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(54) MICRO DEVICE TRANSFER HEAD AND RELATED METHOD

(57) A micro device transfer head includes a base arm, a first side arm, a second side arm, and an isolation layer. The first side arm, including one or multiple first electrodes, is disposed on a first surface of the base arm and located on a first end of the base arm. The second side arm, including one or multiple second electrodes, is disposed on the first surface of the base arm and located on a second end of the base arm. The isolation later is disposed on the first surface of the base arm and covers the surface of the first side arm and the second side arm.

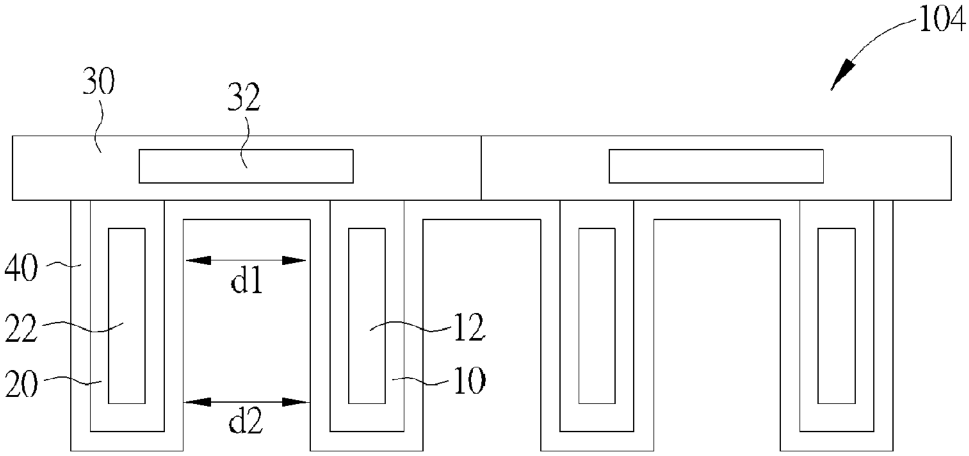

FIG. 4

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Description

Field of the Invention

[0001] The present invention is related to a micro device transfer head and a related method capable of mass-transferring micro LEDs rapidly and efficiently.

Background of the Invention

[0002] Compared to traditional incandescent bulbs, light-emitting diodes (LEDs) are advantageous in low power consumption, long lifetime, small size, no warm-up time, fast reaction speed, and the ability to be manufactured as small or array devices. In addition to outdoor displays, traffic signs, and liquid crystal display (LCD) backlight for various electronic devices such as mobile phones, notebook computers or personal digital assistants (PDAs), LEDs are also widely used as indoor/outdoor lighting devices in place of fluorescent of incandescent lamps. An LED may adopt front-emission micro devices or side-emission micro devices. Front-emission micro devices provide wider viewing angles, but have poor performances in emission efficiency and half wavelength. Side-emission micro devices excel in high emission efficiency and better half wavelength, but can only provide narrower viewing angles.

[0003] The size of traditional LED arrays is the dimension of millimeters (mm). The size of micro LED arrays may be reduced to the dimension of micrometers (μm) while inheriting the same good performances regarding power consumption, brightness, resolution, color saturation, reaction speed, life time and efficiency. In a micro LED manufacturing process, a thin-film, miniaturized and array design is adopted so that multiple micro LEDs are fabricated in the dimension of merely 1-250μm. Next, these micro LEDs are mass transferred to be disposed on another circuit board. Protection layers and upper electrodes may be formed in a physical deposition process before packaging the upper substrate.

[0004] Therefore, there is a need for a micro device transfer head array and a related method capable of mass-transferring micro LEDs rapidly and efficiently.

Summary of the Invention

[0005] The present invention aims at providing a micro device transfer head and a related method capable of mass-transferring micro LEDs rapidly and efficiently.

[0006] This is achieved by a micro device transfer head according to claim 1 and a method of transferring a micro device using a micro device transfer head according to claim 7. The dependent claims pertain to corresponding further developments and improvements.

[0007] As will be seen more clearly from the detailed description following below, the claimed micro device transfer head includes a base arm, a first side arm, a second side arm and an isolation layer. The first base arm includes a first surface and a second surface. The first side arm includes one or multiple first electrodes and is disposed on the first surface of the base arm at a first end of the base arm. The second side arm includes one or multiple second electrodes and is disposed on the first surface of the base arm at a second end of the base arm. The isolation layer is disposed on the first surface of the base arm and covers a surface of the first side arm and a surface of the second side arm.

[0008] As will be seen more clearly from the detailed description following below, the claimed method of transferring a micro device uses a micro device transfer head which includes a first base arm, a first side arm and a second side arm with the micro device fabricated on a substrate. The claimed method includes moving the first side arm within a sensing range of the micro device, charging the first side arm for drawing the micro device away from the substrate to move towards a space between the first side arm and the second side arm, and shortening a distance between the first side arm and the second side arm for clamping the micro device.

Brief Description of the Drawings

[0009] In the following, the invention is further illustrated by way of example, taking reference to the accompanying drawings.

FIG. 1 is a structural diagram illustrating a micro device transfer head array according to an embodiment of the present invention.

FIG. 2 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIG. 3 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIG. 4 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIG. 5 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIG. 6 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIG. 7 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIG. 8 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIG. 9 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIG. 10 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIG. 11 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIG. 12 is a structural diagram illustrating a micro device transfer head array according to another embodiment of the present invention.

FIGs. 13A~13E are diagrams illustrating the operation of a micro device transfer head array according to an embodiments of the present invention.

FIGs. 14A~14E are diagrams illustrating the operation of a micro device transfer head array according to another embodiments of the present invention.

FIGs. 15A~15E are diagrams illustrating the operation of a micro device transfer head array according to another embodiments of the present invention.

FIGs. 16A~16D are diagrams illustrating the operation of a micro device transfer head array according to another embodiment of the present invention.

Detailed Description

[0010] FIGs. 1~6 are structural diagrams illustrating micro device transfer head arrays 101~106 according to embodiments of the present invention. Each of the micro device transfer head arrays 101~106 includes a plurality of transfer heads (only two transfer heads are depicted for illustrative purpose) for transferring a predetermined amount of micro devices to a substrate. Each transfer head includes a first side arm 10, a second side arm 20, a base arm 30, and an isolation layer 40. The first side arm 10 and the second side arm 20 are structures extending from both ends of the base arm 30, respectively. The space between the first side arm 10 and the second side arm 20 may provide room to clamp and accommodate a micro device. The isolation layer 40 covers the surface of the first side arm 10 and the second side arm 20, as well as covers one surface of the base arm 30. The first end of first side arm 10 and the first end of the second side arm 20 are contact ends to the base arm 30, while the second end of first side arm 10 and the second end of the second side arm 20 are clamping ends. The distance between the first end of first side arm 10 and the first end of the second side arm 20 is represented by d1, while the distance between the second end of first side arm 10 and the second end of the second side arm 20 is represented by d2.

[0011] In the embodiments illustrated in FIGs. 1-3, the first side arm 10 includes one or multiple electrodes 12 and the second side arm 20 includes one or multiple electrodes 22. In the micro device transfer head array 101 depicted in FIG. 1, the first side arm 10 and the second side arm 20 are of the same length. In the micro device transfer head array 102 depicted in FIG. 2, the first side arm 10 is longer than the second side arm 20. In the micro device transfer head array 103 depicted in FIG. 3, the first side arm 10 and the second side arm 20 are of the same length and both include a hook-shaped second end.

[0012] In the embodiments illustrated in FIGs. 4-6, the first side arm 10 includes one or multiple electrodes 12, the second side arm 20 includes one or multiple electrodes 22, and the base arm 30 includes one or multiple electrodes 32. In the micro device transfer head array 104 depicted in FIG. 4, the first side arm 10 and the second side arm 20 are of the same length. In the micro device transfer head array 105 depicted in FIG. 5, the first side arm 10 is longer than the second side arm 20. In the micro device transfer head array 106 depicted in FIG. 6, the first side arm 10 and the second side arm 20 are of the same length and both include a hook-shaped second end.

[0013] FIGs. 7~9 are structural diagrams illustrating micro device transfer head arrays 107~109 according to embodiments of the present invention. Each of the micro device transfer head arrays 107~109 includes a plurality of transfer heads (only two transfer heads are depicted for illustrative purpose) for transferring a predetermined amount of micro devices to a substrate. Each transfer head includes a first side arm 10, a second side arm 20, two base arms 31 and 35, and an isolation layer 40. The first side arm 10 and the second side arm 20 are structures extending from both ends of the base arm 31, respectively. The space between the first side arm 10 and the second side arm 20 may provide room to clamp and accommodate a micro device. The isolation layer 40 covers the surface of the first side arm 10 and the second side arm 20, as well as covers a first surface of the base arm 31. The base arm 35 is disposed on a second surface of the base arm 31. The space between the base arm 31 and the base arm 35 may provide deformation room for operating the micro device transfer head arrays 107-109, which will be illustrated in detail in subsequent paragraphs. The first end of first side arm 10 and the first end of the second side arm 20 are contact ends to the base arm 31, while the second end of first side arm 10 and the second end of the second side arm 20 are clamping ends. The distance between the first end of first side arm 10 and the first end of the second side arm 20 is represented by d1, while the distance between the second end of first side arm 10 and the second end of the second side arm 20 is represented by d2.

[0014] In the embodiments illustrated in FIGs. 7-9, the first side arm 10 includes one or multiple electrodes 12, the second side arm 20 includes one or multiple electrodes 22, the base arm 31 includes one or multiple electrodes 32, and the base arm 35 includes one or multiple sensing elements 42. The one or multiple sensing elements 42 may be one or multiple electrodes or electromagnetic coils. In the micro device transfer head array 107 depicted in FIG. 7, the first side arm 10 and the second side arm 20 are of the same length. In the micro device transfer head array 108 depicted in FIG. 8, the first side arm 10 is shorter than the second side arm 20. In the micro device transfer head array 109 depicted in FIG. 9, the first side arm 10 and the second side arm 20 are of the same length and both include a hook-shaped second end.

