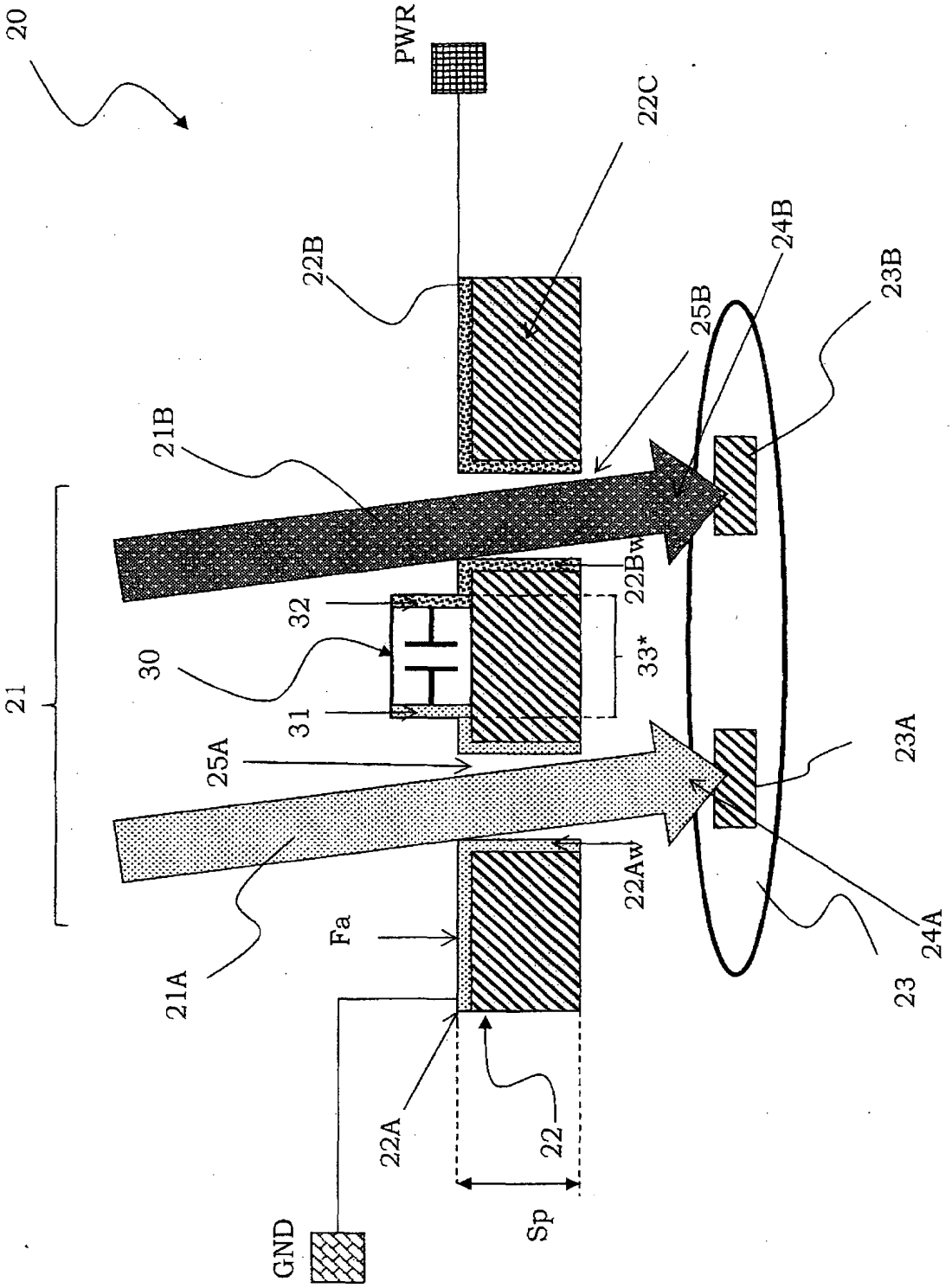


FIG. 2B

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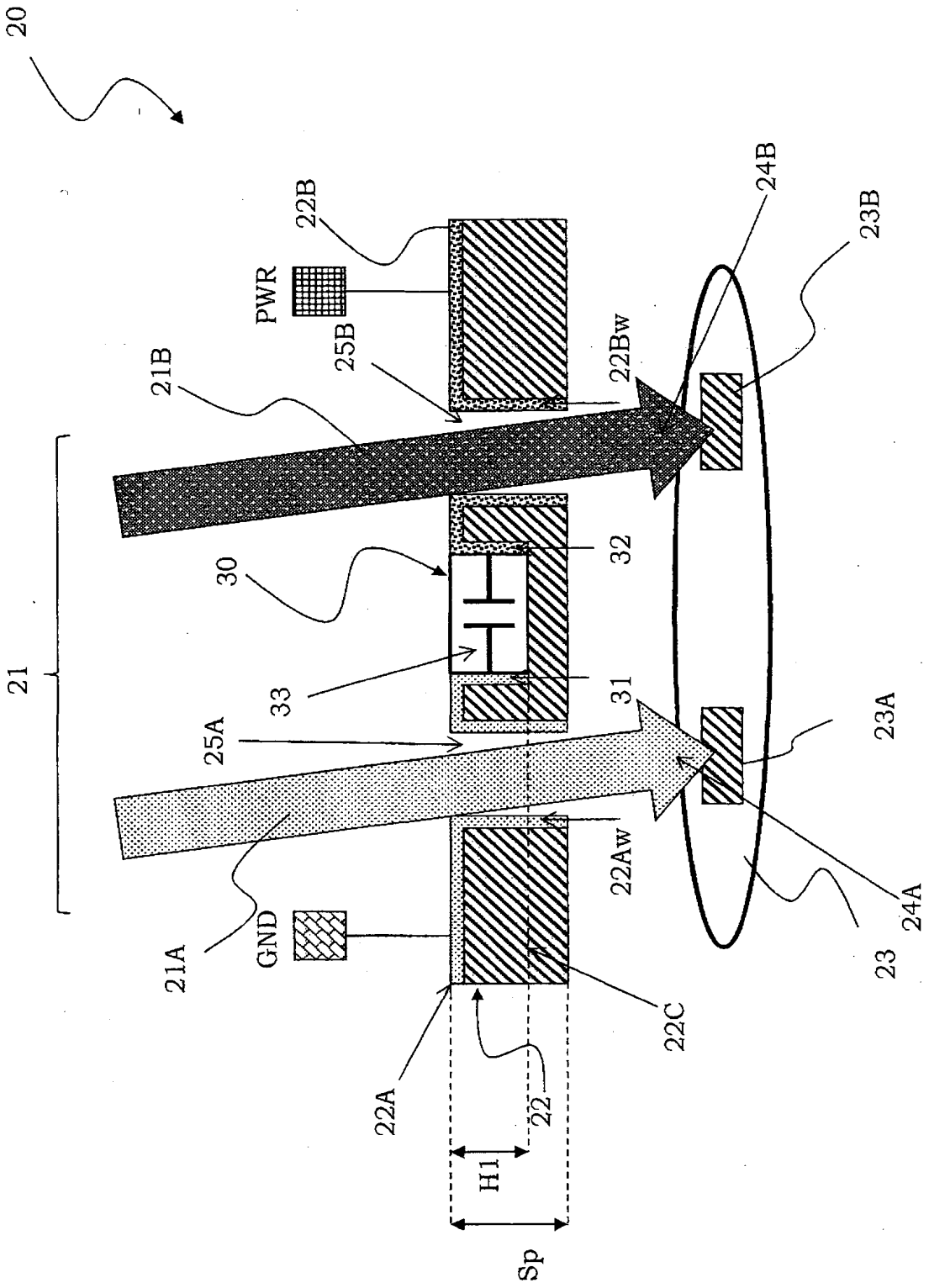


FIG. 2C

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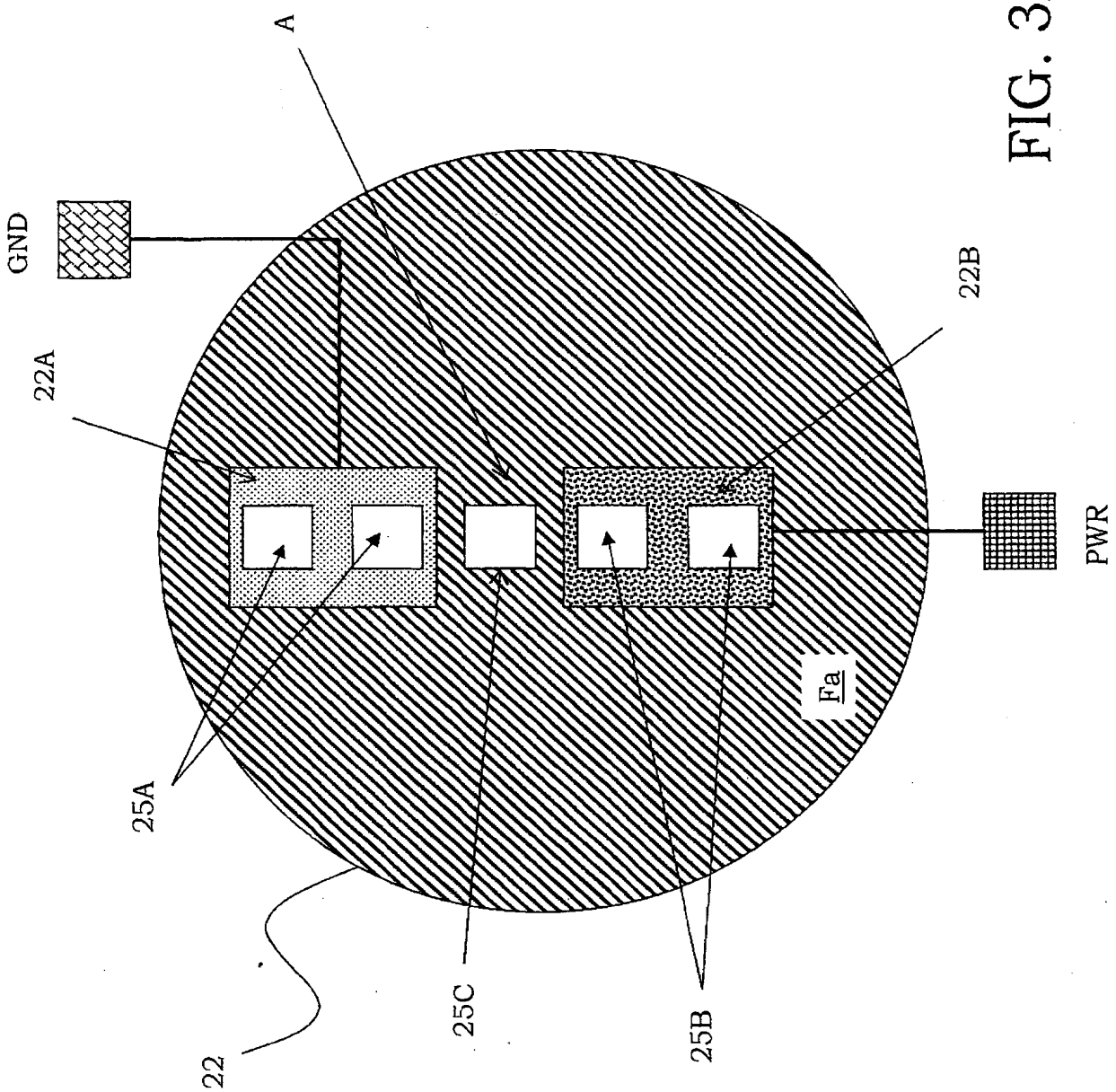


FIG. 3A

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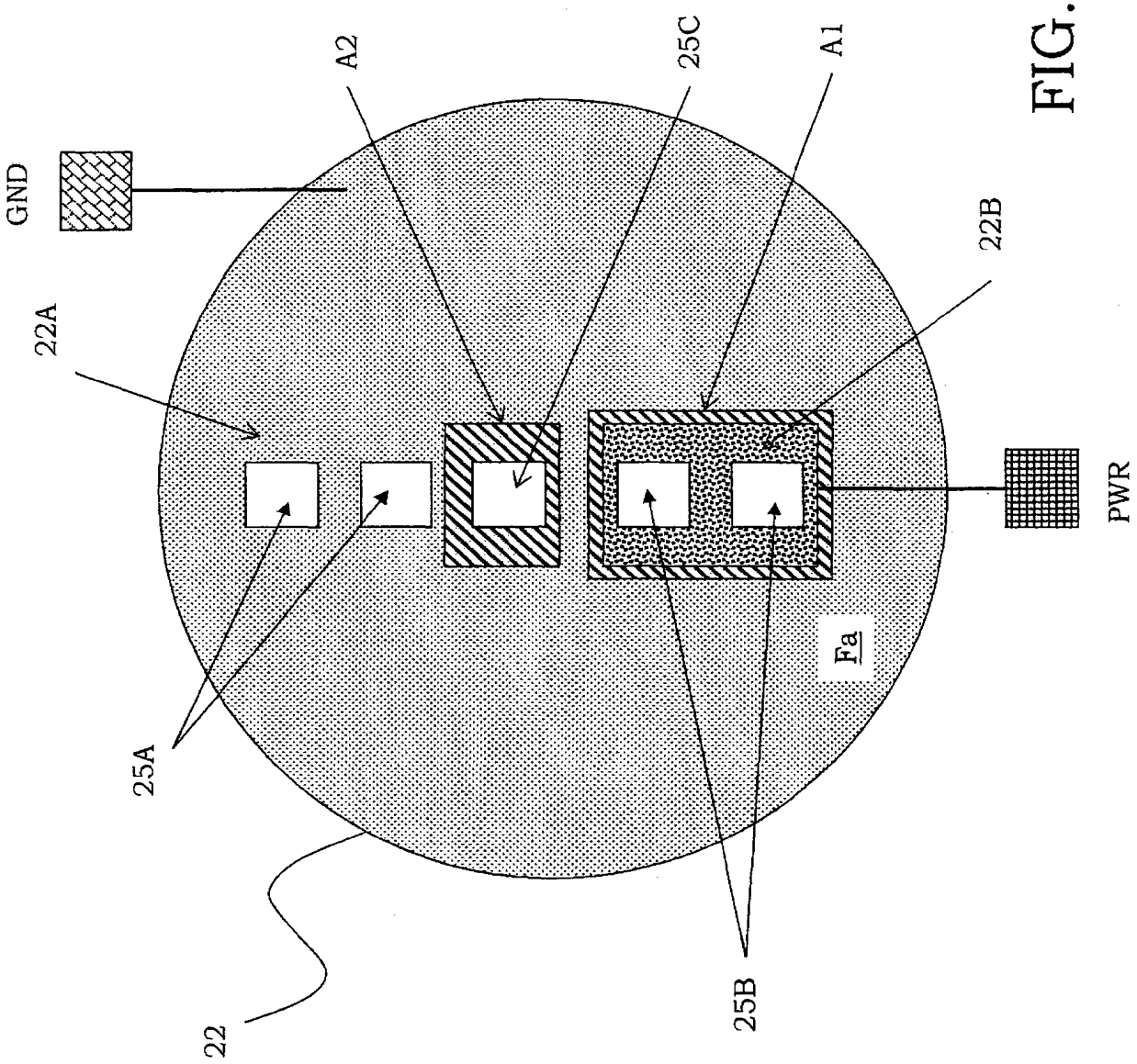


FIG. 3B

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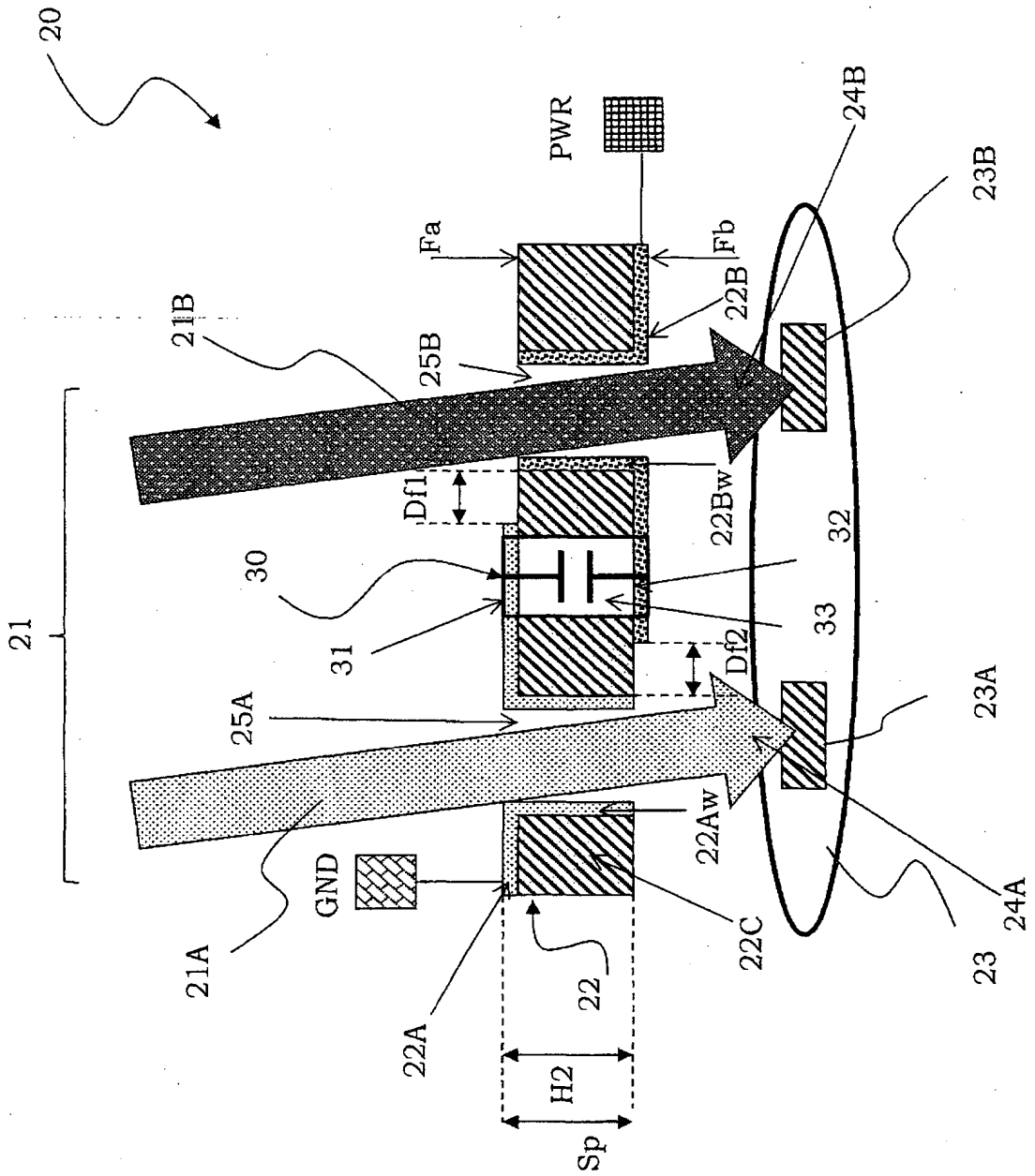


