

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

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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.
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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. 16/742,230	Applicant(s) AN et al.	
	Examiner TOWFIQ ELAHI	Art Unit 2625	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 06/11/2021.
☐ 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 1-16. 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. 15/660,827.

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

/TOWFIQ ELAHI/ Primary Examiner, Art Unit 2625	
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Notice of Pre-AIA or AIA Status

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

After a thorough search, examination, persuasive amendment and arguments and in light of the prior art made of record claims 1-16 are allowed. The following is an Examiner's statement of reasons for allowance:

The Applicants' replies make evident the reasons for allowance, satisfying the "record as a whole" proviso of the rule 37 CFR 1.104(e). Specifically, the substance of applicants' remarks, filed 06/11/2021 with amended claims and approved terminal disclaimer, are persuasive, as such the reasons for allowance are in all probability evident from the record and no statement is deemed necessary (see MPEP 1302.14).

"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 submission should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TOWFIQ ELAHI whose telephone number is (571)270-1687. The examiner can normally be reached on M-F: 10AM-3PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an

interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Boddie can be reached on (571)272-0666. 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 <https://ppair-my.uspto.gov/pair/PrivatePair>. 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.

/TOWFIQ ELAHI/
Primary Examiner, Art Unit 2625

<i>Search Notes</i> 	Application/Control No. 16/742,230	Applicant(s)/Patent Under Reexamination AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625

CPC - Searched*		
Symbol	Date	Examiner
H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256	07/30/2020	TE

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

Search Notes		
Search Notes	Date	Examiner
Text searched in EAST	07/30/2020	TE
Updated search in EAST	04/14/2021	TE
Updated search in EAST	09/09/2021	TE

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
345/G06F3	173/0446	09/09/2021	TE

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Issue Classification 	Application/Control No. 16/742,230	Applicant(s)/Patent Under Reexamination AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625

CPC						
Symbol					Type	Version
G06F	/	3	/	0443	F	2019-05-01
G06F	/	3	/	0446	I	2019-05-01
G06F	/	3	/	0412	I	2013-01-01
G09G	/	3	/	3225	I	2013-01-01
H01L	/	27	/	323	I	2013-01-01
H01L	/	51	/	5256	I	2013-01-01
G06F	/	2203	/	04102	A	2013-01-01
G06F	/	2203	/	04111	A	2013-01-01
G06F	/	2203	/	04103	A	2013-01-01
H01L	/	27	/	3244	A	2013-01-01

CPC Combination Sets					
Symbol		Type	Set	Ranking	Version
	/		/		

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 16	
/TOWFIQ ELAHI/ Primary Examiner, Art Unit 2625 (Primary Examiner) _____ (Date) 09 September 2021		O.G. Print Claim(s) 1	O.G. Print Figure 10A

Issue Classification 	Application/Control No. 16/742,230	Applicant(s)/Patent Under Reexamination AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G06F	/	3	/ 044

NON-CLAIMED			
/	/	/	/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	16	
/TOWFIQ ELAHI/ Primary Examiner, Art Unit 2625 (Primary Examiner)	09 September 2021 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 10A

<i>Issue Classification</i> 	Application/Control No. 16/742,230	Applicant(s)/Patent Under Reexamination AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625

☐ 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	10	10												
2	2	11	11												
3	3	12	12												
4	4	13	13												
5	5	14	14												
6	6	15	15												
7	7	16	16												
8	8														
9	9														

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 16	
/TOWFIQ ELAHI/ Primary Examiner, Art Unit 2625 (Primary Examiner) _____ (Date) 09 September 2021		O.G. Print Claim(s) 1	O.G. Print Figure 10A

U.S. Patent and Trademark Office

Part of Paper No.: 20210909

Bibliographic Data

Application No: 16/742,230

Foreign Priority claimed: ☒ Yes ☐ No

35 USC 119 (a-d) conditions met: ☒ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /TOWFIQ ELAHI/

Examiner's Signature

Initials

Title: DISPLAY DEVICE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/14/2020	345	2625	183539/411598-04552
RULE			

APPLICANTS

SAMSUNG DISPLAY CO., LTD., Yongin-si, KOREA, REPUBLIC OF

INVENTORS

Chiwook AN, Hwaseong-si, Gyeonggi-do, KOREA, REPUBLIC OF

Doyeon KIM, Seoul, KOREA, REPUBLIC OF

Sunghyun PARK, Seongnam-si, KOREA, REPUBLIC OF

Jaehyun LEE, Seoul, KOREA, REPUBLIC OF

Sung-woong CHO, Asan-si, KOREA, REPUBLIC OF

CONTINUING DATA

This application is a CON of 15660827 07/26/2017 PAT 10541279

FOREIGN APPLICATIONS

KOREA, REPUBLIC OF KR10-2016-0097493 07/29/2016

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/03/2020

STATE OR COUNTRY

KOREA, REPUBLIC OF

ADDRESS

Lewis Roca Rothgerber Christie LLP

PO BOX 29001

Glendale, CA 91209-9001

UNITED STATES

FILING FEE RECEIVED

\$1,720

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	"15660827"	US-PGPUB; USPAT	OR	OFF	2018/09/04 14:03
S2	13	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	US-PGPUB; USPAT	OR	OFF	2018/09/04 14:06
S3	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern same touch	US-PGPUB; USPAT	OR	OFF	2018/09/04 14:06
S4	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and touch	US-PGPUB; USPAT	OR	OFF	2018/09/04 14:07
S5	14	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	US-PGPUB; USPAT	OR	OFF	2018/09/04 14:09
S6	2	"20160041644"	US-PGPUB; USPAT	OR	OFF	2018/09/04 14:10
S7	2	"20160103549"	US-PGPUB; USPAT	OR	OFF	2018/09/04 14:22
S8	1	"20160147335"	US-PGPUB; USPAT	OR	OFF	2018/09/04 15:02
S9	1	"20170336907"	US-PGPUB; USPAT	OR	OFF	2018/09/04 15:05
S10	2	"20140160066"	US-PGPUB; USPAT	OR	OFF	2018/09/04 15:14
S11	0	((("AN") near3 ("Chiwook"))).INV.	USPAT	OR	OFF	2018/09/04 15:18
S12	12	((("KIM") near3 ("Doyeon"))).INV.	US-PGPUB	OR	OFF	2018/09/04 15:18
S13	8	((("PARK") near3 ("Sunghyun"))).INV.	USPAT	OR	OFF	2018/09/04 15:19

S14	21	((("LEE") near3 ("Jaehyun"))).INV.	USPAT	OR	OFF	2018/09/04 15:19
S15	0	((("CHO") near3 ("Sung-woong"))).INV.	USPAT	OR	OFF	2018/09/04 15:19
S16	0	((("CHO") near3 ("Sung-woong"))).INV.	USPAT	OR	OFF	2018/09/04 15:20
S17	4	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and display	US- PGPUB; USPAT	OR	OFF	2018/09/05 10:04
S18	0	touch near3 (sens\$3 detect\$3) near3 on near3 display near3 (part section substrate)	US- PGPUB; USPAT	OR	OFF	2018/09/05 10:06
S19	196	touch near3 (sens\$3 detect\$3) near3 display near3 (part section substrate) same insulat\$3	US- PGPUB; USPAT	OR	OFF	2018/09/05 10:07
S20	35,861	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US- PGPUB; USPAT	OR	OFF	2018/09/05 10:09
S21	170	S19 and S20	US- PGPUB; USPAT	OR	OFF	2018/09/05 10:10
S22	1	"20160147335"	US- PGPUB; USPAT	OR	OFF	2018/09/05 13:37
S23	2	"20100182273"	US- PGPUB; USPAT	OR	OFF	2018/09/06 08:59
S24	2	"20160041644"	US- PGPUB; USPAT	OR	OFF	2018/09/06 08:59
S25	2	"20160103549"	US- PGPUB; USPAT	OR	OFF	2018/09/06 08:59
S26	0	(first second third) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	US- PGPUB; USPAT	OR	OFF	2018/09/06 09:55
S27	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	US- PGPUB; USPAT	OR	OFF	2018/09/06 09:56
S28	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	US- PGPUB; USPAT	OR	OFF	2018/09/06 09:57

S29	0	conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	US- PGPUB; USPAT	OR	OFF	2018/09/06 09:57
S30	0	conductive near3 layer near3 resistivi near3 (less lower different) near3 (first second third other another) near3 layer	US- PGPUB; USPAT	OR	OFF	2018/09/06 09:57
S31	1,122,191	(first second third other another) near3 layer conductive near3 layers near3 resistivi near3 (less lower different)	US- PGPUB; USPAT	OR	OFF	2018/09/06 09:58
S32	35,893	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US- PGPUB; USPAT	OR	OFF	2018/09/06 09:59
S33	15,461	S31 and S32	US- PGPUB; USPAT	OR	OFF	2018/09/06 09:59
S34	1,122,172	(first second third) near3 layer conductive near3 layers near3 resistivi near3 (less lower different more)	US- PGPUB; USPAT	OR	OFF	2018/09/06 10:00
S35	15,461	S32 and S34	US- PGPUB; USPAT	OR	OFF	2018/09/06 10:00
S36	1,556,030	(first second third one) near3 layer conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	US- PGPUB; USPAT	OR	OFF	2018/09/06 10:02
S37	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	US- PGPUB; USPAT	OR	OFF	2018/09/06 10:03
S38	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same (first second third other another)	US- PGPUB; USPAT	OR	OFF	2018/09/06 10:03
S39	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) and (first second third other another)	US- PGPUB; USPAT	OR	OFF	2018/09/06 10:03
S40	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different more)	US- PGPUB; USPAT	OR	OFF	2018/09/06 10:04

S41	0	(first second third one) near3 layer near3 conduct\$3 near3 layers near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2018/09/06 10:07
S42	0	(first second third one) near3 layer near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2018/09/06 10:07
S43	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2018/09/06 10:07
S44	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	US-PGPUB; USPAT	OR	OFF	2018/09/06 10:08
S45	0	conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	US-PGPUB; USPAT	OR	OFF	2018/09/06 10:08
S46	206,361	second near2 conductive layer near3 electrical near3 resistivity near3 less near3 than	US-PGPUB; USPAT	OR	OFF	2018/09/06 10:09
S47	0	second near2 conductive near3 layer near3 electrical near3 resistivity near3 less near3 than	US-PGPUB; USPAT	OR	OFF	2018/09/06 10:09
S48	0	second near2 conductive near3 layer near3 resistivity near3 less near3 than	US-PGPUB; USPAT	OR	OFF	2018/09/06 10:10
S49	21	second near2 conductive near3 layer same electrical near3 resistivity same less	US-PGPUB; USPAT	OR	OFF	2018/09/06 10:11
S50	7	middle near2 conductive near3 layer near3 (thicker)	US-PGPUB; USPAT	OR	OFF	2018/09/06 10:34
S51	22	(middle mid center centre) near2 conductive near3 (layer section part) near3 (thicker wider fatter)	US-PGPUB; USPAT	OR	OFF	2018/09/06 13:56
S52	35,893	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2018/09/06 13:56
S53	0	S51 and S52	US-PGPUB; USPAT	OR	OFF	2018/09/06 13:56
S55	2	"20100182273"	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:29

S56	2	"20160041644"	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:29
S57	1	"6504202".pn.	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:29
S58	1	"20160103549".pn.	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:32
S59	0	first same third same conduct\$3 same layer same titanium	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:34
S60	5,389	first same third same conduct\$3 same layer same titanium	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:34
S61	35,893	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:35
S62	4,524	first same third same conduct\$3 same layer same titanium and aluminum	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:35
S63	3,038	first same third same conduct\$3 same layer same titanium same aluminum	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:35
S64	122	S61 and S63	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:36
S65	1,108	first near2 conduct\$3 same second near2 conduct\$3 same third near2 conduct\$3 same layer same Titanium same Aluminum	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:42
S66	28	S61 and S65	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:43
S67	1,153	aluminum near2 layer same (between sorrounded) near3 Titanium	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:50
S68	641	aluminum near2 layer same (between sorrounded) near3 Titanium near2 layer	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:50
S69	66	S61 and S68	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:51
S70	183	towfiq near elahi	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:31

S71	2	"20140320769"	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:36
S72	1	"20170076502"	US-PGPUB; USPAT	OR	OFF	2018/09/07 12:39
S73	1	"20180095581"	US-PGPUB; USPAT	OR	OFF	2018/09/10 09:54
S74	2	"20100182273"	US-PGPUB; USPAT	OR	OFF	2019/02/27 15:40
S75	204	towfiq near2 elahi	US-PGPUB; USPAT	OR	OFF	2019/02/27 15:47
S76	5	("20100060602" "20110102370" "20120118614" "20120212449" "20120312677").PN. OR ("9323370").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/27 16:04
S77	75	"20060097991"	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/27 16:06
S78	1	"15660827" and (thickness near3 second near2 connection part\$1)	US-PGPUB; USPAT	OR	OFF	2019/02/28 08:51
S79	0	"15660827" and (thickness near3 second near2 connection near2 part\$1)	US-PGPUB; USPAT	OR	OFF	2019/02/28 08:52
S80	2	"20100182273"	US-PGPUB; USPAT	OR	OFF	2019/02/28 14:48
S81	2	"20160041644"	US-PGPUB; USPAT	OR	OFF	2019/02/28 14:58
S82	2	"20140320769"	US-PGPUB; USPAT	OR	OFF	2019/02/28 15:21
S83	1	"15660827"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S84	14	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00

S85	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern same touch	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S86	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and touch	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S87	15	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S88	2	"20160041644"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S89	2	"20160103549"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S90	1	"20160147335"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S91	2	"20170336907"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S92	2	"20140160066"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S93	0	((("AN") near3 ("Chiwook"))).INV.	USPAT	OR	OFF	2019/02/28 17:00
S94	12	((("KIM") near3 ("Doyeon"))).INV.	US-PGPUB	OR	OFF	2019/02/28 17:00
S95	10	((("PARK") near3 ("Sunghyun"))).INV.	USPAT	OR	OFF	2019/02/28 17:00
S96	22	((("LEE") near3 ("Jaehyun"))).INV.	USPAT	OR	OFF	2019/02/28 17:00
S97	0	((("CHO") near3 ("Sung-woong"))).INV.	USPAT	OR	OFF	2019/02/28 17:00
S98	0	((("CHO") near3 ("Sung-woong"))).INV.	USPAT	OR	OFF	2019/02/28 17:00
S99	4	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and display	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S100	0	touch near3 (sens\$3 detect\$3) near3 on near3 display near3 (part section substrate)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00

S101	222	touch near3 (sens\$3 detect\$3) near3 display near3 (part section substrate) same insulat\$3	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S102	39,064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S103	193	S101 and S102	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S104	1	"20160147335"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S105	2	"20100182273"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S106	2	"20160041644"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S107	2	"20160103549"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S108	0	(first second third) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S109	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S110	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S111	0	conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S112	0	conductive near3 layer near3 resistivi near3 (less lower different) near3 (first second third other another) near3 layer	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S113	1,162,602	(first second third other another) near3 layer conductive near3 layers near3 resistivi near3 (less lower different)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S114	39,064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00

S115	17,063	S113 and S114	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S116	1,162,583	(first second third) near3 layer conductive near3 layers near3 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S117	17,063	S114 and S116	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S118	1,612,494	(first second third one) near3 layer conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S119	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S120	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same (first second third other another)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S121	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) and (first second third other another)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S122	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S123	0	(first second third one) near3 layer near3 conduct\$3 near3 layers near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S124	0	(first second third one) near3 layer near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S125	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S126	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00

S127	0	conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S128	214,000	second near2 conductive layer near3 electrical near3 resistivity near3 less near3 than	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S129	0	second near2 conductive near3 layer near3 electrical near3 resistivity near3 less near3 than	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S130	0	second near2 conductive near3 layer near3 resistivity near3 less near3 than	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S131	22	second near2 conductive near3 layer same electrical near3 resistivity same less	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S132	8	middle near2 conductive near3 layer near3 (thicker)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S133	23	(middle mid center centre) near2 conductive near3 (layer section part) near3 (thicker wider fatter)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S134	39,064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S135	0	S133 and S134	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S136	2	"20100182273"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S137	2	"20160041644"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S138	1	"6504202".pn.	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S139	1	"20160103549".pn.	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S140	0	first same third same conduct\$3 same layer same titanium	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S141	5,648	first same third same conduct\$3 same layer same titanium	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00

S142	39,064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S143	4,756	first same third same conduct\$3 same layer same titanium and aluminum	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S144	3,209	first same third same conduct\$3 same layer same titanium same aluminum	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S145	145	S142 and S144	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S146	1,129	first near2 conduct\$3 same second near2 conduct\$3 same third near2 conduct\$3 same layer same Titanium same Aluminum	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S147	33	S142 and S146	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S148	1,191	aluminum near2 layer same (between sorrounded) near3 Titanium	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S149	667	aluminum near2 layer same (between sorrounded) near3 Titanium near2 layer	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S150	73	S142 and S149	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S151	204	towfiq near elahi	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S152	2	"20140320769"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S153	1	"20170076502"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S154	1	"20180095581"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S155	2	"20100182273"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S156	204	towfiq near2 elahi	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00

S157	5	("20100060602" "20110102370" "20120118614" "20120212449" "20120312677").PN. OR ("9323370").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/28 17:00
S158	75	"20060097991"	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/28 17:00
S159	1	"15660827" and (thickness near3 second near2 connection part\$1)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S160	0	"15660827" and (thickness near3 second near2 connection near2 part\$1)	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S161	2	"20100182273"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S162	2	"20160041644"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S163	2	"20140320769"	US-PGPUB; USPAT	OR	OFF	2019/02/28 17:00
S164	0	second near3 conductive near3 pattern near4 thickness near4 (greater bigger (more adj than)) near3 thickness near3 second near3 connection near3 part	US-PGPUB; USPAT	OR	OFF	2019/05/09 11:00
S165	0	conductive near3 pattern near4 thickness near4 (greater bigger (more adj than)) near3 thickness near3 connection near3 part	US-PGPUB; USPAT	OR	OFF	2019/05/09 11:04
S166	263	second near3 conductive near3 pattern near4 thickness near4 (greater bigger (more adj than)) samr thickness near3 second near3 connection near3 part	US-PGPUB; USPAT	OR	OFF	2019/05/09 11:05
S167	1,006	second near3 conduct\$3 near3 pattern near4 (thickness width) near4 (greater bigger (more adj than)) samr (thickness width) near3 second near3 connect\$3 near3 (part section)	US-PGPUB; USPAT	OR	OFF	2019/05/09 11:10
S168	0	second near3 conduct\$3 near3 pattern near4 (thickness width) near4 (greater bigger (more adj than)) same (thickness width) near3 second near3 connect\$3 near3 (part section)	US-PGPUB; USPAT	OR	OFF	2019/05/09 11:10

S169	1	"16742230"	US-PGPUB; USPAT	OR	OFF	2020/07/29 10:30
S170	1	"10541279" .pn.	US-PGPUB; USPAT	OR	OFF	2020/07/29 10:31
S171	7	buffer near2 layer near2 directly near3 encapsulation near layer	US-PGPUB; USPAT	OR	OFF	2020/07/29 11:49
S172	3	buffer near2 directly near3 encapsulation near layer	US-PGPUB; USPAT	OR	OFF	2020/07/29 11:54
S173	5	buffer near2 directly near3 encapsulation	US-PGPUB; USPAT	OR	OFF	2020/07/29 11:54
S174	2	"20100182273"	US-PGPUB; USPAT	OR	OFF	2020/07/29 15:13
S175	2	"20160041644"	US-PGPUB; USPAT	OR	OFF	2020/07/29 15:14
S176	2	"20140320769"	US-PGPUB; USPAT	OR	OFF	2020/07/29 15:15
S177	2	"20160103549"	US-PGPUB; USPAT	OR	OFF	2020/07/29 15:20
S178	0	buffer same encaptulation same conductive near2 pattewrn	US-PGPUB; USPAT	OR	OFF	2020/07/29 15:28
S179	0	buffer same encaptulation same conductive near2 pattern	US-PGPUB; USPAT	OR	OFF	2020/07/29 15:28
S180	0	buffer same encaptulation same (conductive metal) near2 pattern	US-PGPUB; USPAT	OR	OFF	2020/07/29 15:28
S181	0	buffer near2 layer and encaptulation near2 layer and (conductive metal) near2 pattern	US-PGPUB; USPAT	OR	OFF	2020/07/29 15:29
S182	2	"20180166507"	US-PGPUB; USPAT	OR	OFF	2020/07/29 15:57
S183	11	("20090058250" "20100265206" "20140049522" "20150049263" "20150091849" "20150153881" "20150355771" "20160179264" "20170083140" "20170277296"	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/29 16:02

		"20170321087").PN. OR ("10720474").URPN.				
S184	286	buffer near2 layer near3 encapsulation near layer	US- PGPUB; USPAT	OR	OFF	2020/07/29 16:12
S185	49,085	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US- PGPUB; USPAT	OR	OFF	2020/07/29 16:13
S186	135	S184 and S185	US- PGPUB; USPAT	OR	OFF	2020/07/29 16:13
S187	3,004,158	S184 and S185 and conductive neae2 pattern	US- PGPUB; USPAT	OR	OFF	2020/07/29 16:13
S188	12	S184 and S185 and conductive near2 pattern	US- PGPUB; USPAT	OR	OFF	2020/07/29 16:14
S189	35	("10268238" "20080277259" "20100182250" "20110285661" "20130002569" "20130147727" "20130278513" "20140028599" "20140078108" "20140078692" "20140217373" "20140217382" "20140217397" "20140232956" "20140256070" "20150193058" "20160093685" "20160306472" "20160315284" "7864503" "7920129" "8274488" "8358284" "8461760" "8698768" "8730191" "8946690" "9001079" "9035907" "9046952" "9128569" "9239654" "9335881" "9515131" "RE44866").PN. OR ("10707280").URPN.	US- PGPUB; USPAT; USOCR	OR	OFF	2020/07/29 16:17
S190	0	buffer near2 layer and encaptulation near2 layer and (conductive metal touch sesnor detector) near2 pattern	US- PGPUB; USPAT	OR	OFF	2020/07/29 17:19
S191	0	buffer near2 layer and encaptulation near2 layer and (conductive metal touch sensor or detector) near2 pattern	US- PGPUB; USPAT	OR	OFF	2020/07/29 17:19
S192	0	buffer near2 layer and encaptulation near2 layer and (conductive metal touch sensor or detector)	US- PGPUB; USPAT	OR	OFF	2020/07/29 17:20
S193	2	insulation near2 layer near3 encapsulation near layer same conductive near2 pattern	US- PGPUB; USPAT	OR	OFF	2020/07/30 09:22
S194	26	insulation near2 layer near3 encapsulation near layer and conductive near2 pattern	US- PGPUB; USPAT	OR	OFF	2020/07/30 09:24

S195	1	"16742230"	US-PGPUB; USPAT	OR	OFF	2020/07/30 11:35
S196	0	first conductive layer near3 buffer layer same second conductive layer same first conductive layer third conductive layer near3 second conductive layer	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 15:40
S197	2	second conductive pattern near4 fourth conductive layer same insulating layer same fifth conductive layer same fourth conductive layer same sixth conductive layer same fifth conductive layer	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 15:52
S198	3	second conductive layer same fifth conductive layer near3 aluminum	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 15:55
S199	9	thickness near3 second conductive layer near3 greater near4 thickness near3 first conductive layer near3 thickness near4 third conductive layer	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 16:38
S200	1	(thickness or width) near3 fifth conductive layer near3 (greater or bigger or larger) near4 (thickness or width) near3 fifth conductive layer near3 (thickness or width) near3 sixth conductive layer	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 16:43
S201	0	thicknessnear3 insulating layer near3 less near3 thickness near3 second conductive pattern	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:00
S202	1	thickness near3 insulating layer near3 less near3 thickness near3 second conductive pattern	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:00
S203	6	thickness near3 insulating layer near3 less near3 thickness near3 conductive pattern	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:01
S204	2	"20160103549"	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:07
S205	3	(thickness or width) near3 second conductive layer near3 (less or smaller) near3 (thickness or width) near3 fifth conductive layer	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:20
S206	1	(thickness or width) near3 (difference or variation) near3 second conductive layer near3 first conductive layer near3 greater near3 (thickness or width) near3 (difference or variation) near3 third conductive layer near3 first conductive layer	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:23

S207	1	(thickness or width) near3 (difference or variation) near3 fifth conductive layer near3 fourth conductive layer near3 greater near3 (thickness or width) near3 (difference or variation) near3 sixth conductive layer near3 fourth conductive layer	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:25
S208	1	(thickness or width) near3 (difference or variation) near3 fifth conductive layer near3 fourth conductive layer near3 greater near3 (thickness or width) near3 (difference or variation) near3 second conductive layer near3 first conductive layer	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:26
S209	2	"20100110023"	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:34
S210	2	"20110193793"	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:34
S211	1	"20150085205"	US-PGPUB; USPAT	NEAR	OFF	2020/07/30 17:35
S212	2	"20160162060"	US-PGPUB; USPAT	OR	OFF	2020/07/30 17:39
S213	2	"20170336907"	US-PGPUB; USPAT	OR	OFF	2020/07/30 17:39
S214	1	"20200152710"	US-PGPUB; USPAT	OR	OFF	2021/04/14 09:34
S215	2	"20160313837"	US-PGPUB; USPAT	OR	OFF	2021/04/14 09:43
S216	2	"20140232956"	US-PGPUB; USPAT	OR	OFF	2021/04/14 09:44
S217	1	"6504202".pn.	US-PGPUB; USPAT	OR	OFF	2021/04/14 09:44
S218	1	"20210048921".pn.	US-PGPUB; USPAT	OR	OFF	2021/04/14 10:39
S219	362	insulating near2 layer near3 between near4 conductive near2 patterns	US-PGPUB; USPAT	OR	OFF	2021/04/14 10:42

S220	40,306	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2021/04/14 10:42
S221	25	S219 and S220	US-PGPUB; USPAT	OR	OFF	2021/04/14 10:42
S222	193,753	345/\$.ccls.	US-PGPUB; USPAT	OR	OFF	2021/04/14 10:46
S223	11	S219 and S222	US-PGPUB; USPAT	OR	OFF	2021/04/14 10:46
S224	207	insulating near2 layer near3 between near2 conductive near2 patterns	US-PGPUB; USPAT	OR	OFF	2021/04/14 10:57
S225	4	insulating near2 layer near3 between near2 conductive near2 patterns with display near device	US-PGPUB; USPAT	OR	OFF	2021/04/14 10:57
S226	13	insulating near2 layer near3 between near2 conductive near2 (patterns layers) with display near device	US-PGPUB; USPAT	OR	OFF	2021/04/14 10:58
S227	1	"15660827"	USPAT	OR	OFF	2021/08/25 11:32
S228	1	"20160313837"	USPAT	OR	OFF	2021/08/25 11:36
S229	1	"20140232956"	USPAT	OR	OFF	2021/08/25 11:36
S230	0	"20150185911"	USPAT	OR	OFF	2021/08/25 11:36
S233	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern same touch	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S234	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and touch	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S241	7	((("AN") near3 ("Chiwook"))).INV.	USPAT	OR	OFF	2021/08/25 14:56
S245	1	((("CHO") near3 ("Sung-woong"))).INV.	USPAT	OR	OFF	2021/08/25 14:56
S246	1	((("CHO") near3 ("Sung-woong"))).INV.	USPAT	OR	OFF	2021/08/25 14:56
S248	0	touch near3 (sens\$3 detect\$3) near3 on near3 display near3 (part section substrate)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56

S249	316	touch near3 (sens\$3 detect\$3) near3 display near3 (part section substrate) same insulat\$3	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S250	42,435	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S256	0	(first second third) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S257	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S258	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S259	0	conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S260	0	conductive near3 layer near3 resistivi near3 (less lower different) near3 (first second third other another) near3 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S261	1,402,388	(first second third other another) near3 layer conductive near3 layers near3 resistivi near3 (less lower different)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S262	42,435	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S263	20,211	S261 and S262	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S264	1,402,369	(first second third) near3 layer conductive near3 layers near3 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S265	20,211	S262 and S264	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S266	1,948,264	(first second third one) near3 layer conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S267	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56

		lower different) same than near3 (first second third other another)				
S268	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same (first second third other another)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S269	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) and (first second third other another)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S270	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S271	0	(first second third one) near3 layer near3 conduct\$3 near3 layers near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S272	0	(first second third one) near3 layer near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S273	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S274	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S275	0	conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S276	258,457	second near2 conductive layer near3 electrical near3 resistivity near3 less near3 than	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S277	0	second near2 conductive near3 layer near3 electrical near3 resistivity near3 less near3 than	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S278	0	second near2 conductive near3 layer near3 resistivity near3 less near3 than	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S282	42,435	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56

S283	0	S281 and S282	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:56
S288	0	first same third same conduct\$3 same layer same titanium	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S289	7,447	first same third same conduct\$3 same layer same titanium	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S290	42,435	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S291	6,377	first same third same conduct\$3 same layer same titanium and aluminum	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S292	4,434	first same third same conduct\$3 same layer same titanium same aluminum	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S294	1,335	first near2 conduct\$3 same second near2 conduct\$3 same third near2 conduct\$3 same layer same Titanium same Aluminum	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S296	1,333	aluminum near2 layer same (between sorrounded) near3 Titanium	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S297	767	aluminum near2 layer same (between sorrounded) near3 Titanium near2 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S308	1	"15660827" and (thickness near3 second near2 connection near2 part1)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S314	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern same touch	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S315	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and touch	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S322	7	((("AN") near3 ("Chiwook"))).INV.	USPAT	OR	OFF	2021/08/25 14:57
S326	1	((("CHO") near3 ("Sung-woong"))).INV.	USPAT	OR	OFF	2021/08/25 14:57
S327	1	((("CHO") near3 ("Sung-woong"))).INV.	USPAT	OR	OFF	2021/08/25 14:57

S329	0	touch near3 (sens\$3 detect\$3) near3 on near3 display near3 (part section substrate)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S330	316	touch near3 (sens\$3 detect\$3) near3 display near3 (part section substrate) same insulat\$3	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S331	42,435	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S337	0	(first second third) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S338	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S339	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S340	0	conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S341	0	conductive near3 layer near3 resistivi near3 (less lower different) near3 (first second third other another) near3 layer	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S342	1,402,388	(first second third other another) near3 layer conductive near3 layers near3 resistivi near3 (less lower different)	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S343	42,435	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S344	20,211	S342 and S343	US-PGPUB; USPAT	OR	OFF	2021/08/25 14:57
S345	1	"20150185911"	US-PGPUB; USPAT	OR	OFF	2021/08/25 16:04
S346	0	second conductive pattern near3 insulated near3 first conductive pattern same thickness above near3 first conductive pattern near3 thickness direction near3 display near3 (greater bigger larger) near3 than near3 thickness near3 first conductive pattern near3 thickness near3 direction near3 display	US-PGPUB; USPAT	NEAR	OFF	2021/08/25 16:12

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S347	0	(second conductive pattern near3 insulated near3 first conductive pattern same thickness above near3 first conductive pattern near3 thickness direction near3 display near3 (greater bigger larger) near3 than near3 thickness near3 first conductive pattern near3 thickness near3 direction near3 display).clm.	USPAT	NEAR	OFF	2021/08/25 16:18

9/9/2021 8:53:18 AM

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)	Attorney Docket Number	183539
	Application Number	16/742,230
	Filing Date	January 14, 2020
	Inventor(s)	Chiwook An, et al.
	Group Art Unit	2625
	Examiner Name	Towfiq Elahi

U.S. PATENT DOCUMENTS				
EXAMINER INITIALS	Cite No. ¹	DOCUMENT NUMBER Number - Kind Code ² (If Known)	PUBLICATION DATE OR ISSUE DATE MM-DD-YYYY	NAME OF PATENTEE
		10,185,430 B2	01-22-2019	Zhu et al.