[0015] FIGs. 10~12 are structural diagrams illustrating micro device transfer head arrays 110~112 according to embodiments of the present invention. Each of the micro device transfer head arrays 110~112 includes a plurality of transfer heads (only two transfer heads are depicted for illustrative purpose) for transferring a predetermined amount of micro devices to a substrate. Each transfer head includes a first side arm 10, a second side arm 20, a base arm 30, an isolation layer 40, and adjusting arms 51 and 53. The first side arm 10 and the second side arm 20 are structures extending from both ends of the base arm 30, respectively. The space between the first side arm 10 and the second side arm 20 may provide room to clamp and accommodate a micro device. The isolation layer 40 covers the surface of the first side arm 10 and the second side arm 20, as well as covers a first surface of the base arm 30. The adjusting arms 51 and 53 are disposed on a second surface of the base arm 30, wherein the location of each adjusting arm 51 corresponds to the space between the first side arm 10 and the second side arm 20 in each transfer head, while the location of each adjusting arm 53 corresponds to the space between each transfer head. The first end of first side arm 10 and the first end of the second side arm 20 are contact ends to the base arm 30, while the second end of first side arm 10 and the second end of the second side arm 20 are clamping ends. The distance between the first end of first side arm 10 and the first end of the second side arm 20 is represented by d1, while the distance between the second end of first side arm 10 and the second end of the second side arm 20 is represented by d2.

[0016] In the embodiments illustrated in FIGs. 10-12, the first side arm 10 includes one or multiple electrodes 12, and the second side arm 20 includes one or multiple electrodes 22. In the micro device transfer head array 110 depicted in FIG. 110, the first side arm 10 and the second side arm 20 are of the same length. In the micro device transfer head array 111 depicted in FIG. 11, the first side arm 10 is longer than the second side arm 20. In the micro device transfer head array 112 depicted in FIG. 12, the first side arm 10 and the second side arm 20 are of the same length and both include a hook-shaped second end.

[0017] FIGs. 13A~13E are diagrams illustrating the operation of the micro device transfer head arrays 101~103 according to embodiments of the present invention. For illustrative purpose, FIGs. 13A~13E depict the 5-state operation of the micro device transfer head array 102. In the initial first state depicted in FIG. 13A, the electrodes 12 and 22 are not charged, and the distance between the first side arm 10 and its corresponding micro device 5 is h0. In the second state depicted in FIG. 13B, the electrodes 12 is charged, and the micro device transfer head array 102 is moved within the sensing range of the corresponding micro device 5 (as indicated by arrow S1), wherein the distance between the first side arm 10 and its corresponding micro device 5 is h1 (h1<h0). In the third state depicted in FIG. 13C, the micro device transfer head array 102 is moved in the lateral direction (as indicated by arrow S2) so that the charged electrode 12 may draw the corresponding micro device 5 away from the substrate to move towards the space between the first side arm 10 and the second side arm 20(as indicated by arrow S3). In the fourth state depicted in FIG. 13D, with the lateral movement of the micro device transfer head array 102 and under the attraction force induced by the charged electrode 12, the corresponding micro device 5 may be drawn into the space between the first side arm 10 and the second side arm 20(as indicated by arrow S4). In the fifth state depicted in FIG. 13E, when the electrodes 12 and 22 are then charged by voltages of opposite polarities, the induced attraction force shortens the distance between the second end of the first side arm 10 and the second end of the second side arm 20 (d2>d1), thereby clamping the corresponding micro device 5 steadily.

[0018] FIGs. 14A~14E are diagrams illustrating the operation of the micro device transfer head arrays 104~106 according to embodiments of the present invention. For illustrative purpose, FIGs. 14A~14E depict the 5-state operation of the micro device transfer head array 105. In the initial first state depicted in FIG. 14A, the electrodes 12 and 22 are not charged, and the distance between the first side arm 10 and its corresponding micro device 5 is h0. In the second state depicted in FIG. 14B, the electrodes 12 is charged, and the micro device transfer head array 105 is moved within the sensing range of the corresponding micro device 5 (as indicated by arrow S1), wherein the distance between the first side arm 10 and the corresponding micro device 5 is h1 (h1<h0). In the third state depicted in FIG. 14C, the micro device transfer head array 105 is moved in the lateral direction (as indicated by arrow S2) so that the charged electrode 12 may draw the corresponding micro device 5 away from the substrate to move towards the space between the first side arm 10 and the second side arm 20(as indicated by arrow S3). In the fourth state depicted in FIG. 14D, with the lateral movement of the micro device transfer head array 105 and under the attraction force induced by the charged electrode 12, the corresponding micro device 5 may be drawn into the space between the first side arm 10 and the second side arm 20. Meanwhile, the electrode 32 is charged to further draw the corresponding micro device 5 towards the base arm 30 to fully be accommodated inside the space between the first side arm 10 and the second side arm 20 (as indicated by arrow S4). In the fifth state depicted in FIG. 14E, when the electrodes 12 and 22 are then charged by voltages of opposite polarities, the induced attraction force shortens the distance between the second end of the first side arm 10 and the second end of the second side arm 20 (d2>d1), thereby clamping the corresponding micro device 5 steadily.

[0019] FIGs. 15A~15E are diagrams illustrating the operation of the micro device transfer head arrays 107~109 according to embodiments of the present invention. For illustrative purpose, FIGs. 15A~15E depict the 5-state operation of the micro device transfer head array 108 with an auxiliary board 50. The auxiliary board 50 includes one or multiple sensing elements 52 each associated with a corresponding micro device 5. In the initial first state depicted in FIG. 15A, the electrodes 12 and 22 are not charged, and the distance between the first side arm 10 and its corresponding micro device 5 is h0. Under such circumstance, the one or multiple sensing elements 52 of the auxiliary board 50 are aligned with corresponding one or multiple micro devices 5, but are not in contact with the substrate which contains the one or multiple micro devices 5. In the second state depicted in FIG. 15B, the auxiliary board 50 is moved towards the substrate which contains the one or multiple micro devices 5 and the one or multiple sensing elements 52 are charged, while the micro device transfer head array 108 is moved within the sensing range of the corresponding micro device 5 and the electrodes 12 is charged (as indicated by arrow S1), wherein the distance between the first side arm 10 and the corresponding micro device 5 is h1 (h1<h0). In the third state depicted in FIG. 15C, the micro device transfer head array 108 is moved in the lateral direction (as indicated by arrow S2) so that the charged electrode 12 may draw the corresponding micro device 5 away from the substrate to move towards the space between the first side arm 10 and the second side arm 20(as indicated by arrow S3). In the fourth state depicted in FIG. 15D, with the lateral movement of the micro device transfer head array 108 and under the attraction force induced by the charged electrode 12, the corresponding micro device 5 may be drawn into the space between the first side arm 10 and the second side arm 20. Meanwhile, the electrode 32 is charged to further draw the corresponding micro device 5 towards the base arm 30 to fully be accommodated inside the space between the first side arm 10 and the second side arm 20 (as indicated by arrow S4). In the fifth state depicted in FIG. 15E, when the sensing element 42 and the electrode 12 are then charged by voltages of opposite polarities, the induced attraction force shortens the distance between the base arm 31 and the base arm 35 so that the base arm 31 encounters deformation which changes the relative locations of both ends of the first side arm 10 and the second side arm 20 (d2>d1), thereby clamping the corresponding micro device 5 steadily.

[0020] FIGs. 16A~16D are diagrams illustrating the operation of the micro device transfer head arrays 110~112 according to embodiments of the present invention. For illustrative purpose, FIGs. 16A~16D depict the 4-state operation of the micro device transfer head array 110 with an auxiliary board 60. The auxiliary board 60 includes one or multiple bulging structures 62 each associated with a corresponding micro device 5. In the initial first state depicted in FIG. 16A, the electrodes 12 and 22 are not charged, and the distance between the first side arm 10 and its corresponding micro device 5 is h0. An edge-cutting procedure is performed on the substrate containing the one or more micro devices, thereby weakening the edges which define the one or more micro devices. The one or multiple sensing elements 52 of the auxiliary board 50 are aligned with corresponding one or multiple micro devices 5, but are not in contact with the substrate which contains the one or multiple micro devices 5. In the second state depicted in FIG. 15B, the auxiliary board 50 is moved towards the substrate which contains the one or multiple micro devices 5 so that one end of the one or multiple micro devices 5 may be jacked up. Meanwhile, the electrodes 12 is charged and the micro device transfer head array 110 is moved within the sensing range of the corresponding micro device 5(as indicated by arrow S1) until the corresponding micro device 5 may be drawn into the space between the first side arm 10 and the second side arm 20(as indicated by arrow S3). In the fourth state depicted in FIG. 16D, each adjusting arm 51 is applied with an upward force and each adjusting arm 53 is applied with an downward force so that the base arm 30 may encounter deformation which changes the relative locations of both ends of the first side arm 10 and the second side arm 20 (d2<d1), thereby clamping the corresponding micro device 5 stably.

[0021] In conclusion, the present invention provides a micro device transfer head array and a related method capable of mass-transferring micro LEDs rapidly and efficiently.

Claims

1. A micro device transfer head (101~112), comprising:

   a first base arm (30, 31) including a first surface and a second surface;

   characterized by:

   a first side arm (10) including one or multiple first electrodes (12) and disposed on the first surface of the first base arm (30, 31) at a first end of the first base arm (30, 31);
   a second side arm (20) including one or multiple second electrodes (22) and disposed on the first surface of the first base arm (30, 31) at a second end of the first base arm (30, 31); and
   an isolation layer (40) disposed on the first surface of the first base arm (30, 31) and covering a surface of the first side arm (10) and a surface of the second side arm (20).

2. The micro device transfer head (104~109) of claim 1, **characterized in that** the first base arm (30, 31) further includes one or multiple third electrodes (32).