FIG. 4

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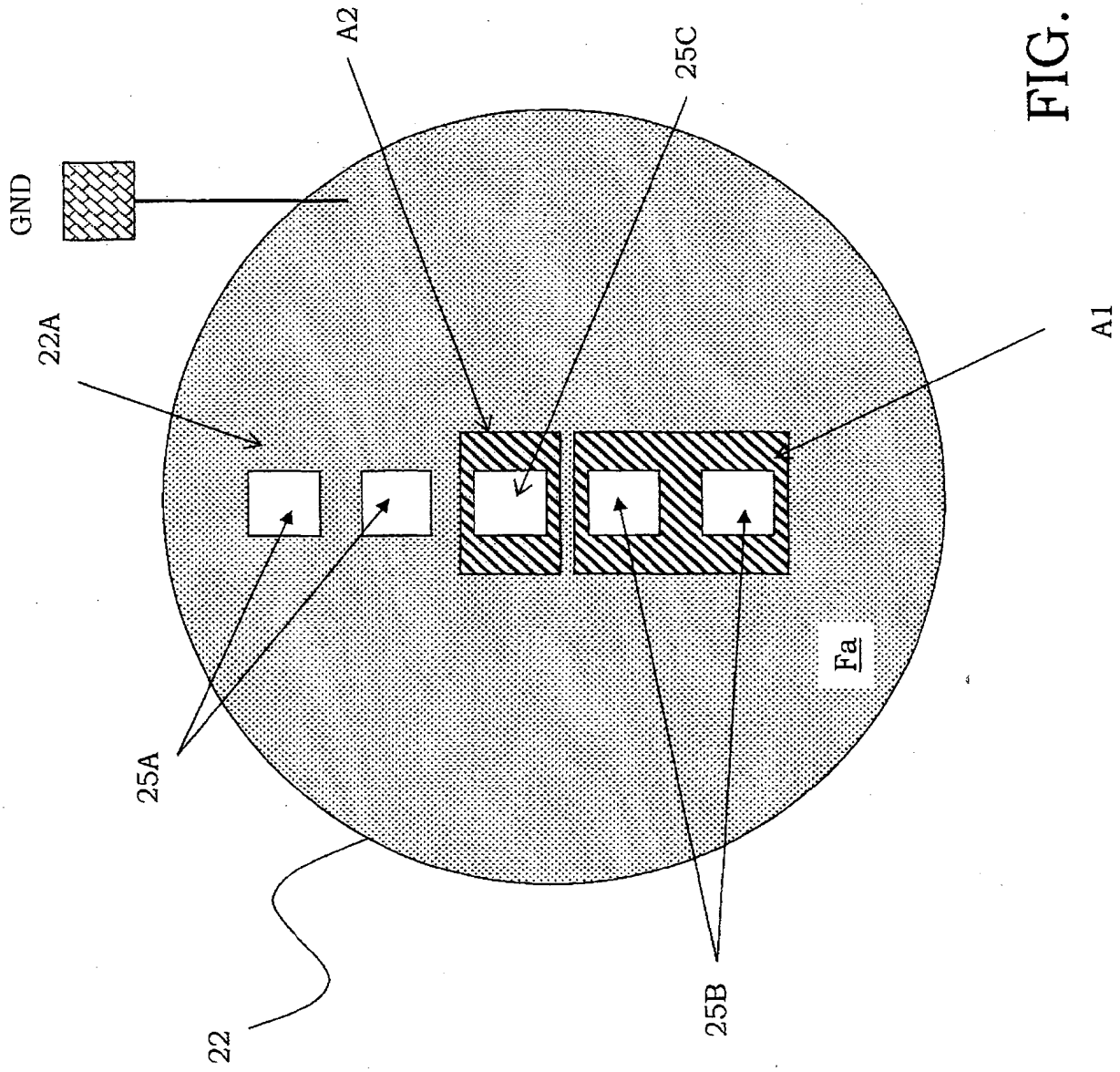


FIG. 5A

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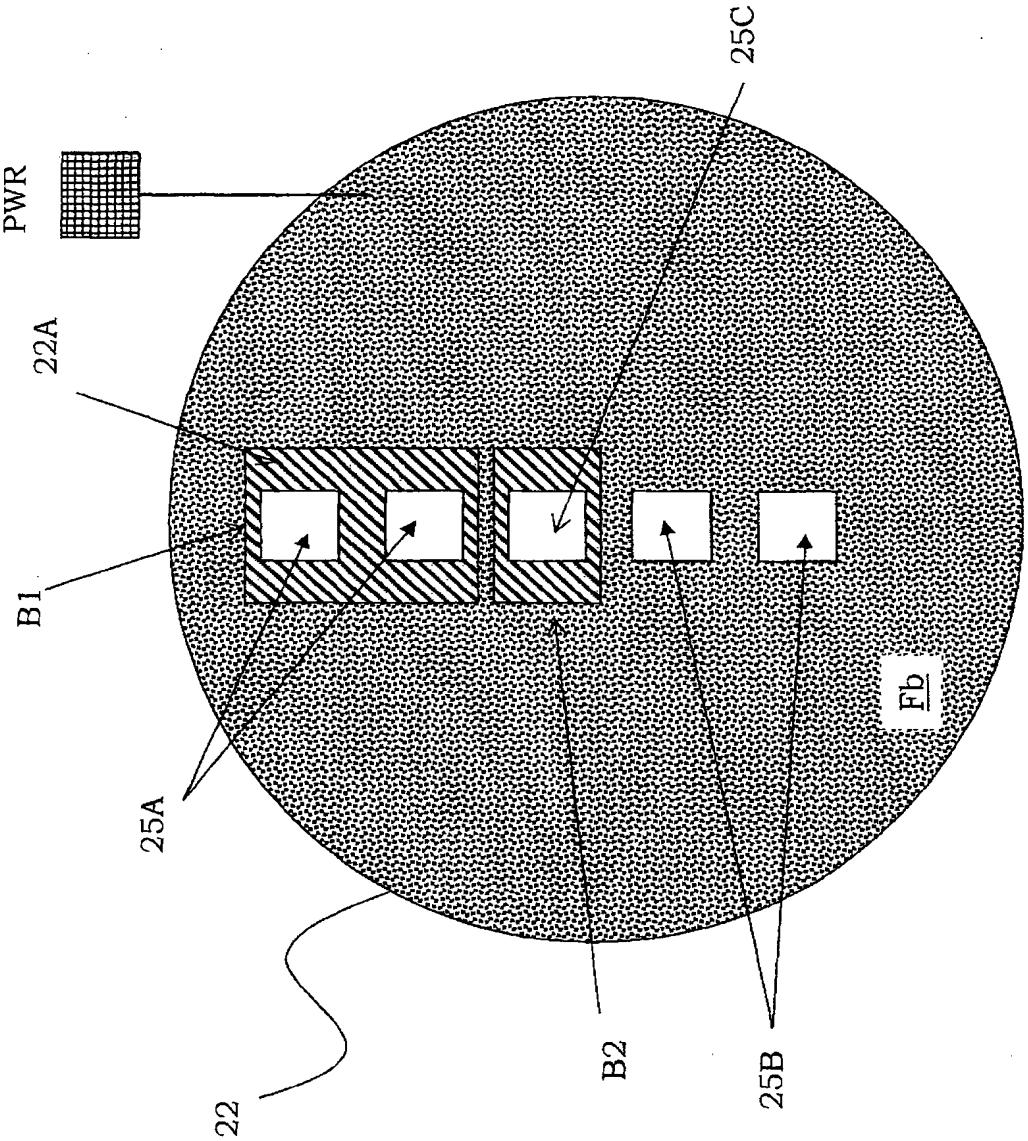


FIG. 5B

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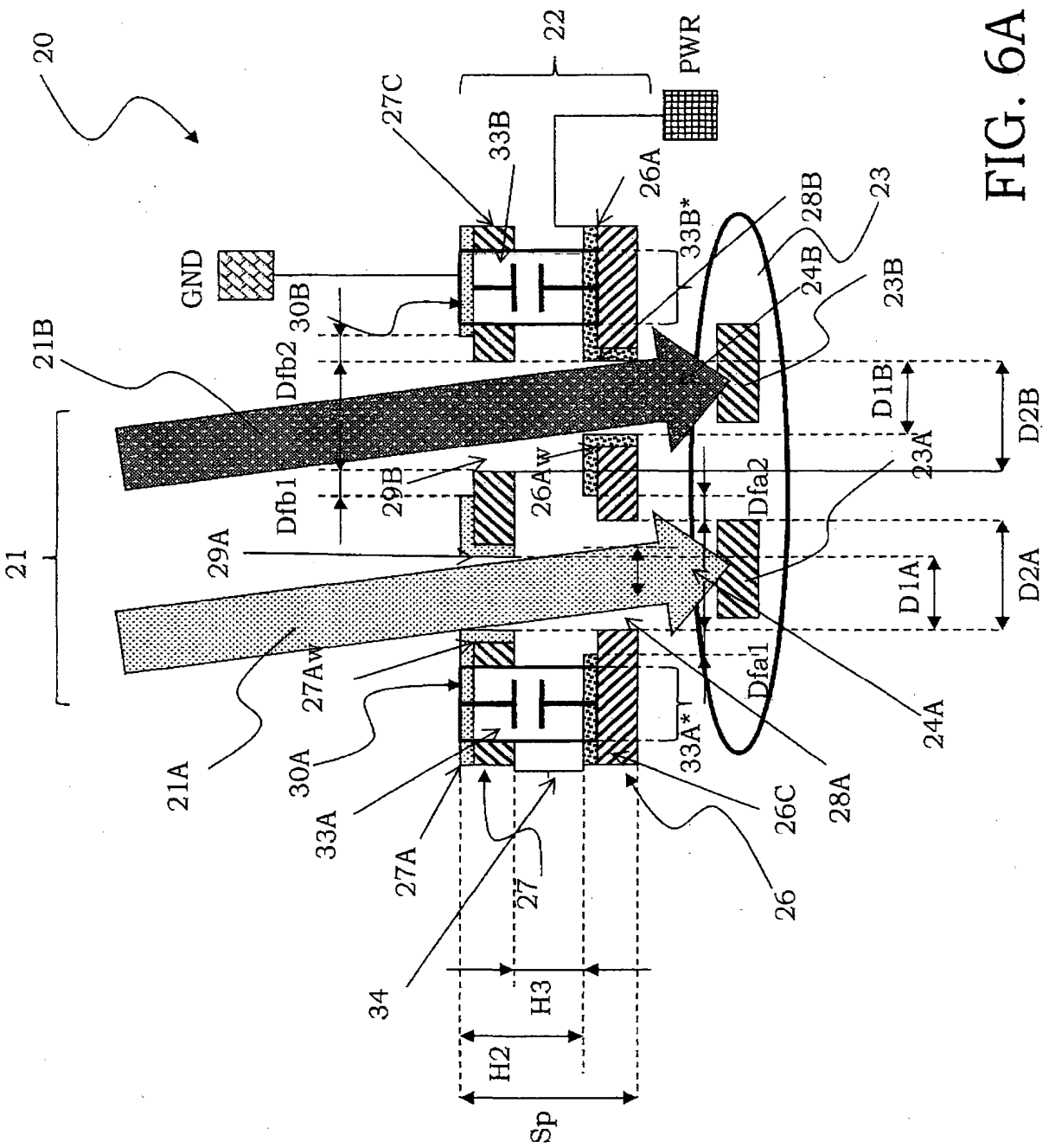


FIG. 6A

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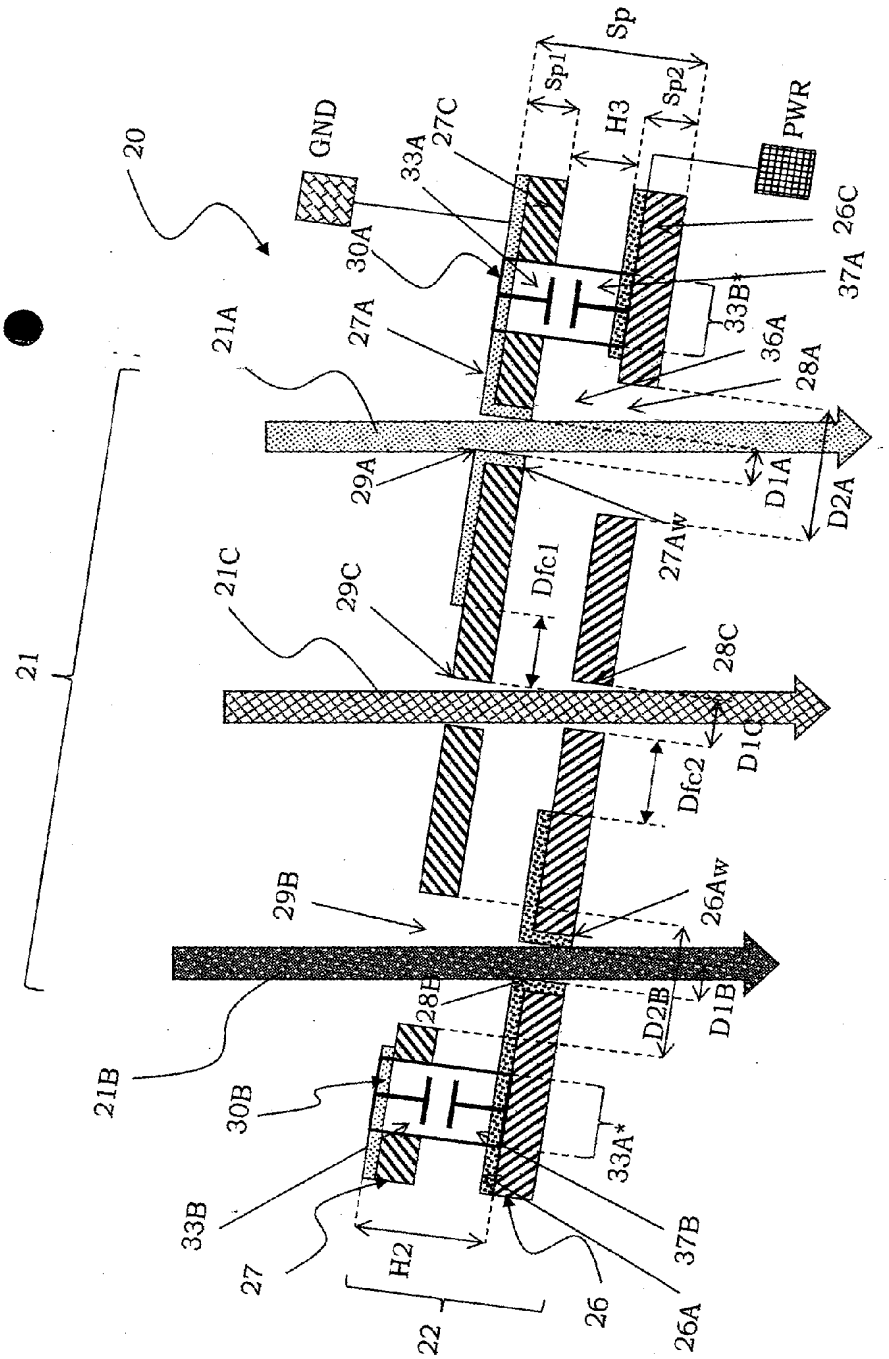