FOREIGN PATENT DOCUMENTS					
EXAMINER INITIALS	Cite No. ¹	Foreign Patent Document Country Code ³ - Number ⁴ - Kind Code ⁵ (If Known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶ (✓)
		WO 2015/096765 A1	07-02-2015	Zhu et al.	Corresponds to 10,185,430 B2 as listed above.

OTHER DOCUMENTS		
EXAMINER INITIALS	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article, title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.

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Sheet 1 of 2

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)	Attorney Docket Number	183539
	Application Number	16/742,230
	Filing Date	January 14, 2020
	Inventor(s)	Chiwook An, et al.
	Group Art Unit	2625
	Examiner Name	Towfiq Elahi

EXAMINER SIGNATURE		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. ¹Applicant's unique citation designation number (optional). ²See Kinds Codes of USPTO Patent Documents at www.pto.gov or MPEP 901.4. ³Enter Office that issued the document, by the two-letter code (WIPO standard ST.3). ⁴For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶Applicant is to place a check mark here if English Language Translation is attached.			

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Sheet 2 of 2

(12) 按照专利合作条约所公布的国际申请

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国际局

(43) 国际公布日
2015 年 7 月 2 日 (02.07.2015)



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- (30) 优先权:
201310737600.1 2013 年 12 月 27 日 (27.12.2013) CN
- (71) 申请人: 昆山工研院新型平板显示技术中心有限公司 (KUNSHAN NEW FLAT PANEL DISPLAY TECHNOLOGY CENTER CO., LTD.) [CN/CN]; 中国江苏省昆山市开发区光电产业园富春江路 320 号, Jiangsu 215300 (CN)。 昆山国显光电有限公司 (KUNSHAN GO-VISIONOX OPTO-ELECTRONICS CO., LTD.) [CN/CN]; 中国江苏省昆山市开发区龙腾路 1 号 4 幢, Jiangsu 215300 (CN)。
- (72) 发明人: 朱少鹏 (ZHU, Shaopeng); 中国江苏省昆山市高新区晨丰路 188 号, Jiangsu 215300 (CN)。 邱勇 (QIU, Yong); 中国江苏省昆山市高新区晨丰路 188 号, Jiangsu 215300 (CN)。 平山秀雄 (HIDEO, Hirayama); 中国江苏省昆山市高新区晨丰路 188 号, Jiangsu 215300 (CN)。 黄秀颀 (HUANG, Xiuqi); 中国江苏省昆山市高新区晨丰路 188 号, Jiangsu 215300 (CN)。
- (74) 代理人: 北京三聚阳光知识产权代理有限公司 (SUNSHINE INTELLECTUAL PROPERTY INTERNATIONAL CO., LTD.); 中国北京市海淀区海淀南路甲 21 号中关村知识产权大厦 A 座 503 室, Beijing 100080 (CN)。
- (81) 指定国 (除另有指明, 要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ,

[见续页]

(54) Title: TOUCH CONTROL DISPLAY DEVICE AND PREPARATION METHOD THEREFOR

(54) 发明名称: 一种触控显示装置及其制备方法

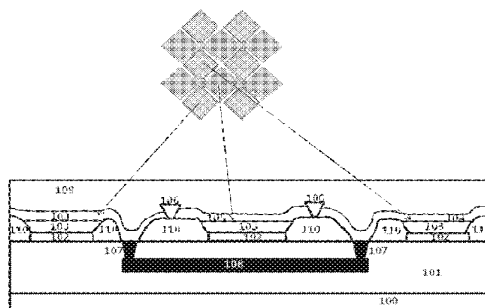


图 1 / Fig.1

(57) Abstract: A touch control display device of the present invention. When second electrodes are formed, the second electrodes are respectively connected in series horizontally and vertically so that side crosswise networks which are insulated from each other are formed, namely, touch control sensing layers are formed, and a touch control function is integrated into an organic light-emitting diode. The structure is simple, it is not necessary to additionally set touch control components, the light-emitting efficiency is high, and the response speed is quick. In the preparation method for a touch control display device of the present invention, second electrodes are prepared in structures which are respectively connected in series horizontally and vertically, so that a touch control function can be integrated via a mature photoetching and etching process while completing the preparation of an organic light-emitting diode. The preparation method is simple, and process costs are low.

(57) 摘要: 本发明所述的一种触控显示装置, 在形成第二电极的同时, 第二电极分别沿横向和纵向串联连接, 形成彼此绝缘侧交叉网络, 即形成触控感测层, 将触控功能集成在所述有机发光二极管中, 结构简单, 无需另外再设置触控部件, 发光效率高、响应速度快。本发明所述的一种触控显示装置的制备方法, 将第二电极制备成分别沿横向和纵向串联连接结构, 在完成有机发光二极管制备的同时, 通过工艺成熟的光刻和刻蚀工艺便可以集成有触控功能, 制备方法简单, 工艺成本低。

WO 2015/096765 A1



NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW。

PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG)。

(84) **指定国** (除另有指明, 要求每一种可提供的地区保护): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 欧亚 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 欧洲 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO,

根据细则 4.17 的声明:

— 发明人资格(细则 4.17(iv))

本国际公布:

— 包括国际检索报告(条约第 21 条(3))。

一种触控显示装置及其制备方法

技术领域

本发明涉及显示技术领域，具体涉及一种具有内嵌式触控结构的有机发光显示装置及其制备方法。

背景技术

触控屏（英文全称为 Touch Panel），又称触摸屏、触控面板，是一种可接收触头等输入信号的感应式显示装置，广泛应用在各种电子产品上。按照触摸屏的工作原理和传输信息的介质，触摸屏可分为四种：电阻式、电容式、红外线式和表面声波式。

电容式触摸屏（英文全称为 Capacitive Touch Panel，简称为 CTP）是利用人体的电流感应对屏幕进行控制的。根据侦测触碰区域的电容变化，进而计算手指所在位置，精确度可达 99%，响应时间小于 3ms。CTP 具有灵敏度高、容易实现多点触控技术等优点，逐渐成为智能手机、平板电脑等电子产品中应用的主流触摸屏。

现有技术中，按照触控层叠结构和显示面板的相对位置，CTP 可分为：out cell（触控装置外挂于显示面板外）、on cell（触控装置设置在显示面板上）和 in cell（触控装置集成在显示面板中）等技术架构。尽管 out cell 和 on cell 技术成熟，在中小尺寸显示面板中得到了广泛的应用，而且 out cell 技术中的 OFS（英文全称为 One Film Solution，译为单片薄膜解决方案）可应用在有机电致发光显示装置中，使得柔性触控显示成为可能。但是 in cell 可以使显示面板更加轻薄、透光率更高、功率更小，而且可以实现柔性，被称为是触控显示，特别是有机电致发光显示触控的终极解决方案，将逐渐成为有机电致发光显示装置中触控技术的发展主流。

中国专利 CN101635276A 公开了一种有机发光二极管触控面板,包括基板、OLED 元件,以及光学感测元件。基板上定义有至少一像素区域,且像素区域中定义有显示区域与感测区域。OLED 元件设置于显示区域中的基板上,包括第一薄膜晶体管、发光下电极部、图案化有机发光层,以及发光上电极部。发光下电极部设置于发光上电极部上,且电连接至第一薄膜晶体管。图案化有机发光层设置于发光下电极部上。发光上电极部设置于图案化有机发光层上。光学感测元件设置于感测区域中的基板上,包括第二薄膜晶体管、感光下电极部、图案化感光介电层,以及感光上电极部。感光下电极部设置于第二薄膜晶体管上,且电连接至第二薄膜晶体管。图案化感光介电层设置于感光下电极部上,感光上电极部设置于图案化感光介电层上。该专利灵敏度高,但属于 in-cell 型光学触控方式,不但结构和制备工艺复杂而且难以实现多点触控,不属于主流的触控技术。

发明内容

为此,本发明所要解决的是现有技术中 in-cell 型触控技术结构和制备工艺复杂的问题,提供一种结构和工艺简单且具有内嵌式触控结构的有机发光显示装置及其制备方法。

为解决上述技术问题,本发明采用的技术方案如下:

本发明所述的一种触控显示装置,包括基板、设置在基板上的多个有机发光二极管,所述有机发光二极管包括依次堆叠设置的第一电极、有机材料层和第二电极;所述第一电极独立设置;所述第二电极分别串联形成若干平行排列的第一导电条和若干平行排列的第二导电条,所述第一导电条与所述第二导电条形成彼此绝缘的交叉网络。

所述第一导电条由沿第一方向排布的所述第二电极同层串联形成;所述第二导电条由沿第二方向排布的所述第二电极通过设置在所述有机发光二极管外部的导电桥进行串联形成。

所述导电桥设置在所述基板上,并通过直接覆盖在所述导电桥上的绝缘层与所述有机发光二极管绝缘。

所述导电桥为金属导电桥。

所述导电桥的厚度为 10 nm~1000 nm。

所述基板上还设置有隔离相邻所述有机发光二极管的像素限定层。

所述像素限定层上还直接设置有分隔相邻所述第一导电条与所述第二导电条的隔离柱层。

所述第二电极的厚度为 1 nm~500 nm。

还包括设置在所述基板上的若干驱动薄膜晶体管，各所述第一电极与各所述驱动薄膜晶体管的源极或漏极接触连接。

本发明所述的触控装置的制备方法，包括如下步骤：

S1、在基板上形成第一导电层，并图案化形成多个沿第二方向平行设置的导电桥；

S2、在基板上形成覆盖导电桥的绝缘层，在绝缘层中设置导通导电桥的通孔；

S3、在绝缘层上直接形成彼此独立的第一电极、在各第一电极上形成有机材料层；

S4、在有机材料层上形成第二电极，沿第一方向排布的若干第二电极同层串联，形成多个平行排列的第一导电条，沿第二方向排布的若干第二电极通过通孔与导电桥进行串联，形成多个平行排列的第二导电条，所述第一导电条与所述第二导电条形成彼此绝缘的交叉网络。

步骤 S3 中形成所述第一电极后，还包括在所述基板上形成环绕所述第一电极的像素限定层的步骤。

步骤 S3 中还包括在所述像素限定层上形成隔离柱层的步骤；步骤 S4 中形成的相邻所述第一导电条与所述第二导电条由所述隔离柱层隔开。

步骤 S2 中所述通孔的轴向与所述基板的夹角为 10° ~ 90° 。

本发明的上述技术方案相比现有技术具有以下优点：

1、本发明所述的一种触控显示装置，包括基板、设置在基板上的有机发光二极管，所述第一电极独立设置；所述第二电极分别串联形成若干平行排列的第一导电条和若干平行排列的第二导电条，所述第一导电条与所述第二导电条形成彼此绝缘的交叉网络。在形成第二电极的同时，第二电极分别沿横向和纵向串联连接，形成彼此绝缘侧交叉网络，即形成触控感测层，将触控功能集成在所述有机发光二极管的第二电极中，结构简单；而且，可以实现多点触控。

2、本发明所述的一种触控显示装置，将触控功能集成在所述有机发光二极管中，无需另外再设置触控部件，发光效率高、相应速度快。

3、本发明所述的一种触控显示装置的制备方法，将第二电极制备成分别沿横向和纵向串联连接结构，在完成有机发光二极管制备的同时，通过工艺成熟的光刻和刻蚀工艺便可以集成有触控功能，制备方法简单，工艺成本低。

附图说明

为了使本发明的内容更容易被清楚的理解，下面根据本发明的具体实施例并结合附图，对本发明作进一步详细的说明，其中

图1是本发明实施例1中所述触控显示装置的结构示意图；

图中附图标记表示为：100-基板、101-绝缘层、102-第一电极、103-有机材料层、104-第二导电条中的第二电极、105-第一导电条中的第二电极、106-隔离柱层、107-通孔、108-导电桥、109-封装层、110-像素限定层。

具体实施方式

为了使本发明的目的、技术方案和优点更加清楚，下面将结合附图对本发明的实施方式作进一步地详细描述。

本发明可以以许多不同的形式实施，而不应该被理解为限于在此阐述的实施例。相反，提供这些实施例，使得本公开将是彻底和完整的，并且将把本发明的构思充分传达给本领域技术人员，本发明将仅由权利要求来限定。

在附图中，为了清晰起见，会夸大层和区域的尺寸和相对尺寸。应当理解的是，当元件例如层、区域或基板被称作“形成在”或“设置在”另一元件“上”时，该元件可以直接设置在所述另一元件上，或者也可以存在中间元件。相反，当元件被称作“直接形成在”或“直接设置在”另一元件上时，不存在中间元件。

本实施例提供一种触控显示装置，如图 1 所示，包括基板 100、设置在基板 100 上的有机发光二极管，其第一电极 102 独立设置；所述第二电极 104 和 105 分别串联形成的若干平行排列的第一导电条和若干平行排列的第二导电条，所述第一导电条与所述第二导电条形成彼此绝缘的交叉网络。

所述第一导电条由沿第一方向排布的所述第二电极 105 同层串联形成；所述第二导电条由沿第二方向排布的所述第二电极 104 通过设置在所述有机发光二极管外部的导电桥进行串联形成。

所述导电桥 108 设置在所述基板 100 与所述有机发光二极管之间的绝缘层 101 中，所述导电桥 108 选自但不限于单层或多层导电聚合物或钼、铝、钛、钨等金属或其合金薄膜，优选为多层金属导电桥，本实施例更优选依次堆叠的钼/铝/钼三层金属膜。

本实施例中所述导电桥 108 中钼/铝/钼分别为 50 nm/250 nm/50 nm，作为本发明的其他实施例，所述导电桥 108 的厚度还可以为 10nm~1000nm，均可以实现本发明的目的，属于本发明的保护范围。

所述绝缘层 101 选自但不限于氮化硅、氧化硅、氮氧化硅、氧化铝等中的一层或多层堆叠结构，本实施例优选为单层的氮化硅层。

本发明所述第一电极 102、所述有机材料层 103、所述第二电极所用材料和厚度均同现有技术，其中所述第二电极的厚度优选为 1nm~500nm。本实施例中所述第一电极 102 为依次堆叠的 ITO/Ag/ITO 层，厚度为 15nm/110nm/7 nm；所述有机材料层 103 包括发光层以及空穴注入层、空穴传输层、电子阻挡层、空穴阻挡层、电子传输层以及电子注入层中的一种或多种的组合，本实施例中所述有机材料层 103 包括依次堆叠设置的空穴传输

层、发光层和电子传输层，厚度总共为 200 nm，所述第二电极为 Ag，厚度为 5 nm。

所述基板 100 上还设置有隔离相邻所述有机发光二极管的像素限定层 110，所述像素限定层 110 上还直接设置有分隔相邻所述第一导电条与所述第二导电条的隔离柱层 106。

本实施例中，将所述第二电极分隔为所述第一导电条和所述第二导电条的隔离柱 106 优选为聚酰亚胺层，其的高度为 $0.1\mu\text{m} \sim 5\mu\text{m}$ ，本实施例优选为 $1\mu\text{m}$ ，宽度为 $1\mu\text{m}$ 。作为本发明的其他实施例，所述隔离柱 106 还可以为其他绝缘材料制备，所述第二电极之间也可以不设置隔离柱 106，能保证相邻所述第一导电条与所述第二导电条绝缘即可实现本发明的目的，属于本发明的保护范围。

本实施例所述的触控显示装置为主动矩阵有机发光显示装置，还包括设置在所述基板 100 上的若干驱动薄膜晶体管，各所述第一电极 102 与各所述驱动薄膜晶体管的源极或漏极接触连接。

本发明所述触控显示装置优选为顶发射有机发光显示装置，即所述第二电极 102 为透明电极。

本实施例中，所述第二电极 104 和 105 上还设置有封装层 109，所述封装层 109 包括一层或多层交替设置的有机薄膜和/或无机薄膜的膜层，无机薄膜选自但不限于氮化硅、氧化硅等薄膜，有机薄膜选自紫外光固化树脂、二氧化硅-丙烯酸树脂复合材料等薄膜。本实施例中，所述封装层 109 优选为四对交替沉积的聚丙烯酸酯层和氧化铝层，聚丙烯酸酯层膜厚均为 1.5 微米，氧化铝层的膜厚均为 50 nm。

本实施例所述的一种触控显示装置，所述第二电极设置为分别沿横向和纵向串联连接结构，形成彼此绝缘侧交叉网络，在形成第二电极的同时，形成触控感测层，将触控功能集成在所述有机发光二极管中，结构简单；而且，将触控功能集成在所述有机发光二极管中，无需另外再设置触控部件，发光效率高、相应速度快。

所述的触控装置的制备方法，包括如下步骤：

S1、通过溅射工艺在基板 101 上形成第一导电层，并图案化形成多个纵向平行设置的连续的导电条，即形成导电桥 108。

作为本发明的其他实施例，所述第一导电层还可以图案化形成导线状的导电桥 108，所述导线或导电条还可以为不连续的。

S2、通过等离子增强化学气相沉积（PECVD）工艺，形成覆盖所述导电桥 108 的绝缘层 101，通过光刻工艺，在同列相邻所述第二有机发光二极管之间的绝缘层 101 中设置导通同一条所述导电桥 108 的通孔 107。所述通孔 107 的轴向与所述基板 100 的夹角为 50° ，作为本发明的其他实施例，所述通孔还可以通过激光烧蚀、离子束刻蚀、电子束刻蚀等工艺制备，所述通孔 107 的轴向与所述基板 100 的夹角还可以为 $10^\circ \sim 90^\circ$ 的任意角度，均可以实现本发明的目的，属于本发明的保护范围。

S3、通过溅射工艺在绝缘层 101 上直接形成第二导电层，并通过光刻和刻蚀工艺图案化形成彼此独立的第一电极 102。

作为本发明的其他实施例，所述第二导电层还可以通过 CVD、电化学反应等工艺制备，均可以实现本发明的目的，属于本发明的保护范围。

通过涂覆工艺在基板上形成覆盖所述第一电极 102 的像素限定层 110，并通过光刻工艺图案化，暴露所述第一电极 102 和通孔 107。

然后通过涂覆和光刻工艺，在像素限定层 110 上形成隔离柱层 106。

通过精细掩膜蒸镀工艺，在所述第一电极 102 上形成有机材料层 103。

S4、通过蒸镀工艺，以所述隔离柱层 106 为掩膜，在所述有机材料层 103 上形成沿第一方向同层串联连接的第二电极 105，以及沿第二方向彼此分离的第二电极 104，第二电极 104 与第二电极 105 由负角度的隔离柱 106 层自然隔开。所述第二电极 105 串联形成第一导电条，形成所述第二电极的材料填充在所述通孔 107 中并与所述导电桥 108 电接触连接，使得所述第二电极 104 得以沿第二方向串联，形成第二导电条。

本实施例中，所述步骤 S4 之后还包括在所述基板 100 上制备覆盖所述第二电极 104 和 105 的封装层 109 的步骤，具体实施方式同现有技术。

本实施例所述的一种触控显示装置的制备方法，将第二电极制备成分别沿横向和纵向串联连接结构，在完成有机发光二极管制备的同时，通过工艺成熟的光刻工艺便可以集成有触控功能，制备方法简单，工艺成本低。

显然，上述实施例仅仅是为清楚地说明所作的举例，而并非对实施方式的限定。对于所属领域的普通技术人员来说，在上述说明的基础上还可以做出其它不同形式的变化或变动。这里无需也无法对所有的实施方式予以穷举。而由此所引伸出的显而易见的变化或变动仍处于本发明的保护范围之内。

权 利 要 求 书

1. 一种触控显示装置，包括基板、设置在基板上的多个有机发光二极管，所述有机发光二极管包括依次堆叠设置的第一电极、有机材料层和第二电极；
5 其特征在于，所述第一电极独立设置；所述第二电极分别串联形成若干平行排列的第一导电条和若干平行排列的第二导电条，所述第一导电条与所述第二导电条形成彼此绝缘的交叉网络。

2. 根据权利要求 1 所述的触控显示装置，其特征在于，所述第一导电条由沿第一方向排布的所述第二电极同层串联形成；所述第二导电条由沿第二方
10 排布的所述第二电极通过设置在所述有机发光二极管外部的导电桥进行串联形成。

3. 根据权利要求 2 所述的触控显示装置，其特征在于，所述导电桥设置在所述基板上，并通过直接覆盖在所述导电桥上的绝缘层与所述有机发光二极管绝缘。

15 4. 根据权利要求 3 所述的触控显示装置，其特征在于，所述导电桥为金属导电桥。

5. 根据权利要求 3 所述的触控显示装置，其特征在于，所述导电桥的厚度为 10 nm~1000 nm。

20 6. 根据权利要求 1 所述的触控显示装置，其特征在于，所述基板上还设置有隔离相邻所述有机发光二极管的像素限定层。

7. 根据权利要求 6 所述的触控显示装置，其特征在于，所述像素限定层上还直接设置有分隔相邻所述第一导电条与所述第二导电条的隔离柱层。

8. 根据权利要求 1-7 任一所述的触控显示装置，其特征在于，所述第二电极的厚度为 1 nm~500 nm。

25 9. 根据权利要求 1-7 任一所述的触控显示装置，其特征在于，还包括设置在所述基板上的若干驱动薄膜晶体管，各所述第一电极与各所述驱动薄膜晶

体管的源极或漏极接触连接。

10.一种权利要求 1-9 任一所述的触控装置的制备方法，其特征在于，包括如下步骤：

5 S1、在基板上形成第一导电层，并图案化形成多个沿第二方向平行设置的导电桥；

S2、在基板上形成覆盖导电桥的绝缘层，在绝缘层中设置导通导电桥的通孔；

S3、在绝缘层上直接形成彼此独立的第一电极、在各第一电极上形成有机材料层；

10 S4、在有机材料层上形成第二电极，沿第一方向排布的若干第二电极同层串联，形成多个平行排列的第一导电条，沿第二方向排布的若干第二电极通过通孔与导电桥进行串联，形成多个平行排列的第二导电条，所述第一导电条与所述第二导电条形成彼此绝缘的交叉网络。

15 11.根据权利要求 10 所述的触控装置的制备方法，其特征在于，步骤 S3 中形成所述第一电极后，还包括在所述基板上形成环绕所述第一电极的像素限定层的步骤。

12.根据权利要求 11 所述的触控装置的制备方法，其特征在于，步骤 S3 中还包括在所述像素限定层上形成隔离柱层的步骤；步骤 S4 中形成的相邻所述第一导电条与所述第二导电条由所述隔离柱层隔开。

20 13.根据权利要求 10 所述的触控装置的制备方法，其特征在于，步骤 S2 中所述通孔的轴向与所述基板的夹角为 10° ~ 90° 。

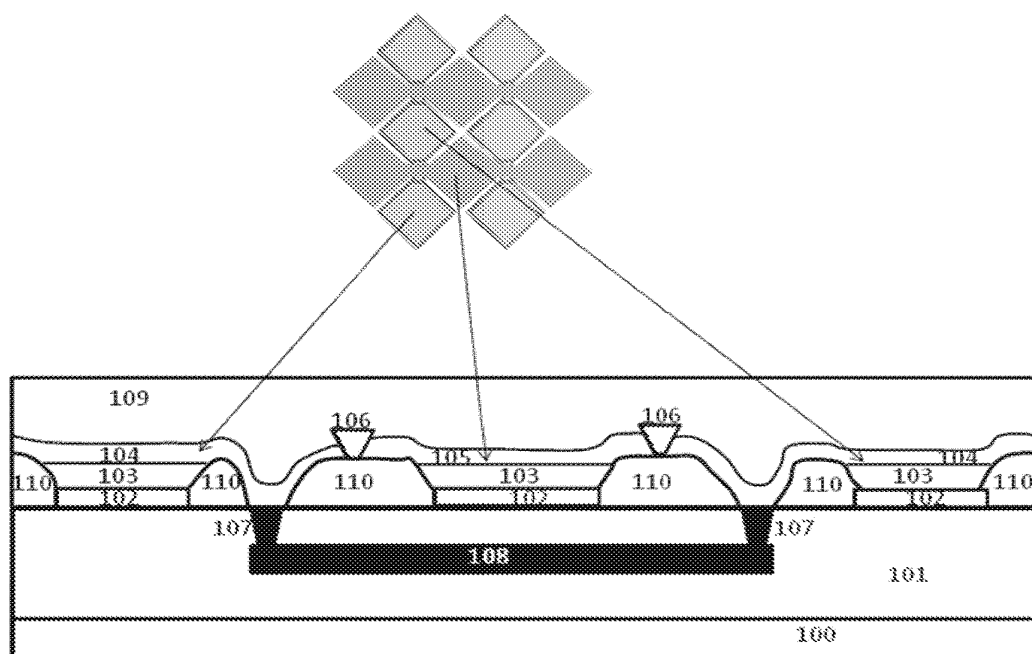


图 1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2014/094919**A. CLASSIFICATION OF SUBJECT MATTER**

G06F 3/041(2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F 3/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, CNKI, WPI, EPODOC: DIODE, ELECTRODE, TOUCH+, SCREEN, BOARD, PANEL, COUDUCTION, CROSS, INSULATION, METAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 203178979 U (SHENZHEN O-FILM TECH CO., LTD.), 04 September 2013 (04.09.2013), description, paragraphs 0006-0060, and figures 3-9	1, 8-10
A	CN 102023739 A (DELTA ELECTRONICS, INC.), 20 April 2011 (20.04.2011), the whole document	1-13
A	CN 103197798 A (SHENZHEN O-FILM TECH CO., LTD.), 10 July 2013 (10.07.2013), the whole document	1-13

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

10 March 2015 (10.03.2015)

Date of mailing of the international search report

18 March 2015 (18.03.2015)

Name and mailing address of the ISA/CN:

State Intellectual Property Office of the P. R. China
No. 6, Xitucheng Road, Jimenqiao
Haidian District, Beijing 100088, China
Facsimile No.: (86-10) 62019451

Authorized officer

WANG, ShaofengTelephone No.: (86-10) **62411714**

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2014/094919

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 203178979 U	04 September 2013	None	
CN 102023739 A	20 April 2011	US 2011067933 A1	24 March 2011
		TW 201112078 A	01 April 2011
CN 103197798 A	10 July 2013	WO 2014161250 A1	09 October 2014
		CN 103197798 B	07 May 2014
		TW 201439841 A	16 October 2014

Form PCT/ISA/210 (patent family annex) (July 2009)

国际检索报告

国际申请号

PCT/CN2014/094919

A. 主题的分类

G06F 3/041 (2006.01) i

按照国际专利分类 (IPC) 或者同时按照国家分类和 IPC 两种分类

B. 检索领域

检索的最低限度文献 (标明分类系统和分类号)

G06F 3/-

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库 (数据库的名称, 和使用的检索词 (如使用))

CNPAT, CNKI, WPI, EPDOC: 二极管, 电极, 触摸, 屏, 板, 导电, 交叉, 绝缘, 金属, 隔离, DIODE, ELECTRODE, TOUCH+, SCREEN, BOARD, PANEL, CONDUCTION, CROSS, INSULATION, METAL, INSULATION

C. 相关文件

类 型*	引用文件, 必要时, 指明相关段落	相关的权利要求
X	CN 203178979 U (深圳欧菲光科技股份有限公司) 2013年 9月 4日 (2013 - 09 - 04) 说明书第0006段至第0060段、附图3-9	1, 8-10
A	CN 102023739 A (台达电子工业股份有限公司) 2011年 4月 20日 (2011 - 04 - 20) 全文	1-13
A	CN 103197798 A (深圳欧菲光科技股份有限公司) 2013年 7月 10日 (2013 - 07 - 10) 全文	1-13

☐ 其余文件在C栏的续页中列出。☒ 见同族专利附件。

* 引用文件的具体类型:

“A” 认为不特别相关的表示了现有技术一般状态的文件
“E” 在国际申请日的当天或之后公布的在先申请或专利
“L” 可能对优先权要求构成怀疑的文件, 或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件 (如具体说明的)
“O” 涉及口头公开、使用、展览或其他方式公开的文件
“P” 公布日先于国际申请日但迟于所要求的优先权日的文件

“T” 在申请日或优先权日之后公布, 与申请不相抵触, 但为了理解发明之理论或原理的在后文件
“X” 特别相关的文件, 单独考虑该文件, 认定要求保护的发明不是新颖的或不具有创造性
“Y” 特别相关的文件, 当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时, 要求保护的发明不具有创造性
“&” 同族专利的文件

国际检索实际完成的日期

2015年 3月 10日

国际检索报告邮寄日期

2015年 3月 18日

ISA/CN的名称和邮寄地址

中华人民共和国国家知识产权局 (ISA/CN)
北京市海淀区蓟门桥西土城路6号
100088 中国

传真号 (86-10)62019451

受权官员

王少锋

电话号码 (86-10)62411714

表 PCT/ISA/210 (第2页) (2009年7月)

国际检索报告
关于同族专利的信息

国际申请号

PCT/CN2014/094919

检索报告引用的专利文件			公布日 (年/月/日)	同族专利			公布日 (年/月/日)
CN	203178979	U	2013年 9月 4日	无			
CN	102023739	A	2011年 4月 20日	US	2011067933	A1	2011年 3月 24日
				TW	201112078	A	2011年 4月 1日
CN	103197798	A	2013年 7月 10日	WO	2014161250	A1	2014年 10月 9日
				CN	103197798	B	2014年 5月 7日
				TW	201439841	A	2014年 10月 16日

表 PCT/ISA/210 (同族专利附件) (2009年7月)

Electronic Patent Application Fee Transmittal				
Application Number:		16742230		
Filing Date:		14-Jan-2020		
Title of Invention:		DISPLAY DEVICE		
First Named Inventor/Applicant Name:		Chiwook AN		
Filer:		Ryan Matthew Swank/Sheila Harter		
Attorney Docket Number:		183539/411598-04552		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
Total in USD (\$)				260

Electronic Acknowledgement Receipt	
EFS ID:	43834776
Application Number:	16742230
International Application Number:	
Confirmation Number:	7917
Title of Invention:	DISPLAY DEVICE
First Named Inventor/Applicant Name:	Chiwook AN
Customer Number:	23363
Filer:	Ryan Matthew Swank/Sheila Harter
Filer Authorized By:	Ryan Matthew Swank
Attorney Docket Number:	183539/411598-04552
Receipt Date:	22-SEP-2021
Filing Date:	14-JAN-2020
Time Stamp:	15:15:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$260
RAM confirmation Number	E20219LF15332082
Deposit Account	031728
Authorized User	Sheila Harter
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	183539IDSTransmittal.pdf	105973	no	2
			388a71de56c2c44bc82667fc6e72ef1eb4beac51		
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	183539SB08.pdf	96801	no	2
			a6f48c28225f602ca3b9ec254c7abe6101134833c		
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	WO765.pdf	2153361	no	17
			c553ceacc3ba05687d669100f66ddcf87d41cd76		
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	37987	no	2
			efc99143e624438c9ad64f72ef6beaa2878dd3b6		
Warnings:					
Information:					
Total Files Size (in bytes):			2394122		

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.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

I hereby certify that this correspondence is being EFS-Web transmitted to the United States Patent and Trademark Office on September 22, 2021 at or before 11:59 p.m. Pacific Time under the Rules of 37 CFR § 1.8.