3. The micro device transfer head (107~109) of any of claim 1-2, **further characterized by** comprising:

a second base arm (35) disposed on the second surface of the first base arm (31) and including one or multiple sensing elements (42).

4. The micro device transfer head (107~109) of claim 3, **characterized in that** the one or multiple sensing elements (42) are one or multiple electrodes or electromagnetic coils.

5. The micro device transfer head (110~112) of claim 1, further **characterized by** comprising:

   a first adjusting arm (51) disposed on the second surface of the first base arm (30) at a location corresponding to a space between the first side arm (10) and the second side arm (20);
   a second adjusting arm (53) disposed on the second surface of the first base arm (30) at the first end of the first base arm (30); and
   a third adjusting arm (53) disposed on the second surface of the first base arm (30) at the second end of the first base arm (30).

6. The micro device transfer head (103, 106, 109, 112) of claim 1, **characterized in that:**

   the first side arm (10) includes a first hook-shaped structure at an end which is farthest away from the first base arm (30, 31); and
   the second side arm (20) includes a second hook-shaped structure at an end which is farthest away from the first base arm (30, 31).

7. A method of transferring a micro device (5) using a micro device transfer head (101~112), wherein the micro device transfer head (101~112) includes a first base arm (30, 31), a first side arm (10) and a second side arm (20), and the micro device (5) is fabricated on a substrate, the method **characterized by** comprising:

   moving the first side arm (10) within a sensing range of the micro device (5);
   charging the first side arm (10) for drawing the micro device (5) away from the substrate to move towards a space between the first side arm (10) and the second side arm (20); and
   shortening a distance between the first side arm (10) and the second side arm (20) for clamping the micro device (5).

8. The method of claim 7, **further characterized by** comprising:

   charging the first base arm (30, 31) for drawing the micro device (5) into the space between the first side arm (10) and the second side arm (20) after charging the first side arm (10) for drawing the micro device (5) to move towards the space between the first side arm (10) and the second side arm (20).

9. The method of claim 8, **further characterized by** comprising:

   applying a voltage of a first polarity to the first side arm (10) and applying a voltage of a second polarity to the second side arm (20) for shortening the distance between the first side arm (10) and the second side arm (20) after drawing the micro device (5) into the space between the first side arm (10) and the second side arm (20).

10. The method of claim 8, wherein the micro transfer head (107~109) further includes a second base arm (35), **further characterized by** comprising:

   applying a torque deformation on the first base arm (30) using the second base arm (35) for shortening the distance between the first side arm (10) and the second side arm (20).

11. The method of claim 7, **further characterized by** comprising:

   moving the micro device transfer head (101~112) along a predetermined direction so that the charged first side arm (10) draws the micro device (5) into the space between the first side arm (10) and the second side arm (20) after charging the first side arm (10) for drawing the micro device (5) to move towards the space between the first side arm (10) and the second side arm (20), wherein the predetermined direction is parallel to a surface of the substrate.

12. The method of claim 11, **further characterized by** comprising:

   applying a voltage of a first polarity to the first side arm (10) and applying a voltage of a second polarity to the second side arm (20) for shortening the distance between the first side arm (10) and the second side arm (20) after drawing the micro device (5) into the space between the first side arm (10) and the second side arm (20).

13. The method of claim 11, wherein the micro transfer head (107~109) further includes a second base arm (35), **characterized in that** comprising:

   applying a torque deformation on the first base arm (30) using the second base arm (35) for shortening the distance between the first side arm (10) and the second side arm (20).

14. The method of claim 7, **further characterized by** comprising:

applying a first voltage to the substrate and applying a second voltage to the first side arm (10) so as to detach the micro device (5) from the substrate and move towards the space between the first side arm (10) and the second side arm (20), wherein the first voltage and the second voltage have opposite polarities.

15. The method of claim 7, **further characterized by** comprising:

performing an edge-cutting procedure on the substrate for defining a range of the micro device (5);
jacking up an end of the micro device (5) away from the substrate using an auxiliary board (60); and
charging the first side arm (10) for detaching the micro device (5) from the substrate to move towards the space between the first side arm (10) and the second side arm (20).