FIG. 6B

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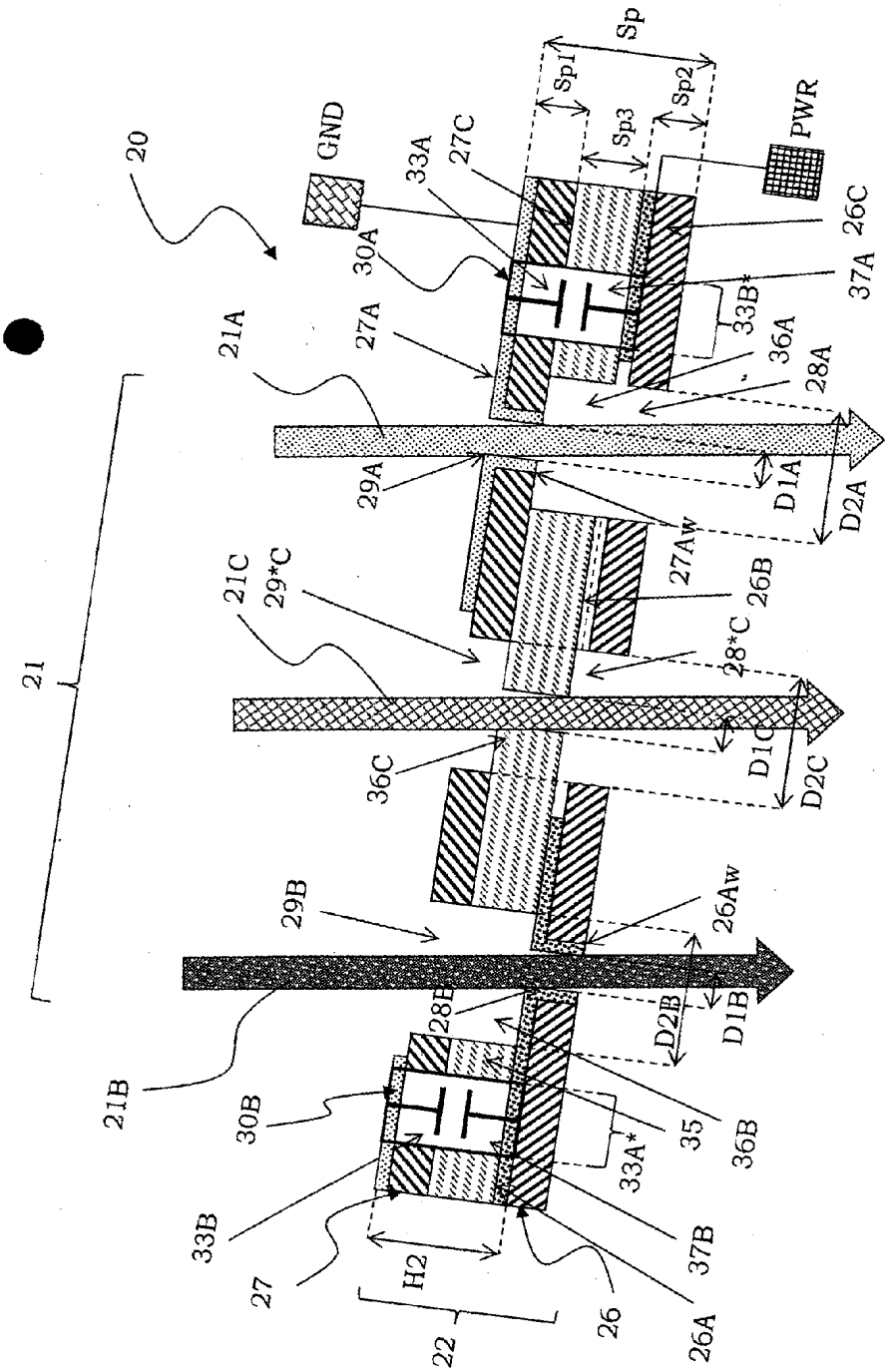


FIG. 6C

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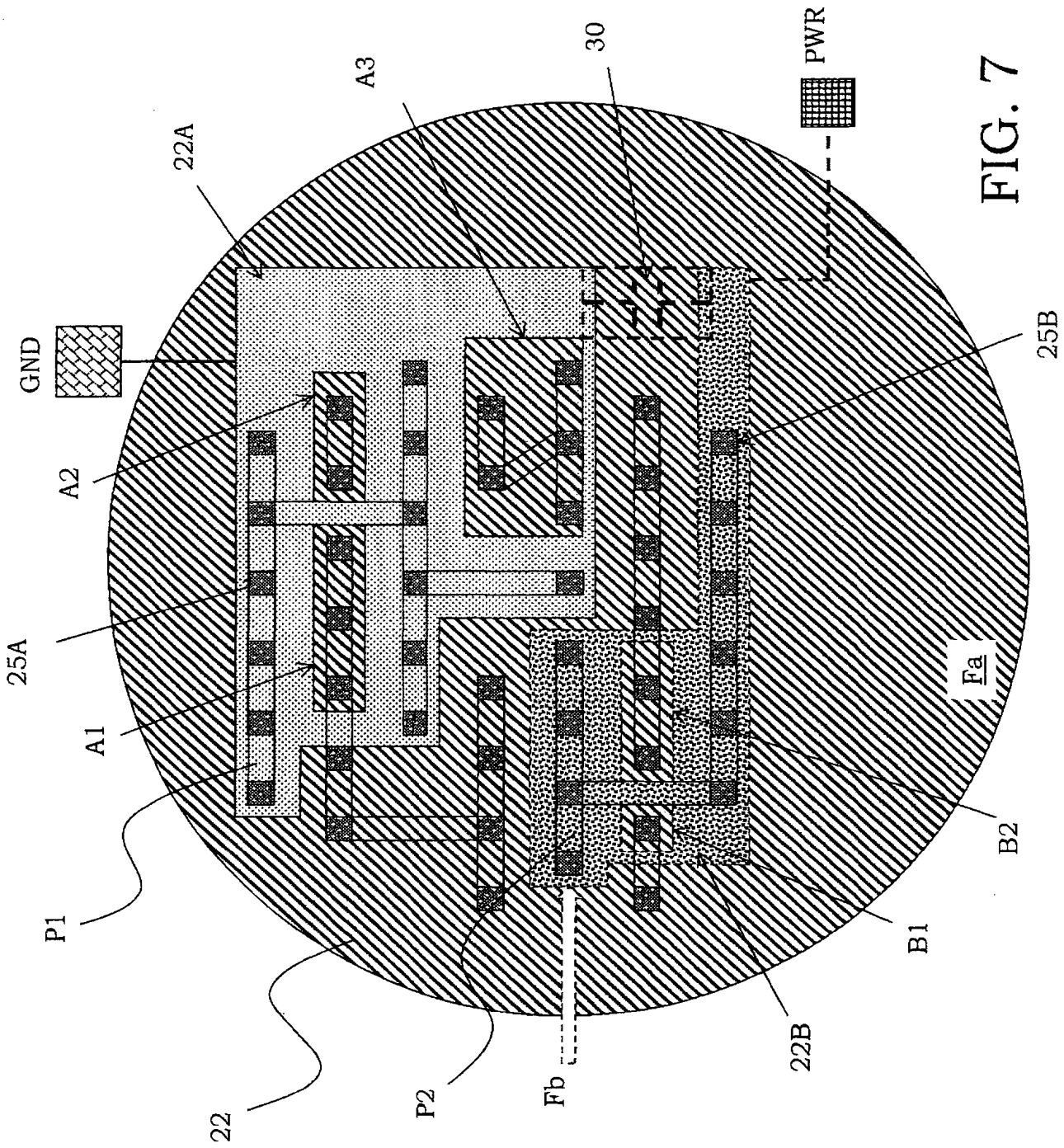


FIG. 7

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PTO/SB/38 (12-18)
Approved for use through 12/31/2021. OMB 0651-0031
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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Request to Retrieve Electronic Priority Application(s)

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

COMPLETE IF KNOWN	
Application Number	16/442,385
Filing Date	June 14, 2019
First Named Inventor	Flavio MAGGIONI
Art Unit	2867
Examiner Name	Huy Q Phan
Attorney Docket Number	160062.429C1

Pursuant to 37 CFR 1.55(i), the undersigned hereby requests that the USPTO retrieve an electronic copy of each of the following foreign applications for which priority has been claimed under 35 U.S.C. 119(a)-(d) from a foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement. This Request must be submitted:

- within the later of sixteen months from the filing date of the prior foreign application or four months from the actual filing date of an application under 35 U.S.C. 111(a),
- within four months from the later of the date of commencement (37 CFR 1.491(a)) or the date of the initial submission under 35 U.S.C. 371 of an application entering the national stage under 35 U.S.C. 371, or
- with a petition under 37 CFR 1.55(e) or (f).

☒ **OPTION A**

Please retrieve the priority application identified in Column C, a certified copy of which is contained in the EP or JP application identified in Columns A and B:

	A	B			C	
	Code for Participating Office (EP or JP only)	Application containing the non-participating priority application			Non-participating priority application to be retrieved	
		App. No.	Filing Date	Access Code (for JP only)	Country Code	App. No.
1	EP	17825770.5	December 11, 2017		IT	102017000021389 & 102018000127581

☐ **OPTION B**

This Request may be used for the infrequent circumstance when a claim for priority to an application filed in a participating foreign intellectual property office was made prior to that foreign intellectual property office becoming a participating foreign intellectual property office.

Please retrieve the priority application identified in Columns A and B:

	A	B		
	Code for Participating Office (e.g., EP) or WIPO DAS Depositing Office (e.g., AU, BR, CN, DK, EA, EE, ES, FI, GB, IB, IN, JP, KR, MA, NL, NZ, SE)	Application to be retrieved		
		App. No.	Filing Date	Access Code (for WIPO DAS Depositing Office)
1				
2				

The USPTO will not attempt to retrieve the identified priority application(s) unless an identical claim for foreign priority to the application identified above is made pursuant to 37 CFR 1.55(d) or a petition is granted under 37 CFR 1.55(e) or (f). Applicants are advised to consult Private PAIR (accessed through www.uspto.gov) to assure that the retrieval has been successful. The applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period set forth in 37 CFR 1.55(g)(1).

I hereby declare that I have the authority to grant access to the above-identified foreign application(s).

/Robert Iannucci/	February 19, 2020
Signature	Date
Robert Iannucci	206.622.4900
Printed or Typed Name	Telephone Number
	33,514
Title	Registration Number, if applicable

This collection of information is required by 37 CFR 1.55(d). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	38634542
Application Number:	16442385
International Application Number:	
Confirmation Number:	7220
Title of Invention:	TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES
First Named Inventor/Applicant Name:	Flavio MAGGIONI
Customer Number:	500
Filer:	Robert Iannucci/Nicole Villanueva
Filer Authorized By:	Robert Iannucci
Attorney Docket Number:	160062.429C1
Receipt Date:	19-FEB-2020
Filing Date:	14-JUN-2019
Time Stamp:	19:36:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for USPTO to retrieve priority docs	429C1_RREPA_02192020.pdf	1249993 2efc773bc8b635437a953c19f64790b839f75ddc	no	2

Warnings:

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Information:	
Total Files Size (in bytes):	1249993

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/442,385	06/14/2019	Flavio MAGGIONI	160062.429C1

CONFIRMATION NO. 7220

500
SEED INTELLECTUAL PROPERTY LAW GROUP LLP
701 FIFTH AVE
SUITE 5400
SEATTLE, WA 98104

PUBLICATION NOTICE

OC000000111633921

Title:TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES

Publication No.US-2019-0302148-A1
Publication Date:10/03/2019

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TEC 2826

PTO/AIA/01 (06-12)
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES

As the below named inventor, I hereby declare that:

This declaration is directed to:

- ☐ The attached application, or
- ☒ United States application or PCT international application number 16/442,385 filed on June 14, 2019.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: Flavio MAGGIONI Date (Optional) :

Signature: Flavio Maggioni

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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Electronic Acknowledgement Receipt

EFS ID:	37073512
Application Number:	16442385
International Application Number:	
Confirmation Number:	7220
Title of Invention:	TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES
First Named Inventor/Applicant Name:	Flavio MAGGIONI
Customer Number:	500
Filer:	Robert Iannucci/Kristina Nielander
Filer Authorized By:	Robert Iannucci
Attorney Docket Number:	160062.429C1
Receipt Date:	10-SEP-2019
Filing Date:	14-JUN-2019
Time Stamp:	12:51:18
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	Declarations.PDF	30382 0a18214752ce85aebdda364f18d6aba8b362ea4a	no	1

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/442,385	06/14/2019	2858	2380	160062.429C1	25	2

CONFIRMATION NO. 7220

FILING RECEIPT

500
SEED INTELLECTUAL PROPERTY LAW GROUP LLP
701 FIFTH AVE
SUITE 5400
SEATTLE, WA 98104

OC000000109095794

Date Mailed: 06/24/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Flavio MAGGIONI, Cernusco Lombardone, ITALY;

Applicant(s)

TECHNOPROBE S.P.A., Cernusco Lombardone, ITALY

Power of Attorney: The patent practitioners associated with Customer Number 00500

Domestic Priority data as claimed by applicant

This application is a CIP of PCT/EP2017/082180 12/11/2017

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ITALY 102016000127581 12/16/2016
ITALY 102017000021389 02/24/2017

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/442,385**

Projected Publication Date: 10/03/2019

Non-Publication Request: No

Early Publication Request: No

Title

TESTING HEAD HAVING IMPROVED FREQUENCY PROPERTIES

Preliminary Class

324

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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IPR2024-00933

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/442,385

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	25 minus 20 =	* 5			OR	x 100 =	500
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 460 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2220

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L 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".
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/442,385	06/14/2019	Flavio MAGGIONI	160062.429C1

CONFIRMATION NO. 7220

500
SEED INTELLECTUAL PROPERTY LAW GROUP LLP
701 FIFTH AVE
SUITE 5400
SEATTLE, WA 98104

INFORMAL NOTICE

OC00000109095795

Date Mailed: 06/24/2019

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Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
  Flavio MAGGIONI

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/lvongxay/

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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTY. DOCKET NO. 160062.429C1	APPLICATION NO.
INFORMATION DISCLOSURE STATEMENT (Use several sheets if necessary)	FIRST NAMED INVENTOR Flavio MAGGIONI	
	FILING DATE	GROUP ART UNIT

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	KIND CODE	DATE	NAME	FILING DATE IF APPROPRIATE
	1	5,519,331	A	05/21/1996	Cowart et al.	
	2	2008/0139017	A1	06/12/2008	Kiyofuji et al.	
	3	2009/0085593	A1	04/02/2009	Yoshida et al.	
	4	2012/0242360	A1	09/27/2012	Huang et al.	
	5	2014/0091826	A1	04/03/2014	Chui	
	6	2014/0197860	A1	07/17/2014	Hsu et al.	
	7	2015/0309074	A1	10/29/2015	Kuo et al.	
	8	2018/0024167	A1	01/25/2018	Maggioni	

FOREIGN PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	KIND CODE	DATE	COUNTRY	TRANSLATION YES	TRANSLATION NO
	1	102466739	B	04/09/2014	CN	X	
	2	10-1421051	B1	07/22/2014	KR	X	
	3	2012/106220	A1	08/09/2012	WO		

NON-PATENT LITERATURE DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	1		"rheophore," *Wiktionary*, edited March 17, 2019, retrieved from https://en.wiktionary.org/w/index.php?title=rheophore&oldid=51978536.

EXAMINER	DATE CONSIDERED

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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Espacenet

Bibliographic data: CN102466739 (B) — 2014-04-09

Probe card

Inventor(s): LIAO BINGXIAO; ZHANG QIJIAN; XIE ZHAOPING; GU WEIZHENG; LIN HEHUI; CHEN MINGQI; HE ZHIHAO ± (LIAO BINGXIAO, ; ZHANG QIJIAN, ; XIE ZHAOPING, ; GU WEIZHENG, ; LIN HEHUI, ; CHEN MINGQI, ; HE ZHIHAO)

Applicant(s): MPI CORP ± (MPI CORPORATION)

Classification: **- international:** ***G01R1/067; G01R1/073***
- cooperative:

Application number: CN201010534218 20101102 Global Dossier

Priority number(s): CN201010534218 20101102

Also published as: CN102466739 (A)

Abstract of CN102466739 (A)

The invention provides a probe card which comprises that: a printed circuit board which is provided with a first contact point and a second contact point; a space converter which is provided with an orifice plate, a compliant first lead, a compliant second lead, a compliant third lead and a compliant fourth lead, wherein, the orifice plate has a plurality of holes, a lower surface of the orifice plate has a first conducting layer, a second conducting layer, a first contact pad, and a second contact pad, two ends of the first lead are electrically connected with the first contact point and the first conducting layer respectively, two ends of the second lead are electrically connected with the second contact point and the second conducting layer respectively, the third lead is connected with the first conducting layer and the first contact pad respectively, the fourth lead is connected with the second conducting layer and the second contact pad respectively, and the third lead and the fourth lead pass through the holes to connect with the first contact pad and the second contact pad respectively; an electronic component which is at the lower surface of the orifice plate and is electrically connected with the first conducting layer and the second conducting layer.

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DESCRIPTION CN102466739

The present invention provides a probe card comprising a printed circuit board having a first contact and a second contact; a space converter having an aperture plate and a first conductor of compliance, a first a second wire, a third wire and a fourth wire, the hole plate having a plurality of holes, including a first conductive layer, a second conductive layer, a first contact pad and a first surface on the lower surface of the hole plate The two contact pads are electrically connected to the first contact and the first conductive layer, and the two ends of the second wire are electrically connected to the second contact and the second conductive layer respectively. The third wire is respectively connected to the first conductive layer and the first contact pad, the fourth wire is respectively connected to the second conductive layer and the second contact pad, and the third wire and the fourth wire are disposed through the The holes are respectively connected to the first contact pad and the second contact pad; and an electronic component is located on the lower surface of the hole plate and electrically connected to the first conductive layer and the second conductive layer.

Probe card

Technical field

The present invention relates to a probe card, and more particularly to a vertical probe card.

Background technique

In the semiconductor industry, wafer packaging testing is a very important part. Before the chip packaging engineering, functional testing of these chips is required to eliminate defective products and avoid unnecessary

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waste of cost and loss of processing the defective chips. The presence of the probe card, which serves as an interface between the test machine and the wafer, provides a signal transfer path from the test machine to the wafer for use in wafer level test engineering.

Therefore, how to improve the test quality and efficiency of the probe card as much as possible is the goal pursued in the field. After all, for semiconductor manufacturers whose product cost is millions to tens of millions, no matter how much the improvement of the yield, the impact will not be ignored.

At present, the vertical probe card structure basically comprises three parts: a printed circuit board (PCB), a space converter and a probe. The printed circuit board is covered with a number of electronic components. The power and signals are transmitted by the lines on the printed circuit board to the space converter below it, and then passed to the probe below the space converter, and the probe and the underside Test the wafer for contact. Such a long signal transmission path causes interference to the signal, increases signal noise, voltage instability, and the like. As a result, the test quality of the probe card will be greatly affected, and the integrity of the overall test signal transmission will be destroyed.

The types of vertical probe cards can be divided into Hand Wire (HW), Multi-Layer Ceramic/Multi-Layer Organic (MLC/MLO), and Integrated Circuit Board (Integrated). PCB, INT PCB) and other three architectures.