/Sheila R. Harter/
Sheila R. Harter

Inventor(s) : Chiwook An, et al. Confirmation No. 7917
Application No. : 16/742,230
Filed : January 14, 2020
Title : DISPLAY DEVICE

Grp./Div. : 2625
Examiner : Towfiq Elahi

Docket No. : 183539

**INFORMATION DISCLOSURE STATEMENT WITH FEE
UNDER 37 CFR §§ 1.97(d) AND 1.17(p)**

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

Post Office Box 29001
Glendale, CA 91209-9001
September 22, 2021

Commissioner:

In compliance with the duty of disclosure under 37 CFR §§ 1.56, 1.97 and 1.98, and in accordance with the provisions in the Manual of Patent Examining Procedure §§ 609 and 707.05(b), enclosed is an information disclosure statement listing the references that are known to applicant. Copies of each of the listed Foreign Patent Documents and Other Documents references are enclosed.

It is respectfully requested that the listed references be considered in the examination of this application and identified on the list of references cited on the patent issuing for this application. Applicant also requests that an initialed copy of the information disclosure statement be entered in the application file and returned to applicant with the next communication from the Office in accordance with MPEP § 609.

115586687.1

Application No. 16/742,230

Applicant's undersigned attorney hereby certifies, in accordance with 37 CFR § 1.97(e)(1), that each item of information contained in the information disclosure statement was first cited in a communication from any foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement.

The processing fee of \$260.00 as required by 37 CFR § 1.17(p) is submitted herewith. The Commissioner is hereby authorized to charge any fees which may be required by this paper to Deposit Account No. 03-1728. Please show our docket number with any Deposit Account transaction.

Respectfully submitted,
LEWIS ROCA ROTHGERBER CHRISTIE LLP

By /Ryan M. Swank/
Ryan M. Swank
Reg. No. 62,600
626/795-9900

RMS/srh
Enclosures: Information Disclosure Statement, w/references



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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/742,230	01/14/2020	Chiwook AN	183539/411598-04552	7917
23363	7590	09/28/2021	EXAMINER	
Lewis Roca Rothgerber Christie LLP			ELAHI, TOWFIQ	
PO BOX 29001				
Glendale, CA 91209-9001				
			ART UNIT	PAPER NUMBER
			2625	
			NOTIFICATION DATE	DELIVERY MODE
			09/28/2021	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):

PLPrivatePair@lrrc.com
pto@lewisroca.com

Corrected Notice of Allowability	Application No. 16/742,230	Applicant(s) AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625
		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 6/11/2021.

☐ 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 1-16. 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)	5. ☐ Examiner's Amendment/Comment
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☐ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____.	

/TOWFIQ ELAHI/ Primary Examiner, Art Unit 2625	
---	--

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.E/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)	Attorney Docket Number	183539
	Application Number	16/742,230
	Filing Date	January 14, 2020
	Inventor(s)	Chiwook An, et al.
	Group Art Unit	2625
	Examiner Name	Towfiq Elhal

U.S. PATENT DOCUMENTS				
EXAMINER INITIALS	Cite No. ¹	DOCUMENT NUMBER Number - Kind Code ² (If Known)	PUBLICATION DATE OR ISSUE DATE MM-DD-YYYY	NAME OF PATENTEE
		8,325,312 B2	12-04-2012	Seo et al.
		8,629,842 B2	01-14-2014	Jang
		2010/0182273 A1	07-22-2010	Noguchi et al.
		2013/0285938 A1	10-31-2013	Kang et al.
		2015/0280154 A1	10-01-2015	Jang et al.
		2016/0043320 A1	02-11-2016	Kwon
		2016/0103549 A1	04-14-2016	Lee et al.

FOREIGN PATENT DOCUMENTS					
EXAMINER INITIALS	Cite No. ¹	Foreign Patent Document Country Code ³ - Number ⁴ - Kind Code ⁵ (If Known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶ (✓)
		CN 101398588 A	04-01-2009	Seo et al.	Corresponds to US 8,325,312 B2 as listed above.
		CN 105511665 A	04-20-2016	Lee et al.	Corresponds to US 2016/0103549 A1 as listed above.
		CN 101681221 A	03-24-2010	Noguchi et al.	Corresponds to US 2010/0182273 A1 as listed above.
		CN 101626017 A	01-13-2010	Jang	Corresponds to US 8,629,842 B2 as listed above.

EXAMINER SIGNATURE	/TOWFIQ ELAHI/	DATE CONSIDERED	09/22/2021
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. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.pto.gov or MPEP 901.4. ³ Enter Office that issued the document, by the two-letter code (WIPO standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English Language Translation is attached.			

RMS/srh

Sheet 1 of 2

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.E/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)	Attorney Docket Number	183539
	Application Number	16/742,230
	Filing Date	January 14, 2020
	Inventor(s)	Chiwook An, et al.
	Group Art Unit	2625
	Examiner Name	Towfiq Elhal

OTHER DOCUMENTS		
EXAMINER INITIALS	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article, title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.

EXAMINER SIGNATURE		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. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.pto.gov or MPEP 901.4. ³ Enter Office that issued the document, by the two-letter code (WIPO standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English Language Translation is attached.			

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Sheet 2 of 2

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/742,230	01/14/2020	Chiwook AN	183539/411598-04552	7917
23363	7590	10/14/2021	EXAMINER	
Lewis Roca Rothgerber Christie LLP			ELAHI, TOWFIQ	
PO BOX 29001				
Glendale, CA 91209-9001				
			ART UNIT	PAPER NUMBER
			2625	
			NOTIFICATION DATE	DELIVERY MODE
			10/14/2021	ELECTRONIC

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PLPrivatePair@lrrc.com
pto@lewisroca.com

Corrected Notice of Allowability	Application No. 16/742,230	Applicant(s) AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625
		AIA (FITF) Status Yes

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1. ☒ This communication is responsive to 06/11/2021.
☐ 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 1-16. 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).

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a) ☐ All b) ☐ Some* c) ☐ None of the:

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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 _____
---	--

/TOWFIQ ELAHI/ Primary Examiner, Art Unit 2625	
---	--

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.E/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)	Attorney Docket Number	183539
	Application Number	16/742,230
	Filing Date	January 14, 2020
	Inventor(s)	Chiwook An, et al.
	Group Art Unit	2625
	Examiner Name	Towfiq Elahi

U.S. PATENT DOCUMENTS				
EXAMINER INITIALS	Cite No. ¹	DOCUMENT NUMBER Number - Kind Code ² (If Known)	PUBLICATION DATE OR ISSUE DATE MM-DD-YYYY	NAME OF PATENTEE
		10,185,430 B2	01-22-2019	Zhu et al.

FOREIGN PATENT DOCUMENTS					
EXAMINER INITIALS	Cite No. ¹	Foreign Patent Document Country Code ³ - Number ⁴ - Kind Code ⁵ (If Known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶ (✓)
		WO 2015/096765 A1	07-02-2015	Zhu et al.	Corresponds to 10,185,430 B2 as listed above.

OTHER DOCUMENTS		
EXAMINER INITIALS	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article, title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.

EXAMINER SIGNATURE	/TOWFIQ ELAHI/	DATE CONSIDERED	10/04/2021
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. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.pto.gov or MPEP 901.4. ³ Enter Office that issued the document, by the two-letter code (WIPO standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English Language Translation is attached.			

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Sheet 1 of 2

115586654.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.E/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)	Attorney Docket Number	183539
	Application Number	16/742,230
	Filing Date	January 14, 2020
	Inventor(s)	Chiwook An, et al.
	Group Art Unit	2625
	Examiner Name	Towfiq Elahi

EXAMINER SIGNATURE	/TOWFIQ ELAHI/	DATE CONSIDERED	10/11/2021
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. ¹Applicant's unique citation designation number (optional). ²See Kinds Codes of USPTO Patent Documents at www.pto.gov or MPEP 901.4. ³Enter Office that issued the document, by the two-letter code (WIPO standard ST.3). ⁴For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶Applicant is to place a check mark here if English Language Translation is attached.			

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Sheet 2 of 2

115586654.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.E/

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/742,230		Filing Date 01/14/2020		☐ To be Mailed				
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO												
APPLICATION AS FILED - PART I												
		(Column 1)	(Column 2)									
FOR		NUMBER FILED	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), (j), 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	12/13/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)					
	Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0	x \$100 =	0					
	Independent (37 CFR 1.16(h))	* 2	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				
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".						/ALLYSON PURNELL/						
*** 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.

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

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

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

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL (Submitted Only via EFS-Web)

Application Number	16742230	Filing Date	2020-01-14	Docket Number (if applicable)	183539	Art Unit	2625
First Named Inventor	Chiwook An			Examiner Name	Towfiq Elahl		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.

Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☒ Other September 15, 2021 Notice of Allowance

☒ Enclosed

☒ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☒ The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 031728

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

Doc code: RCEX

Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

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

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

Signature of Registered U.S. Patent Practitioner			
Signature	Ryan M. Swank/	Date (YYYY-MM-DD)	2021-12-13
Name	Ryan M. Swank	Registration Number	62600

This collection of information is required by 37 CFR 1.114. 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 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.

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

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 the Freedom of Information Act requires disclosure of these records.
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.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

I hereby certify that this correspondence is being EFS-Web transmitted to the United States Patent and Trademark Office on December 13, 2021 at or before 11:59 p.m. Pacific Time under the Rules of 37 CFR § 1.8.

/Sheila R. Harter/
Sheila R. Harter

Appl No. : 16/742,230
Inventor : Chiwook An, et al.
Filed : January 14, 2020
Title : DISPLAY DEVICE

Confirmation No. 7917

TC/A.U. : 2625
Examiner : Towfiq Elahl

Docket No. : 183539

Customer No. : 23363

AMENDMENT WITH REQUEST FOR CONTINUED EXAMINATION

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

Post Office Box 29001
Glendale, CA 91209-9001
December 13, 2021

Commissioner:

This paper is in response to the Notice of Allowance dated September 15, 2021, which set an initial period for reply to expire on December 15, 2021. As such, this response is timely filed. Please amend the above-identified application as follows:

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

Remarks/Arguments begin on page 6 of this paper.

AppIn No. 16/742,230
Amdt date December 13, 2021
Reply to Office action of April 19, 2021

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 display device comprising:
 - an organic light emitting device layer;
 - a thin film encapsulation layer on the organic light emitting device layer;
 - a buffer layer directly on the thin film encapsulation layer; and
 - a touch sensing unit directly on the buffer layer, the touch sensing unit comprising:
 - a first conductive pattern on the buffer layer;
 - an insulating layer covering the first conductive pattern; and
 - a second conductive pattern on the insulating layer, ~~the second conductive pattern partially crossing the first conductive pattern,~~ being electrically insulated from the first conductive pattern, and having a thickness above the first conductive pattern in a thickness direction of the display device that is greater than a thickness of the first conductive pattern in the thickness direction of the display device.
2. (Currently Amended) The display ~~apparatus~~ device of claim 1, wherein the first conductive pattern is directly on the buffer layer.
3. (Currently Amended) The display ~~apparatus~~ device of claim 1, wherein the buffer layer comprises at least one of a silicon nitride, a silicon-oxy-nitride, and a silicon oxide.
4. (Currently Amended) The display ~~apparatus~~ device of claim 1, wherein the thin film encapsulation layer comprises:

Appln No. 16/742,230
Amdt date December 13, 2021
Reply to Office action of April 19, 2021

- a first inorganic layer;
- an organic layer on the first inorganic layer; and
- a second inorganic layer on the organic layer.

5. (Currently Amended) The display ~~apparatus~~ device of claim 4, wherein the buffer layer is directly on the second inorganic layer.

6. (Currently Amended) A display device comprising:

- an organic light emitting device layer;
- a thin film encapsulation layer on the organic light emitting device layer;
- a buffer layer directly on the thin film encapsulation layer; and
- a touch sensing unit directly on the buffer layer, the touch sensing unit comprising:
 - a first conductive pattern on the buffer layer, and comprising:
 - a first conductive layer on the buffer layer;
 - a second conductive layer on the first conductive layer; and
 - a third conductive layer on the second conductive layer;
 - an insulating layer covering the first conductive pattern; and
 - a second conductive pattern on the insulating layer, ~~the second conductive pattern partially crossing the first conductive pattern,~~ and having a thickness that is greater than a thickness of the first conductive pattern, and comprising:
 - a fourth conductive layer on the insulating layer;
 - a fifth conductive layer on the fourth conductive layer; and
 - a sixth conductive layer on the fifth conductive layer.

7. (Currently Amended) The display ~~apparatus~~ device of claim 6, wherein each of the second conductive layer and the fifth conductive layer comprises aluminum (Al), and

wherein each of the first conductive layer, the third conductive layer, the fourth conductive layer and the sixth conductive layer comprises titanium (Ti).

8. (Currently Amended) The display ~~apparatus~~ device of claim 6, wherein a thickness of the second conductive layer is greater than each of a thickness of the first conductive layer and a thickness of the third conductive layer.

9. (Currently Amended) The display ~~apparatus~~ device of claim 6, wherein a thickness of the fifth conductive layer is greater than each of a thickness of the fifth conductive layer and a thickness of the sixth conductive layer.

10. (Currently Amended) The display ~~apparatus~~ device of claim 6, wherein a thickness of the second conductive layer is less than a thickness of the fifth conductive layer.

11. (Currently Amended) The display ~~apparatus~~ device of claim 6, wherein a thickness difference between the second conductive layer and the first conductive layer is greater than a thickness difference between the third conductive layer and the first conductive layer.

12. (Currently Amended) The display ~~apparatus~~ device of claim 6, wherein a thickness difference between the fifth conductive layer and the fourth conductive layer is greater than a thickness difference between the sixth conductive layer and the fourth conductive layer.

13. (Currently Amended) The display ~~apparatus~~ device of claim 6, wherein a thickness difference between the fifth conductive layer and the fourth conductive layer is

Appln No. 16/742,230
Amdt date December 13, 2021
Reply to Office action of April 19, 2021

greater than a thickness difference between the second conductive layer and the first conductive layer.

14. (Currently Amended) The display ~~apparatus~~ device of claim 1, wherein the second conductive pattern comprises:

first touch sensor parts;

second touch sensor parts spaced from the first touch sensor parts; and

first connection parts connecting respective ones of the first touch sensor parts,

wherein the first conductive pattern comprises electrically conductive second connection parts connecting respective ones of the second touch sensor parts.

15. (Currently Amended) The display ~~apparatus~~ device of claim 14, wherein the second connection parts are directly on the buffer layer.

16. (Currently Amended) The display ~~apparatus~~ device of claim 1, wherein a thickness of the insulating layer is less than a thickness of the second conductive pattern.

17. (New) The display device of claim 14, wherein each of the first touch sensor parts and the second touch sensor parts comprise a plurality of mesh lines defining a plurality of mesh openings.

18. (New) The display device of claim 17, wherein the second connection parts cross the mesh lines of the first touch sensor parts and the mesh lines of the second touch sensor parts.

19. (New) The display device of claim 14, wherein at least one of the first connection parts and the second connection parts has a mesh shape.

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Amdt date December 13, 2021
Reply to Office action of April 19, 2021

REMARKS/ARGUMENTS

Claims 1-19 are pending in the instant application, of which claims 1 and 6 are independent. Claims 1-16 have been amended herein. Claims 17-19 have been added. No new matter is added.

Applicant has amended some of the claims, which were previously indicated as allowed, to further clarify the allowed claims characteristics, and has also added three new claims.

Applicant respectfully requests that the claim amendments be entered, and that claims 1-19 be allowed.

Concluding Remarks

In view of the foregoing amendments and remarks, Applicant earnestly solicits a timely issuance of a Notice of Allowance with claims 1-19. If there are any remaining issues that can be addressed over the telephone, the Examiner is cordially invited to call Applicant's attorney at the number listed below.

Payment of any fee required to enter and process this response is provided. The Director is authorized to charge any underpayment of fees or credit any overpayment of fees to Deposit Account No. 03-1728.

Respectfully submitted,

LEWIS ROCA ROTHGERBER CHRISTIE LLP

By /Ryan M. Swank/

Ryan M. Swank
Reg. No. 62,600
626/795-9900

RMS/srh

Electronic Patent Application Fee Transmittal				
Application Number:		16742230		
Filing Date:		14-Jan-2020		
Title of Invention:		DISPLAY DEVICE		
First Named Inventor/Applicant Name:		Chiwook AN		
Filer:		Ryan Matthew Swank/Sheila Harter		
Attorney Docket Number:		183539/411598-04552		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	1820	1	2000	2000
Total in USD (\$)				2000

Electronic Acknowledgement Receipt	
EFS ID:	44500722
Application Number:	16742230
International Application Number:	
Confirmation Number:	7917
Title of Invention:	DISPLAY DEVICE
First Named Inventor/Applicant Name:	Chiwook AN
Customer Number:	23363
Filer:	Ryan Matthew Swank/Sheila Harter
Filer Authorized By:	Ryan Matthew Swank
Attorney Docket Number:	183539/411598-04552
Receipt Date:	13-DEC-2021
Filing Date:	14-JAN-2020
Time Stamp:	15:36:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$2000
RAM confirmation Number	E2021BCF37081976
Deposit Account	031728
Authorized User	Sheila Harter
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	183539RCE.pdf	1349976	no	3
			4be7a5a17212f7ba5e7f491794ba013b2903415f		
Warnings:					
Information:					
2		183539RCEAmendment.pdf	115340	yes	6
			80ff51512451bd001f58b7aaa4399320fca22b7b		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment Submitted/Entered with Filing of CPA/RCE		1	1	
	Claims		2	5	
	Applicant Arguments/Remarks Made in an Amendment		6	6	
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	37889	no	2
			e9702cfb4ec343c7ef184d7637886bcc44e550a1		
Warnings:					
Information:					
Total Files Size (in bytes):			1503205		

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.

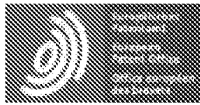
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)	Attorney Docket Number	183539
	Application Number	16/742,230
	Filing Date	January 14, 2020
	Inventor(s)	Chiwook An, et al.
	Group Art Unit	2625
	Examiner Name	Towfiq Elahi

U.S. PATENT DOCUMENTS				
EXAMINER INITIALS	Cite No. ¹	DOCUMENT NUMBER Number - Kind Code ² (If Known)	PUBLICATION DATE OR ISSUE DATE MM-DD-YYYY	NAME OF PATENTEE

FOREIGN PATENT DOCUMENTS					
EXAMINER INITIALS	Cite No. ¹	Foreign Patent Document Country Code ³ - Number ⁴ - Kind Code ⁵ (If Known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶ (✓)
		TW 201508587 A	03-01-2015	Dongwoo Fine Chem Co Ltd	Abstract

OTHER DOCUMENTS		
EXAMINER INITIALS	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article, title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.
		Taiwanese Examination Report dated 12-14-2021, Application Serial No. 108131554, 12 pages

EXAMINER SIGNATURE		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. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.pto.gov or MPEP 901.4. ³ Enter Office that issued the document, by the two-letter code (WIPO standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English Language Translation is attached.			



Espacenet

Bibliographic data: TW201508587 (A) — 2015-03-01

Touch-sensing electrode and touch screen panel including the same

Inventor(s): HA KYOUNG-SU [KR]; PARK DONG-PIL [KR]; KIM SANG-SOO [KR] ± (HA, KYOUNG-SU, ; PARK, DONG-PIL, ; KIM, SANG-SOO)

Applicant(s): DONGWOO FINE CHEM CO LTD [KR] ± (DONGWOO FINE-CHEM CO., LTD)

Classification: - international: G06F3/041; G06F3/044
- cooperative: G06F3/0412 (KR); G06F3/044 (KR); G06F3/0443 (EP, US); G06F3/0446 (EP, US); G06F2203/04103 (EP, KR); G06F2203/04111 (EP, KR)

Application number: TW20140127944 20140814

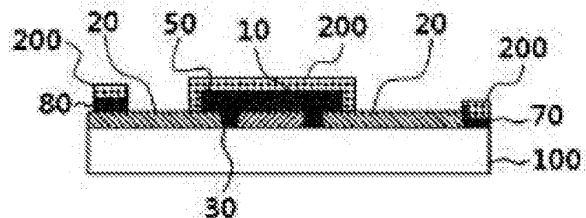
Priority number(s): KR20130098261 20130820

Also published as: KR101389876 (B1) WO2015026071 (A1)

Abstract of TW201508587 (A)

The present invention relates to a touch-sensing electrode having superior electrical conductivity, and a touch screen panel including the same. The touch-sensing electrode includes a first sensing pattern formed in a first direction and a second sensing pattern formed in a

second direction, a bridge electrode configured to electrically connect separated unit patterns of the second sensing pattern above the first sensing pattern, an insulating layer interposed between the first sensing pattern and the bridge electrode at an intersection of the first sensing pattern and the bridge electrode, and a metal plating layer formed on an upper surface of the bridge electrode.





(19)中華民國智慧財產局

(12)發明說明書公開本

(11)公開編號：TW 201508587 A

(43)公開日：中華民國 104 (2015) 年 03 月 01 日

(21)申請案號：103127944

(22)申請日：中華民國 103 (2014) 年 08 月 14 日

(51)Int. Cl. : G06F3/041 (2006.01)

G06F3/044 (2006.01)

(30)優先權：2013/08/20 南韓

10-2013-0098261

(71)申請人：東友精細化工有限公司 (南韓) DONGWOO FINE-CHEM CO., LTD. (KR)

大韓民國 570-977 全羅北道益山市新興洞 740-30

(72)發明人：河京秀 HA, KYOUNG SU (KR)；朴東必 PARK, DONG PIL (KR)；金相洙 KIM,

SANG SOO (KR)

(74)代理人：蔡清福

申請實體審查：無 申請專利範圍項數：14 項 圖式數：4 共 25 頁

(54)名稱

觸感電極及含此之觸控螢幕面板

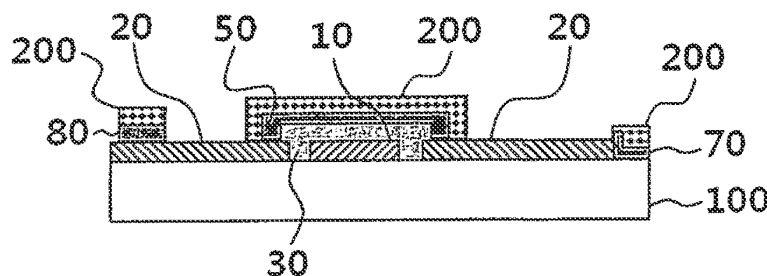
TOUCH-SENSING ELECTRODE AND TOUCH SCREEN PANEL INCLUDING THE SAME

(57)摘要

本發明有關一種具有極佳導電性的觸感電極，以及包括該觸感電極的觸控螢幕面板。該觸感電極包括以第一方向形成的第一感應圖型以及以第二方向形成的第二感應圖型、被配置於該第一感應圖型之上用以電連接該第二感應圖型的分開單位圖型的橋電極、在該第一感應圖型以及該橋電極的交叉處介於該第一感應圖型以及該橋電極之間的一絕緣層、以及形成在該橋電極的上表面上的金屬鍍層。

The present invention relates to a touch-sensing electrode having superior electrical conductivity, and a touch screen panel including the same. The touch-sensing electrode includes a first sensing pattern formed in a first direction and a second sensing pattern formed in a second direction, a bridge electrode configured to electrically connect separated unit patterns of the second sensing pattern above the first sensing pattern, an insulating layer interposed between the first sensing pattern and the bridge electrode at an intersection of the first sensing pattern and the bridge electrode, and a metal plating layer formed on an upper surface of the bridge electrode.