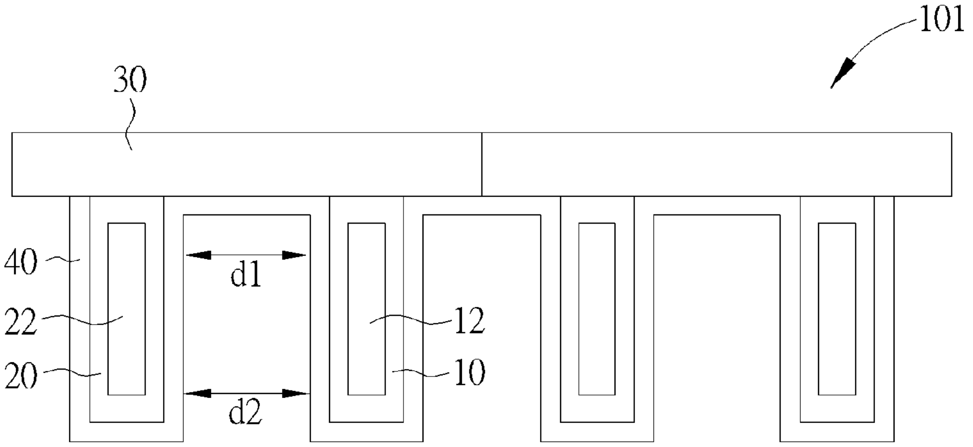

FIG. 1

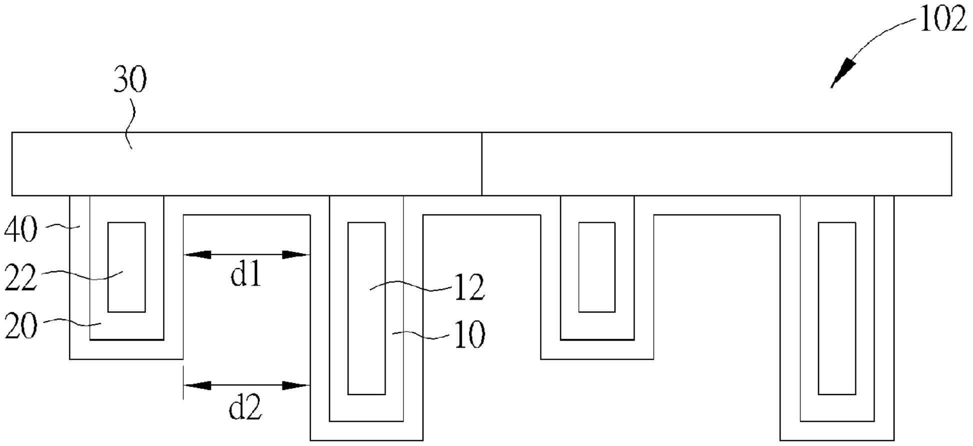

FIG. 2

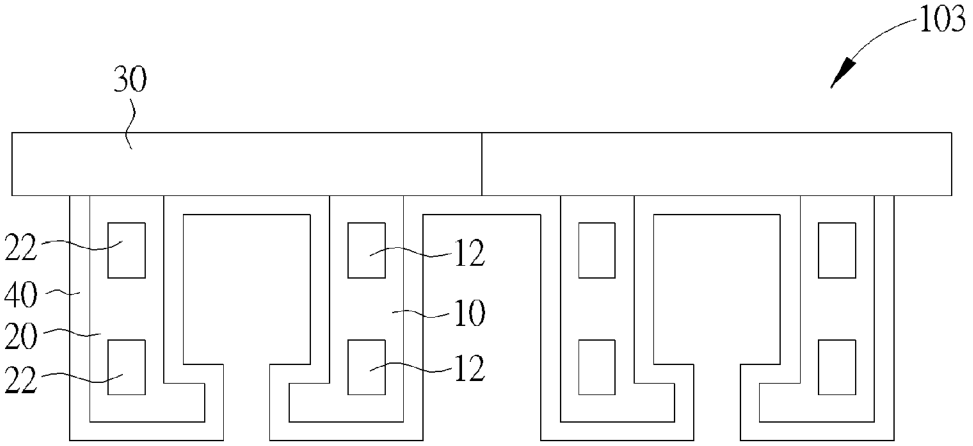

FIG. 3

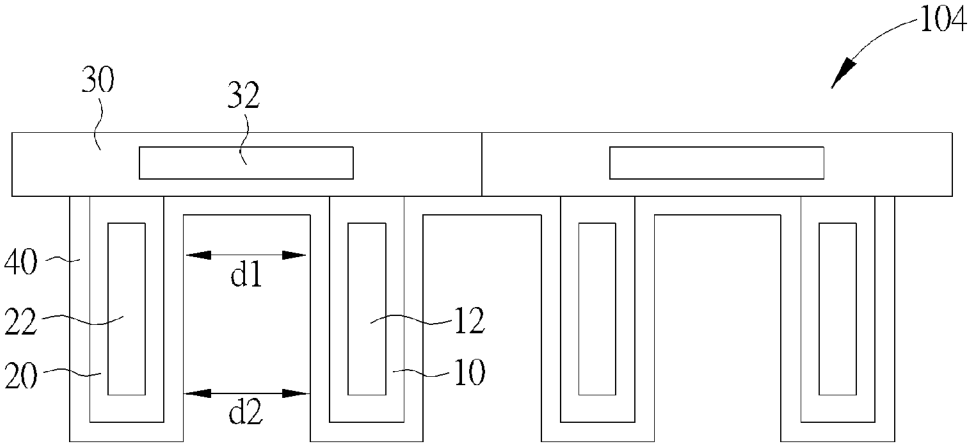

FIG. 4

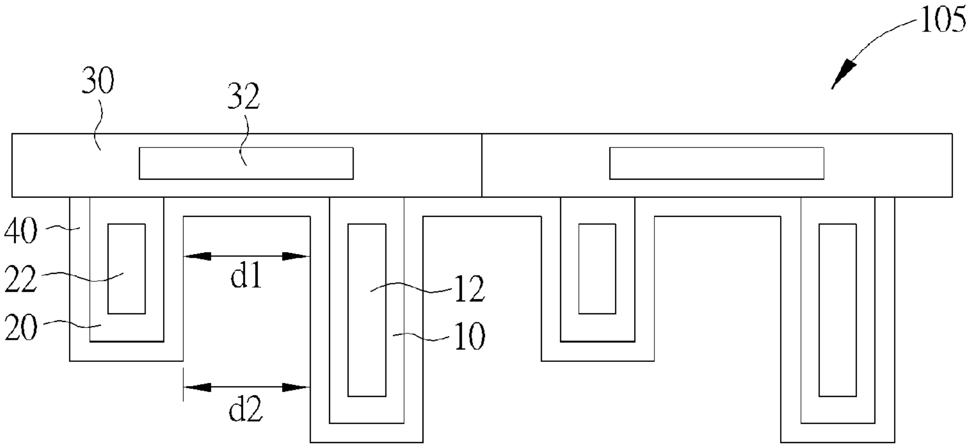

FIG. 5

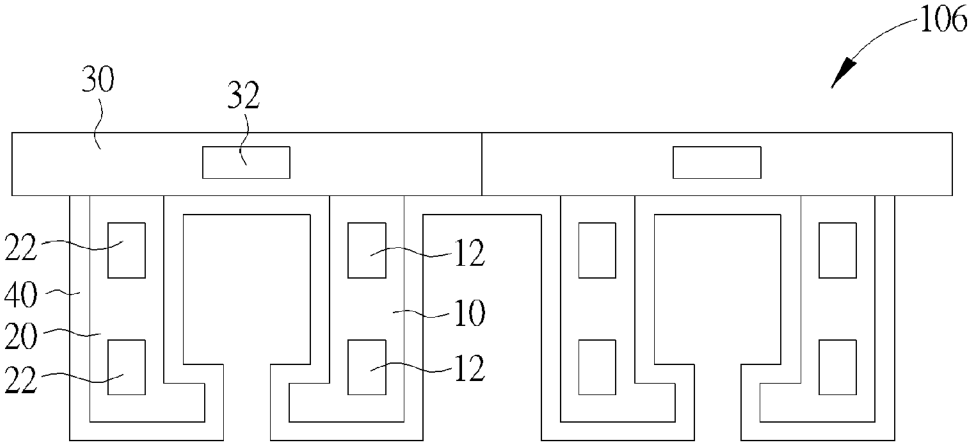

FIG. 6

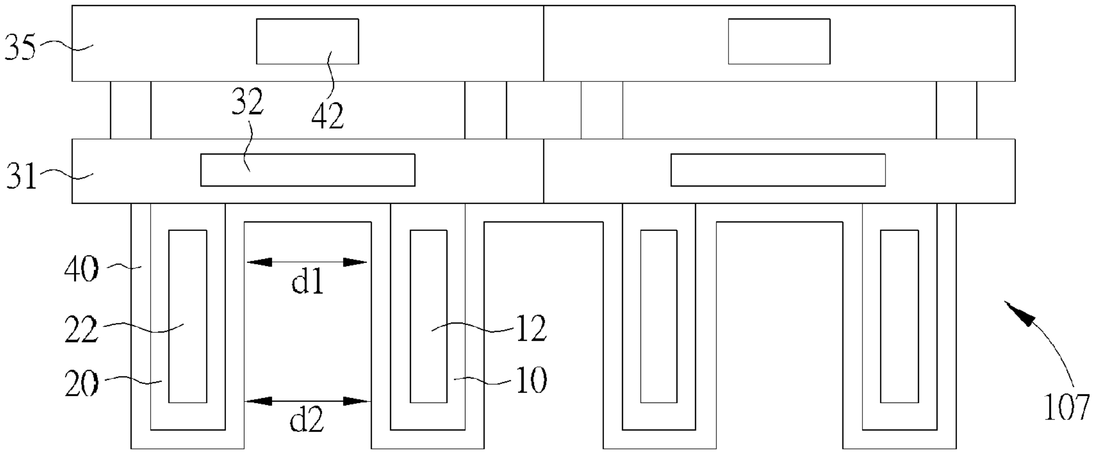

FIG. 7

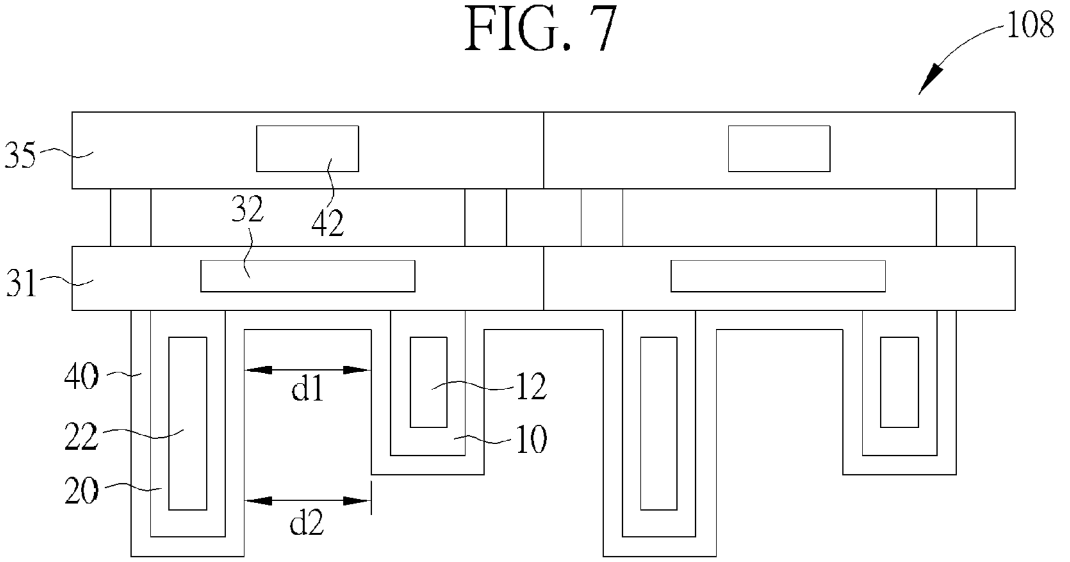

FIG. 8

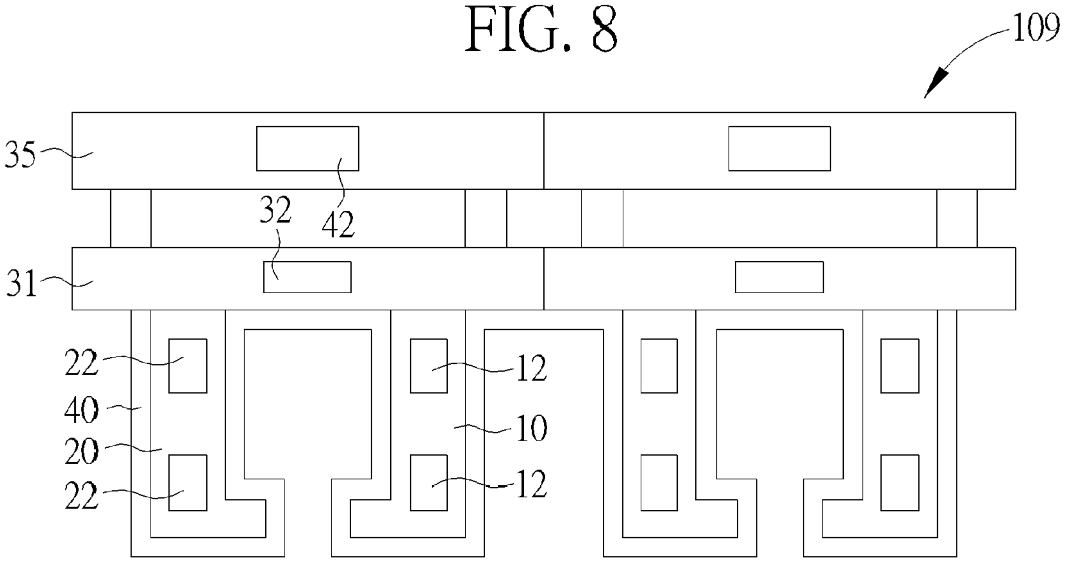

FIG. 9

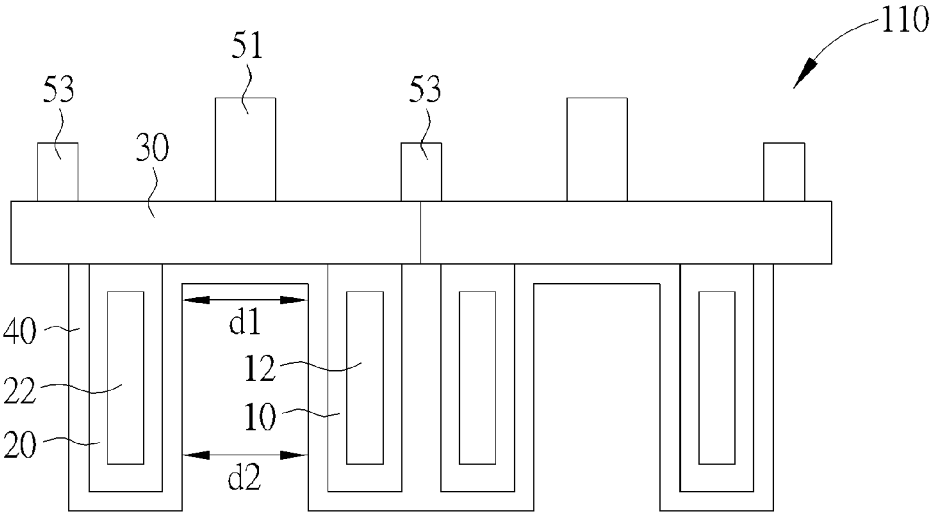

FIG. 10

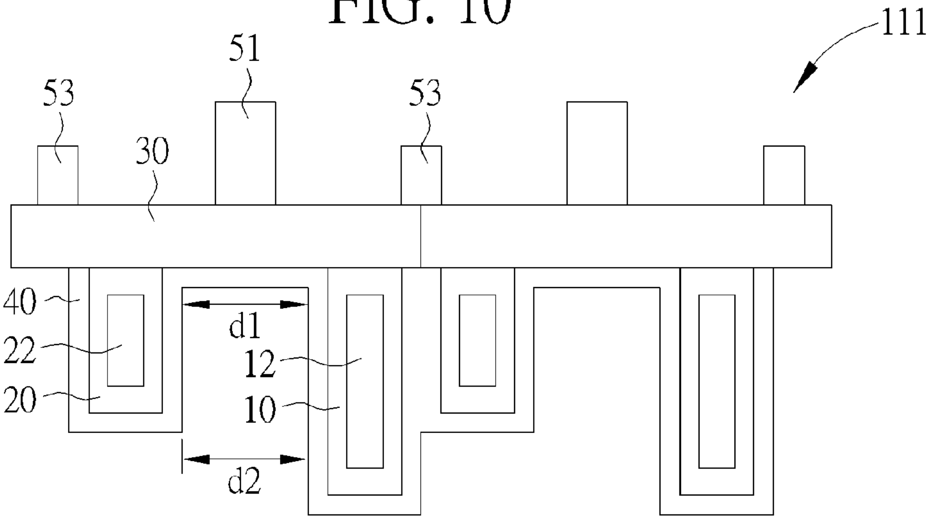

FIG. 11

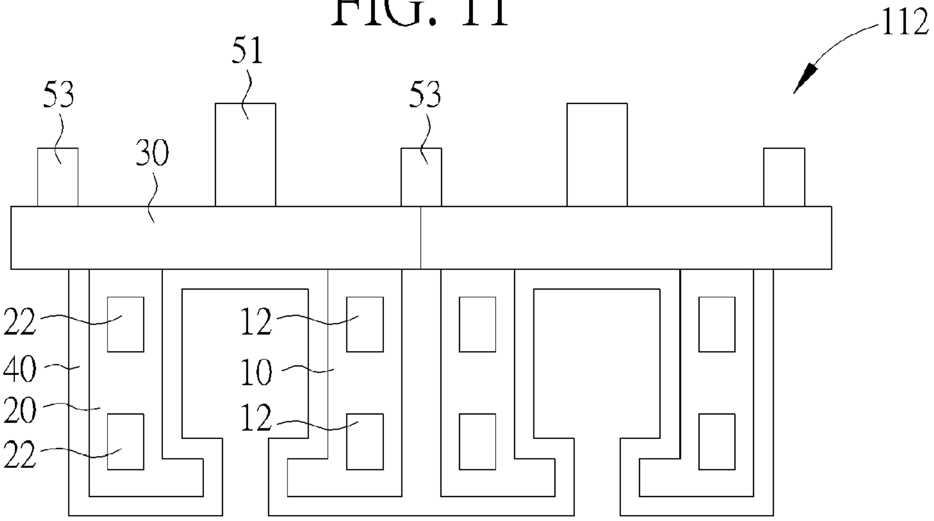

FIG. 12

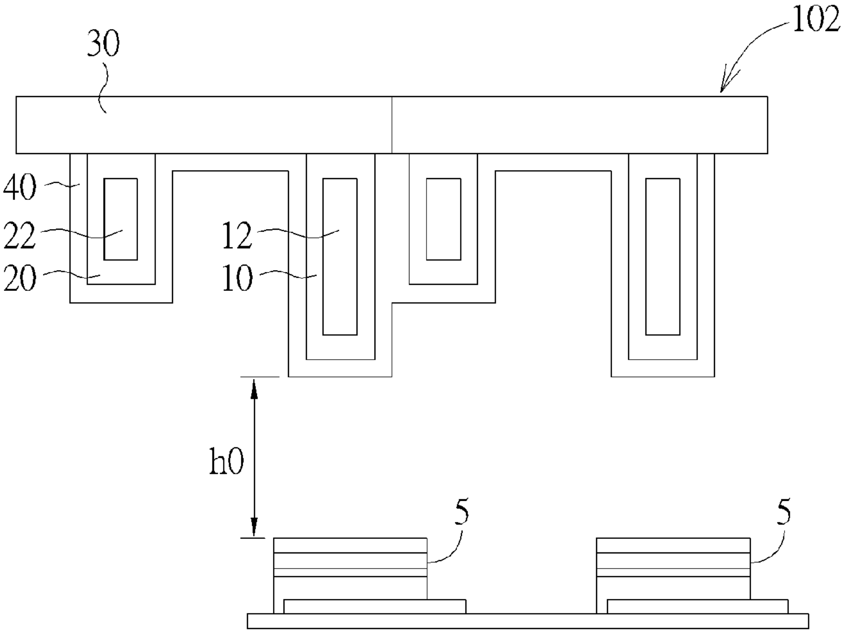

FIG. 13A