Under the structure of the manual cable, the space converter is a function of a space conversion by a substrate having a plurality of through holes, or an orifice plate. The wires connecting the compliant printed circuit board are connected to the probes under the orifice plate through the upper and lower surfaces of the orifice plate through the through holes; and in the multilayer ceramic/multilayer organic structure, the multilayer ceramic substrate or It is a multilayer organic substrate as a space converter. The multilayer ceramic substrate or the multilayer organic substrate has a complicated wiring layout and routing inside the substrate, so that the contacts on the upper and lower surfaces of the substrate are electrically connected.

In terms of the structure of the manual cable, the orifice plate has no internal layout, and the plurality of through holes on the orifice plate are the upper and lower surfaces of the through-hole plate, and the spacing between the orifice plates is smaller than that of the circuit structures on the printed circuit board. The spacing between the contacts is such that one end of the compliant wire is connected to the contact on the printed circuit board, and the other end is passed through the through hole on the hole plate to fix and concentrate the wire, thereby achieving the purpose of space conversion. The multi-layer ceramic/multi-layer organic structure is formed by the wiring layout inside the multilayer ceramic substrate or the multilayer organic substrate, and the circuit structure of the upper surface of the substrate connected to the printed circuit board is converted into a small

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pitch of the lower surface. . However, multi-layer ceramic/multi-layer organic architecture requires a lot of cost and time in design and fabrication, while the manual cable structure is a way to connect the compliant wires, and then use simple orifice plates to fix the wires, so the design And the production cost is lower.

The architecture of the integrated circuit board is to directly integrate the concept of multi-layer ceramic/multi-layer organic on the printed circuit board, that is, to integrate the printed circuit board and the space converter to form an integrated circuit board. The integrated circuit board itself has the function of space conversion. Traditional printed circuit boards cannot directly convert large pitches into small pitches at the wafer level, but integrated circuit boards can do this.

In summary, the existing technologies currently have many electronic components placed on a printed circuit board, and the signal transmission path is too long, which easily brings many disadvantages.

In the U.S. Patent Publication No. 2009/0085593, a probe structure is disclosed in which a plurality of spring probes 1SIG, 1POW, 1GND are disposed in respective guide holes 5 of the probe holder 3, and inner walls of the guide holes 5 are provided. The conductive layer 10 is coated, and the probe holder 3 has a capacitor 9 so that the spring probes are covered by the conductive layer 10 and thus electrically connected to the capacitor 9. However, the above structure is only applicable to the spring probe structure, and is not applicable to the vertical probe of the present case, or is distinguished from the spring probe structure. The vertical probe of the present invention can be called a Buckling Beam probe. For a description of the frustration probe, reference is made to the description of U.S. Patent Publication No. 3,806,801. If the above structure replaces the spring probe with a frustum-column probe structure, the probe needs to be in contact with the object to be tested during the test, and the force acting on the probe on the probe will cause the probe to frustrate. Lateral deformation causes friction between the probe and the inner wall of the guide hole 5. Therefore, the conductive layer 10 is gradually damaged and peeled off after long-term use, so that the contact resistance is improved. Therefore, such a result may result in poor probe card electrical characteristics and is not conducive to industrial use.

Therefore, in view of the shortcomings of the known technology, the applicant has carefully studied and studied to create the "structure of the probe card" of the present invention to overcome the above drawbacks. The following is a brief description of the case.

Summary of the invention

The main object of the present invention is to provide a structure suitable for a vertical probe card, which can reduce the disadvantages and disadvantages caused by the existing methods, thereby achieving cost saving,

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reducing the defect rate, and improving the application field.

According to the concept of the present invention, a probe card is provided, comprising a printed circuit board having a first contact and a second contact; a space converter having an aperture plate and a first conductor of compliance, a second wire, a third wire and a fourth wire, the hole plate has a plurality of holes, and the first surface of the hole plate includes a first conductive layer, a second conductive layer, a first contact pad and a second contact pad, the two ends of the first wire are respectively electrically connected to the first contact and the first conductive layer, and the two ends of the second wire are electrically connected to the second contact and the second conductive layer, respectively The third wire is respectively connected to the first conductive layer and the first contact pad, the fourth wire is respectively connected to the second conductive layer and the second contact pad, and the third wire and the fourth wire are connected by the device The holes are respectively connected to the first contact pad and the second contact pad; and an electronic component is located on the lower surface of the hole plate and electrically connected to the first conductive layer and the second conductive layer.

Preferably, the probe card of the present invention further includes a probe holder disposed under the space transformer and including a first probe and a second probe, wherein the first probe The second probe is electrically connected to the first contact pad and the second contact pad respectively.

Preferably, the probe card of the present invention, wherein the first probe is one of a power probe and a signal probe, and the second probe is a ground probe.

Preferably, the probe card of the present invention, wherein the first probe and the second probe are frustum probes.

Preferably, the probe card of the present invention, wherein the electronic component is at least one of an active component, a passive component, and a radio frequency component.

According to another aspect of the present invention, a probe card is provided, comprising a printed circuit board having a contact; a space converter having an aperture plate and a first conductor and a second conductor compliant, The hole plate has a plurality of holes, and a first conductive layer, a second conductive layer and a contact pad are disposed on the lower surface of the hole plate, and the two ends of the first wire are electrically connected to the contact and the first conductive a layer, the two ends of the second wire are electrically connected to the second conductive layer and the contact pad, the second wire is connected to the contact pad through the hole; and an electronic component is located on the hole plate a lower surface electrically connecting

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the first conductive layer and the second conductive layer.

Preferably, the probe card of the present invention further includes a probe holder disposed under the space transformer and including a probe, wherein the probe is electrically connected to the second conductive layer.

Preferably, the probe card of the present invention, wherein the probe is one of a power probe, a signal probe and a ground probe.

Preferably, the probe card of the present invention, wherein the two probes are frustum probes.

Preferably, the probe card of the present invention, wherein the electronic component is at least one of an active component, a passive component, and a radio frequency component.

According to still another aspect of the present invention, a probe card is provided, including a printed circuit board having a first contact and a second contact; a probe holder having a first conductive layer and a first portion disposed therein a second conductive layer electrically connected to the first contact and the second contact; a first probe and a second probe penetrating the probe holder and electrically connecting the first conductive layer and The second conductive layer; and an electronic component located inside the probe holder.

Preferably, the probe card of the present invention further includes a space transformer between the printed circuit board and the probe holder.

Preferably, the probe card of the present invention is characterized in that the space converter is an orifice plate and has a plurality of holes for allowing a plurality of wires to pass through, and the first contacts are electrically connected by the plurality of wires. The first probe is electrically connected to the second probe.

Preferably, the probe card of the present invention is a substrate of a multi-layer ceramic structure or a substrate of a multi-layer organic structure, and has a circuit structure inside, and the internal structure has a circuit structure. The first contact is electrically connected to the first probe, and the second contact is electrically connected to the second probe.

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Preferably, the probe card of the present invention, wherein the printed circuit board is an integrated circuit board.

Preferably, the probe card of the present invention further includes a lower guide and an upper guide, and the electronic component is located at least on one of the lower guide and the upper guide.

Preferably, the probe card of the present invention further includes a plurality of dummy probes and a plurality of contact pads, wherein the first conductive layer and the second conductive layer are respectively disposed on the lower conductive plate And the first guiding electrode is electrically connected to the first conductive layer by the plurality of dummy probes, and the second probe is electrically connected to the second conductive layer by the plurality of contact pads.

Preferably, the probe card of the present invention further includes a plurality of dummy probes, wherein the first probe is disposed when the first conductive layer and the second conductive layer are located on the lower conductive plate The first probe is electrically connected to the first conductive layer, and the second probe is electrically connected to the second conductive layer.

Preferably, the probe card of the present invention, wherein the probe holder further comprises a plurality of contact pads, wherein the first probe is when the first conductive layer and the second conductive layer are located on the upper conductive plate The first probe is electrically connected to the first conductive layer and the second conductive layer through the plurality of contact pads on the upper conductive plate, so that the first probe is electrically connected to the first conductive layer, the second The probe is electrically connected to the second conductive layer.

Preferably, the probe card of the present invention, wherein the first probe and the second probe are frustum probes.

Preferably, in the probe card of the present invention, the first probe is one of a power probe and a signal probe, and the second probe is a ground probe.

Preferably, the probe card of the present invention, wherein the electronic component is at least one of an active component, a passive component, and a radio frequency component.

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According to still another aspect of the present invention, a probe card includes a printed circuit board having a contact; a probe holder having a first conductive layer and a second conductive layer, the first conductive layer Electrically connecting the contact; a probe penetrating the probe holder and electrically connecting the second conductive layer; and an electronic component located inside the probe holder.

Preferably, the probe card of the present invention further includes a space transformer between the printed circuit board and the probe holder.

Preferably, the probe card of the present invention, wherein the space converter is an orifice plate, and has a plurality of holes for allowing a plurality of wires to pass through, the plurality of wires electrically connecting the contacts and the probe .

Preferably, the probe card of the present invention, wherein the space converter is a multi-layer ceramic structure substrate or a multi-layer organic structure substrate, and has a circuit structure inside, so that the contact is electrically connected to the probe. needle.

Preferably, the probe card of the present invention, wherein the printed circuit board is an integrated circuit board.

Preferably, the probe card of the present invention further includes a lower guide and an upper guide, and the electronic component is located at least on one of the lower guide and the upper guide.

Preferably, the probe card of the present invention further includes a dummy probe and a contact pad, wherein the first conductive layer and the second conductive layer are respectively disposed on the lower guide plate and the When the upper guide plate is used, the probe is electrically connected to the first conductive layer, and the contact pad electrically connects the contact to the second conductive layer.

Preferably, the probe card of the present invention further includes a plurality of dummy probes, wherein the probe electrical property is when the first conductive layer and the second conductive layer are located on the lower conductive plate One of the plurality of dummy probes is connected to electrically connect the probe to the second conductive layer.

Preferably, the probe card of the present invention further includes a plurality of contact pads, wherein the probe

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passes through the upper guide when the first conductive layer and the second conductive layer are located on the upper conductive plate One of the plurality of contact pads is electrically connected to the second conductive layer.

Preferably, the probe card of the present invention, wherein the first probe and the second probe are frustum probes.

Preferably, the probe card of the present invention, wherein the probe is one of a power probe, a signal probe and a ground probe.

Preferably, the probe card of the present invention, wherein the electronic component is at least one of an active component, a passive component, and a radio frequency component.

DRAWINGS

The present invention will be fully understood by the following description of the embodiments and the accompanying drawings, which can be understood by those skilled in the art, but the implementation of the present invention is not limited by the following embodiments, wherein:

Fig. 1(a) is a schematic view showing the structure of a probe card of a first embodiment of the present invention.

Fig. 1(b) is a schematic view showing the structure of a probe card of the first embodiment of the present invention.

Fig. 1 (c) is a bottom view of Figs. 1 (a) and (b).

2 is a schematic structural view of a probe card of a second embodiment of the present invention.

Fig. 3 (a) is a schematic structural view of a probe card of a third embodiment of the present invention.

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Fig. 3 (b) is a schematic structural view of a probe card of a third embodiment of the present invention.

Figure 3 (c) is a schematic view showing the structure of the probe card of the third embodiment of the present invention.

Fig. 4 (a) is a schematic structural view of a probe card of a fourth embodiment of the present invention.

Fig. 4 (b) is a schematic view showing the structure of a probe card of a fourth embodiment of the present invention.

Fig. 4 (c) is a schematic structural view of a probe card of a fourth embodiment of the present invention.

FIG. 5 is a schematic structural view of a probe card according to a fifth embodiment of the present invention.

Fig. 6 is a schematic structural view of a probe card of a sixth embodiment of the present invention.

Detailed ways

The first embodiment of the present invention is described below. Please refer to FIG. 1(a) and (b), which are schematic diagrams of the probe card structure proposed in the present application. As shown in FIG. 1(a), the probe card 1 has a printed circuit board 10 having a first contact 101 and a second contact 102. When the probe card is used to test the object to be tested, the contacts 101 and 102 are connected. It is electrically connected to the test machine to receive the signal transmitted by the test machine. The printed circuit board 10 has an opening in the middle thereof, and below it is a space converter, that is, an orifice plate 11. The orifice plate 11 has an upper surface and a lower surface 111 and a plurality of holes (not shown), and the holes are through-hole plates. A first wire 181, a second wire 182, a third wire 183, and a fourth wire 184 for facilitating compliance are vertically disposed therein. A recess 12 is formed on the lower surface 111, a first conductive layer 141 and a second conductive layer 142 are disposed on the recess 12, and the lower surface 111 further has a first contact pad 191 and a first surface. Two contact pads 192. The two ends of the first wire 181 are respectively electrically connected to the first contact 101 and the first conductive layer 141. The two ends of the second wire 182 are electrically connected to the second contact 102 and the second conductive layer 142, respectively. The first conductive layer 141 and the first contact pad 191, the fourth wire 184 is connected to the second conductive

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layer 142 and the second contact pad 192, respectively, and the third wire 183 and the fourth wire 184 are respectively connected by the holes. Contact pad 191 and second contact pad 192. An electronic component 13 , such as a capacitor, is disposed in the recess 12 to electrically connect the two contacts of the electronic component 13 to the first conductive layer 141 and the second conductive layer 142 , respectively. In the embodiment of Fig. 1(a), the circuit connection of the probe card 1 is in the form of a parallel connection.

The probe card 1 further includes a probe holder 15 which is located below the orifice plate 11. The probe base 15 includes a first probe 16 and a second probe 17 that are connected to the first contact pad 191 and the second contact pad 192, respectively. Therefore, the complete circuit path is connected from the first contact 101 to the first wire 181, via the first conductive layer 141, the third wire 183 and the first contact pad 191, and finally to the first probe 16; and the other complete circuit The path connects the second wire 182 from the second contact 102, via the second conductive layer 142, the fourth wire 184 and the second contact pad 192, and finally to the second probe 17. At the same time, the first conductive layer 141 and the second conductive layer 142 are electrically connected through the two contacts of the electronic component 13 to connect the electronic component 13 in parallel with the two paths.

In the present embodiment, each of the wires that are passed through the orifice plate 11 belong to an external trace, so that it has a characteristic of so-called compliance. That is to say, compared with the fixed circuit provided inside the conventional printed circuit board, it has greater flexibility and tolerance to deformation. In addition, instead of providing the recess 12, the lower surface 111 of the orifice plate 11 is provided with a hole 151 in the probe holder 15, as shown in Fig. 1(b) for accommodating the space in which the electronic component 13 protrudes. The first conductive layer 141 and the second conductive layer 142 are still disposed on the lower surface 111.

Fig. 1(c) shows a bottom view of Fig. 1(a) and Fig. 1(b) (excluding the probe holder 15), from which the arrangement relationship of the elements in the present embodiment can be more clearly understood. In the present invention, the number of the electronic components 13 is not limited, which is clearly explained by Fig. 1(c), and the manner of setting thereof can be adjusted according to requirements or circuit design.

Basically, from the viewpoint of FIGS. 1(a) and (b), when the electronic component 13 is disposed below the orifice plate 11, it is easier to repair or replace the component. After all, there are countless lines above the orifice plate 11, and there are many obstacles to checking or replacing components. However, if the electronic component 13 is positioned below the orifice plate 11, it is only necessary to remove the probe holder 15 to facilitate the work.

In this embodiment, the first probe 16 is one of a power probe and a signal probe, and the second probe 17 is a

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ground probe. When the first probe 16 is a power probe, the first contact 101 is used as a power contact for receiving power transmitted by the test machine; and when the first probe 16 is a signal probe, the first contact 101 is used as a signal. The contact is for receiving the test signal transmitted by the test machine; the second contact 102 is used as the ground contact.

The embodiment shown in FIGS. 1(a) and (b) is such that electronic components are arranged in parallel on the circuit path of the probe card structure, but the embodiment thereof is not limited thereto.

As shown in FIG. 2, which is a second embodiment of the present invention, electronic components are disposed on a series path of the probe card structure. The probe card 2 has a printed circuit board 20 with a contact 201 thereon. The printed circuit board 20 has an opening in the middle thereof, and below it is a space converter, that is, an orifice plate 21. The orifice plate 21 has an upper surface and a lower surface 211 and a plurality of holes (not shown), and the holes are through-hole plates. A first wire 281 and a second wire 282 of the compliant upper and lower surfaces are vertically penetrated therein. A first conductive layer 241 and a second conductive layer 242 are disposed on the lower surface 211, and a contact pad 29 is further disposed on the lower surface 211. The two ends of the first wire 281 are respectively electrically connected to the contact 201 and the first conductive layer 241. The two ends of the second wire 282 are electrically connected to the second conductive layer 242 and the contact pad 29, respectively. The contact pad 29 is connected to the hole. The lower surface 211 is provided with an electronic component 23, such as a resistor, an integrated circuit (IC) or a diode, such that the two contacts of the electronic component 23 are electrically connected to the first conductive layer 241 and the second conductive layer 242, respectively.

The probe card 2 further includes a probe holder 25 located below the orifice plate 21. The probe holder 25 includes a probe 26 that connects the contact pad 29 and a hole 251 for receiving a space in which the electronic component 23 protrudes. Therefore, the complete circuit path is connected to the first wire 281 from the contact 201, the second conductive layer 242 is connected through the first conductive layer 241 through the electronic component 23, the second wire 282 is connected to the contact pad 29, and finally the probe 26 is connected. A series path is formed.

In the second embodiment, only the shape in which the hole 251 is designed in the probe holder 25 to accommodate the electronic component 23 is exhibited. However, the embodiment can be changed as shown in Fig. 1(a), that is, a recess (not shown) is provided on the lower surface 211, and the electronic component 23 is disposed in the recess. Of course, it is also possible to have a configuration of a plurality of electronic components and an embodiment including a merged string and a parallel path as described above.

In addition, the probe 26 can be a power probe, a signal probe or a ground probe, and the contact 201

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corresponds to the type used by the probe 26 as a corresponding power contact, signal contact and ground contact.