第3圖



10 . . . 第一感應圖型

20 . . . 第二感應圖型

30 . . . 絕緣層

50 . . . 橋電極

70 . . . 金屬互連

80 . . . 金屬網格

100 . . . 基板

200 . . . 金屬鍍層

【發明說明書】

【中文發明名稱】 觸感電極及含此之觸控螢幕面板

【英文發明名稱】 Touch-Sensing Electrode And Touch Screen Panel
Including The Same

【技術領域】

相關申請案的交叉參考

此申請案主張於2013年8月20日所申請的韓國專利申請案編號2013-0098261的優先權以及權益，其全部揭露內容併入於本文中以作為參考。

【先前技術】

1. 發明所屬之技術領域

本發明有關一種觸感電極以及包括該觸感電極的觸控螢幕面板。更具體而言，本發明有關一種具有高導電性的觸感電極，以及包括該觸感電極的觸控螢幕面板。

2. 相關技術的討論

一般而言，觸控螢幕面板是一種配備有特殊輸入裝置的螢幕面板，當由手碰觸到該螢幕面板時，經由該輸入裝置輸入了碰觸點。這種觸控螢幕面板是一種經由它而從螢幕直接接收輸入資料而不使用鍵盤的裝置，以至於當人手或物體碰觸到顯示在該螢幕上的字母或特定位置，其碰觸點被辨識，並根據所儲存的軟體來執行特定的程序。該觸控螢幕面板是由積層結構所形成。

爲了識別碰觸點而不降低顯示在螢幕上的影像可見度，透明觸感電極的使用是必要的，且通常使用了由預先決定的圖型所形成感應圖型。

有各種類型用於觸控螢幕面板中的透明感應電極結構，例如，玻璃-ITO薄膜-ITO薄膜（GFF）結構、玻璃-ITO薄膜（GIF）結構、只有玻璃（G2）的結構。

例如，第1圖示出了現有的透明感應電極結構。

透明感應電極可由第一感應圖型10以及第二感應圖型20所形成。該第一感應圖型10以及該第二感應圖型20可以不同的方向配置，並提供碰觸點的X以及Y座標資訊。更具體而言，當人手或物體碰觸透明基板時，根據該碰觸點的電容改變可經由該第一感應圖型10、該第二感應圖型20以及位置偵測線，也就是金屬互連，來轉送至驅動電路。此外，該電容的改變可由X以及Y輸入處理電路（未示出）或諸如此類來轉換成電訊號，因此可辨識出該碰觸點。

關於這一點，第一感應圖型10以及第二感應圖型20是形成在相同的基板上，且需要彼此電連接，以偵測碰觸點。這裡，由於該第一感應圖型10連接至彼此，但是該第二感應圖型20以島的形式隔離，可能需要額外的連接電極（橋電極50）來電連接該第二感應圖型20。

然而，橋電極50可形成在與第一感應圖型10不同的層上，以不電連接至該第一感應圖型10。第2圖是延著第1圖的線A-A'所取的截面之形成該橋電極50所在的部分的放大圖。

參見第2圖，感應圖型10以及20是形成在基板100上，且絕緣層30

以及橋電極50形成於其上。該第一感應圖型10以及該第二感應圖型20彼此間隔，由形成於其上的該絕緣層30而與該橋電極50分開。在那些之中，該第一感應圖型10是處於與該橋電極50電隔離的狀態。此外，如上所描述，由於該第二感應圖型20需要電連接至另一個第二感應圖型20，其是使用該橋電極50來電連接。爲了使用該橋電極50來連接以島的形式分開的該第二感應圖型20，同時電隔離該第二感應圖型20與該第一感應圖型10，可能需要在該絕緣層30中形成接觸洞40。

然而，由於橋電極50一般由金屬形成以增加導電性，有一個問題是，由於感應圖型10以及20的反射率差異，該橋電極50是可見的。

爲了解決這種可見度問題，橋電極50可由具有非常小寬度的金屬來形成。在此情況中，可改進可見度問題，且由於該橋電極50可與金屬互連同時形成，可簡化過程。然而，形成具有小寬度的橋電極50需要高精密度的製造裝置，且形成高精密度的圖型是一個耗時的過程。此外，由於電阻增加，導電性可能會減少，因此感應速度可能會較慢。因此，該橋電極50的低可見度以及適當的導電性難以同時達成。

此外，近來，已製造出具有窄寬度的顯示裝置，並執行了其上的研究。然而，有一個問題是，邊框越窄，隱藏在邊框中之金屬互連的電阻就越大。

日本專利公開編號2008-98169揭露了一種透明傳導薄膜，其中在透明基板以及透明傳導層之間形成了由具有不同折射係數的兩層

構成的底塗層。

[引證文件列表]

[專利文獻]

1. 日本專利公開編號2008-98169

【發明內容】

本發明針對一種具有高導電性且不降低可見度的觸感電極，以及包括該觸感電極的觸控螢幕面板。

本發明也針對一種具有窄邊框的觸感電極，以及包括該觸感電極的觸控螢幕面板。

根據本發明的一方面，提供了一種觸感電極，該觸感電極包括以第一方向形成的第一感應圖型以及以第二方向形成的第二感應圖型、配置用以電連接該第二感應圖型的分開單位圖型的橋電極、在該第一感應圖型之上且在該第一感應圖型以及該橋電極的交叉處介於該第一感應圖型以及該橋電極之間的絕緣層、以及形成在該橋電極的上表面上的金屬鍍層。

金屬鍍層可進一步形成在金屬互連上，該金屬互連被配置用以將第一感應圖型以及第二感應圖型連接至驅動電路。

金屬網格可形成在第一感應圖型以及第二感應圖型之上或之下。

金屬鍍層可進一步形成在配置在第一感應圖型以及第二感應圖型上的金屬網格上。

金屬鍍層可藉由電鍍法來形成。

金屬鍍層可由銅形成。

金屬鍍層的厚度可為500至1000 nm。

觸感電極可形成在觸控螢幕面板的遮蓋窗基板的表面或顯示面板的表面上。

根據本發明的另一方面，有提供了一種製造觸感電極的方法，包括在基板上以第一方向形成第一感應圖型以及以第二方向形成第二感應圖型，在該第一感應圖型上形成絕緣層，該絕緣層配置在該第一感應圖型以及橋電極的交叉處，在該絕緣層上形成被配置用以電連接該第二感應圖型的該橋電極，以及在該橋電極上形成金屬鍍層。

橋電極的形成可包括在具有絕緣層形成於其上的基板上形成橋電極形成金屬層，在該橋電極形成金屬層的上表面上形成光阻圖型來僅曝露其上要形成金屬鍍層的部分，在所曝露的部分上形成該金屬鍍層，以及移除該光阻圖型以及其上未形成該金屬鍍層的該橋電極形成金屬層。

光阻圖型可進一步包括曝露部分，以在第一感應圖型或第二感應圖型上曝露金屬網格圖型，以及金屬鍍層可進一步形成在金屬網格圖型上。

橋電極形成金屬層可進一步形成在金屬互連上，光阻圖型可進一步該曝露金屬互連，以及金屬鍍層可進一步形成在該金屬互連上。

根據本發明更另一方面，有提供了一種包括上述任一觸感電極的

觸控螢幕面板。

根據本發明更另一方面，有提供了一種包括上述觸控螢幕面板的顯示裝置。

根據本發明示範性具體實施例的觸感電極包括在橋電極上的金屬鍍層，以增加該橋電極的導電性，並因此具有高感應速度。

此外，在根據本發明示範性具體實施例的觸感電極中，藉由以具有低反射率的材料來形成金屬鍍層，可將橋電極的可見度維持類似於或低於一般的橋電極。

此外，根據本發明示範性具體實施例的觸感電極包括在將感應圖型連接至驅動電路的金屬互連上的金屬鍍層。因此，甚至當該金屬互連的寬度減少，可維持高導電性，並因此可實施具有窄邊框的顯示裝置。

此外，由於根據本發明示範性具體實施例的觸感電極包括在感應圖型上的金屬網格，可改進該感應圖型的導電性，以進一步增加感應速度。

對於本領域技術人員將為顯而易見的是，可對上述的本發明示範性具體實施例做出各種修飾，而不悖離本發明的精神以及範圍。因此，意欲的是，本發明涵蓋了它們帶來在附帶申請專利範圍以及它們的均等物的範圍內所提供的所有這種修飾。

【圖式簡單說明】

藉由詳細描述其示範性具體實施例，參照伴隨的圖式，本發明的上述以及其他目標、特徵以及優勢對於本領域具一般技藝的技術

人員將變得更顯而易見，其中：

第1圖是示意性示出現有觸感電極的平面圖；

第2圖是示意性示出現有觸感電極的截面圖；

第3圖是示意性示出根據本發明示範性具體實施例的觸感電極的截面圖；以及

第4圖是示意性示出製造根據本發明示範性具體實施例的觸感電極的方法的圖式。

【實施方式】

本發明有關一種觸感電極以及包括該觸感電極的觸控螢幕面板。該觸感電極包括以第一方向形成的第一感應圖型以及以第二方向形成的第二感應圖型、在該第一感應圖型上被配置用以電連接該第二感應圖型的分開單位圖型的橋電極、在該第一感應圖型以及該橋電極的交叉處介於該第一感應圖型以及該橋電極之間的絕緣層、以及形成在該橋電極的上表面上的金屬鍍層。因此，該觸感電極具有極佳的導電性。

參照伴隨的圖式，將在下面詳細地描述本發明的示範性具體實施例。該圖式是提供用以僅示例本發明的典型或示範性具體實施例，並幫助了解本發明，且應了解的是，本發明的範圍不受伴隨圖式所限制。

第3圖示意性地示出了根據本發明示範性具體實施例的觸感電極。

根據本發明示範性具體實施例的觸感電極包括第一感應圖型10、

橋電極50、以及在該第一感應圖型10以及該橋電極50的交叉處介於該第一感應圖型10以及該橋電極50之間的絕緣層30。金屬鍍層200被配置在該橋電極50上。

橋電極50可用以電連接由彼此分隔開的單位圖型所形成的第二感應圖型20，且由於可見度的問題，可不被形成具有大寬度。由於電阻與電荷轉移路徑的剖面面積成反比，該橋電極50的小寬度導致了該電荷轉移路徑的小剖面面積，其最後限制了導電性。爲了解決這問題，如果單純地增加橋電極50的高度，則有問題是，圖型準確度降低，且基板100翹曲。

根據本發明的示範性具體實施例，這種問題可藉由在橋電極50上額外形成金屬鍍層200來解決。由於該金屬鍍層200形成於該橋電極50上以增加電荷轉移路徑的剖面面積，可顯著地改進該橋電極50的導電性。

金屬鍍層200不特別受限，且只要其具有導電性並可被電鍍在橋電極50上，可使用任何材料。例如，該金屬鍍層200可爲銀（Ag）、金（Au）、銅（Cu），但是不限於此。

較佳的是，由於金屬鍍層200是形成在橋電極50上，較佳使用在可見度方面具有低反射率的材料。在可見度方面，可較佳使用銅（Cu）。

金屬鍍層200的厚度不特別受限，但可較佳在500至1,000 nm的範圍中，以至於不影響觸感電極的整體結構，同時改進該導電性。

橋電極50電連接在第一感應圖型10之上的第二感應圖型20的分開的單位圖型。

根據本發明示範性具體實施例的橋電極50可由金屬來形成，且較佳為與金屬互連70相同的材料。在此情況中，由於該金屬互連70以及該橋電極50是同時形成的，過程可較為簡化。

金屬不特別受限，且只要其具有極佳的導電性以及低電阻，可使用任何材料。例如，可使用鉬（Mo）、銀（Ag）以及鋁（Al），且可較佳使用鉬（Mo）。

橋電極50的厚度（高度）不特別受限，且可在，例如，10至300 nm的範圍中。當該橋電極50的厚度少於10 nm時，導電性可能會增加而降低碰觸敏感度。當該橋電極50的厚度多於300 nm時，製造可能不容易。

橋電極50的寬度可在，例如，2至30 μm 的範圍中，且較佳為2至20 μm ，但是不特別受限。當該橋電極50的厚度是2至30 μm 時，圖型可見度可能會減少，且該橋電極50可具適當的電阻。

絕緣層30可用以電隔離第一感應圖型10與橋電極50。如第2圖中所示，現有的絕緣層是形成在整個感應圖型上。然而，如第3圖中所示，根據本發明示範性具體實施例的絕緣層30是在第一感應圖型以及橋電極的交叉處介於該第一感應圖型以及該橋電極之間。

由於根據本發明示範性具體實施例的絕緣層30僅需要隔離第一感應圖型10與橋電極50，該絕緣層30可不完全形成在基板100上，且可不需要形成接觸孔40的過程。

絕緣層30可使用本領域中所使用的材料以及方法來形成，而沒有任何特別的限制。

第一感應圖型10以及第二感應圖型20可以不同的方向配置，並提供碰觸點的X以及Y座標資訊。更具體而言，當人手或物體碰觸到透明基板時，根據該碰觸點的電容改變可經由該第一感應圖型10、該第二感應圖型20以及該金屬互連70轉移至驅動電路。此外，該電容的改變可由X以及Y輸入處理電路（未示出）或諸如此類轉換成電訊號，因此可識別該碰觸點。

關於這一點，第一感應圖型10以及第二感應圖型20是形成在基板100上，且需要電連接至彼此，以偵測碰觸點。這裡，由於該第一感應圖型10連接至彼此，但是該第二感應圖型20以島的形式隔離，可能需要額外的橋電極50來電連接該第二感應圖型20。

感應圖型的厚度不特別受限，且可在，例如，20至200 nm的範圍中。當該感應圖型的厚度少於20 nm時，導電性可能會增加而降低了碰觸敏感度。當該感應圖型的厚度多於200 nm時，由於反射率增加，可能會發生可見度問題。

作為觸感電極的第一感應圖型10以及第二感應圖型20，可使用本領域所使用的材料，而無任何限制。為了不抑制顯示在螢幕上的影像可見度，該第一感應圖型10以及該第二感應圖型20可較佳由透明材料所形成或以精細的圖型來形成。作為具體的範例，可使用氧化銦錫（ITO）、氧化銦鋅（IZO）、氧化鋅（ZnO）、氧化銦鋅錫（IZTO）、氧化鎢錫（CTO）、聚(3,4-乙烯二氧噻吩)（PEDOT）、奈米碳管（CNT）、金屬線，或諸如此類。這些材料可單獨或藉由混合其二或更多種來使用，且可較佳使用ITO。在金屬線中使用的金屬可不特別受限，且可為，例如，銀（Ag）、金（Au）、鋁（Al）、銅（Cu）、鐵（Fe）、鎳（Ni）、鈦（Ti）

、碲（Te）、鉻（Cr），或諸如此類。這些金屬可單獨或藉由混合其二或更多種來使用。

有選擇地，當需要時，根據本發明示範性具體實施例的觸感電極可在第一感應圖型10以及第二感應圖型20之上或之下額外地包括金屬網格80。例如，該金屬網格80可以適當的形式配置在該第一以及第二感應圖型10以及20的菱形圖型單位之上或之下（參見第1圖），以增加該感應圖型的導電性，且藉此增加感應速度。在此情況中，該額外的金屬網格80可不需要將該單位圖型電連接至彼此，且以及可在每個單位圖型區域中以晶格的形式來形成。

較佳的是，金屬鍍層200也可形成在金屬網格80上。在此情況中，該金屬網格80可較佳形成在感應圖型10以及20上。藉由在該金屬網格80上形成該金屬傳導層200，可顯著地增加導電性。

金屬互連70可作用用以將感應圖型10以及20所偵測到的電容改變轉移至驅動電路。該金屬互連70可由與橋電極50相同的材料來形成，且可較佳與該橋電極50同時形成。

同時，金屬互連70可被配置在顯示裝置的邊框部分，且當要將該邊框形成地很窄時，該金屬互連70可被形成具有盡可能的最小寬度。然而，當將該金屬互連70形成地很窄時，可能會減少導電性，且可存在斷路的風險。因此，當需要時，根據本發明示範性具體實施例的該金屬互連70可進一步包括形成於其上的金屬鍍層200。

配置在金屬互連70上的金屬鍍層200可由與配置在橋電極50上的金屬鍍層200相同的材料所形成，且可較佳同時形成。

根據本發明示範性具體實施例的觸感電極是形成在基板100上。

作為基板100，可使用在本領域中一般使用的材料而無任何特別的限制。例如，可使用玻璃、聚醚砜（PES）、聚丙烯酸酯（PAR）、聚醚醯亞胺（PEI）、聚萘二甲酸乙二酯（PEN）、聚對苯二甲酸乙二酯（PET）、聚苯硫醚（PPS）、聚芳酯、聚醯亞胺、聚碳酸酯（PC）、三醋酸纖維素（三醋酸纖維素：TAC）以及醋酸丙酸纖維素（CAP）。

基板100可為形成觸控螢幕面板的最外表面或顯示面板的表面的遮蓋窗基板。

當基板100是遮蓋窗基板時，當需要時，根據本發明示範性具體實施例的觸感電極可進一步包括在該基板100以及感應圖型之間的透明介電層。該透明介電層可藉由降低由於根據該感應圖型結構的位置特定結構差異造成的光學特性差異，來改進觸控螢幕面板的光學均勻性。

透明介電層可由氧化鋯、氧化矽、氧化鈣、氧化鈦，等等所形成。這些材料可單獨或藉由混合其二或更多種來使用。該透明介電層可藉由真空氣相沉積方法、濺鍍法、離子鍍方法，或諸如此類來形成，且可使用上述方法而以薄膜的形式來製造。

當需要時，可將根據本發明示範性具體實施例的透明介電層形成為多層。在此情況中，每層可由不同的材料來形成，且可具有不同的折射係數以及不同的厚度。

此後，將詳細地描述製造根據本發明示範性具體實施例的觸感電極的方法。第4圖示意性示出一種製造根據本發明示範性具體實

施例的觸感電極的方法。

首先，可在基板上形成以第一方向配置的第一感應圖型以及以第二方向配置的第二感應圖型。然後，可在該第一感應圖型以及橋電極的交叉處在該第一感應圖型上形成絕緣層。

可藉由各種薄膜沉積方法，例如物理氣相沉積（PVD）方法以及化學氣相沉積（CVD）方法，來形成感應圖型10以及20。例如，在該PVD方法的一個範例中，該感應圖型10以及20可藉由反應性濺鍍來形成。

此外，感應圖型10以及20可使用印刷製程來形成。可使用各種類型的印刷方法，例如凹版平版印刷、反面平版印刷、噴墨印刷、網版印刷以及凹版印刷。特別是，當該感應圖型10以及20是藉由印刷製程來形成時，可使用可印刷用膏材料。例如，可使用奈米碳管（CNT）、傳導聚合物或Ag奈米線墨水。

此外，除了上述方法之外，感應圖型10以及20可藉由光蝕刻製程來形成。

在形成感應圖型10以及20之後，在第一感應圖型10以及之後會形成的橋電極50的交叉處在該第一感應圖型10上形成絕緣層30。該絕緣層30可使用本領域所使用的材料以及方法來形成，而無任何特別的限制。

接下來，可在絕緣層30上形成電連接第二感應圖型20的橋電極50。

將更具體地描述形成該橋電極50的過程。

首先，可在其上形成絕緣層30的基板上形成橋電極形成金屬層。該橋電極形成金屬層可形成在該基板的整個上表面上。

橋電極形成金屬層可由用以作為橋電極50的金屬來形成。形成該橋電極形成金屬層的方法不特別受限，且可使用各種薄膜沉積方法，例如PVD方法以及CVD方法。例如，該橋電極形成金屬層可藉由反應性濺鍍（PVD方法的一個範例）來形成，但是不限於此。作為另一個範例，可應用使用包括金屬顆粒的塗層溶液的塗層方法。

在形成橋電極形成金屬層之後，可在該橋電極形成金屬層的上表面上形成光阻圖型210，以只曝露上面將要形成金屬鍍層200的部分。

光阻圖型210所曝露的部分可變成橋電極50。此外，如上所述，當需要時，可曝露其上要形成金屬網格80以及金屬互連70的部分。在此情況中，該金屬網格80或該金屬互連70可與該橋電極50同時形成。

當金屬網格80是形成在感應圖型10以及20之下時，該感應圖型10以及20可在該金屬網格80形成在該基板100上之後形成。

此外，當金屬網格80是形成在感應圖型10以及20上時，形成光阻圖型以覆蓋該金屬網格80，以至於不形成金屬鍍層200。

接下來，可在所曝露的部分上形成金屬鍍層200。

金屬鍍層200可藉由一般的金屬鍍方法來形成。在該金屬鍍方法中沒有限制，但是在精密度方面，由於該金屬鍍層200只形成在

橋電極50上，電鍍法可能是較佳的。

更具體而言，在將橋電極形成金屬層設定為陰極以及金屬鍍層形成金屬設定成陽極之後，將基板浸沒於含有該陽極的金屬離子的電解質溶液中，然後將電源連接於其以通電。因此，該金屬鍍層200可藉由光阻圖型形成在所曝露的部分上。

接下來，根據本發明示範性具體實施例的觸感電極可藉由移除該光阻圖型然後移除其上未形成金屬鍍層200的橋電極形成金屬層來獲得。其上未形成金屬鍍層200的橋電極形成金屬層的移除可使用能夠蝕刻該橋電極形成金屬層而不蝕刻該金屬鍍層的蝕刻劑來輕易地執行。

根據本發明示範性具體實施例的觸感電極可藉由進行本領域所熟知的額外製程來配置觸控螢幕面板。在此情況中，該顯示裝置可為液晶顯示器（LCD）、有機發光二極體（OLED）、或可撓顯示器，但不限於此。

此後，揭露了本發明的各種示範性具體實施例，但是本發明不應解讀為限於本文中提出的本發明示範性具體實施例。雖然本發明是有關其示範性具體實施例來示出並描述，對於本領域的技術人員將為顯而易見的是，可做出各種修飾而不悖離本發明的精神以及範圍。

範例1

具有20 nm厚度的第一以及第二感應圖型是由ITO（折射係數：1.8）形成在玻璃基板（折射係數：1.51）上。

接下來，在其上要形成橋電極的第一感應圖型上形成絕緣層之後，藉由濺鍍法在其上形成該絕緣層的基板的上表面上形成具有10 nm厚度的鉬金屬層。

接下來，形成光阻圖型以曝露其上要形成橋電極以及金屬互連的部分，然後將電源連接至鉬金屬層，並將該電源的另一端連接至銅電極，然後將基板以及該銅電極浸沒於銅電解質溶液中，以進行電鍍過程。因此，在所曝露的鉬金屬層上形成了鍍銅層。

接下來，藉由移除光阻圖型以及其上未形成鍍銅層的鉬金屬層來製造觸感電極。

爲了參考，基於具有550 nm波長的光列出了折射係數。

範例2

除了在第一以及第二感應圖型上進一步形成金屬網格，以及在該金屬網格上進一步形成金屬鍍層之外，使用如範例1中所描述的相同方法來製造觸感電極。

範例3

除了在第一以及第二感應圖型之下進一步形成金屬網格之外，使用如範例1中所描述的相同方法來製造觸感電極。

比較性範例1

除了不形成鍍銅層且將鉬金屬層形成具有300 nm的厚度之外，使用如範例1中所描述的相同方法來製造觸感電極。

實施範例

測量所製造出的觸感電極的反射率以及電阻，且其結果列於下面表1中。反射率可指在400 nm至700 nm的範圍中測量的平均反射率。

【表1】

	平均反射率	第二感應圖型（以橋電極連接的圖型）的電阻
範例 1	12.2%	1.6 kΩ
範例 2	12.8%	0.4 kΩ
範例 3	12.8%	0.4 kΩ
比較性範例 1	12.0%	2.1 kΩ

//

參見表1，範例的反射率差異幾乎類似於比較性範例中的反射率差異，但是範例的電阻顯著地小於其中未形成金屬鍍層的比較性範例的電阻。

【符號說明】

10：第一感應圖型

20：第二感應圖型

30：絕緣層

40：接觸洞

50：橋電極

70：金屬互連

80：金屬網格

100：基板

200：金屬鍍層

210：光阻圖型

A-A'：線



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G06F3/044 (2006.01)

201508587

【發明摘要】

【中文發明名稱】 觸感電極及含此之觸控螢幕面板

【英文發明名稱】 Touch-Sensing Electrode And Touch Screen Panel
Including The Same

【中文】

本發明有關一種具有極佳導電性的觸感電極，以及包括該觸感電極的觸控螢幕面板。該觸感電極包括以第一方向形成的第一感應圖型以及以第二方向形成的第二感應圖型、被配置於該第一感應圖型之上用以電連接該第二感應圖型的分開單位圖型的橋電極、在該第一感應圖型以及該橋電極的交叉處介於該第一感應圖型以及該橋電極之間的一絕緣層、以及形成在該橋電極的上表面上的金屬鍍層。

【英文】

The present invention relates to a touch-sensing electrode having superior electrical conductivity, and a touch screen panel including the same. The touch-sensing electrode includes a first sensing pattern formed in a first direction and a second sensing pattern formed in a second direction, a bridge electrode configured to electrically connect separated unit patterns of the second sensing pattern above the first sensing pattern, an insulating layer interposed between the first sensing pattern and the bridge electrode at an intersection of the first sensing pattern and the bridge electrode, and a metal plating layer formed on an upper surface of the bridge electrode.

【指定代表圖】 第3圖

【代表圖之符號簡單說明】

10：第一感應圖型

20：第二感應圖型

30：絕緣層

50：橋電極

70：金屬互連

80：金屬網格

100：基板

200：金屬鍍層

【特徵化學式】

無

【發明申請專利範圍】

- 【第1項】 一種觸感電極，包含：
- 以第一方向形成的一第一感應圖型以及以第二方向形成的一第二感應圖型；
- 在該第一感應圖型之上，被配置用以電連接該第二感應圖型的分開的單位圖型的一橋電極；
- 在該第一感應圖型以及該橋電極的一交叉處介於該第一感應圖型以及該橋電極之間的一絕緣層；以及
- 形成在該橋電極的一上表面上的一金屬鍍層。
- 【第2項】 如申請專利範圍第1項所述的觸感電極，其中該金屬鍍層被進一步形成在一金屬互連上，該金屬互連被配置用以將該第一感應圖型以及該第二感應圖型連接至一驅動電路。
- 【第3項】 如申請專利範圍第1項所述的觸感電極，其中一金屬網格是形成在該第一感應圖型以及該第二感應圖型之上或之下。
- 【第4項】 如申請專利範圍第3項所述的觸感電極，其中該金屬鍍層是進一步形成在配置在該第一感應圖型以及該第二感應圖型上的該金屬網格上。
- 【第5項】 如申請專利範圍第1項所述的觸感電極，其中該金屬鍍層是藉由一電鍍法來形成。
- 【第6項】 如申請專利範圍第1項所述的觸感電極，其中該金屬鍍層是由銅所形成。
- 【第7項】 如申請專利範圍第1項所述的觸感電極，其中該金屬鍍層的一厚

度在500至1000 nm的範圍中。

【第8項】 如申請專利範圍第1項所述的觸感電極，其中該觸感電極是形成在一觸控螢幕面板的一遮蓋窗基板的一表面或一顯示面板的一表面上。

【第9項】 一種製造一觸感電極的方法，包含：
在一基板上以一第一方向形成一第一感應圖型以及以一第二方向形成第二感應圖型；
在該第一感應圖型以及一橋電極的一交叉處，在該第一感應圖型配置上形成一絕緣層；
在該絕緣層上形成被配置用以電連接該第二感應圖型的該橋電極；以及
在該橋電極上形成一金屬鍍層。

【第10項】 如申請專利範圍第9項所述的方法，其中該橋電極的形成包含：
在具有該絕緣層形成於其上的該基板上形成一橋電極形成金屬層；
在該橋電極形成金屬層的一表面上形成一光阻圖型，以只曝露將要形成該金屬鍍層所在的一部分；
在所曝露的部分上形成該金屬鍍層；以及
移除該光阻圖型以及未形成該金屬鍍層所在的該橋電極形成金屬層。

【第11項】 如申請專利範圍第10項所述的方法，其中該光阻圖型進一步包括一曝露部分，以在該第一感應圖型或該第二感應圖型上曝露一金屬網格圖型，以及在該金屬網格圖型上進一步形成該金屬鍍層。

【第12項】 如申請專利範圍第10項所述的方法，其中在一金屬互連上進一步形成該橋電極形成金屬層，該光阻圖型進一步曝露該金屬互連，

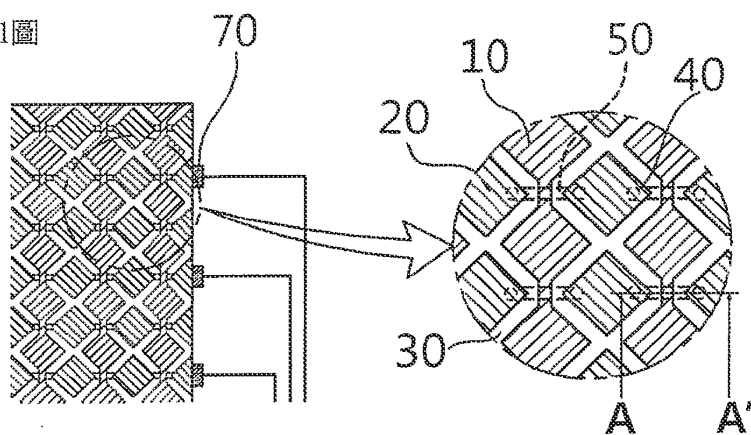
以及在該金屬互連上進一步形成該金屬鍍層。

【第13項】 一種觸控螢幕面板，包含如申請專利範圍第1項至第8項任一項所述的觸感電極。

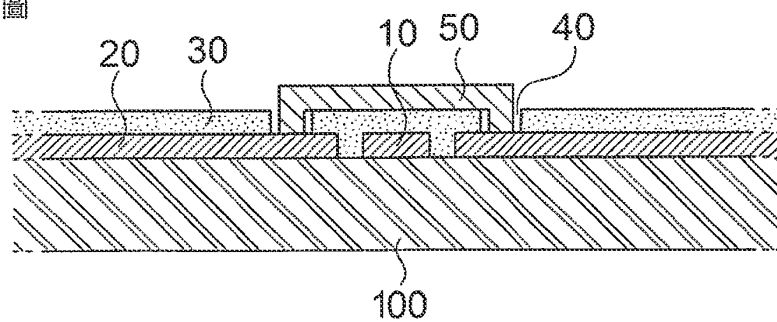
【第14項】 一種顯示裝置，包含如申請專利範圍第13項所述的觸控螢幕面板。

【發明圖式】

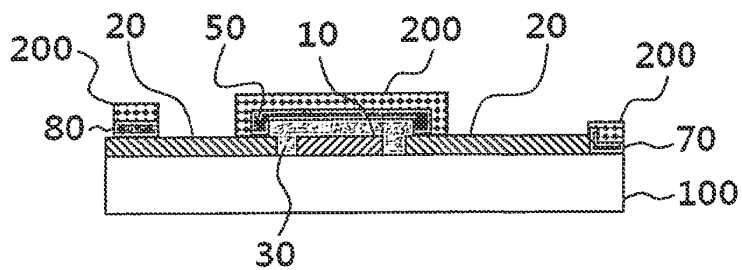
第1圖



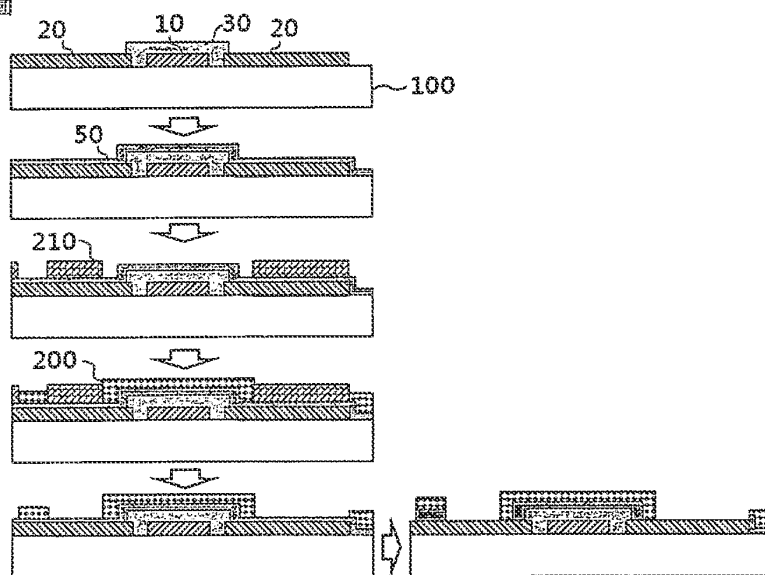
第2圖



第3圖



第4圖



Electronic Acknowledgement Receipt	
EFS ID:	44635405
Application Number:	16742230
International Application Number:	
Confirmation Number:	7917
Title of Invention:	DISPLAY DEVICE
First Named Inventor/Applicant Name:	Chiwook AN
Customer Number:	23363
Filer:	Ryan Matthew Swank/Sheila Harter
Filer Authorized By:	Ryan Matthew Swank
Attorney Docket Number:	183539/411598-04552
Receipt Date:	29-DEC-2021
Filing Date:	14-JAN-2020
Time Stamp:	17:35:45
Application Type:	Utility under 35 USC 111(a)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Letter specifying the conditions for filing under 37CFR1.97	183539IDSTransmittal.pdf	102918 cf5beb2bdf2c12d12a3c03c2a0b8c1b21b410afa	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	183539SB08.pdf	93402	no	1
			d367f2c3bc1e4f7948b777b9d05ff7ef87f67d0a		
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	TW587.pdf	3406064	no	27
			186e66509e0e0207918dcedbbb38f10392d0bb31		
Warnings:					
Information:					
4	Other Reference-Patent/App/Search documents	TWOA.pdf	603787	no	12
			8c3fd5c340d35961325cd0d2bb806b62950f4420		
Warnings:					
Information:					
Total Files Size (in bytes):			4206171		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.					