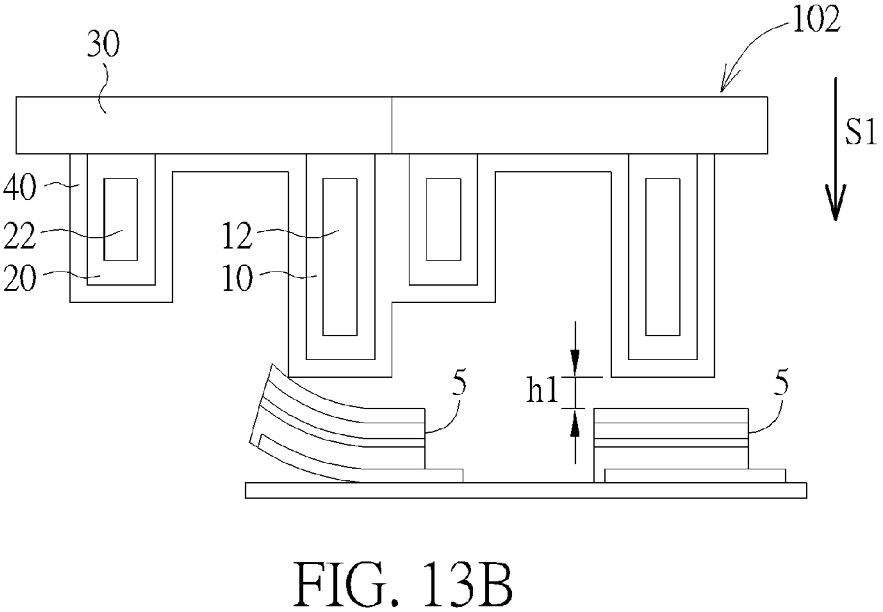

FIG. 13B

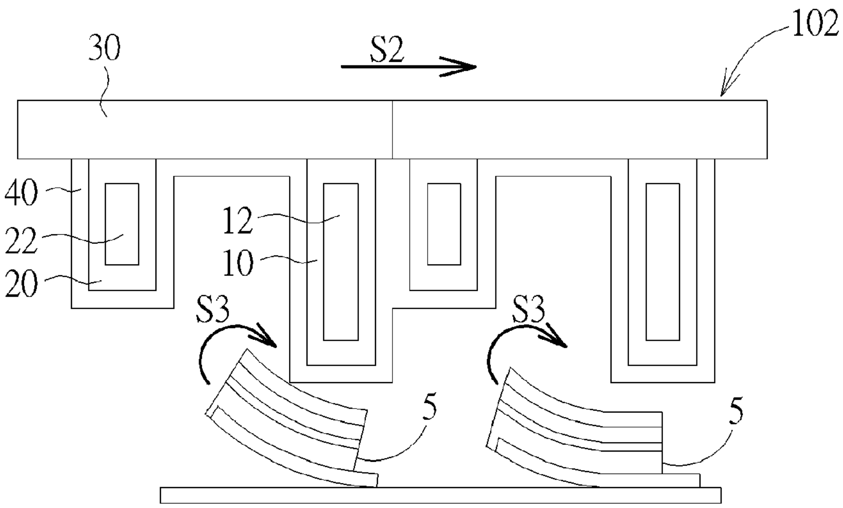

FIG. 13C

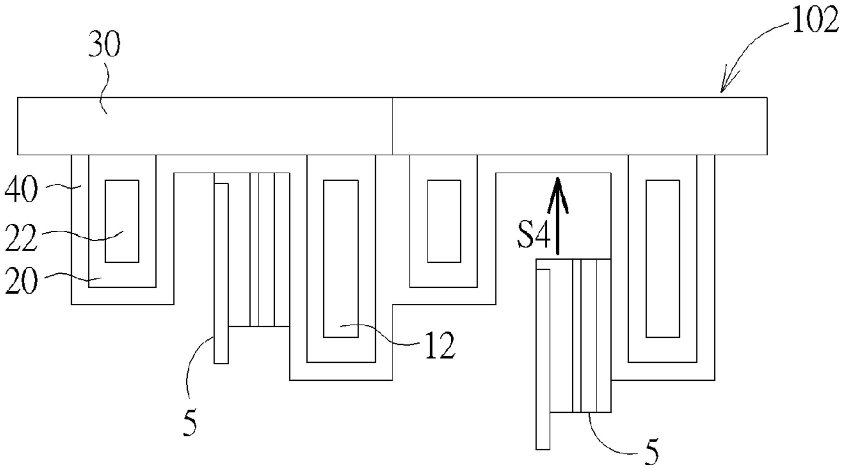

FIG. 13D

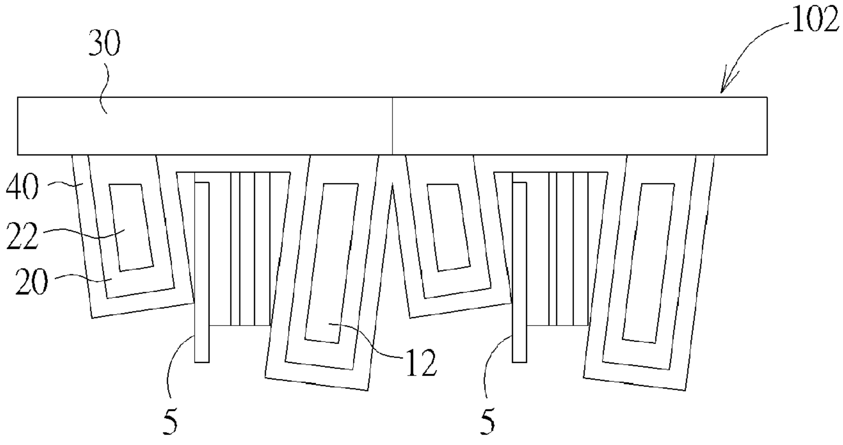

FIG. 13E

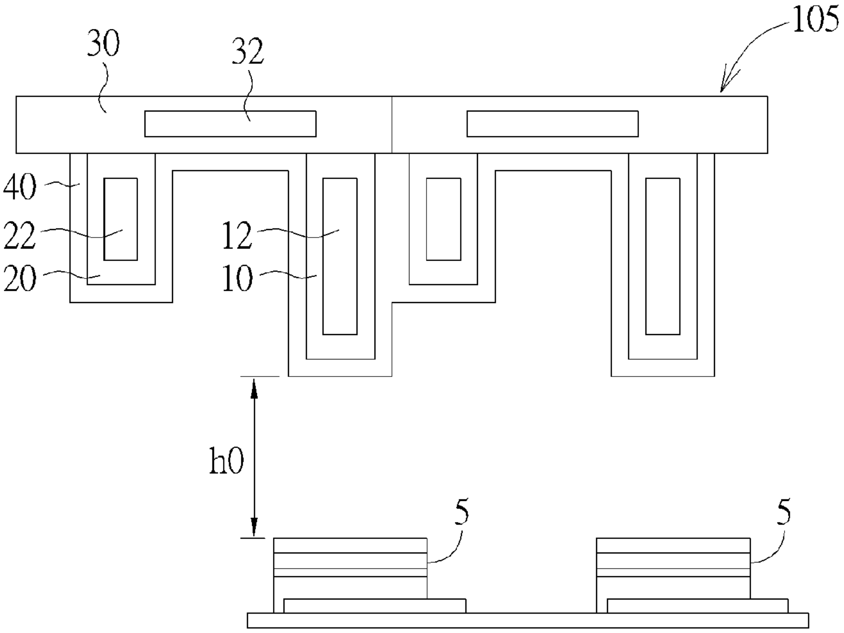

FIG. 14A

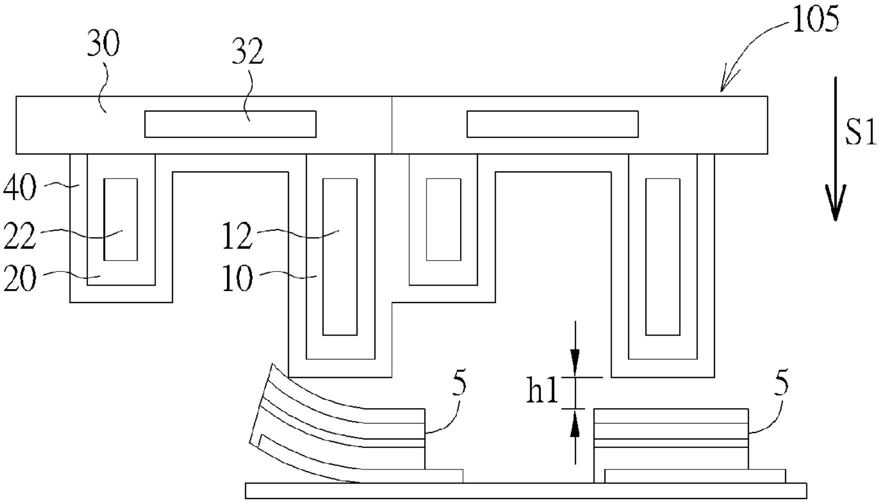

FIG. 14B

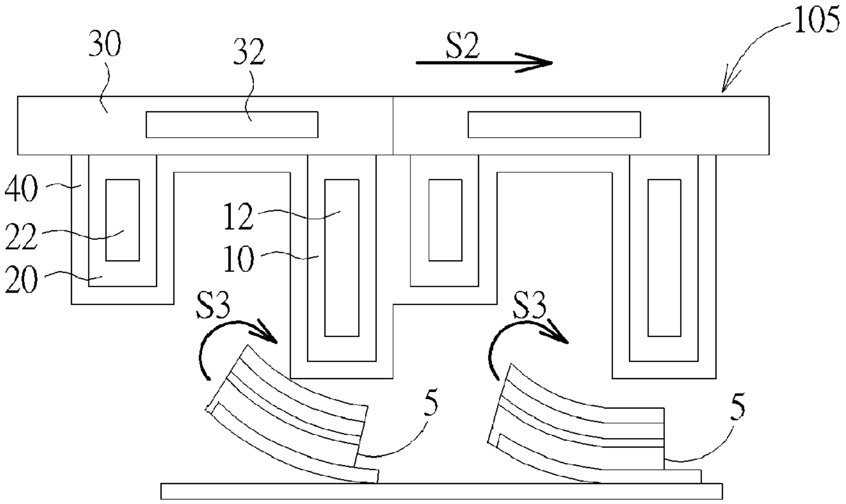

FIG. 14C

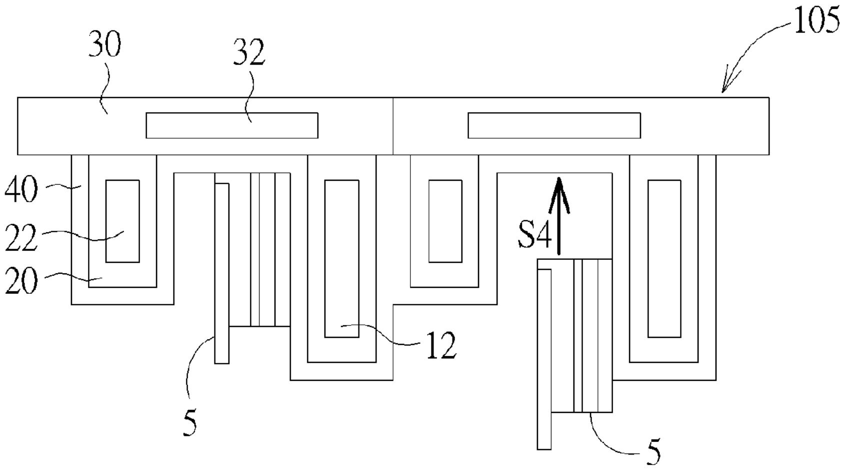

FIG. 14D

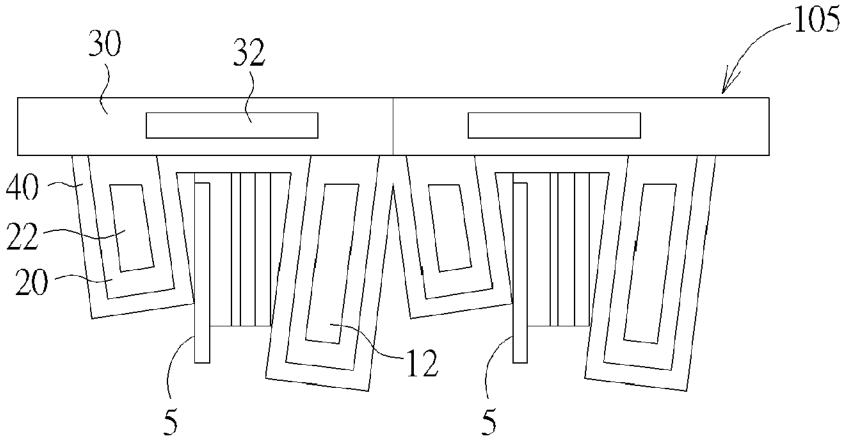

FIG. 14E

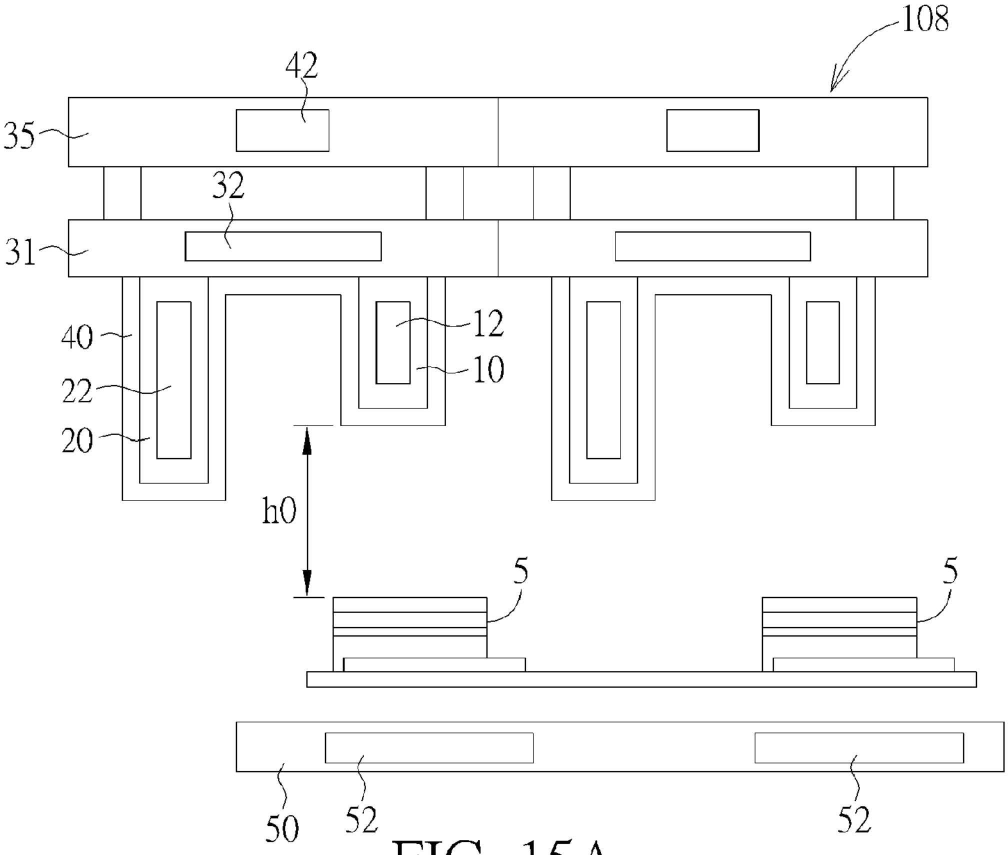

FIG. 15A

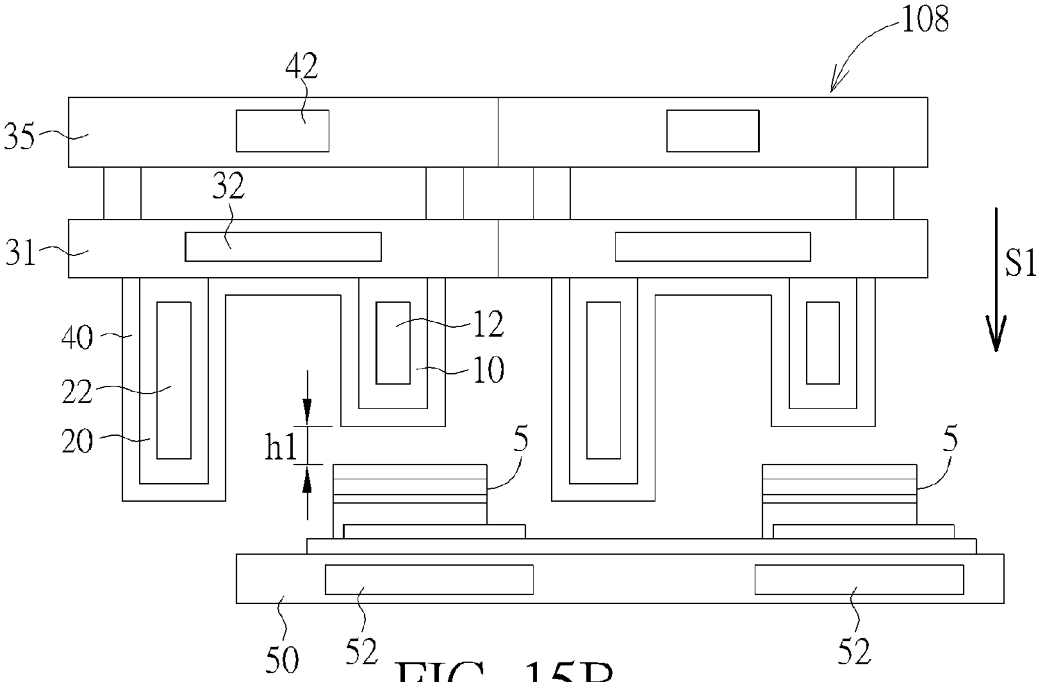

FIG. 15B

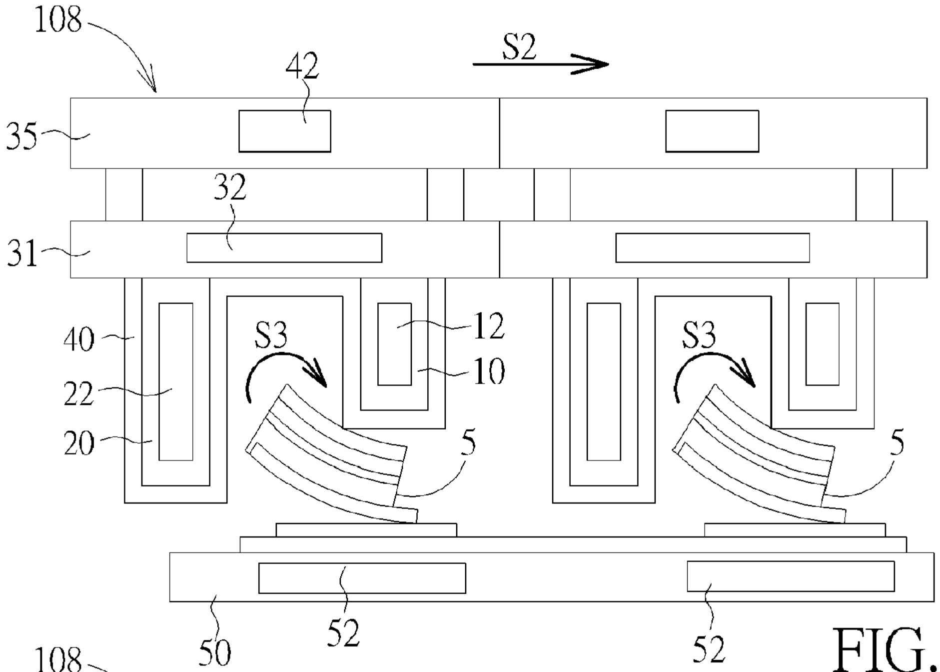

FIG. 15C

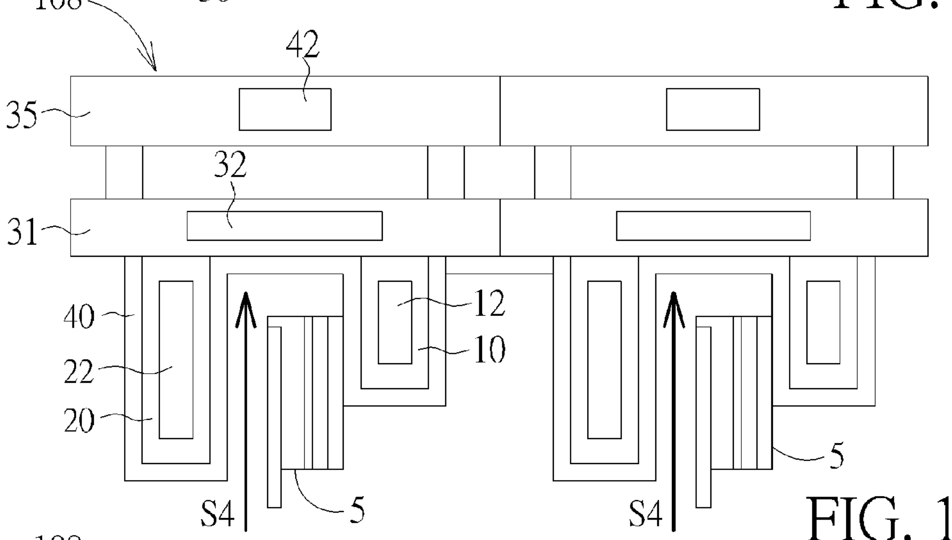