In the first and second embodiments of the present invention, in order to prevent damage of the electronic component due to external force collision, a protective layer such as a protective colloid may be applied outside the electronic component, and the protective layer also has a function of fixing the electronic component.

Next, a third embodiment of the present invention will be described. Please refer to FIG. 3(a), (b) and (c), which are schematic diagrams of the structure of the probe card proposed in the present invention, which are the same as the first embodiment, and are all in the probe card. The electronic components are arranged in parallel on the circuit path of the structure, but the difference from the first embodiment is that the first embodiment is to arrange the electronic components on the lower surface of the orifice plate, and the third embodiment is to arrange the electronic components on the probes. Inside the seat. The probe card 3 has a printed circuit board 30 having a first contact 301 and a second contact 302 thereon. The probe card 3 further includes a probe holder 32, and a first conductive layer 371 and a second conductive layer 372 are disposed therein, and are electrically connected to the first contact 301 and the second contact 302, respectively. The probe holder 32 includes a first probe 34 and a second probe 35. The probe holder 32 is disposed through the probe holder 32 and electrically connected to the first conductive layer 371 and the second conductive layer 372, respectively. The inside of the probe holder 32 has an electronic component 33. The two ends of the electronic component 33 are electrically connected to the first conductive layer 371 and the second conductive layer 372, respectively. Therefore, the arrangement of the space converter, that is, the arrangement of the aperture plate 31 and the wires 381, 382, 383 and 384, electrically connects the first probe 34 with the first contact 301 and the first conductive layer 371 to form a circuit. The second probe 35 is electrically connected to the second contact 302 and the second conductive layer 372 to form another circuit path, and the first conductive layer 371 and the second conductive layer 372 are connected through the electronic component 33 to make the electronic component 33 Parallel to the two paths. The way in which such circuit connections are performed is not limited, and can be explained by the following descriptions.

As shown in FIGS. 3(a)-(c), the probe card 3 further has a space converter between the printed circuit board 30 and the probe holder 32. The space converter is an orifice plate 31, and the orifice plate 31 has a plurality of holes (not shown), each of which is through the upper and lower surfaces of the hole plate 31, so that a first wire 381, a second wire 382, a third wire 383, and a fourth wire 384 are vertically compliant. Set it. The orifice plate 31 includes a plurality of contact pads 391, 392, 393, 394, 395, 396. The first wire 381 is electrically connected to the first contact 301 and the third contact pad 393 respectively, and the second wire 382 is electrically connected to the second contact 302 and the fourth contact pad 394 respectively, and the third wire 383 is electrically connected to the fifth wire respectively. The contact pads 395 and the first contact pads 391, the fourth wires 384 are electrically connected to the sixth contact pads 396 and the second contact pads 392, respectively. That is, the first contact 301 is electrically connected to a first probe 34 of the probe holder 32, and the second contact 302 is

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electrically connected to a second probe of the probe holder 32. 35.

As shown in FIG. 3(a), the probe holder 32 further includes an upper guiding plate 322 and a lower guiding plate 321 , and a plurality of dummy probes 361 and 362 electrically connected to the first conductive layer 371 and the second conductive layer 372 . , 363, 364, the electronic component 33 is located on the lower guide 321 . The first conductive layer 371 and the second conductive layer 372 are disposed on the lower conductive plate 321 . The electrical connection between the first probe 34 and the first contact 301 and the second probe 35 and the second contact 302 is achieved by the layout between the aperture plate 31 and the probe holder 32. That is, the circuit path of the first contact 301 to the first probe 34 is from the first contact 301 to the third contact pad 393 via the first wire 381, and then to the first conductive layer 371 via the first dummy probe 361. Then, through a second dummy probe 362 to the fifth contact pad 395, and then from the third wire 383, the first contact pad 391 to the first probe 34; and the circuit path of the second contact 302 to the second probe 35 is from The second contact 302 passes through the second wire 382 to the fourth contact pad 394, and then passes through a third dummy probe 363 to the second conductive layer 372, and then passes through a fourth dummy probe 364 to the sixth contact pad 396. The fourth wire 384, the second contact pad 392 to the second probe 35. At the same time, the first conductive layer 371 and the second conductive layer 372 are electrically connected through the two contacts of the electronic component 33 to connect the electronic component 33 in parallel with the two paths. In other words, the first probe 34 and the second probe 35 are electrically connected to the corresponding dummy probes 361-364, respectively, such that the first probe 34 is electrically connected to the first conductive layer 371. The second probe 35 is electrically connected to the second conductive layer 372.

Further, as shown in FIG. 3(b), the electronic component 33 may be disposed on the upper conductive plate 322. Of course, the two conductive layers 371, 372 are also disposed on the upper conductive plate 322. Here, the two conductive layers 371, 372 and the plurality of contact pads 393, 394, 395, 396 are not electrically connected by a dummy probe, but a plurality of through holes are designed by the upper guiding plate 322 and filled with conductive The metal material or other conductive material capable of transmitting a signal forms a via hole, and at the same time is a plurality of contact pads 397, 398, 399 and 3910 for electrically connecting the plurality of contact pads 393, 394, 395, 396, respectively. Sexual connection. The circuit path of the first contact 301 to the first probe 34 is from the first contact 301 to the third contact pad 393 via the first wire 381, and then to the first conductive layer 371 via the seventh contact pad 397 and the via hole, and then via The via hole, the ninth contact pad 399 to the fifth contact pad 395, and then the third wire 383, the first contact pad 391 to the first probe 34; and the circuit path of the second contact 302 to the second probe 35 The two contacts 302 pass through the second wire 382 to the fourth contact pad 394, and then through the eighth contact pad 398, the via hole to the second conductive layer 372, and then through the via hole, the tenth contact pad 3910 to the sixth contact pad 396, and then From the fourth wire 384, the second contact pad 392 to the second probe 35. At the same time, the first conductive layer 371 and the second conductive layer 372 are electrically connected through the two contacts of the electronic component 33 to connect the electronic component 33 in parallel with the two paths. In other words, the first probe 34 and the second probe 35 are electrically connected to the first conductive layer 371 and the second conductive layer 372 through a plurality of contact pads 397-3910 on the upper

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conductive plate 322, respectively. The first probe 34 is electrically connected to the first conductive layer 371 , and the second probe 35 is electrically connected to the second conductive layer 372 .

Alternatively, as shown in FIG. 3(c), the electronic component 33 may be disposed at two ends across the upper and lower guide plates 322 and 321 . The two conductive layers 371 and 372 are respectively disposed on the lower upper guide plates 321 and 322. The circuit path of the first contact 301 to the first probe 34 is from the first contact 301 to the third contact pad 393 via the first wire 381, and then to the first conductive layer 371 via a fifth dummy probe 365, and then via a The sixth dummy probe 366 to the fifth contact pad 395, and then from the third wire 383, the first contact pad 391 to the first probe 34; and the circuit path of the second contact 302 to the second probe 35 from the second contact 302 via the second wire 382 to the fourth contact pad 394, and then through a twelfth contact pad 3912, via hole to the second conductive layer 372, and then through the via hole, the eleventh contact pad 3911 to the sixth contact pad 396, From the fourth wire 384, the second contact pad 392 to the second probe 35. At the same time, the first conductive layer 371 and the second conductive layer 372 are electrically connected through the two contacts of the electronic component 33 to connect the electronic component 33 in parallel with the two paths. In other words, the first probe 34 can be electrically connected to the first conductive layer 371 by the plurality of dummy probes 365, 366, and the second probe is made by the plurality of contact pads 3911, 3912 and their corresponding via holes. The second conductive layer 372 is electrically connected to the 35.

In short, the above several ways basically consist in that the corresponding circuit path design and component configuration are made as the electronic component 33 is disposed at least on one of the upper and lower guide plates 322, 311. It can also be said that the first conductive layer 371 and the second conductive layer 372 are disposed on one of the upper conductive plate 322 or the lower conductive plate 311 to make a corresponding circuit path design and component configuration.

In this embodiment, the first probe 34 is a power probe or a signal probe, and the second probe 35 is a ground probe. When the first probe 34 is a power probe, the first contact 301 is used as a power contact for receiving power transmitted by the test machine; and when the first probe 34 is a signal probe, the first contact 301 is used as a signal. The contact is for receiving the test signal transmitted by the test machine; the second contact 302 is used as the ground contact.

As mentioned above, the electronic components of the conventional probe card are disposed on the printed circuit board, which causes the signal transmission path to be too long, causing interference to the signal, resulting in increased signal noise and voltage instability. Therefore, as shown in FIGS. 3(a)-(c), the electronic component 33 of the present invention is disposed in the probe holder 32. Since the bottom of the probe holder 32 is the wafer to be tested, the distance between the electronic component and the object to be tested is effectively shortened by this structure, and the integrity of the power source or signal transmission is also

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improved.

Since a fixed distance must be maintained between the first probe 34 and the second probe 35, the signal impedance matching characteristics can be effectively maintained, and high-quality high-frequency signals can be transmitted. Therefore, the presence of the dummy probes 361-366 allows the first probe 34 and the second probe 35 to be connected to the electronic component 33 when they are kept at a fixed distance from each other, and is further connected to the printed circuit board 30 by wires.

Furthermore, the probes used in the present invention are all frustum-column probes, and the probes can be electrically connected to the electronic components 33 by the arrangement of the dummy probes or the structures of FIGS. 3(a) to 3(c). The connection is such that the inner wall of the guide hole of the probe holder does not need to be coated with a conductive layer. Therefore, the disadvantages caused by the US Patent Publication No. 2009/0085593 can be avoided. For example, the inner wall of each guide hole of the probe base needs to be coated with a conductive layer. Under long-term use, the friction between the probe and the inner wall of the guide hole will cause the guides. The conductive layer on the inner wall of the hole is gradually damaged and peeled off, so that the contact resistance is improved.

Therefore, the structure proposed by the present invention not only narrows the distance between the electronic component 33 and the object to be tested, but also the pseudo probes 361-366 can better protect the impedance matching characteristics of the high frequency signal, thereby greatly improving the detection. The quality and stability of the needle card 3.

In the contents of the foregoing third embodiment and the drawings, the electronic components are arranged in a parallel circuit path. Similarly, it is also possible to connect electronic components in a series circuit, as shown in Figures 4(a)-(c), which is the fourth embodiment of the present invention. The probe card 4 has a printed circuit board 40 with a contact 401 thereon. The probe card 4 further includes a probe holder 42 having a first conductive layer 471 and a second conductive layer 472. The first conductive layer 471 is electrically connected to the contacts 401. The probe holder 42 includes a probe 44 that passes through the probe holder 42 and is electrically connected to the second conductive layer 472. The inside of the probe holder 42 has an electronic component 43. The two ends of the electronic component 43 are electrically connected to the first conductive layer 471 and the second conductive layer 472, respectively. Therefore, it is understood from the above-described circuit connection relationship that in the fourth embodiment, an embodiment of the series circuit in the probe card 4 is shown.

As shown in FIG. 4(a), the probe card 4 further has a space converter between the printed circuit board 40 and the probe holder 42, that is, an orifice plate 41 having a plurality of holes (not shown). Each of the holes is formed

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through the upper and lower surfaces of the orifice plate 41, and a first wire 481 and a second wire 482 which are compliant are vertically disposed therein. Therefore, the complete circuit path is connected to the first wire 481 from the contact 401, and then to the first conductive layer 471 via a second contact pad 492 and a first dummy probe 461, and then the second conductive layer 472 is connected through the electronic component 43. Then, a second dummy probe 462, a third contact pad 493, a second wire 482 to the first contact pad 491, and finally the probe 44 are connected to form a series path. In other words, the probe holder 42 further includes a plurality of dummy probes 461, 462 electrically connected to one of the plurality of dummy probes, that is, the second dummy probe 462, so that the probe 44 The second conductive layer 472 is electrically connected.

Of course, the circuit connection is also not limited in its performance. That is to say, the electronic component 43 can be disposed on the upper guide 422 in addition to the lower guide 421 as shown in FIG. 4(a). Or the arrangement of the two guide plates 421, 422. It can also be said that the first conductive layer 471 and the second conductive layer 472 are disposed on one of the upper conductive plate 422 or the lower conductive plate 421 to make a corresponding circuit path design and component configuration. As shown in FIG. 4(b), it is shown that the electronic component 43 is disposed above the upper guide 422. Here, the two conductive layers 471, 472 and the plurality of contact pads 492, 493 are not electrically connected by a dummy probe, but a plurality of through holes are designed by the upper guiding plate 422 and filled with conductive metal material or Other conductive materials that can transmit signals form vias, while thereon are a plurality of contact pads 494, 495 for electrical connection with the plurality of contact pads 492, 493, respectively. Therefore, the complete circuit path connects the first wire 481 to the second contact pad 492 from the contact 401, and then connects to the first conductive layer 471 through the via hole via the fourth contact pad 494, and then connects the second conductive layer through the electronic component 43. 472, the third contact pad 493 is connected via the via hole, the fifth contact pad 495, and the probe 44 is finally connected via the second wire 482 to the first contact pad 491 to form a series path. In other words, the contact 401 is electrically connected to the first conductive layer 471 through a plurality of contact pads 492, 494. The probe 44 is electrically connected to the second conductive layer 472 through a plurality of contact pads 493, 495, and via an electronic Element 43 is such that the entire circuit path is connected in series.

Further, as shown in FIG. 4(c), the electronic component 43 may be provided with the both ends spanning the upper and lower guide plates 422 and 421, and the two conductive layers 471 and 472 are respectively disposed on the lower upper guide plates 421 and 422. Therefore, the complete circuit path connects the first wire 481 to the second contact pad 492 from the contact 401, and then connects to the second conductive layer 472 through the via hole via the sixth contact pad 496, and then connects the first conductive layer through the electronic component 43. 471, the third contact pad 493 is connected via the dummy probe 463, and the probe 44 is finally connected via the second wire 482 to the first contact pad 491 to form a series path. In other words, the probe 44 can be electrically connected to the first conductive layer 471 by the dummy probe 463, and the contact 401 is electrically connected to the second conductive layer 472 by the contact pad 496 and its corresponding via hole, and via the electron. Element 43 is such that the entire circuit path is connected in series.

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The probe 44 can be a power probe, a signal probe or a ground probe, and the contact 401 corresponds to the type of the probe 44 used as a corresponding power contact, signal contact and ground contact.

Of course, in the third and fourth embodiments, the arrangement of the electronic components is also not limited to only a single one, and the configuration of the plurality of electronic components and the embodiment including the merged string and the parallel are also possible. Of course, the arrangement of the conductive layer, the various probes, and the wires also needs to be increased, but as long as the design of the circuit has the possibility of being present, it can be applied to the structure of the probe card proposed by the present invention.

Next, a fifth embodiment of the present invention will be described. Please refer to FIG. 5 , which is a schematic structural diagram of the probe card proposed in the present application. Different from the third and fourth embodiments, the portion of the space converter is replaced by a multi-layer ceramic (MLC) or a multi-layer organic (MLO) substrate 51. The structure of the artificial cable in the form of wires. The substrate 51 has a circuit structure 52 inside, so that a first contact 501 on the printed circuit board 50 can be electrically connected to a first probe 55 of the probe holder 53 to electrically connect a second contact 502 on the printed circuit board 50. A second probe 56 of the probe holder 53 is connected. The circuit path from the first contact 501 to the first probe 55 is from the first contact 501 via the internal wiring of the printed circuit board 50, through the circuit structure 52 inside the substrate 51 to the first conductive layer 571 in the probe holder 53, and The first conductive layer 571 is electrically connected to the first probe 55 by the circuit structure 52 inside the substrate 51; the circuit path of the second contact 502 to the second probe 56 is from the second contact 502 via the inside of the printed circuit board 50. The circuit passes through the circuit structure 52 inside the substrate 51 to the second conductive layer 572 in the probe holder 53 . The second conductive layer 572 is electrically connected to the second probe 56 via the circuit structure 52 inside the substrate 51 . At the same time, the first conductive layer 571 and the second conductive layer 572 are electrically connected through the two contacts of the electronic component 54 to connect the electronic component 54 in parallel with the two paths.

Similarly, in the fifth embodiment, the paths of the circuits may also be parallel, series, or combined in series and parallel. In addition, the configuration of the plurality of electronic components can also be applied to the embodiment, and the electronic component 54 can be disposed on the upper guiding plate 532 or the two guiding plates 531 and 532 in addition to the lower guiding plate 531. . Moreover, in the parallel path, the first probe 55 is a power probe or a signal probe, and the second probe 56 is a ground probe. When the first probe 55 is a power probe, the first contact 501 is used as a power contact for receiving power transmitted by the test machine; and when the first probe 55 is a signal probe, the first contact 501 is used as a signal. The contact is for receiving the test signal transmitted by the test machine; the second contact 502 is used as the ground contact. In series, a single probe can be a power probe, a signal probe or a ground probe, and the contacts correspond to the type of probe used as the corresponding power contact, signal contact and ground contact.

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Next, a sixth embodiment of the present invention will be described. Please refer to FIG. 6 , which is a schematic structural diagram of the probe card proposed in the present application. The difference from the third to fifth embodiments is that the portion of the space converter is replaced by an integrated circuit board 60 in place of the MLC/MLO substrate and the structure of the manual cable. Therefore, the path of the circuit is electrically connected to the first probe 64 of the probe holder 62 by the first contact 601 on the integrated circuit board 60, and the second contact 602 of the integrated circuit board 60 is electrically connected to the probe holder. The second probe 65 of 62.

The circuit path from the first contact 601 to the first probe 64 is electrically connected from the first contact 601 to the first conductive layer 661 via the circuit structure 61 inside the integrated circuit board 60, and then through the circuit inside the integrated circuit board 60. The structure 61 is electrically connected to the first probe 64; the circuit path of the second contact 602 to the second probe 65 is electrically connected from the second contact 602 to the second conductive layer via the circuit structure 61 inside the integrated circuit board 60. 662 is further electrically connected to the second probe 65 via the circuit structure 61 inside the integrated circuit board 60. At the same time, the first conductive layer 661 and the second conductive layer 662 are electrically connected through the two contacts of the electronic component 63 to connect the electronic component 63 in parallel with the two paths.