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

I hereby certify that this correspondence is being EFS-Web transmitted to the United States Patent and Trademark Office on December 29, 2021 at or before 11:59 p.m. Pacific Time under the Rules of 37 CFR § 1.8.

/Sheila R. Harter/
Sheila R. Harter

Inventor(s) : Chiwook An, et al. Confirmation No. 7917
Application No. : 16/742,230
Filed : January 14, 2020
Title : DISPLAY DEVICE

Grp./Div. : 2625
Examiner : Towfiq Elahi

Docket No. : 183539

**INFORMATION DISCLOSURE STATEMENT
37 CFR § 1.97(b)**

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

Post Office Box 29001
Glendale, CA 91209-9001
December 29, 2021

Commissioner:

In compliance with the duty of disclosure under 37 CFR §§ 1.56, 1.97 and 1.98, and in accordance with the provisions in the Manual of Patent Examining Procedure §§ 609 and 707.05(b), enclosed is an information disclosure statement listing the references that are known to applicant. Copies of each of the listed Foreign Patent Documents and Other Documents references are enclosed. This filing is timely because it is made during one of the periods described in 37 CFR § 1.97(b).

It is respectfully requested that the listed references be considered in the examination of this application and identified on the list of references cited on the patent issuing for this application. Applicant also requests that an initialed copy of the information disclosure statement be entered in the application file and returned to applicant with the next communication from the Office in accordance with MPEP § 609.

116363331.1

Application No. 16/742,230

The Commissioner is hereby authorized to charge any fees which may be required by this paper to Deposit Account No. 03-1728. Please show our docket number with any Deposit Account transaction.

Respectfully submitted,

LEWIS ROCA ROTHGERBER CHRISTIE LLP

By /Ryan M. Swank/

Ryan M. Swank

Reg. No. 62,600

626/795-9900

RMS/srh

Enclosures: Information Disclosure Statement, w/references



UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/742,230	01/14/2020	Chiwook AN	183539/411598-04552	7917
23363	7590	02/01/2022	EXAMINER	
Lewis Roca Rothgerber Christie LLP			ELAHI, TOWFIQ	
PO BOX 29001				
Glendale, CA 91209-9001				
			ART UNIT	PAPER NUMBER
			2625	
			NOTIFICATION DATE	DELIVERY MODE
			02/01/2022	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):

PLPrivatePair@lrrc.com
pto@lewisroca.com

Notice of Pre-AIA or AIA Status

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

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/13/2021 has been entered.

Claim Rejections - 35 USC § 103

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

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1-5, 14-15, 17-19 is/are rejected under 35 U.S.C. 103 as being unpatentable over Zhu (US 20160313837) in view of Kwon (US 20140232956) and HA (WO2015026071).

Regarding **claim 1** Zhu disclosed a display device (fig.1) comprising:
an organic light emitting device layer (fig. 1, item 104);

a thin film encapsulation layer (fig. 1, item 106) on the organic light emitting device layer;

a touch sensing unit (fig. 1, items comprising 105 and 107) directly on the buffer layer (fig. 1, item 102), the touch sensing unit comprising:

a first conductive pattern (fig. 1, item 105) on the buffer layer (fig. 1, item 106);

an insulating layer covering the first conductive pattern ([0074] As being different from Embodiment 1, in the present embodiment, separating pillars 109 adapted for separating the second electrodes are configured on the substrate 101, so as to rendering the first conductive units 105 insulated from one another); and

a second conductive pattern on the insulating layer (fig. 1, ABSTRACT: the second conductive units (107) are configured to be insulated from each other),

the second conductive pattern partially crossing the first conductive pattern (fig.2-3, item 105 and 107 partially crossing).

Zhu does not expressly teach a buffer layer directly on the thin film encapsulation layer; and the second conductive pattern having a thickness that is greater than a thickness of the first conductive pattern.

However, Kwon teach a buffer layer (fig. 1E, item 181) directly on the thin film encapsulation layer (fig. 1E, item 188).

Therefore it would have been obvious to one of the ordinary skilled in the art before effective filing date to combine Zhu in light of Kwon so that it may include a buffer layer directly on the thin film encapsulation layer.

The motivation is simple substitution of known element to yield predictable results.

Zhu does not expressly teach the second conductive pattern, being electrically insulated from the first conductive pattern, and having a thickness that is greater than a thickness of the first conductive pattern.

However, HA teach the second conductive pattern (fig. 3, item 200), being electrically insulated (fig. 3, insulating layer 30) from the first conductive pattern (fig. 3, item 10), and having a thickness that is greater (The thickness of the metal plating layer 200 is not particularly limited, but is preferably 500 to 1,000 nm) than a thickness of the first conductive pattern (First and second sensing patterns having a thickness of 20 nm).

Therefore it would have been obvious to one of the ordinary skilled in the art before effective filing date to combine Zhu in light of HA so that it may include the second conductive pattern, being electrically insulated from the first conductive pattern, and having a thickness that is greater than a thickness of the first conductive pattern.

The motivation is a touch screen display, which shows high electrical conductivity but does not degrade visibility.

Regarding **claim 2** Zhu disclosed wherein the first conductive pattern (fig. 1, item 105) is directly on the buffer layer (fig. 1, fig. 1, item 106).

Regarding **claim 3** Zhu disclosed wherein the buffer layer comprises at least one of a silicon nitride, a silicon-oxy-nitride, and a silicon oxide ([0056]).

Regarding **claim 4** Zhu disclosed wherein the thin film encapsulation layer comprises: a first inorganic layer; an organic layer on the first inorganic layer; and a second inorganic layer on the organic layer ([0056] Both of the first encapsulation layer 106 and the second encapsulation layer 108 comprise a single layer of or multiple alternately arranged layers of organic films and/or inorganic films. The inorganic film is selected from but not limited to silicon nitride film, silicon oxide film. The organic film is selected from but not limited to ultraviolet ray curable resin film, silicon dioxide--acrylic resin composite material film).

Regarding **claim 5** Zhu in view of Kwon disclosed wherein the buffer layer (Kwon :fig. 1E, item 181) is directly on the second inorganic layer (Kwon :fig. 1E, item 131).

Regarding **claim 14** Zhu disclosed wherein the second conductive pattern comprises: first touch sensor parts; second touch sensor parts spaced from the first touch sensor parts (fig1, item 105, 107 spaced from each other); and first connection parts connecting respective ones of the first touch sensor parts, wherein the first conductive pattern comprises electrically conductive second connection parts connecting respective ones of the second touch sensor parts (fig. 2).

Regarding **claim 15** Zhu disclosed wherein the second connection parts (fig. 1, item 107) are directly on the buffer layer (fig. 1, item 106).

Regarding **claim 17** Zhu in view of HA teach wherein each of the first touch sensor parts and the second touch sensor parts comprise a plurality of mesh lines defining a plurality of mesh openings (HA: fig. 1, the touch sensing electrode of the present invention may further include a metal mesh 80 above or below the first sensing pattern 10 and the second sensing pattern 20, as necessary. For example, an appropriate shape may be provided above or below a unit pattern of a rhombus shape (see FIG. 1) of the first sensing pattern 10 and the second sensing pattern 20 to improve the electrical conductivity of the sensing pattern, thereby improving the sensing speed. Can be raised. In this case, the additionally provided metal mesh 80 does not need to be electrically connected between the unit patterns, and may be formed in a grid shape or the like within each unit pattern region.).

Regarding **claim 18** Zhu in view of HA teach wherein the second connection parts cross the mesh lines of the first touch sensor parts and the mesh lines of the second touch sensor parts (HA: fig. 1).

Regarding **claim 19** Zhu in view of HA teach wherein at least one of the first connection parts and the second connection parts has a mesh shape (HA: fig. 1).

Claim 16 is/are rejected under 35 U.S.C. 103 as being unpatentable over Zhu (US 20160313837) in view of Kwon (US 20140232956) and HA (WO2015026071) and further in view of Lee (US 20160103549).

Regarding **claim 16** Zhu does not expressly teach thickness of the insulating layer is less than a thickness of the second conductive pattern.

However Lee teach thickness of the insulating layer (fig. 4C insulating layer 421) is less than a thickness of the second conductive pattern (fig. 4C, item 410).

Therefore it would have been obvious to one of the ordinary skilled in the art before effective filing date to combine Zhu in light of Lee so that it may include thickness of the insulating layer is less than a thickness of the second conductive pattern.

The motivation is simple substitution of known element to yield predictable results.

Allowable Subject Matter

Claims 6-13 allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TOWFIQ ELAHI whose telephone number is (571)270-1687. The examiner can normally be reached M-F: 10AM-3PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Boddie can be reached on (571)272-0666. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TOWFIQ ELAHI/
Primary Examiner, Art Unit 2625

<i>Notice of References Cited</i>	Application/Control No. 16/742,230	Applicant(s)/Patent Under Reexamination AN et al.	
	Examiner TOWFIQ ELAHI	Art Unit 2625	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
	A					
	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	WO-2015026071-A1	02-2015	WO	HA K	G06F3/044
	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.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20220127

<i>Search Notes</i> 	Application/Control No. 16/742,230	Applicant(s)/Patent Under Reexamination AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625

CPC - Searched*		
Symbol	Date	Examiner
H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256	07/30/2020	TE

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

Search Notes		
Search Notes	Date	Examiner
Text searched in EAST	07/30/2020	TE
Updated search in EAST	04/14/2021	TE
Updated search in EAST	09/09/2021	TE
Updated search in pe2e search.	01/27/2022	TE

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
345/G06F3	173/0446	09/09/2021	TE

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	"15660827"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:03 PM
L2	13	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:06 PM
L3	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern same touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:06 PM
L4	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:07 PM
L5	14	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:09 PM
L6	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:10 PM
L7	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:22 PM
L8	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 03:02 PM
L9	1	"20170336907"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 03:05 PM
L10	2	"20140160066"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 03:14 PM
L11	0	((("AN") near3 ("Chiwook"))).INV.	(USPAT)	OR	OFF	OFF	2018/09/04 03:18 PM
L12	12	((("KIM") near3 ("Doyeon"))).INV.	(US-PGPUB)	OR	OFF	OFF	2018/09/04 03:18 PM
L13	8	((("PARK") near3 ("Sunghyun"))).INV.	(USPAT)	OR	OFF	OFF	2018/09/04 03:19 PM
L14	21	((("LEE") near3 ("Jaehyun"))).INV.	(USPAT)	OR	OFF	OFF	2018/09/04 03:19 PM

L15	0	((("CHO") near3 ("Sung-woong"))).INV.	(USPAT)	OR	OFF	OFF	2018/09/04 03:19 PM
L16	0	((("CHO") near3 ("Sung-woong"))).INV.	(USPAT)	OR	OFF	OFF	2018/09/04 03:20 PM
L17	4	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and display	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 10:04 AM
L18	0	touch near3 (sens\$3 detect\$3) near3 on near3 display near3 (part section substrate)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 10:06 AM
L19	196	touch near3 (sens\$3 detect\$3) near3 display near3 (part section substrate) same insulat\$3	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 10:07 AM
L20	35861	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 10:09 AM
L21	170	L19 and L20	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 10:10 AM
L22	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 01:37 PM
L23	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 08:59 AM
L24	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 08:59 AM
L25	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 08:59 AM
L26	0	(first second third) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:55 AM
L27	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:56 AM
L28	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:57 AM

L29	0	conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:57 AM
L30	0	conductive near3 layer near3 resistivi near3 (less lower different) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:57 AM
L31	1122191	(first second third other another) near3 layer conductive near3 layers near3 resistivi near3 (less lower different)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:58 AM
L32	35893	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:59 AM
L33	15461	L31 and L32	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:59 AM
L34	1122172	(first second third) near3 layer conductive near3 layers near3 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:00 AM
L35	15461	L32 and L34	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:00 AM
L36	1556030	(first second third one) near3 layer conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:02 AM
L37	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:03 AM
L38	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:03 AM
L39	0	(first second third one)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06

01/27/2022 11:42:41 AM

Workspace: 16742230CON15660827

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TE

		near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) and (first second third other another)					10:03 AM
L40	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:04 AM
L41	0	(first second third one) near3 layer near3 conduct\$3 near3 layers near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:07 AM
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L43	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:07 AM
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L46	206361	second near2 conductive layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:09 AM
L47	0	second near2 conductive near3 layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:09 AM
L48	0	second near2 conductive near3 layer near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:10 AM
L49	21	second near2 conductive near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:11 AM

01/27/2022 11:42:41 AM

Workspace: 16742230CON15660827

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TE

L50	7	same electrical near3 resistivity same less middle near2 conductive near3 layer near3 (thicker)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:34 AM
L51	22	(middle mid center centre) near2 conductive near3 (layer section part) near3 (thicker wider fatter)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 01:56 PM
L52	35893	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 01:56 PM
L53	0	L51 and L52	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 01:56 PM
L55	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:29 AM
L56	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:29 AM
L57	1	"6504202".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:29 AM
L58	1	"20160103549".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:32 AM
L59	0	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:34 AM
L60	5389	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:34 AM
L61	35893	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:35 AM
L62	4524	first same third same conduct\$3 same layer same titanium and aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:35 AM
L63	3038	first same third same conduct\$3 same layer same titanium same aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:35 AM
L64	122	L61 and L63	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:36 AM
L65	1108	first near2 conduct\$3 same second near2 conduct\$3 same third near2 conduct\$3 same layer same Titanium same Aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:42 AM
L66	28	L61 and L65	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07

L67	1153	aluminum near2 layer same (between sorrounded) near3 Titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	09:43 AM 2018/09/07 09:50 AM
L68	641	aluminum near2 layer same (between sorrounded) near3 Titanium near2 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:50 AM
L69	66	L61 and L68	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:51 AM
L70	183	towfiq near elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 10:31 AM
L71	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 10:36 AM
L72	1	"20170076502"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 12:39 PM
L73	1	"20180095581"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/10 09:54 AM
L74	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/27 03:40 PM
L75	204	towfiq near2 elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/27 03:47 PM
L76	5	("20100060602" "20110102370" "20120118614" "20120212449" "20120312677").PN. OR ("9323370").URPN.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2019/02/27 04:04 PM
L77	75	"20060097991"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2019/02/27 04:06 PM
L78	1	"15660827" and (thickness near3 second near2 connection part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 08:51 AM
L79	0	"15660827" and (thickness near3 second near2 connection near2 part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 08:52 AM
L80	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 02:48 PM
L81	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 02:58 PM
L82	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 03:21 PM
L83	1	"15660827"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L84	14	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM

L85	0	second near3 conduct\$3 near2 pattern insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern same touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L86	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L87	15	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L88	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L89	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L90	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L91	2	"20170336907"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L92	2	"20140160066"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L93	0	((("AN") near3 ("Chiwook"))).INV.	(USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L94	12	((("KIM") near3 ("Doyeon"))).INV.	(US-PGPUB)	OR	OFF	OFF	2019/02/28 05:00 PM
L95	10	((("PARK") near3 ("Sunghyun"))).INV.	(USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L96	22	((("LEE") near3 ("Jaehyun"))).INV.	(USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L97	0	((("CHO") near3 ("Sung- woong"))).INV.	(USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L98	0	((("CHO") near3 ("Sung- woong"))).INV.	(USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L99	4	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and display	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM

L100	0	touch near3 (sens\$3 detect\$3) near3 on near3 display near3 (part section substrate)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L101	222	touch near3 (sens\$3 detect\$3) near3 display near3 (part section substrate) same insulat\$3	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L102	39064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L103	193	L101 and L102	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L104	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L105	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L106	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L107	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L108	0	(first second third) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L109	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L110	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L111	0	conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L112	0	conductive near3 layer near3 resistivi near3 (less lower different) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM

L113	1162602	(first second third other another) near3 layer conductive near3 layers near3 resistivi near3 (less lower different)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L114	39064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L115	17063	L113 and L114	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L116	1162583	(first second third) near3 layer conductive near3 layers near3 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L117	17063	L114 and L116	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L118	1612494	(first second third one) near3 layer conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L119	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L120	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L121	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) and (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L122	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM

L123	0	resistivity near3 (less lower different more) (first second third one) near3 layer near3 conduct\$3 near3 layers near3 electrical near2 resistivity near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L124	0	(first second third one) near3 layer near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivity near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L125	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivity near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L126	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivity	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L127	0	conduct\$3 near3 layer\$1 near3 electrical near2 resistivity	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L128	214000	second near2 conductive layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L129	0	second near2 conductive near3 layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L130	0	second near2 conductive near3 layer near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L131	22	second near2 conductive near3 layer same electrical near3 resistivity same less	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L132	8	middle near2 conductive near3 layer near3 (thicker)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L133	23	(middle mid center centre) near2 conductive near3 (layer section part) near3 (thicker wider fatter)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM

L134	39064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L135	0	L133 and L134	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L136	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L137	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L138	1	"6504202".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L139	1	"20160103549".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L140	0	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L141	5648	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L142	39064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L143	4756	first same third same conduct\$3 same layer same titanium and aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L144	3209	first same third same conduct\$3 same layer same titanium same aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L145	145	L142 and L144	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L146	1129	first near2 conduct\$3 same second near2 conduct\$3 same third near2 conduct\$3 same layer same Titanium same Aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L147	33	L142 and L146	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L148	1191	aluminum near2 layer same (between sorrounded) near3 Titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L149	667	aluminum near2 layer same (between sorrounded) near3 Titanium near2 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L150	73	L142 and L149	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28

L151	204	towfiq near elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L152	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L153	1	"20170076502"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L154	1	"20180095581"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L155	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L156	204	towfiq near2 elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L157	5	("20100060602" "20110102370" "20120118614" "20120212449" "20120312677").PN. OR ("9323370").URPN.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	05:00 PM 2019/02/28
L158	75	"20060097991"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	05:00 PM 2019/02/28
L159	1	"15660827" and (thickness near3 second near2 connection part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L160	0	"15660827" and (thickness near3 second near2 connection near2 part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L161	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L162	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L163	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L164	0	second near3 conductive near3 pattern near4 thickness near4 (greater bigger (more adj than)) near3 thickness near3 second near3 connection near3 part	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/05/09
L165	0	conductive near3 pattern near4 thickness near4 (greater bigger (more adj than)) near3 thickness near3 connection near3 part	(US-PGPUB; USPAT)	OR	OFF	OFF	11:04 AM 2019/05/09
L166	263	second near3 conductive near3 pattern near4 thickness	(US-PGPUB; USPAT)	OR	OFF	OFF	11:05 AM 2019/05/09

L167	1006	near4 (greater bigger (more adj than)) samr thickness near3 second near3 connection near3 part second near3 conduct\$3 near3 pattern near4 (thickness width) near4 (greater bigger (more adj than)) samr (thickness width) near3 second near3 connect\$3 near3 (part section)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/05/09 11:10 AM
L168	0	second near3 conduct\$3 near3 pattern near4 (thickness width) near4 (greater bigger (more adj than)) same (thickness width) near3 second near3 connect\$3 near3 (part section)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/05/09 11:10 AM
L169	9	"201508587"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/27 09:27 AM
L170	0	"TW201508587"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/27 09:28 AM
L171	21	"2015026071"	(US-PGPUB; USPAT;	OR	ON	ON	2022/01/27

			USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				09:31 AM
L172	3	"20160313837"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/27 10:26 AM
L173	3	"20140232956"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/27 10:28 AM
L174	2	"20200152710"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL,	OR	ON	ON	2022/01/27 10:46 AM

			PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
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PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary)	Attorney Docket Number	183539
	Application Number	16/742,230
	Filing Date	January 14, 2020
	Inventor(s)	Chiwook An, et al.
	Group Art Unit	2625
	Examiner Name	Towfiq Elahi

U.S. PATENT DOCUMENTS				
EXAMINER INITIALS	Cite No. ¹	DOCUMENT NUMBER Number - Kind Code ² (If Known)	PUBLICATION DATE OR ISSUE DATE MM-DD-YYYY	NAME OF PATENTEE

FOREIGN PATENT DOCUMENTS					
EXAMINER INITIALS	Cite No. ¹	Foreign Patent Document Country Code ³ - Number ⁴ - Kind Code ⁵ (If Known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	T ⁶ (✓)
		TW 201508587 A	03-01-2015	Dongwoo Fine Chem Co Ltd	Abstract

OTHER DOCUMENTS		
EXAMINER INITIALS	Cite No. ¹	Include name of the author (in CAPITAL LETTERS), title of the article, title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.
		Taiwanese Examination Report dated 12-14-2021, Application Serial No. 108131554, 12 pages

EXAMINER SIGNATURE	/TOWFIQ ELAHI/	DATE CONSIDERED	01/27/2022
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. ¹ Applicant's unique citation designation number (optional). ² See Kinds Codes of USPTO Patent Documents at www.pto.gov or MPEP 901.4. ³ Enter Office that issued the document, by the two-letter code (WIPO standard ST.3). ⁴ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁵ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁶ Applicant is to place a check mark here if English Language Translation is attached.			

RMS/srh

Sheet 1 of 1

116363263.1

TOUCH SENSING ELECTRODE AND TOUCH SCREEN PANEL HAVING SAME

PATENT NUMBER	DOCUMENT ID	DATE PUBLISHED
2015026071	WO 2015026071 A1	2015-02-26

INVENTOR INFORMATION

NAME	CITY	STATE	ZIP CODE	COUNTRY
HA, KYOUNG SU	N/A	N/A	431-706	KR
PARK, DONG PIL	N/A	N/A	406-840	KR
KIM, SANG SOO	N/A	N/A	440-746	KR

DATE FILED

2014-07-29

CPC CURRENT

TYPE	CPC	DATE
CPCI	G 06 F 3/0446	2019-05-01
CPCI	G 06 F 3/0443	2019-05-01
CPCI	G 06 F 3/0443	2019-05-01
CPCI	G 06 F 3/0446	2019-05-01
CPCI	G 06 F 3/0412	2013-01-01
CPCI	G 06 F 3/044	2013-01-01
CPCA	G 06 F 2203/04111	2013-01-01
CPCA	G 06 F 2203/04103	2013-01-01
CPCA	G 06 F 2203/04111	2013-01-01
CPCA	G 06 F 2203/04103	2013-01-01

KWIC Hits

Abstract

The present invention relates to a touch sensing electrode having good electrical conductivity and a touch screen panel having the same, the touch sensing electrode comprising: a bridge electrode electrically connected as a metal mesh up to a metal wiring on a substrate and having a metal plating layer on an upper part thereof; an insulating layer formed on the substrate and the bridge electrode; and a first sensing pattern formed on the insulating layer in a first direction and a second sensing pattern of which spaced unit patterns are electrically connected to the bridge electrode and which is formed in a second direction.

Description

INVENTION-TITLE

TECHNICAL-FIELD

The present invention relates to a touch sensing electrode and a touch screen panel having the same, and more particularly, to a touch sensing electrode having excellent electrical conductivity and a touch screen panel having the same.

BACKGROUND-ART

In general, the touch screen panel is a screen panel equipped with a special input device to receive the position when touched by hand. The touch screen panel receives input data directly from the screen so that when a person's hand or an object touches a character or a specific location displayed on the screen without using a keyboard, the touch screen panel can identify the location and perform specific processing by the stored software. It is made possible by being laminated | stacked in multiple layers.

In order to recognize the touched portion without degrading the visibility of the image displayed on the screen, the use of a transparent touch sensing electrode is essential, and typically, a sensing pattern formed in a predetermined pattern is used.

Various transparent sensing electrode structures used in the touch screen panel have been introduced. For example, glass-ITO film-ITO film (GFF), glass-ITO film (G1F), glass-only (G2) structures, etc. may be mentioned. have.

For example, a structure shown in FIG. 1 may be cited as a conventional transparent sensing electrode structure.

The transparent sensing electrode may be formed of the first sensing pattern 10 and the second sensing pattern 20. The first sensing pattern 10 and the second sensing pattern 20 are disposed in different directions to provide information about the X and Y coordinates of the touched point. Specifically, when a human hand or an object contacts the transparent substrate, the capacitance according to the contact position toward the driving circuit side via the first sensing pattern 10, the second sensing pattern 20, and the metal wiring which is the position detecting line. The change is conveyed. Then, the contact position is grasped by the change of the capacitance converted into an electrical signal by the X and Y input processing circuit (not shown) or the like.

In this regard, the first sensing pattern 10 and the second sensing pattern 20 are formed on the same substrate, and each pattern must be electrically connected to sense a touched point. However, since the first sensing patterns 10 are connected to each other, but the second sensing patterns 20 are separated from each other in an island form, a separate connection is required to electrically connect the second sensing patterns 20. An electrode (bridge electrode) 50 is required.

However, since the bridge electrode 50 should not be electrically connected to the first sensing pattern 10, the bridge electrode 50 should be formed on a different layer from the first sensing pattern 10. To show this structure, an enlarged view of a portion where the bridge electrode 50 is formed in the A-A 'cross section of FIG. 1 is shown in FIG.

Referring to FIG. 2, sensing patterns 10 and 20 are formed on a substrate 100, and an insulating layer 30 and a bridge electrode 50 are formed thereon. The first sensing pattern 10 and the second sensing pattern 20 are spaced apart from each other, and are separated from the bridge electrode 50 by the insulating layer 30 formed thereon. The first sensing pattern 10 is electrically insulated from the bridge electrode 50, and as described above, since the second sensing pattern 20 needs to be electrically connected, the bridge electrode 50 is used. Is electrically connected. In order to connect the second sensing pattern 20 separated in an island form to the bridge electrode 50 while being electrically disconnected from the first sensing pattern 10, a contact hole 40 may be formed on the insulating layer 30. There is a need.

By the way, the bridge electrode 50 is typically formed of a metal in order to increase the electrical conductivity, there is a problem that the pattern is visible due to the difference in reflectance with the sensing pattern.

In order to solve this visibility problem, when the bridge electrode 50 is formed of a metal with a very narrow width, there is an advantage that the visibility can be improved and the process can be simplified by forming with the metal wiring, but to form a narrow width In addition to the high precision process equipment, and the time-consuming problem of forming a precise pattern, the electrical

resistance is increased and the electrical conductivity is lowered, resulting in a slower detection speed. there is a problem.

In addition, the production and research of a display having a narrower bezel has been recently conducted. As the width of the bezel is narrowed, there is a problem in that electrical resistance of the metal wiring hidden in the bezel portion increases.

Japanese Patent Application Laid-Open No. 2008-98169 proposes a transparent conductive film in which an undercoat layer composed of two layers having different refractive indices is formed between a transparent substrate and a transparent conductive layer.

[Preceding technical literature]

[Patent Documents]

(Patent Document 1) Patent Document 1: Japanese Patent Application Laid-Open No. 2008-98169

DISCLOSURE

TECH-PROBLEM

An object of the present invention is to provide a touch sensing electrode and a touch screen panel having the same, which shows high electrical conductivity but does not degrade visibility.

In addition, another object of the present invention is to provide a touch sensing electrode having a narrow bezel and a touch screen panel having the same.

TECH-SOLUTION

1. a first sensing pattern formed in a first direction and a second sensing pattern formed in a second direction; A bridge electrode electrically connecting the spaced unit pattern of the second sensing pattern to an upper portion of the first sensing pattern; An insulating layer interposed between the first sensing pattern and the bridge electrode at an intersection point of the first sensing pattern and the bridge electrode; And a metal plating layer formed on an upper surface of the bridge electrode.
2. In the above 1, wherein the metal wiring connecting the first sensing pattern and the second sensing pattern with a driving circuit further comprises a metal plating layer on the upper surface, the touch sensing electrode.
3. In the above 1, wherein the first sensing pattern and the second sensing pattern includes a metal mesh on the upper or lower, touch sensing electrode.
4. In the above 3, wherein the metal mesh formed on the first sensing pattern and the second sensing pattern further comprises a metal plating layer on the upper surface, the touch sensing electrode.
5. In the above 1, wherein the metal plating layer is formed by electroplating, touch sensing electrode.
6. In the above 1, wherein the metal plating layer is formed of copper, touch sensing electrode.
7. In the above 1, wherein the thickness of the metal plating layer is 500 to 1,000nm, the touch sensing electrode.
8. In the above 1, the touch sensing electrode formed on one surface of the cover window substrate or the display panel of the touch screen panel.
9. A first sensing pattern formed in a first direction and a second sensing pattern formed in a second direction are formed on a substrate, and an insulating layer is formed on the first sensing pattern at a point where the first sensing pattern and the bridge electrode intersect. Forming a; Forming a bridge

electrode on the insulating layer to electrically connect the second sensing pattern; And forming a metal plating layer on the bridge electrode.