FIG. 15D

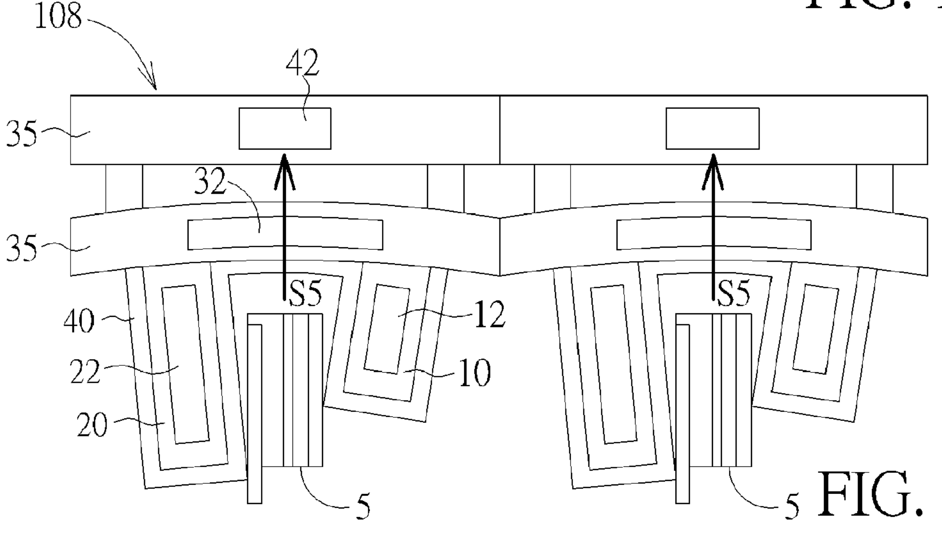

FIG. 15E

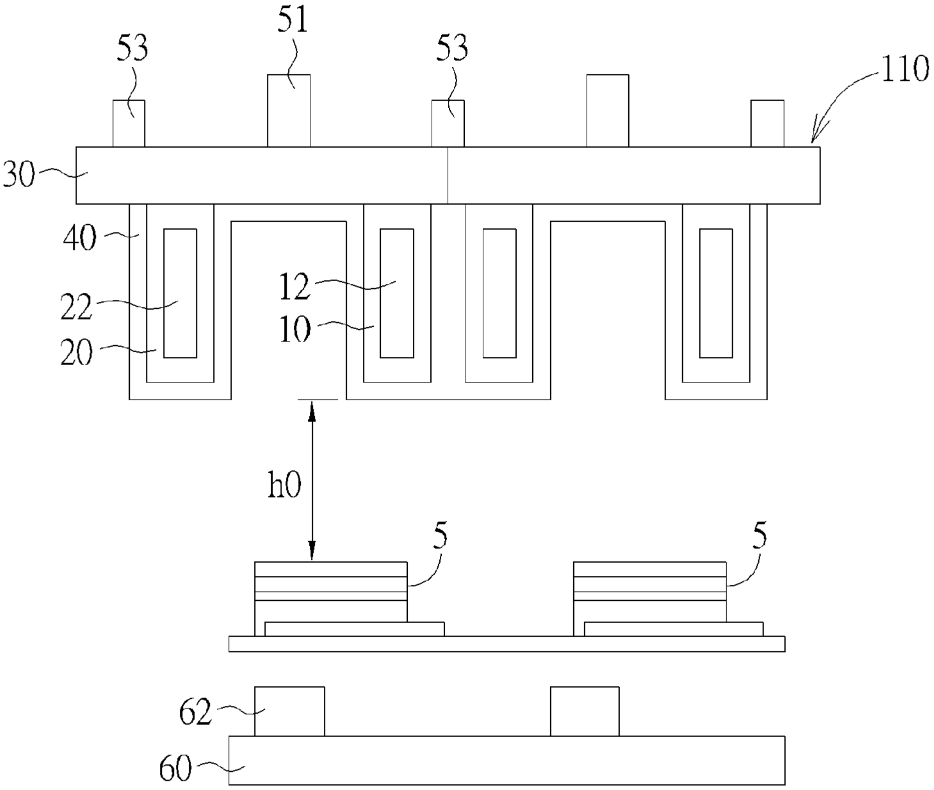

FIG. 16A

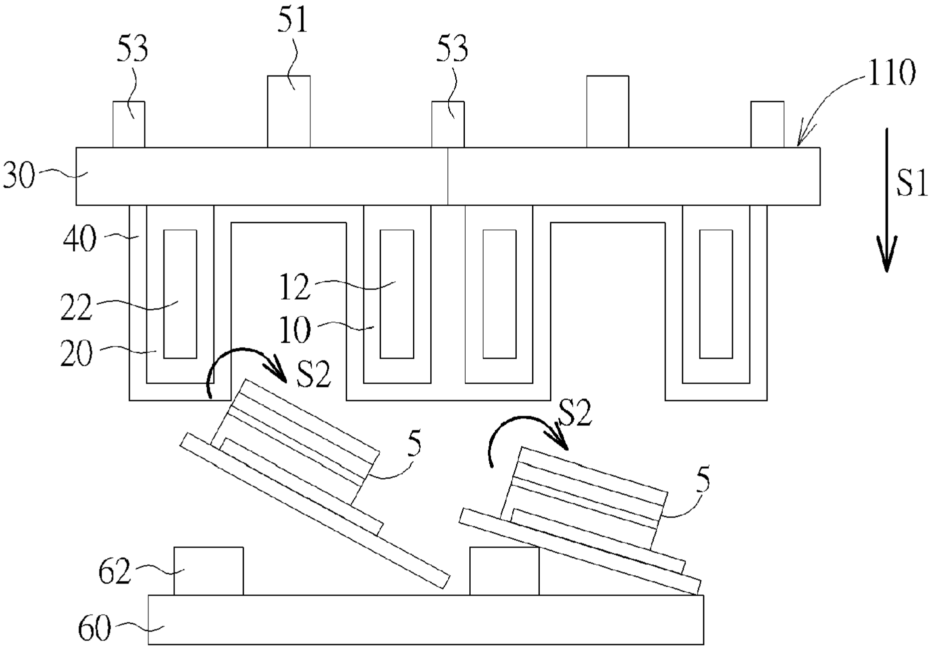

FIG. 16B

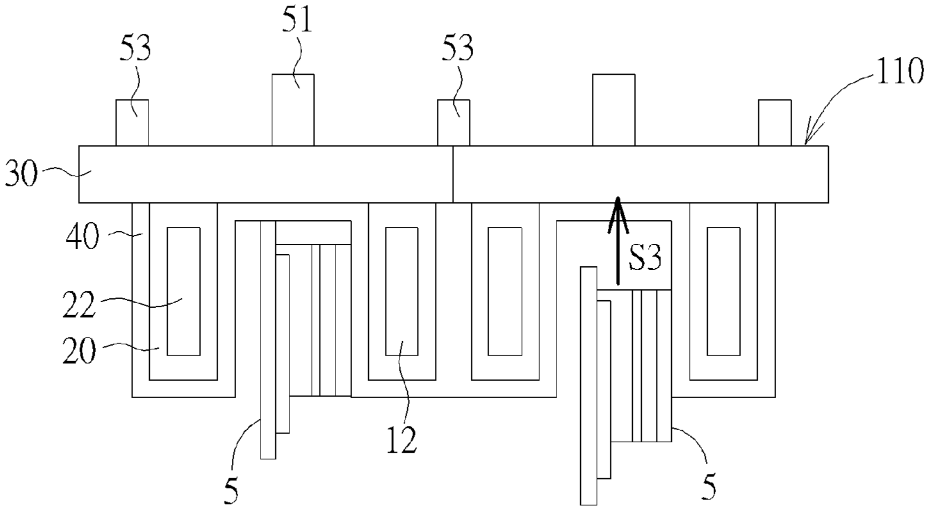

FIG. 16C

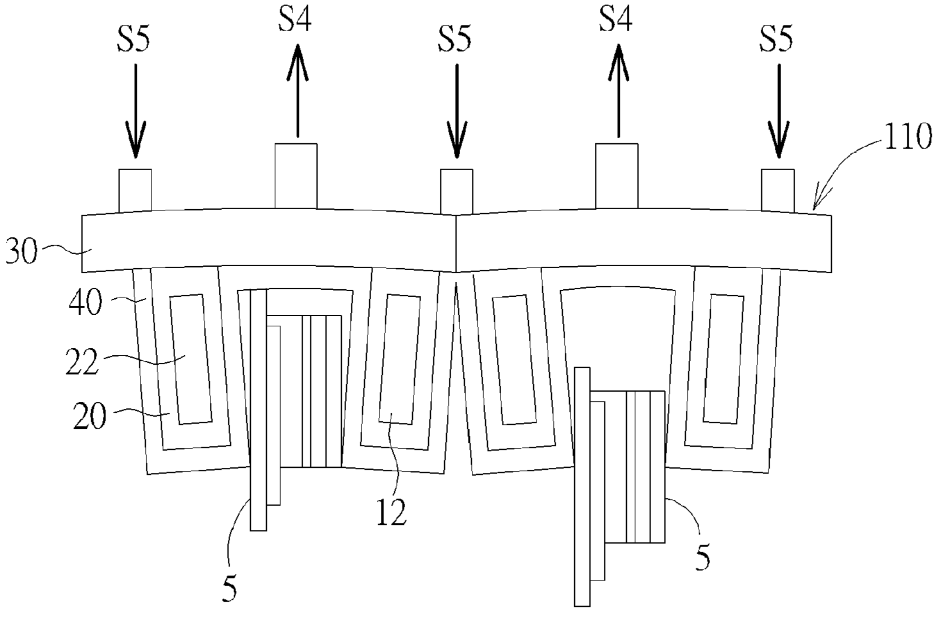

FIG. 16D

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 18 16 2804

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2014/064904 A1 (BIBL ANDREAS [US] ET AL) 6 March 2014 (2014-03-06) * abstract; figures 1,2,3A,4A,4B * -----	1-15	INV. H01L21/67 B81C99/00 H01L23/00
A	US 2017/054390 A1 (CHEN LI-YI [TW] ET AL) 23 February 2017 (2017-02-23) * abstract; figures 2A,2B * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01L B81C