Similarly, in the sixth embodiment, the paths of the circuits may be parallel, series, or combined in series and parallel. Moreover, the arrangement of the plurality of electronic components is also applicable to the embodiment, and the electronic component 63 may be disposed on the upper guide plate 622 or the lower and upper guide plates 621 and 622 in addition to the lower guide plate 624. The way to set it up. Moreover, in the parallel path, the first probe 64 is a power probe or a signal probe, and the second probe 65 is a ground probe. When the first probe 64 is a power probe, the first contact 601 functions as a power contact for receiving power transmitted by the test machine; and when the first probe 64 is a signal probe, the first contact 601 acts as a signal. The contact is for receiving the test signal transmitted by the test machine; the second contact 602 is used as the ground contact. In series, a single probe can be a power probe, a signal probe or a ground probe, and the contacts correspond to the type of probe used as the corresponding power contact, signal contact and ground contact.

The main object of the present invention is to improve the problems of interference and noise increase caused by an excessively long transmission path in the prior art. Therefore, the structure of the probe card proposed by the present invention is obtained by pulling the distance between the electronic component and the object to be tested, that is, the substrate in which the electronic component is disposed in the upper or upper surface of the probe holder or above the probe holder. It has the advantages of current limiting, decoupling, stable voltage, excellent impedance matching, improved electromagnetic compatibility and reduced electromagnetic

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interference.

In addition, the electronic component may also include an active component, a passive component, or a radio frequency component. The active component can be an IC chip, a diode, etc.; the passive component can include a capacitor, a resistor, an inductor, or a transformer; and the wireless RF component can include a filter, a balun, or a duplexer.

The present invention is a rare invention that is rare and worthy of cherish, but the above is only a preferred embodiment of the present invention, and the scope of the present invention is not limited thereto. That is, the equivalent changes and modifications made by the scope of the present invention should still fall within the scope of the claims of the present invention.

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CLAIMS CN102466739

1.

A probe card comprising: a printed circuit board having a first contact and a second contact; a space converter having an aperture plate and a first conductor, a second conductor, and a compliance a third wire and a fourth wire, the hole plate having a plurality of holes, and a first conductive layer, a second conductive layer, a first contact pad and a second contact pad on the lower surface of the hole plate The two ends of the first wire are respectively electrically connected to the first contact and the first conductive layer, and the two ends of the second wire are electrically connected to the second contact and the second conductive layer, respectively Connecting the first conductive layer and the first contact pad respectively, the two ends of the fourth wire are respectively connected to the second conductive layer and the second contact pad, and the two ends of the third wire respectively pass through the two The first conductive layer and the first contact pad are respectively connected to the hole, and the two ends of the fourth wire respectively pass through the two holes to respectively connect the second conductive layer and the second contact pad; and an electronic component Located on the lower surface of the orifice plate and electrically connected to the first conductive layer and A second conductive layer.

2.

The probe card of claim 1 further comprising: a probe holder disposed under the space transformer and including a first probe and a second probe, wherein the first probe and the probe The second probe is electrically connected to the first contact pad and the second contact pad, wherein the first probe is one of a power probe and a signal probe, and the second probe is a ground probe. The first probe and the second probe are frustum probes.

3.

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A probe card comprising: a printed circuit board having a contact; a space converter having an aperture plate and a compliant first wire and a second wire, the hole plate having a plurality of holes a first conductive layer, a second conductive layer and a contact pad are disposed on the lower surface of the hole plate. One end of the first wire is electrically connected to the contact, and the other end of the first wire is disposed through the one The second conductive layer is electrically connected to the second conductive layer and the contact pad, and the two ends of the second wire are respectively disposed in the two holes. Connecting the second conductive layer and the contact pad respectively; and an electronic component located on the lower surface of the aperture plate and electrically connecting the first conductive layer and the second conductive layer.

4.

The probe card of claim 3, further comprising: a probe holder disposed under the space transformer and including a probe, wherein the probe is electrically connected to the second conductive layer, wherein the probe The needle is one of a power probe, a signal probe, and a ground probe, which is a frustum probe.

5.

A probe card includes: a printed circuit board having a first contact and a second contact; a probe holder having a first conductive layer and a second conductive layer disposed therein and electrically respectively Connecting the first contact and the second contact; a space converter is disposed between the printed circuit board and the probe base; a first probe and a second probe are disposed through the probe holder And electrically connecting the first conductive layer and the second conductive layer respectively through the space converter; and an electronic component located inside the probe holder and electrically connecting the first conductive layer and the second a conductive layer; wherein the probe holder comprises a lower guide plate and an upper guide plate, and the electronic component is located on one of the upper and lower guide plates or the lower guide plate and the upper guide plate; wherein the first probe and the second probe The needle is a frustum probe, and the first probe is one of a power probe and a signal probe, and the second probe is a ground probe.

6.

The probe card of claim 5, wherein the space transformer is an orifice plate and has a plurality of holes for allowing a plurality of wires to pass through, wherein the plurality of wires electrically connect the first contacts to the first a probe electrically connected to the second probe.

7.

The probe card of claim 5, wherein the space transformer is a multi-layer ceramic structure substrate or a multi-layer organic structure substrate, and has a circuit structure inside, so that the first contact is electrically connected to the first a probe electrically connected to the second probe.

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8.
The probe card of claim 5, wherein the probe holder further comprises a plurality of dummy probes and a plurality of contact pads, wherein the first conductive layer and the second conductive layer are respectively disposed on the lower guide plate and the upper conductive plate The guiding plate is electrically connected to the first conductive layer by the plurality of dummy probes, and the second probe is electrically connected to the second conductive layer by the plurality of contact pads.

9.
The probe card of claim 5, wherein the probe holder further comprises a plurality of dummy probes, wherein the first conductive layer and the second conductive layer are located on the lower guide, the first probe and the first The two probes are electrically connected to the corresponding dummy probes, so that the first probes are electrically connected to the first conductive layer, and the second probes are electrically connected to the second conductive layer.

10.
The probe card of claim 5, wherein the probe holder further comprises a plurality of contact pads, wherein the first conductive layer and the second conductive layer are located on the upper guide, the first probe and the second probe The first conductive layer and the second conductive layer are electrically connected to each other through a plurality of contact pads on the upper conductive plate, so that the first probe is electrically connected to the first conductive layer, and the second probe is electrically connected. The second conductive layer.

11.
A probe card comprising: a printed circuit board having a contact; a probe holder having a first conductive layer and a second conductive layer, the first conductive layer electrically connecting the contact; a space a transducer disposed between the printed circuit board and the probe holder; a probe penetrating the probe holder and electrically connecting the second conductive layer through the space transformer; and an electronic component Is located inside the probe holder and electrically connected to the first conductive layer and the second conductive layer; wherein the probe holder comprises a lower guide plate and an upper guide plate, and the electronic component is located on the upper and lower guide plates or the One of the lower guide plate and the upper guide plate; wherein the probe is a buckling probe, and the probe is one of a power probe, a signal probe and a ground probe.

12.
The probe card of claim 11 , wherein the space transformer is an orifice plate and has a plurality of holes for allowing a plurality of wires to pass therethrough, the plurality of wires electrically connecting the contacts and the probe.

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13.
The probe card according to claim 11, wherein the space transformer is a multilayer ceramic structure substrate or a multilayer organic structure substrate, and has a circuit structure inside, so that the contact is electrically connected to the probe.

14.
The probe card of claim 11, wherein the probe holder further comprises a dummy probe and a contact pad, wherein the first conductive layer and the second conductive layer are respectively disposed on the lower guide plate and the upper guide plate. The probe is electrically connected to the first conductive layer by the dummy probe, and the contact pad electrically connects the contact to the second conductive layer.

15.
The probe card of claim 11 , wherein the probe holder further comprises a plurality of dummy probes, wherein the first conductive layer and the second conductive layer are located on the lower guide plate, and the probe is electrically connected to the plurality of probes One of the dummy probes to electrically connect the probe to the second conductive layer.

16.
The probe card of claim 11 , wherein the probe holder further comprises a plurality of contact pads, wherein the first conductive layer and the second conductive layer are located on the upper guide plate, and the probe passes through the plurality of upper guide plates One of the contact pads is electrically connected to the second conductive layer.

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CN 101738509 A,2010.06.16,
US 6087840 A,2000.07.11,
US 2009/0085593 A1,2009.04.02,
US 5525911 A,1996.06.11,
CN 101335265 A,2008.12.31,
US 2004/0163252 A1,2004.08.26,
JP 特开平 11-125645 A,1999.05.11,
US 7140883 B2,2006.11.28,
JP 特开 2009-10378 A,2009.01.15,

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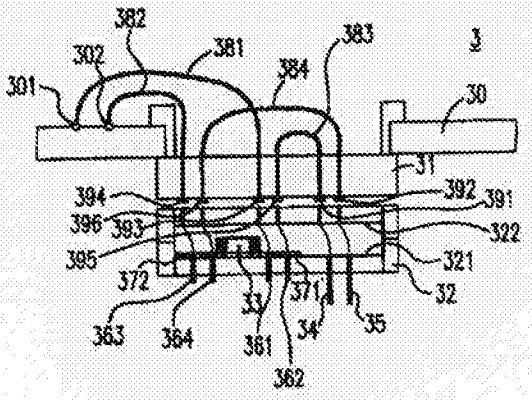
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(54)发明名称

探针卡

(57)摘要

本发明是提供一种探针卡，包括一印刷电路板，其具有一第一接点与一第二接点；一空间转换器，其具有一孔板与顺应性的一第一导线、一第二导线、一第三导线及一第四导线，该孔板具有多个孔洞，在该孔板的下表面上包括一第一导电层、一第二导电层、一第一接触垫及一第二接触垫，该第一导线的两端分别电性连接该第一接点及该第一导电层，该第二导线的两端分别电性连接该第二接点及该第二导电层，该第三导线分别连接该第一导电层及该第一接触垫，该第四导线分别连接该第二导电层及该第二接触垫，该第三导线及该第四导线是藉由穿设于所述孔洞分别连接该第一接触垫及该第二接触垫；以及一电子元件，其位于该孔板的下表面，并电性连接该第一导电层及该第二导电层。



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1. 一种探针卡，包括：

一印刷电路板，其具有一第一接点与一第二接点；

一空间转换器，其具有一孔板与顺应性的一第一导线、一第二导线、一第三导线及一第四导线，该孔板具有多个孔洞，在该孔板的下表面上包括一第一导电层、一第二导电层、一第一接触垫及一第二接触垫，该第一导线的两端分别电性连接该第一接点及该第一导电层，该第二导线的两端分别电性连接该第二接点及该第二导电层，该第三导线的两端分别连接该第一导电层及该第一接触垫，该第四导线的两端分别连接该第二导电层及该第二接触垫，该第三导线的两端分别穿设二个所述孔洞而分别连接该第一导电层及该第一接触垫，该第四导线的两端分别穿设二个所述孔洞而分别连接该第二导电层及该第二接触垫；以及

一电子元件，其位于该孔板的下表面，并电性连接该第一导电层及该第二导电层。

2. 如权利要求 1 所述的探针卡，还包括：

一探针座，其配置在该空间转换器下，并包括一第一探针与一第二探针，其中该第一探针与该第二探针分别电性连接该第一接触垫与该第二接触垫，其中该第一探针为电源探针及信号探针其中之一，该第二探针为一接地探针，该第一探针及该第二探针为挫屈柱探针。

3. 一种探针卡，包括：

一印刷电路板，其具有一接点；

一空间转换器，其具有一孔板与顺应性的一第一导线及一第二导线，该孔板具有多个孔洞，在该孔板的下表面上包括一第一导电层、一第二导电层及一接触垫，该第一导线的一端电性连接该接点，该第一导线的另一端穿设于一个所述孔洞而电性连接该第一导电层，该第二导线的两端分别电性连接该第二导电层及该接触垫，该第二导线的两端分别穿设于二个所述孔洞中而分别连接该第二导电层及该接触垫；以及

一电子元件，其位于该孔板的下表面，并电性连接该第一导电层及该第二导电层。

4. 如权利要求 3 所述的探针卡，还包括：

一探针座，其配置在该空间转换器下，并包括一探针，其中该探针电性连接该第二导电层，其中该探针为电源探针、信号探针及接地探针的其中之一，该探针为挫屈柱探针。

5. 一种探针卡，包括：

一印刷电路板，其具有一第一接点与一第二接点；

一探针座，在其内部设置一第一导电层及一第二导电层，并分别电性连接该第一接点与该第二接点；

一空间转换器，其位于该印刷电路板与该探针座之间；

一第一探针及一第二探针，其穿设该探针座，并透过该空间转换器而分别电性连接该第一导电层及该第二导电层；以及

一电子元件，其位于该探针座内部，并电性连接该第一导电层及该第二导电层；

其中该探针座包含一下导板与一上导板，且该电子元件位于该上、下导板或该下导板及该上导板其中之一上；

其中该第一探针及该第二探针为挫屈柱探针，该第一探针为电源探针及信号探针其中之一，该第二探针为一接地探针。

6. 如权利要求 5 所述的探针卡，其中该空间转换器为一孔板，并具有多个孔洞以使多

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条导线穿设其中，由该多条导线使该第一接点电性连接该第一探针，该第二接点电性连接该第二探针。

7. 如权利要求 5 所述的探针卡，其中该空间转换器为一多层陶瓷结构的基板或一多层有机结构的基板，并且内部具有一电路结构，使该第一接点电性连接该第一探针，该第二接点电性连接该第二探针。

8. 如权利要求 5 所述的探针卡，其中该探针座还包含多个假探针及多个接触垫，其中该第一导电层及该第二导电层分别设置在该下导板及该上导板，由该多个假探针使该第一探针电性连接该第一导电层，由该多个接触垫使该第二探针电性连接该第二导电层。

9. 如权利要求 5 所述的探针卡，其中该探针座还包含多个假探针，其 中该第一导电层及该第二导电层位于该下导板，该第一探针与该第二探针分别电性连接对应的假探针，以使该第一探针电性连接该第一导电层，该第二探针电性连接该第二导电层。

10. 如权利要求 5 所述的探针卡，其中该探针座还包含多个接触垫，其中该第一导电层及该第二导电层位于该上导板，该第一探针与该第二探针通过上导板上的多个接触垫分别电性连接该第一导电层与该第二导电层，以使该第一探针电性连接该第一导电层，该第二探针电性连接该第二导电层。

11. 一种探针卡，包括：

一印刷电路板，其具有一接点；

一探针座，其具有一第一导电层及一第二导电层，该第一导电层电性连接该接点；

一空间转换器，其位于该印刷电路板与该探针座之间；

一探针，其穿设该探针座，并透过该空间转换器而电性连接该第二导电层；以及

一电子元件，其位于该探针座内部，并电性连接该第一导电层及该第二导电层；

其中该探针座包含一下导板与一上导板，且该电子元件位于该上、下导板或该下导板及该上导板其中之一上；

其中该探针为挫屈柱探针，该探针为电源探针、信号探针及接地探针的其中之一。

12. 如权利要求 11 所述的探针卡，

其中该空间转换器为一孔板，并具有多个孔洞以使多条导线穿设其中，该多条导线电性连接该接点及该探针。

13. 如权利要求 11 所述的探针卡，

其中该空间转换器为一多层陶瓷结构的基板或一多层有机结构的基板，并且内部具有一电路结构，使该接点电性连接该探针。

14. 如权利要求 11 所述的探针卡，其中该探针座还包含一假探针及一接触垫，其中该第一导电层及该第二导电层分别设置在该下导板及该上导板，由该假探针使该探针电性连接该第一导电层，由该接触垫使该接点电 性连接该第二导电层。

15. 如权利要求 11 所述的探针卡，其中该探针座还包含多个假探针，其中该第一导电层及该第二导电层位于该下导板，该探针电性连接该多个假探针的其中之一，以使该探针电性连接该第二导电层。

16. 如权利要求 11 所述的探针卡，其中该探针座还包含多个接触垫，其中该第一导电层及该第二导电层位于该上导板，该探针通过上导板上的多个接触垫的其中之一电性连接该第二导电层。

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探针卡

技术领域

[0001] 本发明是关于一种探针卡，特别是指一种垂直式探针卡。

背景技术

[0002] 在半导体产业当中，晶圆的封装测试乃是非常重要的一环。在进行芯片的封装工程之前，需先对这些芯片做功能测试，以淘汰不良品，避免将有缺陷的芯片继续加工而造成不必要的成本浪费与损失。而探针卡的存在，即是作为测试机台与晶圆间的一个接口，提供从测试机台至晶圆的信号传递路径，以应用在晶圆级的测试工程当中。

[0003] 因此如何尽可能的提升探针卡的测试品质与效率，乃是本领域不断追求的目标。毕竟对于产品成本动辄数百万至上千万的半导体厂商而言，无论是多细微的良率改善，其造成的影响亦绝对不可忽视。

[0004] 目前而言，垂直式探针卡结构基本上包括了印刷电路板 (Printed Circuit Board，PCB)、空间转换器以及探针三个部份。印刷电路板上会布满许多的电子元件，电源与信号由印刷电路板上的线路传递至其下的空间转换器，接着再传递至空间转换器下方的探针，而由探针和下方的测试晶圆作接触。这样长的信号传输路径，会对信号造成干扰、并使信号噪声增加、电压不稳定等等。如此一来，将会大大影响到探针卡的测试品质，也破坏了整体测试信号传输的完整性。

[0005] 而垂直式探针卡的种类则可区分为人工拉线 (Hand Wire，HW)，多层陶瓷 / 多层有机 (Multi-Layer Ceramic/Multi-Layer Organic，MLC/MLO) 以及整合式电路板 (Integrated PCB，INT PCB) 等三种架构。