10. The method of 9 above, wherein the forming of the bridge electrode includes: forming a bridge electrode forming metal layer on the substrate formed up to the insulating layer; Forming a photoresist pattern on the upper surface of the metal layer for forming bridge electrodes to expose only a portion where a metal plating layer is to be formed; Forming a metal plating layer on the exposed portion; And removing the metal layer for forming bridge electrodes on which the photoresist pattern and the metal plating layer are not formed.

11. In the above 10, wherein the photoresist pattern further comprises an exposed portion to form a metal mesh pattern on the first sensing pattern or the second sensing pattern, the metal plating layer is also formed on the metal mesh pattern That is, the manufacturing method of the touch sensing electrode.

12. In the above 10, the bridge electrode forming metal layer is formed to a metal wiring portion, the photoresist pattern further includes an exposed portion to include the metal wiring portion, the metal plating layer is also formed on the upper metal wiring That is, the manufacturing method of the touch sensing electrode.

13. The touch screen panel including the touch sensing electrode of any one of the above 1 to 8.

14. Display device including the touch screen panel of 13 above.

ADVANTAGEOUS-EFFECTS

The touch sensing electrode of the present invention has a metal plating layer on top of the bridge electrode to increase the electrical conductivity of the bridge electrode, thereby exhibiting an excellent sensing speed.

In addition, the touch sensing electrode of the present invention may maintain the visibility of the bridge electrode similar to the conventional or even lower when the metal plating layer is used as a material having a low reflectance.

In addition, the touch sensing electrode of the present invention may include a metal plating layer on the metal wiring connecting the sensing pattern to the circuit, thereby maintaining a high electric conductivity even when the metal wiring is narrowed, thereby implementing a narrow bezel display device.

In addition, the touch sensing electrode of the present invention includes a metal mesh in the sensing pattern, thereby improving the electrical conductivity of the sensing pattern to further improve the sensing speed.

MODE-FOR-INVENTION

The present invention includes a first sensing pattern formed in a first direction and a second sensing pattern formed in a second direction; A bridge electrode electrically connecting the spaced unit pattern of the second sensing pattern to an upper portion of the first sensing pattern; An insulating layer interposed between the first sensing pattern and the bridge electrode at an intersection point of the first sensing pattern and the bridge electrode; And a metal plating layer formed on an upper surface of the bridge electrode, and relates to a touch sensing electrode having excellent electrical conductivity and a touch screen panel having the same.

Hereinafter, the present invention will be described in more detail with reference to the drawings. However, the following drawings attached to the present specification are intended to illustrate preferred embodiments of the present invention, and together with the contents of the present invention serves to further understand the technical spirit of the present invention, the present invention described in such drawings It should not be construed as limited to matters.

3 schematically illustrates an embodiment of the touch sensing electrode of the present invention.

The touch sensing electrode of the present invention includes an insulating layer 30 interposed between the first sensing pattern 10 and the bridge electrode 50 at the intersection of the first sensing pattern 10 and the bridge electrode 50. The bridge electrode 50 has a metal plating layer 200 thereon.

The bridge electrode 50 electrically connects the second sensing patterns 20 formed by separating the unit patterns, but the bridge electrodes 50 are not formed to have a wide width due to the visibility of the patterns. Since the electrical resistance is inversely proportional to the cross-sectional area of the charge travel path, the narrow width of the bridge electrode 50 causes the cross-sectional area of the charge travel path to be small, which in turn limits the electrical conductivity. In order to solve this problem, simply forming the bridge electrode 50 to have a high height, the accuracy of the pattern is reduced and the problem that the substrate 100 is bent.

Accordingly, the present invention solves the above-described problem by providing a separate metal plating layer 200 on the bridge electrode 50. The metal plating layer 200 is formed on the bridge electrode 50 to broadly improve the electrical conductivity of the bridge electrode 50 by widening the cross-sectional area of the movement path of the charge.

The metal plating layer 200 is electrically conductive and may be used without particular limitation as long as it is a material capable of plating on the bridge electrode 50. For example, silver (Ag), gold (Au), copper (Cu), and the like, but are not limited thereto.

Preferably, since the metal plating layer 200 is formed on the bridge electrode 50, it is preferable to use a material having low reflectance in view of visibility. In that aspect, it is preferable to use copper (Cu).

The thickness of the metal plating layer 200 is not particularly limited, but is preferably 500 to 1,000 nm in terms of improving the electrical conductivity but not affecting the overall structure of the touch sensing electrode.

The bridge electrode 50 electrically connects the spaced unit pattern of the second sensing pattern 20 to the upper portion of the first sensing pattern 10.

The bridge electrode 50 according to the present invention may be formed of a metal material, and preferably, the bridge electrode 50 may be formed of the same material as the metal wire 70. In such a case, the bridge electrodes 50 may be formed together at the time of forming the metal wiring 70, thereby simplifying the process.

The metal is not particularly limited as long as it is excellent in electrical conductivity and low in resistance, and examples thereof include molybdenum, silver, aluminum, and the like, and molybdenum may be preferably used.

The thickness (height) of the bridge electrode 50 is not particularly limited, and may be, for example, 10 to 300 nm. When the thickness of the bridge electrode 30 is less than 10 nm, the electrical resistance may increase, and thus the touch sensitivity may be lowered.

The width of the bridge electrode 50 is not particularly limited, for example, may be 2 to 30 μm , preferably 2 to 20 μm , but is not limited thereto. When the width of the bridge electrode 50 is 2 to 30 μm , the visibility of the pattern may be reduced and an appropriate electrical resistance may be obtained.

The insulating layer 30 functions to electrically insulate the first sensing pattern 10 from the bridge electrode 50. As shown in FIG. 2, the conventional insulating layer is formed entirely on top of the sensing pattern, but the insulating layer 30 according to the present invention has a first sensing pattern 10 and a bridge electrode as shown in FIG. 3. It is interposed between the first sensing pattern and the bridge electrode at the intersection of 50.

Since the insulating layer 30 according to the present invention only needs to insulate the first sensing pattern 10 and the bridge electrode 50, the insulating layer 30 does not need to be formed entirely on the substrate 100, and also requires a process of forming the contact hole 40. none.

The insulating layer 30 may be formed using any material and method used in the art without particular limitation.

The first sensing pattern 10 and the second sensing pattern 20 are disposed in different directions to provide information about the X and Y coordinates of the touched point. Specifically, when a human hand or an object comes into contact with the transparent substrate, the capacitance of the capacitance according to the contact position is moved to the driving circuit via the first sensing pattern 10, the second sensing pattern 20, and the metal wiring 70. Change is communicated. Then, the contact position is grasped by the change of the capacitance converted into an electrical signal by the X and Y input processing circuit (not shown) or the like.

In this regard, the first sensing pattern 10 and the second sensing pattern 20 are formed on the substrate 100, and each pattern must be electrically connected to detect a touched point. However, since the first sensing pattern 10 is connected to each other but the second sensing pattern 20 has a structure in which the unit patterns are separated in an island form, in order to electrically connect the second sensing pattern 20. A separate bridge electrode 50 is needed.

The thickness of the sensing pattern is not particularly limited, and may be, for example, 20 to 200 nm. If the thickness of the sensing pattern is less than 20 nm, the electrical resistance may be increased, and thus the touch sensitivity may be lowered. If the thickness of the sensing pattern is greater than 200 nm, the reflectance may be increased, thereby causing a problem of visibility.

As the first sensing pattern 10 and the second sensing pattern 20 of the touch sensing electrode, a material used in the art may be used without limitation, and in order not to impair visibility of an image displayed on a screen, a transparent material is used. Or is formed in a fine pattern. Specific examples include indium tin oxide (ITO), indium zinc oxide (IZO), zinc oxide (ZnO), indium zinc oxide (IZTO), cadmium tin oxide (CTO), and PEDOT (poly (3,4-ethylenedioxythiophene)), Carbon nanotubes (CNT), metal wires, and the like. These may be used alone or in combination of two or more, preferably indium tin oxide (ITO) may be used. The metal used for a metal wire is not specifically limited, For example, silver (Ag), gold, aluminum, copper, iron, nickel, titanium, tellurium, chromium, etc. are mentioned. These can be used individually or in mixture of 2 or more types.

Optionally, the touch sensing electrode of the present invention may further include a metal mesh 80 above or below the first sensing pattern 10 and the second sensing pattern 20, as necessary. For example, an appropriate shape may be provided above or below a unit pattern of a rhombus shape (see FIG. 1) of the first sensing pattern 10 and the second sensing pattern 20 to improve the electrical conductivity of the sensing pattern, thereby improving the sensing speed. Can be raised. In this case, the additionally provided metal mesh 80 does not need to be electrically connected between the unit patterns, and may be formed in a grid shape or the like within each unit pattern region.

Preferably, the metal mesh 80 may further include a metal conductive layer 200 thereon. In this case, the metal mesh 80 is preferably provided on the sensing patterns 10 and 20. The metal mesh 80 may include a metal conductive layer 200, whereby electrical conductivity may be significantly increased.

The metal line 70 transmits a change in capacitance sensed in the sensing patterns 10 and 20 to the driving circuit side. The metal wire 70 may be formed of the same material as the bridge electrode 50, and therefore, the metal wire 70 may be formed at the same time when the bridge electrode 50 is formed.

On the other hand, the metal wire 70 is disposed on the bezel portion of the display device. When the bezel is narrowly formed as described above, the metal wire 70 is preferably formed with the minimum width possible. However, when the metal wiring 70 is narrowly formed, electrical conductivity may be

lowered, and there may be a risk of disconnection. Therefore, if necessary, the metal wiring 70 of the present invention may further include a metal plating layer 200 thereon.

The metal plating layer 200 on the upper portion of the metal wiring may be formed of the same material as the metal plating layer 200 formed on the bridge electrode 50, and may be formed at the same time.

The touch sensing electrode of the present invention is formed on the substrate 100.

The substrate 100 may be a material commonly used in the art without limitation, for example, glass, polyethersulphone (PES), polyacrylate (PAR, polyacrylate), polyether imide (PEI, polyetherimide, polyethylene naphthalate (PEN, polyethylenen naphthalate), polyethylene terephthalate (PET, polyethylenene terephthalate), polyphenylene sulfide (PPS), polyallylate, polyimide, polycarbonate (PC, polycarbonate), cellulose tri acetate (TAC), cellulose acetate propionate (CAP), and the like.

The substrate 100 may be one surface of a cover window substrate or a display panel forming an outermost surface of the touch screen panel.

When the substrate 100 is a cover window substrate, the touch sensing electrode of the present invention may further include a transparent dielectric layer between the substrate 100 and the sensing pattern as necessary. The transparent dielectric layer improves the optical uniformity of the touch screen panel by reducing the difference in optical characteristics due to positional structural differences according to the sensing pattern structure.

The transparent dielectric layer may be formed by mixing niobium oxide, silicon oxide, cerium oxide, indium oxide, or the like, alone or in combination of two or more thereof. The formation method may be a vacuum deposition method, a sputtering method, an ion plating method, and the like, and may be easily manufactured in the form of a thin film through the above method.

In the present invention, if necessary, the transparent dielectric layer may be formed of a plurality of layers. In this case, each layer may be formed of different materials, and may have different refractive indices and thicknesses.

Hereinafter, a method of manufacturing the touch sensing electrode of the present invention will be described in more detail.

First, a first sensing pattern formed in a first direction and a second sensing pattern formed in a second direction are formed on a substrate, and an insulating layer is formed on the first sensing pattern at a point where the first sensing pattern and the bridge electrode intersect. To form.

The sensing patterns 10 and 20 may be formed by various thin film deposition techniques such as physical vapor deposition (PVD) and chemical vapor deposition (CVD). For example, it may be formed by reactive sputtering, which is an example of physical vapor deposition.

In addition, the sensing pattern may be formed by a printing process. In this printing process, various printing methods such as gravure off set, reverse off set, inkjet printing, screen printing, and gravure printing may be used. In particular, when the sensing pattern is formed by a printing process, the sensing pattern may be formed of a printable paste material. For example, it may be formed of carbon nanotubes (CNTs), conductive polymers, and silver nano wire inks.

In addition, the sensing pattern may be formed by photolithography in addition to the above method.

After the sensing patterns 10 and 20 are formed, the insulating layer 30 is formed on the first sensing pattern 10 at the point where the first sensing pattern 10 and the bridge electrode 50 to be formed later intersect. . The insulating layer 30 may be formed using any material and method used in the art without particular limitation.

Next, a bridge electrode 50 is formed on the insulating layer 30 to electrically connect the second sensing pattern 20.

Hereinafter, the step of forming the bridge electrode 50 will be described in more detail.

First, a metal layer for forming bridge electrodes is formed on the substrate formed up to the insulating layer 30. The metal layer may be formed on the entire upper surface of the substrate.

The metal layer for forming the bridge electrode is formed of a metal to be used as the bridge electrode, and the forming method is not particularly limited. For example, various thin films such as physical vapor deposition (PVD) and chemical vapor deposition (CVD) are used. It may be formed by a deposition technique. For example, it may be formed by reactive sputtering, which is one example of a physical vapor deposition method, but is not limited thereto. As another example, a method of coating a coating solution containing metal particles may be applied.

After the bridge electrode forming metal layer is formed, a photoresist pattern is formed on the top surface of the bridge electrode forming metal layer to expose only a portion where the metal plating layer is to be formed.

The portion exposed by the photoresist pattern may be the bridge electrode 50. In addition, as described above, a portion of the metal mesh 80, a portion of the metal wiring 70, and the like may also be exposed. In this case, the metal mesh 80 and the metal wiring 70 are formed simultaneously with the bridge electrode 50.

If the metal mesh 80 is formed below the sensing patterns 10 and 20, the metal mesh 80 is first formed on the substrate 100 and then the sensing patterns 10 and 20 are formed thereon.

In addition, when the metal mesh 80 is formed on the sensing patterns 10 and 20, the photoresist pattern may be formed to cover the metal mesh 80 so as not to include the metal plating layer 200.

Next, a metal plating layer is formed on the exposed portion.

The metal plating layer 200 may be formed by a conventional metal plating method. Although there is no particular limitation on the plating method, an electroplating method is preferable in view of precision to be formed only on the bridge electrode 50.

More specifically, the bridge electrode forming metal layer is used as the cathode electrode and the metal to form the plating layer is used as the anode electrode, the substrate is immersed in an electrolyte solution in which the metal ions of the anode electrode are present, and then a power source is connected. When flowing, the metal plating layer 200 is formed on a portion exposed by the photoresist pattern.

Next, after removing the photoresist pattern, if the metal layer for bridge electrode formation of the portion where the metal plating layer is not formed is removed, the touch sensing electrode of the present invention can be obtained. Removing the metal layer for forming the bridge electrode in the portion where the metal plating layer is not formed may be easily performed by using an etchant capable of etching the bridge electrode forming metal layer without etching the metal plating layer.

The touch sensing electrode of the present invention can form a touch screen panel through additional processes known in the art. In this case, a display device used may include a liquid crystal display, an OLED, a flexible display, but is not limited thereto.

Hereinafter, preferred examples are provided to aid the understanding of the present invention, but these examples are merely illustrative of the present invention and are not intended to limit the scope of the appended claims, which are within the scope and spirit of the present invention. It is apparent to those skilled in the art that various changes and modifications can be made to the present invention, and such modifications and changes belong to the appended claims.

Example 1

First and second sensing patterns having a thickness of 20 nm were formed of indium tin oxide (ITO) (refractive index: 1.8) on a glass substrate (refractive index: 1.51).

Thereafter, an insulating layer was formed on the first sensing pattern of the portion where the bridge pattern was to be formed, and then a molybdenum metal layer having a thickness of 10 nm was formed on the upper surface of the substrate on which the insulating layer was formed by sputtering.

Next, after the photoresist pattern is formed to expose only the portion where the bridge electrode is to be formed and the metal wiring portion, a power source is connected to the molybdenum metal layer, and the other side of the power source is connected to a copper electrode, and then the substrate and copper The electrode was immersed in a copper electrolyte solution and electroplated to form a copper plating layer on the exposed molybdenum metal layer.

Next, the photoresist pattern was removed, and the molybdenum metal layer on which the copper plating layer was not formed was removed to manufacture a touch sensing electrode.

For reference, the refractive index is described based on light of 550 nm wavelength.

Example 2

A touch sensing electrode was manufactured in the same manner as in Example 1, except that the metal mesh and the metal plating layer were further formed on the first sensing pattern and the second sensing pattern.

Example 3

A touch sensing electrode was manufactured in the same manner as in Example 1, except that a metal mesh was further formed below the first sensing pattern and the second sensing pattern.

Comparative Example 1

A touch sensing electrode was manufactured in the same manner as in Example 1, except that the copper plating layer was not formed and molybdenum was formed to have a thickness of 300 nm.

Experimental Example

The reflectance and electrical resistance of the manufactured touch sensing electrode were measured, and the results are shown in Table 2 below. Reflectance means the average of reflectance in 400 nm-700 nm.

Table 1 tabl01

Referring to Table 1, it can be seen that in the case of the embodiments, the electrical resistance is significantly smaller than that of the comparative example and the difference between the reflectivity and the comparative example without forming the metal plating layer.

[Description of the code]

100: substrate

10: first sensing pattern 20: second sensing pattern

30: insulating layer 40: contact hole

50: bridge electrode 200: metal plating layer

80: metal mesh 70: metal wiring

DRAWING DESCRIPTION

1 is a schematic plan view of a conventional touch sensing electrode.

2 is a schematic vertical cross-sectional view of a conventional touch sensing electrode.

3 is a schematic vertical cross-sectional view according to an embodiment of the touch sensing electrode according to the present invention.

4 is a view schematically showing a touch sensing electrode manufacturing method according to the present invention.

Claims

A first sensing pattern formed in a first direction and a second sensing pattern formed in a second direction;

A bridge electrode electrically connecting the spaced unit pattern of the second sensing pattern to an upper portion of the first sensing pattern;

An insulating layer interposed between the first sensing pattern and the bridge electrode at an intersection point of the first sensing pattern and the bridge electrode; And

And a metal plating layer formed on an upper surface of the bridge electrode.

The touch sensing electrode of claim 1, wherein the metal wiring connecting the first sensing pattern and the second sensing pattern to a driving circuit further comprises a metal plating layer on an upper surface thereof.

The touch sensing electrode of claim 1, wherein the first sensing pattern and the second sensing pattern include a metal mesh thereon.

The touch sensing electrode of claim 3, wherein the metal mesh formed on the first sensing pattern and the second sensing pattern further includes a metal plating layer on an upper surface thereof.

The touch sensing electrode of claim 1, wherein the metal plating layer is formed by electroplating.

The touch sensing electrode of claim 1, wherein the metal plating layer is formed of copper.

The touch sensing electrode of claim 1, wherein the metal plating layer has a thickness of 500 nm to 1,000 nm.

The touch sensing electrode of claim 1, wherein the touch sensing electrode is formed on one surface of the cover window substrate or the display panel of the touch screen panel.

A first sensing pattern formed in a first direction and a second sensing pattern formed in a second direction are formed on the substrate, and an insulating layer is formed on the first sensing pattern at the point where the first sensing pattern and the bridge electrode intersect. Doing;

Forming a bridge electrode on the insulating layer to electrically connect the second sensing pattern; And

Forming a metal plating layer on the bridge electrode;

Method of manufacturing a touch sensing electrode comprising a.

The method of claim 9, wherein forming the bridge electrode,

Forming a metal layer for forming bridge electrodes on the substrate formed up to the insulating layer;

Forming a photoresist pattern on the upper surface of the metal layer for forming bridge electrodes to expose only a portion where a metal plating layer is to be formed;

Forming a metal plating layer on the exposed portion; And

Removing the metal layer for forming bridge electrodes on which the photoresist pattern and the metal plating layer are not formed;

Method of manufacturing a touch sensing electrode comprising a.

The method of claim 10, wherein the photoresist pattern further comprises an exposed portion to form a metal mesh pattern on the first sensing pattern or the second sensing pattern, the metal plating layer is also formed on the metal mesh pattern, Method of manufacturing a touch sensing electrode.

The metal layer of claim 10, wherein the metal layer for forming bridge electrodes is formed to a metal wiring portion, the photoresist pattern further includes an exposed portion to include the metal wiring portion, and the metal plating layer is also formed on the metal wiring. Method of manufacturing a touch sensing electrode.

A touch screen panel comprising the touch sensing electrode of claim 1.

Display device comprising the touch screen panel of claim 13.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/742,230		Filing Date 01/14/2020		☐ To be Mailed				
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO												
APPLICATION AS FILED - PART I												
		(Column 1)	(Column 2)									
FOR		NUMBER FILED	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), (j), 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	04/27/2022	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)			
	Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0		x \$100 =		0			
	Independent (37 CFR 1.16(h))	* 2	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				
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						
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/Diana Figueroa/
Diana Figueroa

Appl No.	: 16/742,230	Confirmation No. 7917
Inventor	: Chiwook An, et al.	
Filed	: January 14, 2020	
Title	: DISPLAY DEVICE	
TC/A.U.	: 2625	
Examiner	: ELAHI, TOWFIQ	
Docket No.	: 183539	
Customer No.	: 23363	

AMENDMENT

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April 27, 2022

Commissioner:

This paper is in response to the Office action of February 1, 2022, which set an initial period for reply to expire on May 1, 2022. Any extension of time fee required by this paper is paid concurrently herewith. As such, this response is timely filed. Please amend the above-identified application as follows:

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

Remarks/Arguments begin on page 6 of this paper.

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 display device comprising:
an organic light emitting device layer;
a thin film encapsulation layer on the organic light emitting device layer, the thin film encapsulation layer having a first surface adjacent to the organic light emitting device layer and a second surface facing the first surface and being spaced apart from the organic light emitting device layer;
a buffer layer directly on the second surface of the thin film encapsulation layer;
and
a touch sensing unit directly on the buffer layer, the touch sensing unit comprising:
a first conductive pattern on the buffer layer;
an insulating layer covering the first conductive pattern; and
a second conductive pattern on the insulating layer being electrically insulated from the first conductive pattern, [[and]] having a thickness above the first conductive pattern in a thickness direction of the display device that is greater than a thickness of the first conductive pattern in the thickness direction of the display device.
2. (Previously Presented) The display device of claim 1, wherein the first conductive pattern is directly on the buffer layer.
3. (Previously Presented) The display device of claim 1, wherein the buffer layer comprises at least one of a silicon nitride, a silicon-oxy-nitride, and a silicon oxide.
4. (Previously Presented) The display device of claim 1, wherein the thin film encapsulation layer comprises:

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- a first inorganic layer;
- an organic layer on the first inorganic layer; and
- a second inorganic layer on the organic layer.

5. (Previously Presented) The display device of claim 4, wherein the buffer layer is directly on the second inorganic layer.

6. (Previously Presented) A display device comprising:

- an organic light emitting device layer;
- a thin film encapsulation layer on the organic light emitting device layer;
- a buffer layer directly on the thin film encapsulation layer; and
- a touch sensing unit directly on the buffer layer, the touch sensing unit comprising:
 - a first conductive pattern on the buffer layer, and comprising:
 - a first conductive layer on the buffer layer;
 - a second conductive layer on the first conductive layer; and
 - a third conductive layer on the second conductive layer;
 - an insulating layer covering the first conductive pattern; and
 - a second conductive pattern on the insulating layer, and having a thickness that is greater than a thickness of the first conductive pattern, and comprising:
 - a fourth conductive layer on the insulating layer;
 - a fifth conductive layer on the fourth conductive layer; and
 - a sixth conductive layer on the fifth conductive layer.

7. (Previously Presented) The display device of claim 6, wherein each of the second conductive layer and the fifth conductive layer comprises aluminum (Al), and wherein each of the first conductive layer, the third conductive layer, the fourth conductive layer and the sixth conductive layer comprises titanium (Ti).

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8. (Previously Presented) The display device of claim 6, wherein a thickness of the second conductive layer is greater than each of a thickness of the first conductive layer and a thickness of the third conductive layer.

9. (Previously Presented) The display device of claim 6, wherein a thickness of the fifth conductive layer is greater than each of a thickness of the fifth conductive layer and a thickness of the sixth conductive layer.

10. (Previously Presented) The display device of claim 6, wherein a thickness of the second conductive layer is less than a thickness of the fifth conductive layer.

11. (Previously Presented) The display device of claim 6, wherein a thickness difference between the second conductive layer and the first conductive layer is greater than a thickness difference between the third conductive layer and the first conductive layer.

12. (Previously Presented) The display device of claim 6, wherein a thickness difference between the fifth conductive layer and the fourth conductive layer is greater than a thickness difference between the sixth conductive layer and the fourth conductive layer.

13. (Previously Presented) The display device of claim 6, wherein a thickness difference between the fifth conductive layer and the fourth conductive layer is greater than a thickness difference between the second conductive layer and the first conductive layer.

14. (Previously Presented) The display device of claim 1, wherein the second conductive pattern comprises:

first touch sensor parts;

second touch sensor parts spaced from the first touch sensor parts; and

first connection parts connecting respective ones of the first touch sensor parts,

wherein the first conductive pattern comprises electrically conductive second connection parts connecting respective ones of the second touch sensor parts.

15. (Previously Presented) The display device of claim 14, wherein the second connection parts are directly on the buffer layer.

16. (Previously Presented) The display device of claim 1, wherein a thickness of the insulating layer is less than a thickness of the second conductive pattern.

17. (Previously Presented) The display device of claim 14, wherein each of the first touch sensor parts and the second touch sensor parts comprise a plurality of mesh lines defining a plurality of mesh openings.

18. (Previously Presented) The display device of claim 17, wherein the second connection parts cross the mesh lines of the first touch sensor parts and the mesh lines of the second touch sensor parts.

19. (Previously Presented) The display device of claim 14, wherein at least one of the first connection parts and the second connection parts has a mesh shape.

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REMARKS/ARGUMENTS

Claims 1-19 are in the present application, of which claims 1 and 6 are independent. Claim 1 is amended herein. No new matter is added. In view of the amendments, and remarks that follow, Applicant respectfully requests allowance of claims 1-19.

1. Allowable Subject Matter

Claims 6-13

Applicant thanks the Examiner for indicating that claims 6-13 are allowed, and requests the continued allowance of these claims.

2. Claim Rejections Under 35 U.S.C. § 103

Claims 1-5 and 14-19

Claims 1-5, 14, 15, and 17-19 were rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Zhu et al. (U.S. Pub. No. 2016/0313837, hereinafter “Zhu”) in view of Kwon et al. (U.S. Pub. No. 2014/0232956, hereinafter “Kwon”) and Ha et al. (WO 2015/026071, hereinafter “Ha”).

Claim 16 was rejected under 35 U.S.C. as allegedly being unpatentable over Zhu in view of Kwon and Ha and further in view of Lee et al. (U.S. Pub. No. 2016/0103549, hereinafter “Lee”).

With respect to the 103 rejections of the claims, to establish a *prima facie* case of obviousness, there should be provided some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness demonstrating why one of ordinary skill in the art prior to the effective filing date of the present application would have combined the disclosures of these references to arrive at the claimed embodiment. Furthermore, there should be some explanation why any differences between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art.

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Although Applicant does not necessarily agree with, or acquiesce to, the rejections, in the interest of advancing prosecution, Applicant has amended independent claim 1 to recite, in relevant part (added features shown):

...the thin film encapsulation layer having a first surface adjacent to the organic light emitting device layer and a second surface facing the first surface and being spaced apart from the organic light emitting device layer;

a buffer layer directly on the second surface of the thin film encapsulation layer....

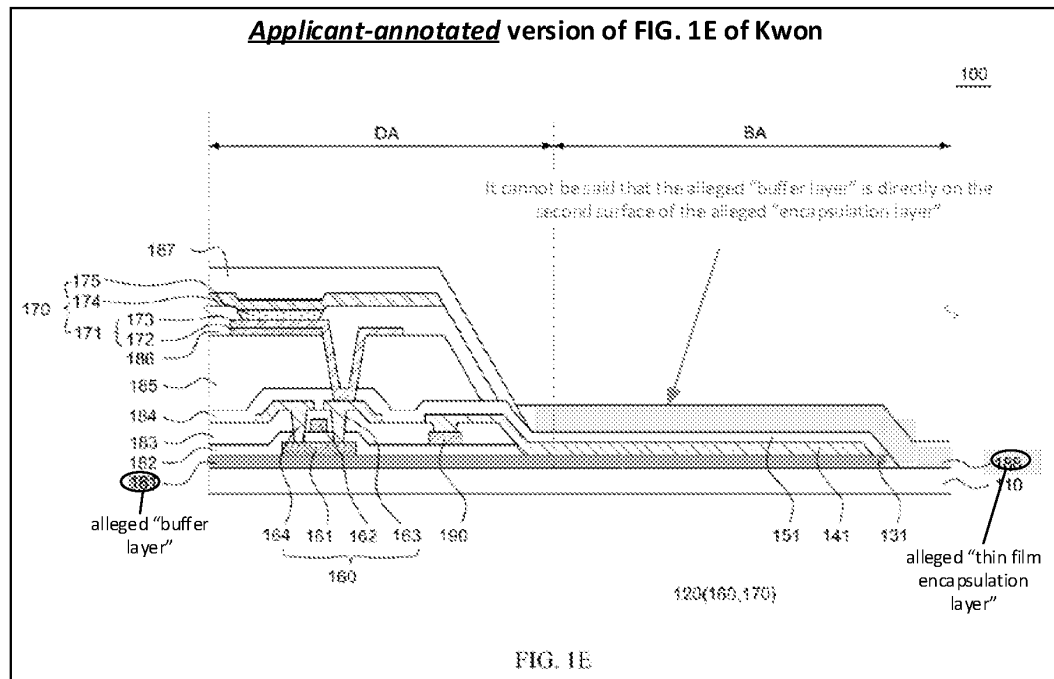
Support for the amendments can be found throughout the application as originally filed (e.g., see paragraph [00105]).