The present search report has been drawn up for all claims

2

Place of search	Date of completion of the search	Examiner
The Hague	19 September 2018	Oberle, Thierry

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
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& : member of the same patent family, corresponding document

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 18 16 2804

19-09-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2014064904 A1	06-03-2014	US 2014064904 A1 US 2014299572 A1	06-03-2014 09-10-2014
US 2017054390 A1	23-02-2017	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

专利名称(译)	微器件转移头及相关方法		
公开(公告)号	EP3506339A1	公开(公告)日	2019-07-03
申请号	EP2018162804	申请日	2018-03-20
[标]申请(专利权)人(译)	宏碁股份有限公司		
申请(专利权)人(译)	宏碁股份有限公司		
当前申请(专利权)人(译)	宏碁股份有限公司		
[标]发明人	HSIANG JUI CHIEH CHEN CHIH CHIANG		
发明人	HSIANG, JUI-CHIEH CHEN, CHIH-CHIANG		
IPC分类号	H01L21/67 B81C99/00 H01L23/00		
CPC分类号	B81C99/002 H01L21/67144 H01L21/67712 H01L21/67721 H01L21/6831 H01L21/68707 H01L33/005		
优先权	106146464 2017-12-29 TW		
外部链接	Espacenet		

摘要(译)

微器件转移头包括基臂，第一侧臂，第二侧臂和隔离层。包括一个或多个第一电极的第一侧臂设置在基臂的第一表面上并位于基臂的第一端上。包括一个或多个第二电极的第二侧臂设置在基臂的第一表面上并位于基臂的第二端上。稍后隔离设置在基臂的第一表面上并覆盖第一侧臂和第二侧臂的表面。

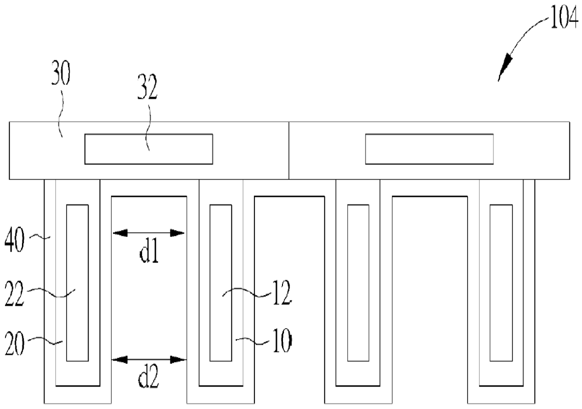

FIG. 4