[0006] 在人工拉线的架构下，空间转换器是由一具有多个通孔的基板，或称孔板来达成空间转换的功能。自印刷电路板连接顺应性的导线经由通孔贯穿孔板的上下表面，而连接至孔板下方的探针；而在多层陶瓷 / 多层有机的架构下，则是由多层陶瓷基板或是多层有机基板来作为空间转换器。多层陶瓷基板或是多层有机基板的基板内部具有复杂的线路布局与走线，使得基板上下表面的接点得以电性导通。

[0007] 以人工拉线的架构而言，其中的孔板是内部不具线路布局，孔板上的多个通孔是贯穿孔板的上下表面，各孔板之间的间距小于印刷电路板上各电路结构的接点之间的间距，是以由顺应性的导线一端连接印刷电路板上的接点，另一端穿设孔板上的通孔并使导线固定并集中，可以达到空间转换的目的。而多层陶瓷 / 多层有机的架构则是通过多层陶瓷基板或多层有机基板内部的线路布局，使基板的上表面连接到印刷电路板大间距的电路结构得以转换成下表面的小间距。然而，多层陶瓷 / 多层有机的架构在设计与制作上需花费较大的成本与时间，而人工拉线架构则以外接顺应性导线的方式，再利用简单的孔板来固定导线，因此设计与制作成本较低。

[0008] 整合式电路板的架构，则是将多层陶瓷 / 多层有机的概念直接整合到印刷电路板上，也就是说，将印刷电路板与空间转换器整合在一起形成一整合式电路板，故整合式电路板本身即具有空间转换的功能。传统的印刷电路板，并无法直接将大间距转换成晶圆级的

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小间距，但整合式电路板则能够做到这样的转换功能。

[0009] 综上所述，目前现有的这些技术，都是在印刷电路板上放置许多的电子元件，信号传递路径过长，容易带来许多的缺点。

[0010] 在美国专利公开第 2009/0085593 号中，揭露了一种探针结构，其中多个弹簧探针 1SIG、1POW、1GND 被配置在一探针座 3 的各个导孔 5 中，各导孔 5 内壁则涂布导电层 10，探针座 3 上则具有一电容 9，如此一来各弹簧探针被导电层 10 所包覆，并因此得以和电容 9 进行电性连接。然而以上结构仅适用于弹簧探针结构，并不适用本案的垂直式探针，或者，与弹簧探针结构作区分，本案的垂直式探针可称为挫屈柱 (Buckling Beam) 探针，有关于挫屈柱探针的叙述，可以参考美国专利公告第 3806801 号的说明。若以上结构以挫屈柱探针结构取代弹簧探针，则在测试时，探针需要和待测物进行接触，在待测物作用在探针上的力，将使探针产生挫屈的侧向变形，导致探针与导孔 5 内壁的摩擦，故长期使用后会使导电层 10 逐渐受损、剥落，使接触电阻提高。因此这样的结果，会使探针卡电特性不佳、不利于产业上的使用。

[0011] 所以申请人有鉴于已知技术的缺点，乃经悉心地试验与研究，创作出本发明“探针卡的结构”，以克服上述缺陷。以下为本案的简要说明。

发明内容

[0012] 本发明的主要目的是提供一种适用于垂直式探针卡的结构，由改善现有方法所造成的缺点与不足，来达到节省成本、降低不良率以及提升应用领域等功效。

[0013] 根据本发明的构想，提出一种探针卡，包括一印刷电路板，其具有一第一接点与一第二接点；一空间转换器，其具有一孔板与顺应性的一第一导线、一第二导线、一第三导线及一第四导线，该孔板具有多个孔洞，在该孔板的下表面上包括一第一导电层、一第二导电层、一第一接触垫及一第二接触垫，该第一导线的两端分别电性连接该第一接点及该第一导电层，该第二导线的两端分别电性连接该第二接点及该第二导电层，该第三导线分别连接该第一导电层及该第一接触垫，该第四导线分别连接该第二导电层及该第二接触垫，该第三导线及该第四导线是由穿设所述孔洞分别连接该第一接触垫及该第二接触垫；以及一电子元件，其位于该孔板的下表面，并电性连接该第一导电层及该第二导电层。

[0014] 较佳地，本发明所提出的探针卡，还包括一探针座，其配置在该空间转换器下，并包括一第一探针与一第二探针，其中该第一探针与该第二探针分别电性连接该第一接触垫与该第二接触垫。

[0015] 较佳地，本发明所提出的探针卡，其中该第一探针为电源探针及信号探针其中之一，该第二探针为一接地探针。

[0016] 较佳地，本发明所提出的探针卡，其中该第一探针及该第二探针为挫屈柱探针。

[0017] 较佳地，本发明所提出的探针卡，其中该电子元件至少为主动元件、被动元件、及无线射频元件其中之一。

[0018] 根据本发明的另一构想，提出一种探针卡，包括一印刷电路板，其具有一接点；一空间转换器，其具有一孔板与顺应性的一第一导线及一第二导线，该孔板具有多个孔洞，在该孔板的下表面上包括一第一导电层、一第二导电层及一接触垫，该第一导线两端分别电性连接该接点及该第一导电层，该第二导线的两端分别电性连接该第二导电层及该接触

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垫，该第二导线由穿设于该孔洞中连接该接触垫；以及一电子元件，其位于该孔板的下表面，并电性连接该第一导电层及该第二导电层。

[0019] 较佳地，本发明所提出的探针卡，还包括一探针座，其配置在该空间转换器下，并包括一探针，其中该探针电性连接该第二导电层。

[0020] 较佳地，本发明所提出的探针卡，其中该探针为电源探针、信号探针及接地探针的其中之一。

[0021] 较佳地，本发明所提出的探针卡，其中该二探针为挫屈柱探针。

[0022] 较佳地，本发明所提出的探针卡，其中该电子元件至少为主动元件、被动元件、及无线射频元件其中之一。

[0023] 根据本发明的又一构想，提出一种探针卡，包括一印刷电路板，其具有一第一接点与一第二接点；一探针座，在其内部设置一第一导电层及一第二导电层，并分别电性连接该第一接点与该第二接点；一第一探针及一第二探针，其穿设该探针座，并分别电性连接该第一导电层及该第二导电层；以及一电子元件，其位于该探针座内部。

[0024] 较佳地，本发明所提出的探针卡，还包括一空间转换器，其位于该印刷电路板与该探针座之间。

[0025] 较佳地，本发明所提出的探针卡，其中该空间转换器为一孔板，并具有多个孔洞以使多条导线穿设其中，由该多条导线使该第一接点电性连接该第一探针，该第二接点电性连接该第二探针。

[0026] 较佳地，本发明所提出的探针卡，该空间转换器为一多层陶瓷结构的基板或一多层有机结构的基板，并且内部具有一电路结构，由该内部具有一电路结构，使该第一接点电性连接该第一探针，该第二接点电性连接该第二探针。

[0027] 较佳地，本发明所提出的探针卡，其中该印刷电路板为一整合式电路板。

[0028] 较佳地，本发明所提出的探针卡，其中该探针座还包含一下导板与一上导板，且该电子元件至少位于该下导板及该上导板其中之一上。

[0029] 较佳地，本发明所提出的探针卡，其中该探针座还包含多个假探针及多个接触垫，其中当该第一导电层及该第二导电层分别设置在该下导板及该上导板时，由该多个假探针使该第一探针电性连接该第一导电层，由该多个接触垫使该第二探针电性连接该第二导电层。

[0030] 较佳地，本发明所提出的探针卡，其中该探针座还包含多个假探针，其中当该第一导电层及该第二导电层位于该下导板时，该第一探针与该第二探针分别电性连接对应的假探针，以使该第一探针电性连接该第一导电层，该第二探针电性连接该第二导电层。

[0031] 较佳地，本发明所提出的探针卡，其中该探针座还包含多个接触垫，其中当该该第一导电层及该第二导电层位于该上导板时，该第一探针与该第二探针通过上导板上的多个接触垫分别电性连接该第一导电层与该第二导电层，以使该第一探针电性连接该第一导电层、该第二探针电性连接该第二导电层。

[0032] 较佳地，本发明所提出的探针卡，其中该第一探针及该第二探针为挫屈柱探针。

[0033] 较佳地，本发明所提出的探针卡，第一探针为电源探针及信号探针其中之一，该第二探针为一接地探针。

[0034] 较佳地，本发明所提出的探针卡，其中该电子元件至少为主动元件、被动元件、及

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无线射频元件其中之一。

[0035] 根据本发明的再一构想，提出一种探针卡，包括一印刷电路板、其具有一接点；一探针座，其具有一第一导电层及一第二导电层，该第一导电层电性连接该接点；一探针，其穿设该探针座，并电性连接该第二导电层；以及一电子元件，其位于该探针座内部。

[0036] 较佳地，本发明所提出的探针卡，还包括一空间转换器，其位于该印刷电路板与该探针座之间。

[0037] 较佳地，本发明所提出的探针卡，其中该空间转换器为一孔板，并具有多个孔洞以使多条导线穿设其中，该多条导线电性连接该接点及该探针。

[0038] 较佳地，本发明所提出的探针卡，其中该空间转换器为一多层陶瓷结构的基板或一多层有机结构的基板，并且内部具有一电路结构，使该接点电性连接该探针。

[0039] 较佳地，本发明所提出的探针卡，其中该印刷电路板为一整合式电路板。

[0040] 较佳地，本发明所提出的探针卡，其中该探针座还包含一下导板与一上导板，且该电子元件至少位于该下导板及该上导板其中之一上。

[0041] 较佳地，本发明所提出的探针卡，其中该探针座还包含一假探针及一接触垫，其中当该第一导电层及该第二导电层分别设置在该下导板及该上导板时，由该假探针使该探针电性连接该第一导电层，由该接触垫使该接点电性连接该第二导电层。

[0042] 较佳地，本发明所提出的探针卡，其中该探针座还包含多个假探针，其中当该第一导电层及该第二导电层位于该下导板时，该探针电性连接该多个假探针的其中之一，以使该探针电性连接该第二导电层。

[0043] 较佳地，本发明所提出的探针卡，其中该探针座还包含多个接触垫，其中当该第一导电层及该第二导电层位于该上导板时，该探针通过上导板上的多个接触垫的其中之一电性连接该第二导电层。

[0044] 较佳地，本发明所提出的探针卡，其中该第一探针及该第二探针为挫屈柱探针。

[0045] 较佳地，本发明所提出的探针卡，其中该探针为电源探针、信号探针及接地探针的其中之一。

[0046] 较佳地，本发明所提出的探针卡，其中该电子元件至少为主动元件、被动元件、及无线射频元件其中之一。

附图说明

[0047] 本案将可由以下的实施例说明及附图而得到充分了解，使得熟习本技术的人士可以据以完成的，然本案的实施并非可由下列实施例而被限制其实施型态，其中：

[0048] 图 1(a) 是本案第一实施例的探针卡结构示意图。

[0049] 图 1(b) 是本案第一实施例的探针卡结构示意图。

[0050] 图 1(c) 是图 1(a)、(b) 的仰视图。

[0051] 图 2 是本案第二实施例的探针卡结构示意图。

[0052] 图 3(a) 是本案第三实施例的探针卡结构示意图。

[0053] 图 3(b) 是本案第三实施例的探针卡结构示意图。

[0054] 图 3(c) 是本案第三实施例的探针卡结构示意图。

[0055] 图 4(a) 是本案第四实施例的探针卡结构示意图。

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[0056] 图 4(b) 是本案第四实施例的探针卡结构示意图。

[0057] 图 4(c) 是本案第四实施例的探针卡结构示意图。

[0058] 图 5 是本案第五实施例的探针卡结构示意图。

[0059] 图 6 是本案第六实施例的探针卡结构示意图。

具体实施方式

[0060] 以下说明本案的第一实施例，请参阅图 1(a)、(b)，其为本案所提出的探针卡结构示意图。如图 1(a) 所示，探针卡 1 具有一印刷电路板 10，其上具有一第一接点 101 与一第二接点 102，在使用探针卡测试待测物时，接点 101、102 是电性连接测试机，以接收测试机传送的信号。该印刷电路板 10 中间有一开口，其下为一空间转换器，也就是一孔板 11，孔板 11 具有一上表面及一下表面 111 以及多个孔洞（未显示），各孔洞是贯穿孔板 11 的上下表面，以利顺应性的一第一导线 181、一第二导线 182、一第三导线 183 以及一第四导线 184 垂直穿设其中。于该下表面 111 上则具有一凹槽 12，在凹槽 12 上具有一第一导电层 141 及一第二导电层 142，且该下表面 111 上还具有一第一接触垫 191 及一第二接触垫 192。第一导线 181 的两端分别电性连接第一接点 101 及第一导电层 141，第二导线 182 的两端分别电性连接第二接点 102 及第二导电层 142，第三导线 183 分别连接第一导电层 141 及第一接触垫 191，第四导线 184 分别连接第二导电层 142 及第二接触垫 192，第三导线 183 及第四导线 184 是由穿设所述孔洞分别连接第一接触垫 191 及第二接触垫 192。凹槽 12 中则配置一电子元件 13，例如电容，使电子元件 13 的两接点分别电性连接第一导电层 141 及第二导电层 142。在图 1(a) 的实施例中，探针卡 1 的电路连接方式为并联的形式。

[0061] 而探针卡 1 还包括一探针座 15，其位于该孔板 11 的下方。探针座 15 包括一第一探针 16 与一第二探针 17，其分别连接第一接触垫 191 及第二接触垫 192。因此，完整的电路路径乃自第一接点 101 连接第一导线 181，经由第一导电层 141、第三导线 183 及第一接触垫 191，最后至第一探针 16；而另一条完整的电路路径自第二接点 102 连接第二导线 182，经由第二导电层 142、第四导线 184 及第二接触垫 192，最后至第二探针 17。同时通过电子元件 13 的两接点电性连接第一导电层 141 以及第二导电层 142 而使电子元件 13 与两路径并联。

[0062] 在本实施例中，穿设于孔板 11 的各导线属于一种外部走线，故其具有所谓顺应性的特征。也就是说，相较于传统的印刷电路板内部设置的固定线路，其有较大的弹性以及变形承受的容忍度。另外，孔板 11 的下表面 111 可以不用设置凹槽 12，而是在探针座 15 上设计一孔洞 151，如图 1(b) 所示，用以容纳电子元件 13 所突出的空间。第一导电层 141 及第二导电层 142 依旧设置在下表面 111 上。

[0063] 图 1(c) 所示为图 1(a)、(b) 的仰视图（不包含探针座 15），从这个角度可以更清楚的了解本实施例中元件的配置关系。在本发明中，电子元件 13 的数量并无限制，这一点由图 1(c) 可清楚的获得解释，且其设置的方式当可根据需求或电路设计而做调整。

[0064] 基本上，从图 1(a)、(b) 的角度而言，电子元件 13 设置在孔板 11 的下方时，维修或者替换元件会较为容易。毕竟孔板 11 上方满布无数条的线路，无论是检查或是更换元件都会受到许多的阻碍。但若电子元件 13 位在孔板 11 下方时，仅需要将探针座 15 卸下，即可方便的进行作业。

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[0065] 在本实施例中，第一探针 16 乃是一电源探针及一信号探针其中之一，第二探针 17 则为一接地探针。当第一探针 16 是电源探针时，第一接点 101 是作为电源接点，用以接收测试机传送的电源；而当第一探针 16 是信号探针时，第一接点 101 是作为信号接点，用以接收测试机传送的测试信号；第二接点 102 则作为接地接点。

[0066] 图 1(a)、(b) 所展示的实施样态，为在探针卡结构的电路路径上并联设置电子元件，但其实施方式当不限于此。

[0067] 如图 2 所示，其为本案的第二实施例，在探针卡结构的串联路径上设置电子元件。探针卡 2 具有一印刷电路板 20，其上具有一接点 201。该印刷电路板 20 中间有一开口，其下为一空间转换器，也就是一孔板 21，孔板 21 具有一上表面及一下表面 211 以及多个孔洞（未显示），各孔洞是贯穿孔板 21 的上下表面，以利顺应性的一第一导线 281、一第二导线 282 垂直穿设其中。于该下表面 211 上具有一第一导电层 241 及一第二导电层 242，且该下表面 211 上还具有一接触垫 29。第一导线 281 的两端分别电性连接接点 201 及第一导电层 241，第二导线 282 的两端分别电性连接第二导电层 242 及接触垫 29，第二导线 282 是由穿设该孔洞而连接该接触垫 29。该下表面 211 上则配置一电子元件 23，例如电阻、集成电路 (IC) 或二极管，使电子元件 23 的两接点分别电性连接第一导电层 241 及第二导电层 242。

[0068] 而探针卡 2 还包括一探针座 25，其位于该孔板 21 的下方。探针座 25 包括一探针 26，其连接该接触垫 29，以及一孔洞 251，用以容纳电子元件 23 所突出的空间。因此，完整的电路路径乃自接点 201 连接第一导线 281，经由第一导电层 241 通过电子元件 23 连接第二导电层 242，再由第二导线 282 至接触垫 29，最后连接探针 26 而形成一串联路径。

[0069] 在本第二实施例中，虽仅展现在探针座 25 上设计一孔洞 251 以容纳电子元件 23 的型态。然而其实施方式当可如图 1(a) 般做变化，也就是在下表面 211 设计一凹槽（未显示）取代，而使电子元件 23 配置在该凹槽中。当然，亦可如前所述具有多个电子元件的配置以及包括合并串、并联路径的实施方式。

[0070] 此外，探针 26 可为一电源探针、一信号探针或是一接地探针，而接点 201 则对应探针 26 所使用的种类而作为相应的电源接点、信号接点以及接地接点。