Applicant submits that the cited references do not appear to teach or suggest the positional relationship between each claimed component in the claimed display device (e.g., the stacking order). For example, the cited references do not appear to disclose a display device including a stacking order of “organic light emitting device layer” / “thin film encapsulation layer” / “buffer layer” / “touch sensing unit.”

In particular, in rejecting claim 1, page 3 of the Office action cites FIG. 1E of Kwon (an **Applicant-annotated** version of which being presented below) as allegedly teaching “a buffer layer directly on the thin film encapsulation layer,” as previously recited in claim 1.

However, as can be seen below in the **Applicant-annotated** version of FIG. 1E of Kwon, Kwon does not appear to teach or even suggest, at least (**emphasis** added), “the thin film encapsulation layer having a first surface adjacent to the organic light emitting device layer and a second surface facing the first surface and being spaced apart from the organic light emitting device layer” and “a buffer layer directly on **the second surface** of the thin film encapsulation layer,” as now recited in claim 1.

Accordingly, the proposed combination of Zhu, Kwon, and Ha does not appear to teach or even suggest, at least, the above-recited features of amended claim 1.



Applicant respectfully submits that the remaining cited references do not appear to cure the deficiencies of Zhu, Kwon, and Ha to teach or even suggest the abovementioned features of claim 1. Accordingly, it appears that the references, whether taken alone or in combination, fail to disclose the features now recited in claim 1. Applicant, therefore, respectfully submits that there is no apparent reason why one of ordinary skill in the art prior to the effective filing date of the present application would have combined the disclosures of the cited references to arrive at the claimed embodiment of claim 1, and that this claim would not have been obvious over the art of record to one skilled in the art at the time prior to the effective filing date of the present application. Accordingly, Applicant respectfully requests the rejection of claim 1 be withdrawn and that this claim be allowed.

Furthermore, because claims 2-5 and 14-19 depend, directly or indirectly, from claim 1, they each incorporate all of the terms and features of their base claim, in addition to other features, which together further patentably distinguish these claims over the art

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of record when considered as a whole. Therefore, Applicant requests that the rejections of these claims also be withdrawn, and that these claims be allowed as well.

3. Concluding Remarks

In view of the foregoing amendments and remarks, Applicant earnestly solicits a timely issuance of a Notice of Allowance with claims 1-19. If there are any remaining issues that can be addressed over the telephone, the Examiner is cordially invited to call Applicant's attorney at the number listed below.

Payment of any fee required to enter and process this response is provided. The Director is authorized to charge any underpayment of fees or credit any overpayment of fees to Deposit Account No. 03-1728.

Respectfully submitted,
LEWIS ROCA ROTHGERBER CHRISTIE LLP

By /Kurt S. Prange/
Kurt S. Prange
Reg. No. 75,137
626/795-9900

KSP/dsf



UNITED STATES
PATENT AND TRADEMARK OFFICE

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/742,230

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04/27/2022 05:14:39 PM ET

ATTORNEY DOCKET #
183539/411598-04552

Title of Invention

DISPLAY DEVICE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7917

FILED BY Diana Figueeroa

PATENT CENTER # 60640826

FILING DATE 01/14/2020

CUSTOMER # 23363

FIRST NAMED
INVENTOR Chiwook AN

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY Kurt Prange

Documents

TOTAL DOCUMENTS: 3

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
183539-Amendment-NFOA 2-1-22.pdf	9	-	246 KB
183539-Amendment-NFOA 2-1-22-A....pdf	(1-1) 1	Amendment/Request for Reconsideration-After Non-Final Rejection	106 KB
183539-Amendment-NFOA 2-1-22-CLM.pdf	(2-5) 4	Claims	89 KB
183539-Amendment-NFOA 2-1-22-REM.pdf	(6-9) 4	Applicant Arguments/Remarks Made in an Amendment	237 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
183539-Amendment-NFOA 2-1-22.pdf	1359120402C5A7AF0C592D34DF5DA96F1B94F5CB978DA0C85552419937E66EC7091190B76C73692429771F885EA3BF1B3387C9C42A01442F275F0107543CA09B
183539-Amendment-NFOA 2-1-22-A....pdf	8D8B0EA854D742F19D67EBE97D30CB32559C19FB24DACDF0E5E289D2417F2584E3C55CFDD15E3B374F580B63D7C49428F93E615043331756E16CEBE68CBF1BB1
183539-Amendment-NFOA 2-1-22-CLM.pdf	1BEEE3B9211019A85129353A8DA474C0D59EC5FA03A5D7A7A7D73D4CF4EBC96A677220A77D99706DD7F8473D4A2979ADB6AC3BEEFB0C9A8FE2CCF210A40E41C1
183539-Amendment-NFOA 2-1-22-REM.pdf	ACDBEE05BEB8447F54731AF351F319C2228ADCBA87F18272EDF16D3B7F83A2D1EEEEEF42C9B2D177D39553244ACEFC06E82A0052F0CD0649BAC5451B83FCB7A8

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 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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16742230
	Filing Date	2020-01-14
	First Named Inventor	Chiwook AN
	Art Unit	2625
	Examiner Name	ELAHI, TOWFIQ
	Attorney Docket Number	183539/411598-04552

U.S.PATENTS							Remove	
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1	9367162	B2	2016-06-14	Lee			
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	1	1020140069708	KR	A	2014-06-10	Lee	Corresponds to US Patent No. 9367162 as shown above	
	2	2013246723	JP	A	2013-12-09	Takenobu	English Abstract	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16742230
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	Art Unit	2625	
	Examiner Name	ELAHI, TOWFIQ	
	Attorney Docket Number	183539/411598-04552	

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
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EXAMINER SIGNATURE			
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¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.			

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16742230
	Filing Date		2020-01-14
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	Art Unit	2625	
	Examiner Name	ELAHI, TOWFIQ	
	Attorney Docket Number	183539/411598-04552	

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).			
OR			
That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).			
See attached certification statement.			
☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.			
A certification statement is not submitted herewith.			
SIGNATURE			
A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.			
Signature	/Kurt S. Prange/	Date (YYYY-MM-DD)	2022-05-19
Name/Print	Kurt S. Prange	Registration Number	75137
This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.			

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 the Freedom of Information Act requires disclosure of these records.
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.

	(19) 대한민국특허청(KR) (12) 공개특허공보(A)	(11) 공개번호 10-2014-0069708 (43) 공개일자 2014년06월10일
(51) 국제특허분류(Int. Cl.) H01L 51/52 (2006.01) H05B 33/04 (2006.01) H05B 33/10 (2006.01) G06F 3/041 (2006.01)	(71) 출원인 삼성디스플레이 주식회사 경기도 용인시 기흥구 삼성2로 95 (농서동)	
(21) 출원번호 10-2012-0137334	(72) 발명자 이정열 경기도 용인시 기흥구 삼성2로 95 (농서동)	
(22) 출원일자 2012년11월29일 심사청구일자 2012년11월29일	(74) 대리인 리엔목특허법인	

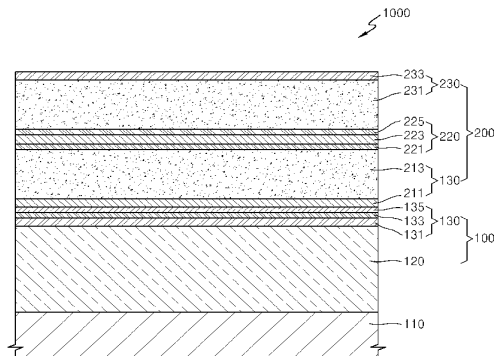
전체 청구항 수 : 총 20 항

(54) 발명의 명칭 유기 발광 표시 장치 및 이의 제조 방법

(57) 요약

터치 구조를 구비하는 박막 봉지층을 포함하는 유기 발광 표시 장치가 제공된다. 상기 유기 발광 표시 장치는 기판, 상기 기판 상의 유기 발광 소자층, 상기 유기 발광 소자층 상에 배치되고, 서로 교대로 적층된 복수의 무기막과 복수의 유기막을 포함하는 박막 봉지층, 및 상기 박막 봉지층 내에 배치되는 터치 감지층을 포함한다. 상기 터치 감지층은 제1 터치 도전막, 상기 제1 터치 도전막 상의 터치 무기막, 및 상기 터치 무기막 상의 제2 터치 도전막을 포함한다. 상기 터치 무기막은 상기 박막 봉지층에 포함되는 상기 복수의 무기막 중 하나의 무기막이다.

도 1



특허청구의 범위

청구항 1

기관;

상기 기관 상의 유기 발광 소자층;

상기 유기 발광 소자층 상에 배치되고, 서로 교대로 적층된 복수의 무기막과 복수의 유기막을 포함하는 박막 봉지층; 및

상기 박막 봉지층 내에 배치되는 터치 감지층을 포함하고,

상기 터치 감지층은 제1 터치 도전막, 상기 제1 터치 도전막 상의 터치 무기막, 및 상기 터치 무기막 상의 제2 터치 도전막을 포함하며,

상기 터치 무기막은 상기 박막 봉지층에 포함되는 상기 복수의 무기막 중 하나의 무기막인 것을 특징으로 하는 유기 발광 표시 장치.

청구항 2

제1 항에 있어서,

상기 유기 발광 소자층은,

상기 기관 상에 배치된 화소 전극;

상기 화소 전극 상에 배치되고, 유기 발광층을 포함하는 중간층; 및

상기 중간층 상에 배치된 대향 전극을 포함하는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 3

제1 항에 있어서,

상기 제1 터치 도전막은,

상기 기관 상에서 제1 방향을 따라 배열되는 복수의 제1 센싱 셀들;

상기 제1 센싱 셀들을 연결하는 복수의 제1 연결 패턴들; 및

상기 기관 상에 제2 방향을 따라 배열되는 복수의 제2 센싱 셀들을 포함하고,

상기 제2 터치 도전막은,

상기 터치 절연층을 관통하여, 상기 제2 센싱 셀들의 일부 영역에 전기적으로 연결되는 콘택 플러그; 및

상기 콘택 플러그를 이용하여 상기 제2 센싱 셀들을 연결하는 제2 연결 패턴들을 포함하는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 4

제3 항에 있어서,

상기 제1 터치 도전막은 투명 도전성 산화물을 포함하는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 5

제1 항에 있어서,

상기 제2 터치 도전막은,

상기 기관 상에서 제1 방향을 따라 배열되는 복수의 제1 센싱 셀들;

상기 제1 센싱 셀들을 연결하는 복수의 제1 연결 패턴들;

상기 기관 상에 제2 방향을 따라 배열되는 복수의 제2 센싱 셀들; 및

상기 터치 절연층을 관통하여, 상기 제2 센싱 셀들의 일부 영역에 전기적으로 연결되는 콘택 플러그를 포함하고,

상기 제1 터치 도전막은 상기 콘택 플러그를 이용하여 상기 제2 센싱 셀들을 연결하는 제2 연결 패턴들을 포함하는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 6

제5 항에 있어서,

상기 제2 터치 도전막은 투명 도전성 산화물을 포함하는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 7

제1 항에 있어서,

상기 박막 봉지층은,

상기 유기 발광 소자층 상의 제1 무기막;

상기 제1 무기막 상의 제1 유기막;

상기 제1 유기막 상의 상기 터치 무기막;

상기 터치 무기막 상의 제2 유기막;

상기 제2 유기막 상의 제2 무기막; 및

상기 터치 무기막과 상기 제1 유기막 또는 상기 제2 유기막 사이에 개재되는 투명 도전성 산화물 층을 포함하는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 8

제7 항에 있어서,

상기 박막 봉지층은,

상기 제1 유기막 상의 제3 무기막; 및

상기 제3 무기막 상의 상기 터치 무기막을 더 포함하는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 9

제1 항에 있어서,

상기 박막 봉지층에 포함되는 복수의 유기막은 상기 터치 무기막 아래의 하부 유기막, 및 상기 터치 무기막 상의 상부 유기막을 포함하며,

상기 제1 터치 도전막은 상기 하부 유기막과 상기 터치 무기막의 배면 사이에 직접 개재되고, 상기 제2 터치 도전막은 상기 터치 무기막의 상면과 상기 상부 유기막 사이에 직접 개재되는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 10

제1 항에 있어서,

상기 기관은 가요성 기관인 것을 특징으로 하는 유기 발광 표시 장치.

청구항 11

제1 항에 있어서,

상기 유기 발광 소자층과 상기 박막 봉지층 사이에 배치된 보호층을 더 포함하는 것을 특징으로 하는 유기 발광

표시 장치.

청구항 12

제1 항에 있어서,

상기 박막 봉지층 상에 배치된 광학 부재를 더 포함하는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 13

기판 상에 화소 전극, 유기 발광층을 포함하는 중간층 및 대향 전극을 순차적으로 형성하는 단계;

상기 대향 전극 상에, 서로 교대로 적층된 복수의 무기막과 복수의 유기막을 포함하는 박막 봉지층을 형성하는 단계;를 포함하며,

상기 박막 봉지층을 형성하는 단계는 상기 복수의 무기막 중 하나의 무기막을 포함하는 터치 감지층을 형성하는 단계를 포함하는 것을 특징으로 하는 유기 발광 표시 장치의 제조 방법.

청구항 14

제13 항에 있어서,

상기 기판 상에 화소 전극, 유기 발광층을 포함하는 중간층 및 대향 전극을 순차적으로 형성하는 단계는,

상기 기판 상에 상기 화소 전극을 형성하는 단계;

상기 화소 전극의 양쪽 가장자리 영역을 덮도록 화소 영역을 정의하는 화소 정의막을 형성하는 단계;

상기 화소 정의막에 의해 정의된 영역에 상기 유기 발광층을 포함하는 중간층을 형성하는 단계; 및

상기 중간층과 상기 화소 정의막을 덮도록 상기 대향 전극을 형성하는 단계;를 포함하는 것을 특징으로 하는 유기 발광 표시 장치의 제조 방법.

청구항 15

제13 항에 있어서,

상기 박막 봉지층을 형성하는 단계는,

상기 대향 전극 상에 제1 무기막을 형성하는 단계;

상기 제1 무기막 상에 제1 유기막을 형성하는 단계;

상기 제1 유기막 상에 상기 터치 감지층을 형성하는 단계;

상기 터치 감지층 상에 제2 유기막을 형성하는 단계; 및

상기 제2 유기막 상에 제2 무기막을 형성하는 단계를 포함하는 것을 특징으로 하는 유기 발광 표시 장치의 제조 방법.

청구항 16

제13 항에 있어서,

상기 터치 감지층을 형성하는 단계는,

제1 터치 도전막을 형성하는 단계;

상기 제1 터치 도전막 상에 터치 무기막을 형성하는 단계; 및

상기 터치 무기막 상에 제2 터치 도전막을 형성하는 단계를 포함하고,

상기 터치 무기막은 상기 박막 봉지층에 포함되는 상기 복수의 무기막 중 하나의 무기막인 것을 특징으로 하는 유기 발광 표시 장치의 제조 방법.

청구항 17

기관;

상기 기관 상의 유기 발광 소자층;

상기 유기 발광 소자층 상에 배치되고, 서로 교대로 적층된 복수의 무기막과 복수의 유기막을 포함하는 박막 봉지층; 및

상기 복수의 무기막 중 하나의 무기막인 터치 무기막을 포함하는 터치 감지층을 포함하는 유기 발광 표시 장치.

청구항 18

제17 항에 있어서,

상기 터치 무기막은 상기 복수의 유기막 중 연속된 2개의 유기막들 사이에 개재되는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 19

제17 항에 있어서,

상기 터치 감지층은 상기 터치 무기막 아래의 제1 터치 도전막, 및 상기 터치 무기막 상의 제2 터치 도전막을 더 포함하는 것을 특징으로 하는 유기 발광 표시 장치.

청구항 20

제19 항에 있어서,

상기 제1 터치 도전막 및 상기 제2 터치 도전막 중 적어도 하나는 투명 도전성 산화물을 포함하고,

상기 박막 봉지층은 상기 투명 도전성 산화물을 포함하는 층을 더 포함하는 것을 특징으로 하는 유기 발광 표시 장치.

명세서

기술분야

[0001] 본 발명은 유기 발광 표시 장치에 관한 것으로서, 더욱 상세하게는 터치 구조를 구비하는 박막 봉지층을 포함하는 유기 발광 표시 장치 및 이의 제조 방법에 관한 것이다.

배경기술

[0002] 유기 발광 표시 장치는 정공 주입 전극과 전자 주입 전극, 및 이들 사이에 개재된 유기 발광층을 포함하는 유기 발광 소자를 구비하며, 상기 정공 주입 전극에서 주입되는 정공과 상기 전자 주입 전극에서 주입되는 전자가 상기 유기 발광층에서 결합하여 생성된 엑시톤(exiton)이 여기 상태(exited state)로부터 기저 상태(ground state)로 떨어지면서 빛을 발생시키는 자발광형 표시 장치이다.

[0003] 자발광형 표시 장치인 유기 발광 표시 장치는 별도의 광원이 불필요하므로 저전압으로 구동이 가능하고 경량의 박형으로 구성할 수 있으며, 넓은 시야각, 높은 콘트라스트(contrast) 및 빠른 응답 속도 등의 고품위 특성으로 인해 차세대 표시 장치로 주목받고 있다.

[0004] 그러나, 유기 발광 표시 장치는 외부의 수분이나 산소 등에 의해 열화되는 특성을 가지므로, 외부의 수분이나 산소 등으로부터 유기 발광 소자를 보호하기 위하여 유기 발광 소자를 밀봉한다.

[0005] 최근, 유기 발광 표시 장치의 박형화 및/또는 플렉서블화를 위하여, 유기 발광 소자를 밀봉하는 수단으로 복수의 무기막들 또는 유기막과 무기막을 포함하는 복수의 층으로 구성된 박막 봉지(TFE; thin film encapsulation)가 이용되고 있다.

[0006] 한편, 터치 패널은 디스플레이에 표시되어 있는 버튼을 손가락으로 접촉하는 것만으로 대화적, 직감적으로 조작함으로써 남녀노소 누구나 쉽게 사용할 수 있는 입력장치이기 때문에, 현재 은행이나 관공서의 발급 장치, 각종 의료장비, 판관 및 주요 기관의 안내, 교통안내 등 많은 분야에서 적용되고 있다.

[0007] 그러나, 터치 패널을 외장형으로 제조한 후, 터치 패널을 유기 발광 표시 장치에 부착하는 방식을 채용하고 있

다. 이 방식을 적용할 경우, 두께가 증가하고, 부착 공정이 추가되고, 이 공정에서 이물이 추가될 수도 있고, 비용이 높아지는 등의 문제가 있다.

발명의 내용

해결하려는 과제

- [0008] 따라서, 본 발명이 해결하고자 하는 과제는 이러한 문제를 해결하기 위한 것으로서, 터치 구조가 형성된 박막 봉지층을 포함하는 유기 발광 표시 장치를 제공하는 것이다.
- [0009] 또한, 본 발명이 해결하고자 하는 과제는 상기 유기 발광 표시 장치를 제조하는 방법을 제공하는 것이다.

과제의 해결 수단

- [0010] 상기 기술적 과제를 달성하기 위한 본 발명의 다양한 실시예들에 따른 유기 발광 표시 장치는 기판, 상기 기판 상의 유기 발광 소자층, 상기 유기 발광 소자층 상에 배치되고, 서로 교대로 적층된 복수의 무기막과 복수의 유기막을 포함하는 박막 봉지층, 및 상기 박막 봉지층 내에 배치되는 터치 감지층을 포함한다. 상기 터치 감지층은 제1 터치 도전막, 상기 제1 터치 도전막 상의 터치 무기막, 및 상기 터치 무기막 상의 제2 터치 도전막을 포함한다. 상기 터치 무기막은 상기 박막 봉지층에 포함되는 상기 복수의 무기막 중 하나의 무기막이다.
- [0011] 상기 유기 발광 표시 장치의 일 예에 따르면, 상기 유기 발광 소자층은 상기 기판 상에 배치된 화소 전극, 상기 화소 전극 상에 배치되고, 유기 발광층을 포함하는 중간층, 및 상기 중간층 상에 배치된 대향 전극을 포함할 수 있다.
- [0012] 상기 유기 발광 표시 장치의 다른 예에 따르면, 상기 제1 터치 도전막은 상기 기판 상에서 제1 방향을 따라 배열되는 복수의 제1 센싱 셀들, 상기 제1 센싱 셀들을 연결하는 복수의 제1 연결 패턴들 및 상기 기판 상에 제2 방향을 따라 배열되는 복수의 제2 센싱 셀들을 포함할 수 있다. 상기 제2 터치 도전막은 상기 터치 절연층을 관통하여, 상기 제2 센싱 셀들의 일부 영역에 전기적으로 연결되는 콘택 플러그, 및 상기 콘택 플러그를 이용하여 상기 제2 센싱 셀들을 연결하는 제2 연결 패턴들을 포함할 수 있다. 이 경우, 상기 제1 터치 도전막은 투명 도전성 산화물을 포함할 수 있다.
- [0013] 상기 유기 발광 표시 장치의 또 다른 예에 따르면, 상기 제2 터치 도전막은 상기 기판 상에서 제1 방향을 따라 배열되는 복수의 제1 센싱 셀들, 상기 제1 센싱 셀들을 연결하는 복수의 제1 연결 패턴들, 상기 기판 상에 제2 방향을 따라 배열되는 복수의 제2 센싱 셀들, 및 상기 터치 절연층을 관통하여, 상기 제2 센싱 셀들의 일부 영역에 전기적으로 연결되는 콘택 플러그를 포함할 수 있다. 상기 제1 터치 도전막은 상기 콘택 플러그를 이용하여 상기 제2 센싱 셀들을 연결하는 제2 연결 패턴들을 포함할 수 있다. 이 경우, 상기 제2 터치 도전막은 투명 도전성 산화물을 포함할 수 있다.
- [0014] 상기 유기 발광 표시 장치의 또 다른 예에 따르면, 상기 박막 봉지층은 상기 유기 발광 소자층 상의 제1 무기막, 상기 제1 무기막 상의 제1 유기막, 상기 제1 유기막 상의 상기 터치 무기막, 상기 터치 무기막 상의 제2 유기막, 상기 제2 유기막 상의 제2 무기막, 및 상기 터치 무기막과 상기 제1 유기막 또는 상기 제2 유기막 사이에 개재되는 투명 도전성 산화물 층을 포함할 수 있다. 또한, 상기 박막 봉지층은 상기 제1 유기막 상의 제3 무기막, 및 상기 제3 무기막 상의 상기 터치 무기막을 더 포함할 수 있다.
- [0015] 상기 유기 발광 표시 장치의 또 다른 예에 따르면, 상기 박막 봉지층에 포함되는 복수의 유기막은 상기 터치 무기막 아래의 하부 유기막, 및 상기 터치 무기막 상의 상부 유기막을 포함할 수 있다. 상기 제1 터치 도전막은 상기 하부 유기막과 상기 터치 무기막의 배면 사이에 직접 개재되고, 상기 제2 터치 도전막은 상기 터치 무기막의 상면과 상기 상부 유기막 사이에 직접 개재될 수 있다.
- [0016] 상기 유기 발광 표시 장치의 또 다른 예에 따르면, 상기 기판은 가요성 기판일 수 있다. 또한, 상기 유기 발광 소자층과 상기 박막 봉지층 사이에 배치된 보호층을 더 포함할 수 있다. 또한, 상기 박막 봉지층 상에 배치된 광학 부재를 더 포함할 수 있다.
- [0017] 상기 기술적 과제를 달성하기 위한 본 발명의 다양한 실시예들에 따른 유기 발광 표시 장치의 제조 방법에 따르면, 기판 상에 화소 전극, 유기 발광층을 포함하는 중간층 및 대향 전극이 순차적으로 형성된다. 상기 대향 전극 상에, 서로 교대로 적층된 복수의 무기막과 복수의 유기막을 포함하는 박막 봉지층이 형성된다. 상기 박막 봉지층이 형성되면서, 상기 복수의 무기막 중 하나의 무기막을 포함하는 터치 감지층이 형성된다.

- [0018] 상기 유기 발광 표시 장치의 제조 방법의 일 예에 따르면, 상기 기판 상에 화소 전극, 유기 발광층을 포함하는 중간층 및 대향 전극을 순차적으로 형성하는 단계는, 상기 기판 상에 상기 화소 전극을 형성하는 단계, 상기 화소 전극의 양쪽 가장자리 영역을 덮도록 화소 영역을 정의하는 화소 정의막을 형성하는 단계, 상기 화소 정의막에 의해 정의된 영역에 상기 유기 발광층을 포함하는 중간층을 형성하는 단계, 및 상기 중간층과 상기 화소 정의막을 덮도록 상기 대향 전극을 형성하는 단계를 포함할 수 있다.
- [0019] 상기 유기 발광 표시 장치의 제조 방법의 다른 예에 따르면, 상기 박막 봉지층을 형성하는 단계는, 상기 대향 전극 상에 제1 무기막을 형성하는 단계, 상기 제1 무기막 상에 제1 유기막을 형성하는 단계, 상기 제1 유기막 상에 상기 터치 감지층을 형성하는 단계, 상기 터치 감지층 상에 제2 유기막을 형성하는 단계, 및 상기 제2 유기막 상에 제2 무기막을 형성하는 단계를 포함할 수 있다.
- [0020] 상기 유기 발광 표시 장치의 제조 방법의 또 다른 예에 따르면, 상기 터치 감지층을 형성하는 단계는, 제1 터치 도전막을 형성하는 단계, 상기 제1 터치 도전막 상에 터치 무기막을 형성하는 단계, 및 상기 터치 무기막 상에 제2 터치 도전막을 형성하는 단계를 포함할 수 있다. 상기 터치 무기막은 상기 박막 봉지층에 포함되는 상기 복수의 무기막 중 하나의 무기막일 수 있다.
- [0021] 상기 기술적 과제를 달성하기 위한 본 발명의 다양한 실시예들에 따른 유기 발광 표시 장치는 기판, 상기 기판 상의 유기 발광 소자층, 상기 유기 발광 소자층 상에 배치되고, 서로 교대로 적층된 복수의 무기막과 복수의 유기막을 포함하는 박막 봉지층, 및 상기 복수의 무기막 중 하나의 무기막인 터치 무기막을 포함하는 터치 감지층을 포함한다.
- [0022] 상기 유기 발광 표시 장치의 일 예에 따르면, 상기 터치 무기막은 상기 복수의 유기막 중 연속된 2개의 유기막들 사이에 개재될 수 있다.
- [0023] 상기 유기 발광 표시 장치의 다른 예에 따르면, 상기 터치 감지층은 상기 터치 무기막 아래의 제1 터치 도전막, 및 상기 터치 무기막 상의 제2 터치 도전막을 더 포함할 수 있다. 상기 제1 터치 도전막 및 상기 제2 터치 도전막 중 적어도 하나는 투명 도전성 산화물을 포함할 수 있다. 상기 박막 봉지층은 상기 투명 도전성 산화물을 포함하는 층을 더 포함할 수 있다.

발명의 효과

- [0024] 본 발명의 유기 발광 표시 장치 및 유기 발광 표시 장치 제조 방법에 따르면, 터치 기능을 포함한 플렉서블 유기 발광 표시 장치를 달성할 수 있다. 뿐만 아니라, 본 발명에 따르면, 전체 두께가 최소화될 수 있고, 부차 공정을 생략하여 제조 수율이 높아질 수 있으며, 제조 비용이 감소될 수 있다.

도면의 간단한 설명

- [0025] 도 1은 본 발명의 일 실시예에 따른 유기 발광 표시 장치를 개략적으로 도시한 단면도이다.
 도 2는 도 1의 유기 발광 표시 장치의 일 화소 영역을 개략적으로 도시한 단면도이다.
 도 3a는 본 발명의 다른 실시예에 따른 유기 발광 표시 장치를 개략적으로 도시한 단면도이다.
 도 3b는 본 발명의 또 다른 실시예에 따른 유기 발광 표시 장치를 개략적으로 도시한 단면도이다.
 도 4a는 본 발명의 일 실시예에 따라 박막 봉지층 내에 배치되는 터치 감지층의 개략적인 평면도이다.
 도 4b는 도 4a의 IV-IV선을 따라 절취한 단면도이다.
 도 4c는 본 발명의 일 실시예에 따라 박막 봉지층 내에 배치되는 터치 감지층을 형성하는 방법을 설명하기 위한 단면도들이다.
 도 5a는 본 발명의 다른 실시예에 따라 박막 봉지층 내에 배치되는 터치 감지층의 개략적인 평면도이다.
 도 5b는 도 5a의 V-V 선을 따라 절취한 단면도이다.
 도 5c는 본 발명의 일 실시예에 따라 박막 봉지층 내에 배치되는 터치 감지층을 형성하는 방법을 설명하기 위한 단면도들이다.