[0071] 在本发明的第一及第二实施例中，为了避免电子元件因外力碰撞而损坏，可以在电子元件之外涂布保护层，例如保护的胶体，保护层也有固定电子元件的功能。

[0072] 接着说明本案的第三实施例，请参阅图 3(a)、(b)、(c)，其为本案所提出的探针卡结构示意图，与第一实施例相同，均是在探针卡结构的电路路径上并联设置电子元件，但与第一实施例的差异的处在于第一实施例是将电子元件设置在孔板的下表面，而第三实施例是将电子元件设置在探针座内部。探针卡 3 具有一印刷电路板 30，其上具有一第一接点 301 与一第二接点 302。探针卡 3 还包括一探针座 32，其内部设置一第一导电层 371 及一第二导电层 372，并分别电性连接第一接点 301 及第二接点 302。该探针座 32 包括一第一探针 34 以及一第二探针 35，其穿设该探针座 32，并分别电性连接第一导电层 371 与第二导电层 372。该探针座 32 内部则具有一电子元件 33，该电子元件 33 的两端则分别电性连接第一导电层 371 与第二导电层 372。因此，由空间转换器的设置，即孔板 31 及各导线 381、382、383 及 384 的设置，使第一探针 34 与第一接点 301 及第一导电层 371 电性连接而形成一电路路径，而第二探针 35 与第二接点 302 及第二导电层 372 电性连接形成另一电路路径，同时通过电子元件 33 连接第一导电层 371 以及第二导电层 372 而使电子元件 33 与两路径并联。

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而这种电路连接的表现方式并不局限，其可分别由以下几种说明来阐释。

[0073] 如图 3(a)-(c) 所示，探针卡 3 于印刷电路板 30 与探针座 32 之间还具有一空间转换器，该空间转换器为一孔板 31，孔板 31 具有多个孔洞（未显示），各孔洞是贯穿孔板 31 的上下表面，以利具顺应性的一第一导线 381、一第二导线 382、一第三导线 383 及一第四导线 384 垂直穿设其中。该孔板 31 包括多个接触垫 391、392、393、394、395、396。而第一导线 381 是分别电性连接第一接点 301 及第三接触垫 393，第二导线 382 分别电性连接第二接点 302 及第四接触垫 394，第三导线 383 分别电性连接第五接触垫 395 及第一接触垫 391，第四导线 384 分别电性连接第六接触垫 396 及第二接触垫 392。即由多条导线 381-384 的布设，可使第一接点 301 电性连接探针座 32 的一第一探针 34，使第二接点 302 电性连接探针座 32 的一第二探针 35。

[0074] 如图 3(a) 所示，该探针座 32 还包括一上导板 322 及一下导板 321，以及与第一导电层 371 和第二导电层 372 电性连接的多个假探针 361、362、363、364，电子元件 33 则位于下导板 321 上。而第一导电层 371 及第二导电层 372 是设置在下导板 321 上。而第一探针 34 与第一接点 301，以及第二探针 35 与第二接点 302 彼此之间的电性连接乃藉由孔板 31 及探针座 32 之间的布局来实现。也就是说，第一接点 301 到第一探针 34 的电路路径乃自第一接点 301 经由第一导线 381 到第三接触垫 393，再经由第一假探针 361 到第一导电层 371，之后经由一第二假探针 362 到第五接触垫 395，再从第三导线 383、第一接触垫 391 至第一探针 34；而第二接点 302 到第二探针 35 的电路路径自第二接点 302 经由第二导线 382 到第四接触垫 394，再经由一第三假探针 363 到第二导电层 372，之后经由一第四假探针 364 到第六接触垫 396，再从第四导线 384、第二接触垫 392 至第二探针 35。同时通过电子元件 33 的两接点电性连接第一导电层 371 以及第二导电层 372 而使电子元件 33 与两路径并联。换句话说，该第一探针 34 与该第二探针 35 分别电性连接对应的假探针 361-364，以使该第一探针 34 电性连接该第一导电层 371，该第二探针 35 电性连接该第二导电层 372。

[0075] 另外如图 3(b) 所示，电子元件 33 可设置在上导板 322 上，当然两导电层 371、372 也是设置在上导板 322 上。此处两导电层 371、372 与多个接触垫 393、394、395、396 之间并非通过假探针进行电性连接，而是由上导板 322 设计多个贯穿的通孔，并填满导电的金属材料或其它可传递信号的导电材料形成导孔，同时其上则为多个接触垫 397、398、399 及 3910，以分别和多个接触垫 393、394、395、396 之间进行电性连接。第一接点 301 到第一探针 34 的电路路径乃自第一接点 301 经由第一导线 381 到第三接触垫 393，再经由第七接触垫 397、导孔到第一导电层 371，之后经由导孔、第九接触垫 399 到第五接触垫 395，再从第三导线 383、第一接触垫 391 至第一探针 34；而第二接点 302 到第二探针 35 的电路路径自第二接点 302 经由第二导线 382 到第四接触垫 394，再经由第八接触垫 398、导孔到第二导电层 372，之后经由导孔、第十接触垫 3910 到第六接触垫 396，再从第四导线 384、第二接触垫 392 至第二探针 35。同时通过电子元件 33 的两接点电性连接第一导电层 371 以及第二导电层 372 而使电子元件 33 与两路径并联。换句话说，该第一探针 34 与该第二探针 35 通过上导板 322 上的多个接触垫 397-3910 分别电性连接该第一导电层 371 与该第二导电层 372，以使该第一探针 34 电性连接该第一导电层 371，该第二探针 35 电性连接该第二导电层 372。

[0076] 或者亦如图 3(c) 所示，电子元件 33 可为两端横跨上下导板 322、321 的设置方式，

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则两导电层 371、372 分别设置在下上导板 321、322。第一接点 301 到第一探针 34 的电路路径乃自第一接点 301 经由第一导线 381 到第三接触垫 393，再经由一第五假探针 365 到第一导电层 371，之后经由一第六假探针 366 到第五接触垫 395，再从第三导线 383、第一接触垫 391 至第一探针 34；而第二接点 302 到第二探针 35 的电路路径自第二接点 302 经由第二导线 382 到第四接触垫 394，再经由一第十二接触垫 3912、导孔到第二导电层 372，之后经由导孔、第十一接触垫 3911 到第六接触垫 396，再从第四导线 384、第二接触垫 392 至第二探针 35。同时通过电子元件 33 的两接点电性连接第一导电层 371 以及第二导电层 372 而使电子元件 33 与两路径并联。换句话说，由多个假探针 365、366 可使第一探针 34 电性连接该第一导电层 371，由多个接触垫 3911、3912 及其对应的导孔使该第二探针 35 电性连接该第二导电层 372。

[0077] 简而言之，上述的几种方式基本上在于随着电子元件 33 至少位于上导板 322 或下导板 311 其中之一上的设置，来做出相应的电路路径设计以及元件配置。也可说是看第一导电层 371 及第二导电层 372 位于上导板 322 或下导板 311 其中之一上的设置，来做出相应的电路路径设计以及元件配置。

[0078] 在本实施例中，第一探针 34 乃是一电源探针或是一信号探针，第二探针 35 则为一接地探针。当第一探针 34 是电源探针时，第一接点 301 是作为电源接点，用以接收测试机传送的电源；而当第一探针 34 是信号探针时，第一接点 301 是作为信号接点，用以接收测试机传送的测试信号；第二接点 302 则作为接地接点。

[0079] 如前所述，传统的探针卡的电子元件是配置在印刷电路板上，这样会造成信号传输路径过长，而对信号造成干扰，并导致信号噪声增加、电压不稳定。因此，如图 3(a)-(c) 所示，本发明的电子元件 33，乃是配置在探针座 32 之中。由于探针座 32 的下方就是待测的晶圆，因此通过这种结构，电子元件与待测物间的距离将有效的缩短，同时也提高了电源或是信号传输时的完整性。

[0080] 由于第一探针 34 与第二探针 35 之间，必须维持一固定的距离，如此一来才能够有效的维持信号阻抗匹配的特性，以及传递高品质的高频信号。因此假探针 361-366 的存在，得以允许第一探针 34 与第二探针 35 彼此间保持固定距离时，亦可连接至电子元件 33，并再通过导线连接至印刷电路板 30 上。

[0081] 再者，本发明所使用的探针均为挫屈柱探针，由假探针的设置或者图 3(a)-图 3(c) 的结构，使各探针可以与电子元件 33 电性连接，故探针座的导孔内壁并不需要涂布导电层。因此，可以避免美国专利公开第 2009/0085593 号所产生的缺点，例如探针座的各导孔内壁需涂布导电层，在长期使用下，探针与导孔内壁的摩擦，将使各导孔内壁导电层逐渐受损、剥落，使接触电阻提高。

[0082] 故本发明所提出的结构，不但拉近了电子元件 33 与待测物之间的距离，同时假探针 361-366 更能保护高频信号的阻抗匹配的特性，如此一来大幅提升了探针卡 3 的品质与稳定性。

[0083] 在前述第三实施例的内容与附图中，是以并联电路路径的方式配置电子元件。而同样的，其亦可以串联电路的方式来连接电子元件，如图 4(a)-(c) 所示，其为本案的第四实施例。探针卡 4 具有一印刷电路板 40，其上具有一接点 401。探针卡 4 还包括一探针座 42，其具有一第一导电层 471 及一第二导电层 472，该第一导电层 471 电性连接接点 401。

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该探针座 42 包括一探针 44，其穿设该探针座 42，并电性连接该第二导电层 472。该探针座 42 内部则具有一电子元件 43，该电子元件 43 的两端则分别电性连接第一导电层 471 与第二导电层 472。因此，通过前述的电路连接关系可知，在本第四实施例中，是表示探针卡 4 中串联电路的实施方式。

[0084] 如图 4(a) 所示，探针卡 4 于印刷电路板 40 以及探针座 42 之间还具有一空间转换器，也就是一孔板 41，孔板 41 具有多个孔洞（未显示），各孔洞是贯穿孔板 41 的上下表面，以利具顺应性的一第一导线 481 与一第二导线 482 垂直穿设其中。因此，完整的电路路径乃自接点 401 连接第一导线 481，再经由一第二接触垫 492、一第一假探针 461 到第一导电层 471，之后通过电子元件 43 连接第二导电层 472，再通过一第二假探针 462，一第三接触垫 493、第二导线 482 至第一接触垫 491，最后连接探针 44 而形成一串联路径。换句话说，探针座 42 还包含多个假探针 461、462，该探针 44 电性连接该多个假探针的其中之一，即第二假探针 462，以使探针 44 电性连接第二导电层 472。

[0085] 当然，这种电路连接的表现方式亦同样没有局限，也就是说，电子元件 43 的设置除了如图 4(a) 所示位于下导板 421 上之外，亦可设置在上导板 422 之上，或是横跨两导板 421、422 的配置方式。也可说是看第一导电层 471 及第二导电层 472 位于上导板 422 或下导板 421 其中之一上的设置，来做出相应的电路路径设计以及元件配置。如图 4(b) 所示，其所展示的乃是将电子元件 43 设置在上导板 422 之上。此处两导电层 471、472 与多个接触垫 492、493 之间并非通过假探针进行电性连接，而是由上导板 422 设计多个贯穿的通孔，并填满导电的金属材料或其它可传递信号的导电材料形成导孔，同时其上则为多个接触垫 494、495，以分别和多个接触垫 492、493 之间进行电性连接。因此，完整的电路路径乃自接点 401 连接第一导线 481 至第二接触垫 492，再经由第四接触垫 494 通过导孔连接到第一导电层 471，之后通过电子元件 43 连接第二导电层 472，再经由导孔、第五接触垫 495 连接第三接触垫 493，并经由第二导线 482 至第一接触垫 491，最后连接探针 44 而形成一串联路径。换句话说，该接点 401 通过多个接触垫 492、494 电性连接该第一导电层 471，该探针 44 通过多个接触垫 493、495 电性连接该第二导电层 472，并经由电子元件 43 以使整个电路路径串联在一起。

[0086] 另外，如图 4(c) 所示，电子元件 43 可为两端横跨上下导板 422、421 的设置方式，则两导电层 471、472 分别设置在下上导板 421、422。因此，完整的电路路径乃自接点 401 连接第一导线 481 至第二接触垫 492，再经由第六接触垫 496 通过导孔连接到第二导电层 472，之后通过电子元件 43 连接第一导电层 471，再经由假探针 463 连接第三接触垫 493，并经由第二导线 482 至第一接触垫 491，最后连接探针 44 而形成一串联路径。换句话说，由假探针 463 可使探针 44 电性连接该第一导电层 471，由接触垫 496 及其对应的导孔使接点 401 电性连接该第二导电层 472，并经由电子元件 43 以使整个电路路径串联在一起。

[0087] 探针 44 可为一电源探针、一信号探针或是一接地探针，而接点 401 则对应探针 44 所使用的种类而作为相应的电源接点、信号接点以及接地接点。

[0088] 当然在第三、第四实施例中，电子元件的配置方式亦同样不限于仅为单一，多个电子元件的配置以及包括合并串、并联的实施方式亦为可能。当然如此一来，导电层、各种探针以及导线的配置亦需增加，但只要电路的设计具有存在的可能性，即可应用于本发明所提出的探针卡的结构当中。

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[0089] 接着说明本案的第五实施例，请参阅图 5，其为本案所提出的探针卡结构示意图。与第三、第四实施例不同处，在于空间转换器的部分由一多层陶瓷 (Multi-Layer Ceramic，MLC) 或是多层有机 (Multi-Layer Organic，MLO) 的基板 51 取代孔板及导线形式的人工拉线的架构。基板 51 内部具有一电路结构 52，可使印刷电路板 50 上的一第一接点 501 电性连接探针座 53 的一第一探针 55，使印刷电路板 50 上的一第二接点 502 电性连接探针座 53 的一第二探针 56。第一接点 501 到第一探针 55 的电路路径乃自第一接点 501 经由印刷电路板 50 的内部线路，经过基板 51 内部的电路结构 52 到探针座 53 中的第一导电层 571，而第一导电层 571 再由基板 51 内部的电路结构 52 电性连接至第一探针 55；第二接点 502 到第二探针 56 的电路路径是自第二接点 502 经由印刷电路板 50 的内部线路，经过基板 51 内部的电路结构 52 到探针座 53 中的第二导电层 572，第二导电层 572 再经由基板 51 内部的电路结构 52 电性连接至第二探针 56。同时通过电子元件 54 的两接点电性连接第一导电层 571 以及第二导电层 572 而使电子元件 54 与两路径并联。

[0090] 同样的，在本第五实施例中，电路的路径亦可为并联、串联或是合并串、并联的实施方式。此外，多个电子元件的配置同样可应用于本实施例中，且电子元件 54 除了设置于下导板 531 上之外，亦可设置于上导板 532，或是跨两导板 531、532 的设置方式。并且，在并联路径上，第一探针 55 乃是一电源探针或是一信号探针，第二探针 56 则为一接地探针。当第一探针 55 是电源探针时，第一接点 501 是作为电源接点，用以接收测试机传送的电源；而当第一探针 55 是信号探针时，第一接点 501 是作为信号接点，用以接收测试机传送的测试信号；第二接点 502 则作为接地接点。而串联时，单一的探针则可为一电源探针、一信号探针或是一接地探针，而接点则对应探针所使用的种类而作为相应的电源接点、信号接点以及接地接点。

[0091] 接着说明本案的第六实施例，请参阅图 6，其为本案所提出的探针卡结构示意图。与第三到第五实施例不同处，在于空间转换器的部分由一整合式电路板 60 取代 MLC/MLO 基板以及人工拉线的架构。因此，电路的路径是由整合式电路板 60 上的第一接点 601 电性连接探针座 62 的第一探针 64，以及整合式电路板 60 上的第二接点 602 电性连接探针座 62 的第二探针 65。

[0092] 第一接点 601 到第一探针 64 的电路路径乃自第一接点 601 经由整合式电路板 60 内部的电路结构 61 电性连接至第一导电层 661，再经由整合式电路板 60 内部的电路结构 61 电性连接至第一探针 64；第二接点 602 到第二探针 65 的电路路径是自第二接点 602 经由整合式电路板 60 内部的电路结构 61 电性连接至第二导电层 662，再经由整合式电路板 60 内部的电路结构 61 电性连接至第二探针 65。同时通过电子元件 63 的两接点电性连接第一导电层 661 以及第二导电层 662 而使电子元件 63 与两路径并联。

[0093] 同样的，在本第六实施例中，电路的路径亦可为并联、串联或是合并串、并联的实施方式。并且，多个电子元件的配置亦同样可应用于本实施例中，且电子元件 63 除了设置于下导板 624 上之外，亦可设置于上导板 622，或是跨下、上导板 621、622 的设置方式。并且，在并联路径时，第一探针 64 乃是一电源探针或是一信号探针，第二探针 65 则为一接地探针。当第一探针 64 是电源探针时，第一接点 601 是作为电源接点，用以接收测试机传送的电源；而当第一探针 64 是信号探针时，第一接点 601 是作为信号接点，用以接收测试机传送的测试信号；第二接点 602 则作为接地接点。而串联时，单一的探针则可为一电源探针、

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一信号探针或是一接地探针，而接点则对应探针所使用的种类而作为相应的电源接点、信号接点以及接地接点。

[0094] 本发明的主要目的在于改善已知技术中，过长的传输路径造成信号的干扰与噪声的增加等问题。因此，由拉近电子元件与待测物的距离，也就是将电子元件设置在探针座之中或其上表面、或是探针座上方的基板，本发明所提出的探针卡的结构具有限流、去耦合、稳定电压、优秀的阻抗匹配特性、提高电磁兼容性以及降低电磁干扰等优点。

[0095] 此外，电子元件亦可包含主动元件、被动元件或是无线射频元件等。主动元件可为IC芯片、二极管等；被动元件可包含电容、电阻、电感或变压器等；而无线射频元件可包含过滤器、平衡－不平衡转换器或是双工器等。

[0096] 本案实为一难得一见、值得珍惜的罕见发明，惟以上所述的，仅为本发明的较佳实施列，当不能以之限定本发明所实施的范围。即凡是依本发明申请专利范围所作的均等变化与修饰，皆应仍属于本发明权利要求涵盖的范围。

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