발명을 실시하기 위한 구체적인 내용

- [0026] 이하, 첨부된 도면을 참조하여 본 발명의 다양한 실시예들을 상세히 설명한다. 본 발명의 실시예들은 본 기술 분야에서 통상의 지식을 가진 자에게 본 발명을 더욱 완전하게 설명하기 위하여 제공되는 것이다. 아래에 제시되는 실시예들은 여러 다른 형태로 변형될 수 있고, 본 발명의 범위가 아래의 실시예들로 한정되는 것은 아니며, 본 발명의 사상 및 기술 범위에 포함되는 모든 변경, 균등물 내지 대체물을 포함하는 것으로 이해되어야 한다.
- [0027] 첨부된 도면들을 설명하면서 유사한 구성요소에 대해 유사한 참조 부호를 사용한다. 첨부된 도면에 있어서, 구조물들의 치수는 본 발명의 명확한 이해를 돕기 위하여 실제보다 확대하거나 축소하여 도시될 수 있다.
- [0028] 본 명세서에서 사용된 용어는 오로지 특정한 실시예를 설명하기 위해 사용된 것이며, 본 발명을 한정하려는 의도로 사용된 것이 아니다. 단수의 표현은 문맥상 명백히 다른 경우를 제외하고는 복수의 표현을 포함한다. 본 명세서에서, "포함하다" 또는 "가지다" 등의 용어는 나열된 특징들의 존재를 특징하는 것이지, 하나 이상의 다른 특징들의 존재 또는 부가 가능성을 미리 배제하지 않는 것으로 이해되어야 한다. 본 명세서에서, 용어 "및/또는"은 열거된 특징들 중 어느 하나 및 하나 이상의 모든 조합들을 포함하기 위해 사용된다. 본 명세서에서, "제1", "제2" 등의 용어가 다양한 특징들을 설명하기 위하여 하나의 특징을 다른 특징과 구별하기 위한 의도로만 사용되며, 이러한 특징들은 이들 용어에 의해 한정되지 않는다. 아래의 설명에서 제1 특징이 제2 특징과 연결, 결합 또는 접속된다고 기재되는 경우, 이는 제1 특징과 제2 특징 사이에 제3 특징이 개재될 수 있다는 것을 배제하지 않는다. 또한, 제1 요소가 제2 요소 상에 배치된다고 기재될 때, 제3 요소가 제1 요소와 제2 요소 사이에 개재되는 것을 배제하지 않는다. 다만, 제1 요소가 제2 요소 상에 직접 배치된다고 기재될 때에는, 제3 요소가 제1 요소와 제2 요소 사이에 개재되는 것을 배제한다.
- [0029] 다르게 정의되지 않는 한, 기술적이거나 과학적인 용어를 포함해서 여기서 사용되는 모든 용어들은 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자에 의해 일반적으로 이해되는 것과 동일한 의미를 갖는다. 일반적으로 사용되는 사전에 정의되어 있는 것과 같은 용어들은 관련 기술의 문맥상 가지는 의미와 일치하는 의미를 가지는 것으로 해석되어야 하며, 본 출원에서 명백하게 정의하지 않는 한, 이상적이거나 과도하게 형식적인 의미로 해석되지 않는다.
- [0030] 도 1은 본 발명의 일 실시예에 따른 유기 발광 표시 장치(1000)를 개략적으로 도시한 단면도이다. 도 2는 도 1의 유기 발광 표시 장치(1000)의 일 화소 영역을 개략적으로 도시한 단면도이다.
- [0031] 도 1 및 도 2를 참조하면, 일 실시예에 관한 유기 발광 표시 장치(1000)는 기판(110), 기판(110) 상의 표시부(100), 및 표시부(100) 상의 박막 봉지층(200)을 포함한다. 표시부(100)는 유기 발광 소자층(130)을 포함한다. 박막 봉지층(200)은 서로 교대로 적층된 복수의 무기막들(211, 223, 233) 및 복수의 유기막들(213, 231)을 포함한다. 박막 봉지층(200)은 터치 감지층(220)을 포함할 수 있다. 터치 감지층(220)은 제2 무기막(233), 및 제2 무기막(233)의 아래와 위에 각각 배치되는 제1 터치 도전막(221) 및 제2 터치 도전막(225)을 포함할 수 있다. 터치 감지층(220)에 포함되는 제2 무기막(233)은 아래의 설명에서 터치 무기막(233)으로 지칭될 수도 있다. 터치 감지층(220)은 사람의 손가락 또는 터치용 물체가 유기 발광 표시 장치(1000)를 직접 접촉한 접촉 위치를 감지하기 위해, 접촉 위치를 전기적 신호로 변환할 수 있다. 예컨대, 터치 감지층(220)은 정전용량 방식의 터치 구조를 포함할 수 있다.
- [0032] 기판(110)은 가요성 기판일 수 있다. 기판(110)은 폴리이미드(PI; polyimide), 폴리에틸렌 테레프탈레이트(PET; polyethylene terephthalate), 폴리에틸렌 나프탈레이트(PEN; polyethylene naphthalate), 폴리카보네이트(PC; polycarbonate), 폴리아릴레이트(PAR; polyarylate), 폴리에테르이미드(PEI; polyetherimide), 및 폴리에테르술폰(PES; polyethersulphonate) 등과 같이 내열성 및 내구성이 우수한 플라스틱을 소재로 만들어 질 수 있다. 그러나 본 발명은 이에 한정되지 않으며, 금속 포일이나 박막 유리(thin glass)와 같은 가요성 있는 다양한 소재가 사용될 수 있다. 한편, 기판(110)은 리지드 기판일 수도 있으며, 이때 기판(110)은 SiO₂를 주성분으로 하는 유리 재질로 이루어질 수도 있다.
- [0033] 화상이 기판(110)방향으로 구현되는 배면 발광형(bottom emission type)인 경우에 기판(110)은 투명한 재질로 형성해야 한다. 그러나, 화상이 기판(110)의 반대 방향으로 구현되는 전면 발광형(top emission type)인 경우에 기판(110)은 반드시 투명한 재질로 형성할 필요는 없다. 이 경우 금속으로 기판(110)을 형성할 수 있다. 금속으로 기판(110)을 형성할 경우 기판(110)은 탄소, 철, 크롬, 망간, 니켈, 티타늄, 몰리브덴, 및 스테인레스 스틸(SUS)으로 이루어진 군으로부터 선택된 하나 이상을 포함할 수 있으나, 이에 한정되는 것은 아니다.

- [0034] 기판(110)의 상면에는 표시부(100)가 배치될 수 있다. 본 명세서에서 언급되는 표시부(100)라는 용어는 유기 발광 소자(OLED) 및 이를 구동하기 위한 박막 트랜지스터(TFT) 어레이를 통칭하는 것으로, 화상을 표시하는 부분과 화상을 표시하기 위한 구동부분을 함께 의미하는 것이다.
- [0035] 표시부(100)는 평면상에서 불 때 복수의 화소들이 매트릭스 형태로 배열된다. 각 화소는 유기 발광 소자(OLED) 및 유기 발광 소자(OLED)와 전기적으로 연결된 전자 소자를 포함한다. 전자 소자는 구동 박막 트랜지스터와 스위칭 박막 트랜지스터를 포함하는 적어도 두 개의 박막 트랜지스터(TFT), 및 스토리지 커패시터 등을 포함할 수 있다. 전자 소자는 배선들과 전기적으로 연결되어 표시부(100) 외부의 구동부로부터 전기적인 신호를 전달받아 구동한다. 이렇게 유기 발광 소자(OLED)와 전기적으로 연결된 전자 소자 및 배선들의 배열을 박막 트랜지스터(TFT) 어레이라 지칭한다.
- [0036] 표시부(100)는 박막 트랜지스터(TFT) 어레이를 포함하는 소자/배선층(120), 및 유기 발광 소자(OLED) 어레이를 포함하는 유기 발광 소자층(130)을 포함한다.
- [0037] 소자/배선층(120)에는 유기 발광 소자(OLED)를 구동시키는 구동 박막 트랜지스터(TFT), 스위칭 박막 트랜지스터(미 도시), 커패시터(미 도시), 상기 박막 트랜지스터들 또는 상기 커패시터에 연결되는 배선들(미 도시)이 포함될 수 있다. 도 2에는 유기 발광 소자(OLED)와 유기 발광 소자(OLED)를 구동하는 구동 박막 트랜지스터(TFT)만 도시되어 있는데, 이는 설명의 편의를 위한 것일 뿐, 본 발명은 도시된 바에 한정되지 않으며, 다수의 박막 트랜지스터(TFT), 스토리지 커패시터 및 각종 배선들이 더 포함될 수 있다는 것은 본 기술분야의 당업자들에게 자명하다.
- [0038] 기판(110)의 상면에는 평활성을 주고 불순물의 침투를 차단하기 위하여 버퍼층(127)이 배치될 수 있다. 버퍼층(127)은 실리콘 산화물, 실리콘 질화물, 및/또는 실리콘 산질화물 등을 포함할 수 있으며, PECVD(plasma enhanced chemical vapor deosition)법, APCVD(atmospheric pressure CVD)법, LPCVD(low pressure CVD)법 등과 같은 다양한 증착 방법에 의해 증착될 수 있다. 버퍼층(127)은 생략될 수도 있다.
- [0039] 버퍼층(127) 상부의 소정 영역에는 활성층(121)이 배치될 수 있다. 활성층(121)은 실리콘(silicon), 산화물 반도체 등과 같은 무기 반도체 또는 유기 반도체 등을 버퍼층(127) 상의 기판(110) 전면에 형성한 후 포토리소그래피 공정 및 식각 공정을 이용하여 패터닝함으로써, 형성될 수 있다.
- [0040] 실리콘 물질로 활성층(121)을 형성하는 경우, 비정질 실리콘층을 기판(110) 전면에 형성한 후, 이를 결정화하여 다결정 실리콘층을 형성하고, 이를 패터닝한 후 주변 영역들에 불순물을 도핑하여 소스 영역, 드레인 영역 및 그 사이의 채널 영역을 포함하는 활성층(121)이 형성될 수 있다.
- [0041] 이렇게 형성된 활성층(121) 상에, 예컨대, 실리콘 산화물, 실리콘 질화물, 및/또는 실리콘 산질화물과 같은 절연 물질을 포함하는 게이트 절연막(129a)이 배치될 수 있다. 게이트 절연막(129a) 상부의 소정 영역에는 게이트 전극(123)이 배치될 수 있다. 게이트 전극(123)은 박막 트랜지스터(TFT)를 제어하기 위한 제어 신호가 인가되는 게이트 라인(미 도시)과 연결될 수 있다.
- [0042] 게이트 전극(123)의 상부에는 층간 절연막(129b)이 배치될 수 있다. 층간 절연막(129b)은 활성층(121)의 소스 영역과 드레인 영역을 노출하는 콘택 홀을 포함하며, 소스 전극(125a) 및 드레인 전극(125b)은 각각 층간 절연막(129b)의 콘택 홀을 통해 활성층(121)의 소스 영역 및 드레인 영역에 전기적으로 연결될 수 있다. 이렇게 형성된 박막 트랜지스터(TFT)는 패시베이션막(129c)으로 덮여 보호될 수 있다.
- [0043] 패시베이션막(129c)은 무기 절연막 및/또는 유기 절연막을 포함할 수 있다. 패시베이션막(129c)에 사용될 수 있는 무기 절연막의 예는 실리콘 산화물(SiO_2), 실리콘 질화물(SiN_x), 실리콘 산질화물(SiON), 알루미늄 산화물(Al_2O_3), 티타늄 산화물(TiO_2), 탄탈륨 산화물(Ta_2O_5), hafnium 산화물(HfO_2), 지르코늄 산화물(ZrO_2), BST(Barium Strontium Titanate), PZT(Lead Zirconate-Titanate) 등을 포함할 수 있다. 또한, 패시베이션막(129c)에 사용될 수 있는 유기 절연막의 예들은 일반 범용고분자(PMMA, PS), 페놀계 그룹을 갖는 고분자 유도체, 아크릴계 고분자, 이미드계 고분자, 아릴에테르계 고분자, 아마이드계 고분자, 불소계고분자, p-자일렌계 고분자, 비닐알콜계 고분자 및 이들의 블렌드 등을 포함할 수 있다. 한편, 패시베이션막(129c)은 무기 절연막과 유기 절연막의 복합 적층 구조를 가질 수도 있다.
- [0044] 패시베이션막(129c) 상부의 발광 영역에는 유기 발광 소자(OLED)가 배치될 수 있다.
- [0045] 유기 발광 소자층(130)은 패시베이션막(129c) 상에 형성된 화소 전극(131), 이에 대향하도록 배치되는 대향 전

극(135) 및 이들 사이에 개재되는 중간층(133)을 포함할 수 있다.

- [0046] 화소 전극(131)과 대향 전극(135) 사이에 전압이 인가되면, 중간층(133)은 빛을 방출할 수 있다. 중간층(133)은 청색광, 녹색광, 적색광, 또는 백색광을 방출할 수 있다.
- [0047] 중간층(133)이 백색광을 방출할 경우, 컬러 이미지를 표현하기 위해, 유기 발광 표시 장치는 청색, 녹색, 및 적색 컬러 필터를 더 포함할 수 있다.
- [0048] 유기 발광 표시 장치는 발광 방향에 따라 배면 발광 타입(bottom emission type), 전면 발광 타입(top emission type) 및 양면 발광 타입(dual emission type) 등으로 구별될 수 있다. 배면 발광 타입의 유기 발광 표시 장치에서는 화소 전극(131)이 광투과 전극으로 구비되고 대향 전극(135)은 반사 전극으로 구비된다. 전면 발광 타입의 유기 발광 표시 장치에서는 화소 전극(131)이 반사 전극으로 구비되고 대향 전극(135)이 반투과 전극으로 구비된다. 본 발명에서는 유기 발광 소자(OLED)가 박막 봉지층(200)의 방향으로 발광하는 전면 발광 타입을 기준으로 설명한다.
- [0049] 화소 전극(131)은 반사 전극일 수 있다. 화소 전극(131)은 반사층과 일함수가 높은 투명 또는 반투명 전극층의 적층 구조를 포함할 수 있다. 반사층은 Ag, Mg, Al, Pt, Pd, Au, Ni, Nd, Ir, Cr, 또는 이들의 합금을 포함할 수 있다. 투명 또는 반투명 전극층은 인듐 주석 산화물(ITO; indium tin oxide), 인듐 아연 산화물(IZO; indium zinc oxide), 아연 산화물(ZnO; zinc oxide), 인듐 산화물(In₂O₃; indium oxide), 인듐 갈륨 산화물(IGO; indium gallium oxide) 및 알루미늄 아연 산화물(AZO; aluminum zinc oxide) 등과 같은 투명 도전성 산화물 물질들 중에서 선택된 적어도 하나의 물질을 포함할 수 있다. 화소 전극(131)은 각 화소에 대응하는 아일랜드 형태로 패터닝되어 형성될 수 있다. 또한, 화소 전극(131)은 애노드(anode) 전극으로 기능할 수 있다.
- [0050] 한편, 화소 전극(131) 상에는 화소 전극(131)의 가장자리를 덮고 화소 전극(131)의 중앙부를 노출하는 소정의 개구부를 포함하는 화소 정의막(140)이 배치될 수 있다. 상기 개구부에 의해 한정되는 영역 상에 빛을 발광하는 유기 발광층을 포함하는 중간층(133)이 배치될 수 있다. 중간층(133)이 배치된 영역은 발광 영역으로 정의될 수 있다. 한편, 화소 정의막(140)의 상기 개구분 내에 발광 영역을 형성하는 경우, 발광 영역들의 사이에는 화소 정의막(140)에 의해 돌출된 영역이 배치되며, 이 돌출된 영역에는 유기 발광층이 형성되지 않으므로 비발광 영역으로 정의될 수 있다.
- [0051] 대향 전극(135)은 투과형 전극으로 형성될 수 있다. 대향 전극(135)은 일함수가 작은 Li, Ca, LiF/Ca, LiF/Al, Al, Mg, Ag 등과 같은 금속을 얇게 형성한 반투과막 일 수 있다. 얇은 금속 반투과막의 고저항 문제를 보완하기 위해, 금속 반투과막 상에 투명 도전성 산화물로 이루어진 투명 도전막이 적층될 수 있다. 대향 전극(135)은 공통 전극의 형태로 기판(110) 전면에 걸쳐 형성될 수 있다. 또한, 이와 같은 대향 전극(135)은 캐소드(cathode) 전극으로 기능할 수 있다.
- [0052] 상기와 같은 화소 전극(131)과 대향 전극(135)은 그 극성이 서로 반대가 될 수도 있다.
- [0053] 중간층(133)은 빛을 발광하는 유기 발광층을 포함하며, 유기 발광층은 저분자 유기물 또는 고분자 유기물을 사용할 수 있다. 유기 발광층이 저분자 유기물로 형성된 저분자 유기층인 경우에는 유기 발광층을 중심으로 화소 전극(131)의 방향으로 홀 수송층(hole transport layer: HTL) 및 홀 주입층(hole injection layer: HIL) 등이 배치되고, 대향 전극(135)의 방향으로 전자 수송층(electron transport layer: ETL) 및 전자 주입층(electron injection layer: EIL) 등이 배치될 수 있다. 물론, 이들 홀 주입층, 홀 수송층, 전자 수송층, 전자 주입층 외에 다른 기능 층들이 적층될 수도 있다.
- [0054] 한편, 유기 발광층이 고분자 유기물로 형성된 고분자 유기층의 경우에는 유기 발광층을 중심으로 화소 전극(131)의 방향으로 홀 수송층만이 구비될 수 있다. 고분자 홀 수송층은 폴리에틸렌 디히드록시 티오펜(PEDOT: poly-(2,4)-ethylene-dihydroxy thiophene)이나, 폴리아닐린(PANI: polyaniline) 등을 사용하여 잉크젯 프린팅이나 스핀 코팅의 방법에 의해 화소 전극(131) 상부에 형성될 수 있다.
- [0055] 본 실시예에서는, 유기 발광 소자층(130)이 구동 박막트랜지스터(TFT)가 배치된 소자/배선층(120) 상에 배치된 구조에 관하여 기재하고 있으나, 본 발명은 이에 한정되지 않으며, 유기 발광 소자(OLED)의 화소 전극(131)이 박막트랜지스터(TFT)의 활성층(121)과 동일층에 형성된 구조, 또는 화소 전극(131)이 박막트랜지스터(TFT)의 게이트 전극(123)과 동일층에 형성된 구조, 또는 화소 전극(131)이 소스 전극 및 드레인 전극(125a, 125b)과 동일층에 형성된 구조 등 다양한 형태로 변형이 가능하다.
- [0056] 또한, 본 실시예에서 구동 박막트랜지스터(TFT)는 게이트 전극(123)이 활성층(121) 상에 배치되지만, 본 발명은

이에 제한되지 않으며 게이트 전극(123)이 활성층(121)의 하부에 배치될 수도 있다.

- [0057] 이러한 표시부(100)를 덮도록 기판(110) 상에는 박막 봉지층(200)이 배치될 수 있다. 표시부(100)에 포함된 유기 발광 소자(OLED)는 유기물로 구성되어 외부의 수분이나 산소에 의해 쉽게 열화될 수 있다. 따라서 이러한 표시부(100)를 보호하기 위해 표시부(100)를 밀봉해야 한다. 박막 봉지층(200)은 표시부(100)를 밀봉하는 수단으로 복수의 무기막들 및 복수의 유기막들을 교대로 적층한 구조를 가질 수 있다.
- [0058] 본 실시예의 유기 발광 표시 장치(1000)에서, 기판(110)을 가요성 기판으로 구성하고, 봉지 수단으로 박막 봉지층(200)을 이용함으로써, 유기 발광 표시 장치(1000)의 가요성 및 박형화를 용이하게 구현할 수 있다.
- [0059] 이와 같이 표시부(100)를 밀봉 기판이 아닌 박막 봉지층(200)으로 밀봉함으로써 유기 발광 표시 장치(1000)의 박형화 및 플렉시블화가 가능하게 된다.
- [0060] 박막 봉지층(200)은 복수의 무기막들(211, 223, 233), 및 복수의 유기막들(213, 231)을 포함할 수 있다. 무기막들(211, 223, 233)과 유기막들(213, 231)은 서로 교대로 적층될 수 있다.
- [0061] 무기막들(211, 223, 233)은 금속 산화물, 금속 질화물, 금속 탄화물 또는 이들의 조합으로 이루어질 수 있다. 예컨대, 무기막들(211, 223, 233)은 알루미늄 산화물, 실리콘 산화물 또는 실리콘 질화물로 이루어질 수 있다. 다른 예에 따르면, 무기막들(211, 223, 233)은 복수의 무기 절연층들의 적층 구조를 포함할 수 있다. 무기막들(211, 223, 233)은 외부의 수분 및/또는 산소 등이 유기 발광 소자층(130)에 침투하는 것을 억제하는 기능을 수행할 수 있다.
- [0062] 유기막들(213, 231)은 고분자 유기 화합물일 수 있다. 예컨대, 유기막들(213, 231)은 에폭시, 아크릴레이트 또는 우레탄아크릴레이트 중 어느 하나를 포함할 수 있다. 유기막들(213, 231)은 무기막들(211, 223, 233)의 내부 스트레스를 완화하거나, 무기막들(211, 223, 233)의 결함을 보완하고 평탄화하는 기능을 수행할 수 있다.
- [0063] 본 발명의 일 실시예에 의하면, 박막 봉지층(200) 사이에 개재되는 제1 터치 도전막(221) 및 제2 터치 도전막(225)을 포함하며, 제1 터치 도전막(221), 제2 무기막(223) 및 제2 터치 도전막(225)은 터치 감지층(220)을 구성할 수 있다.
- [0064] 본 발명의 일 실시예에 따른 터치 감지층(220)은 제1 방향으로 연장되는 제1 센싱 패턴들과 제2 방향으로 연장되는 제2 센싱 패턴들을 포함할 수 있다. 제1 방향과 제2 방향은 서로 직교하는 방향일 수 있으며, 제1 센싱 패턴들과 제2 센싱 패턴들은 서로 절연되면서 직교할 수 있다. 사람의 손이나 터치용 물체가 터치 감지층(220) 상의 박막 봉지층(200)을 접촉하면, 제1 센싱 패턴들과 제2 센싱 패턴들 사이에 정전용량이 변화가 발생한다. 정전용량의 변화가 발생한 제1 센싱 패턴들과 제2 센싱 패턴들을 감지함으로써, 접촉 위치가 결정될 수 있다.
- [0065] 일 예에 따르면, 제1 센싱 패턴들은 제1 터치 도전막(221)에 형성될 수 있고, 제2 센싱 패턴들은 제2 터치 도전막(225)에 형성될 수 있다. 제2 무기막(223)은 제1 터치 도전막(221)과 제2 터치 도전막(225) 사이에 개재될 수 있다. 이 경우, 제1 터치 도전막(221) 및 제2 터치 도전막(225)은 투명 도전성 산화물로 이루어질 수 있다. 투명 도전성 산화물의 예들은 인듐 주석 산화물(ITO; indium tin oxide), 인듐 아연 산화물(IZO; indium zinc oxide), 아연 산화물(ZnO; zinc oxide), 인듐 산화물(In₂O₃; indium oxide), 인듐 갈륨 산화물(IGO; indium gallium oxide) 및 알루미늄 아연 산화물(AZO; aluminum zinc oxide)을 포함할 수 있다.
- [0066] 다른 예에 따르면, 제1 센싱 패턴은 제1 센싱 셀들과 이를 연결하는 제1 연결 패턴들을 포함할 수 있고, 제2 센싱 패턴은 제2 센싱 셀들과 이를 연결하는 제2 연결 패턴들을 포함할 수 있다. 제1 센싱 셀들과 제2 센싱 셀들은 제1 터치 도전막(221)에 형성될 수 있다. 또한, 제1 연결 패턴들은 제1 터치 도전막(221)에 형성되고, 제2 연결 패턴은 제2 터치 도전막(225)에 형성될 수 있다. 이 경우, 제1 터치 도전막(221)은 투명 도전성 산화물로 이루어질 수 있다. 제2 터치 도전막(225)은 저저항 금속 물질로 이루어질 수 있다. 이에 대해서는 도 4a 내지 도 4c를 참조로 아래에서 자세히 설명한다.
- [0067] 또 다른 예에 따르면, 제1 센싱 패턴은 제1 센싱 셀들과 이를 연결하는 제1 연결 패턴들을 포함할 수 있고, 제2 센싱 패턴은 제2 센싱 셀들과 이를 연결하는 제2 연결 패턴들을 포함할 수 있다. 제1 센싱 셀들과 제2 센싱 셀들은 제2 터치 도전막(225)에 형성될 수 있다. 또한, 제1 연결 패턴들은 제2 터치 도전막(225)에 형성되고, 제2 연결 패턴은 제1 터치 도전막(221)에 형성될 수 있다. 이 경우, 제2 터치 도전막(225)은 투명 도전성 산화물로 이루어질 수 있다. 제1 터치 도전막(221)은 저저항 금속 물질로 이루어질 수 있다. 이에 대해서는 도 5a 내지 도 5c를 참조로 아래에서 자세히 설명한다.

- [0068] 본 발명에 따르면, 박막 봉지층(200)은 무기막들(211, 223, 233)과 유기막들(213, 231)뿐만 아니라, 투명 도전성 산화물로 이루어질 수 있는 제1 터치 도전막(221) 및/또는 제2 터치 도전막(225)을 포함한다. 따라서, 유기 발광 표시 장치(1000)는 기구적으로 더욱 견고한 구조를 가질 수 있으며, 투습 방지 성능 및 밀봉 성능이 더욱 개선될 수 있다. 뿐만 아니라, 박막 봉지층(200)을 구성하는 복수의 무기막들(211, 223, 233) 중 하나의 무기막(223)을 터치 감지층(220)으로 이용함으로써, 제조 공정을 단순화할 수 있다. 또한, 터치 패널을 사용하지 않고, 박막 봉지층(200) 내의 터치 감지층(220)을 이용하여 터치 기능을 구현할 수 있기 때문에, 더욱 얇게 유기 발광 표시 장치(1000)를 제조할 수 있을 뿐만 아니라, 가요성을 유지할 수 있다.
- [0069] 도 3a는 본 발명의 다른 실시예에 따른 유기 발광 표시 장치(2000)를 개략적으로 도시한 단면도이다.
- [0070] 도 1 및 도 2에 도시된 유기 발광 표시 장치(1000)와 다른 차이점을 중심으로 다양한 실시예들에 따른 유기 발광 표시 장치들을 설명한다.
- [0071] 도 3a를 참조하면, 박막 봉지층(200a)이 무기막(215)과 유기막(217)을 더 포함한다는 점을 제외한 유기 발광 표시 장치(2000)의 다른 구성은 도 1 및 도 2에 도시된 유기 발광 표시 장치(1000)와 동일하다.
- [0072] 표시부(100)와 터치 감지층(220) 사이에 2개의 무기막(211, 215)과 2개의 유기막(213, 217)이 교대로 적층될 수 있다. 본 실시예에서는 2개의 무기막(211, 215)과 2개의 유기막(213, 217)이 터치 감지층(220) 아래에 적층되는 것으로 도시되지만, 이는 예시적이며, 더 많은 개수의 무기막과 유기막이 표시부(100)와 터치 감지층(220) 사이에 적층될 수 있다.
- [0073] 뿐만 아니라, 터치 감지층(220) 상에 하나의 유기막(231)과 하나의 무기막(233)이 적층되는 것으로 도시되어 있지만, 이는 예시적이다. 더 많은 개수의 무기막과 유기막이 터치 감지층(220) 상에 적층될 수 있다.
- [0074] 뿐만 아니라, 무기막들(211, 215, 223, 233)과 유기막들(213, 217, 231)의 적층 순서도 달라질 수 있다. 본 실시예에서는 표시부(100) 상에 무기막(211)이 적층된 것으로 도시되어 있지만, 이는 예시적이며, 표시부(100) 상에 유기막(213)이 먼저 적층될 수도 있다. 또한, 박막 봉지층(200a)의 최상위층이 무기막(233)인 것으로 도시되어 있지만, 이는 예시적이며, 유기막(231)이 최상위층일 수도 있다.
- [0075] 또한, 터치 감지층(220)이 유기막(217) 상에 직접 배치되는 것으로 도시되어 있지만, 이는 예시적이며, 터치 감지층(220)이 무기막(215) 상에 직접 배치되거나, 터치 감지층(220)과 유기막(217) 사이에 다른 무기막이 개재될 수도 있다.
- [0076] 또한, 터치 감지층(220) 상에 유기막(231)이 직접 배치되는 것으로 도시되어 있지만, 이는 예시적이며, 터치 감지층(220) 상에 무기막(233)이 직접 배치되거나, 터치 감지층(220)과 유기막(231) 사이에 다른 무기막이 개재될 수도 있다.
- [0077] 도 3b는 본 발명의 다른 실시예에 따른 유기 발광 표시 장치(3000)를 개략적으로 도시한 단면도이다.
- [0078] 도 3b를 참조하면, 표시부(100)와 박막 봉지층(200) 사이에 보호층(150)이 배치되고, 박막 봉지층(200) 상에 광학 부재(240)가 배치된다는 점을 제외한 유기 발광 표시 장치(3000)의 다른 구성은 도 1 및 도 2의 실시예에 관한 유기 발광 표시 장치(1000)와 동일하다.
- [0079] 보호층(150)은 캡핑층(151) 및 차단층(152)을 포함할 수 있다. 캡핑층(151)은 a-NPD, NPB, TPD, m-MTDATA, Alq3 또는 CuPc 등의 유기물로 형성될 수 있다. 캡핑층(151)은 유기 발광 소자층(130)을 보호하는 기능 이외에 유기 발광 소자층(130)로부터 발생한 광이 효율적으로 방출될 수 있도록 도와주는 역할을 한다.
- [0080] 차단층(152)은 LiF, MgF₂ 또는 CaF₂ 등의 무기물로 형성될 수 있다. 차단층(152)은 박막 봉지층(200)을 형성하는 과정에서 사용되는 플라즈마가 유기 발광 소자층(130)에 침투하여 중간층(133) 및 대향 전극(135)에 손상을 일으키지 않도록 플라즈마를 차단하는 역할을 한다.
- [0081] 박막 봉지층(200) 상에는 광학 부재(240)가 배치될 수 있다. 광학 부재(240)는 위상 지연판(241)과 편광판(242)을 포함할 수 있다. 위상 지연판(241)은 1/4 파장판($\lambda/4$ plate)일 수 있다.
- [0082] 본 실시예에 따른 유기 발광 표시 장치(3000)의 광학 부재(240)는 외광 반사를 억제하여, 유기 발광 표시 장치

(3000)의 시인성과 콘트라스트를 향상시키는 역할을 할 수 있다.

- [0083] 도 4a는 본 발명의 일 실시예에 따라 박막 봉지층 내에 배치되는 터치 감지층의 개략적인 평면도이고, 도 4b는 도 4a의 IV-IV선을 따라 절취한 단면도이다.
- [0084] 도 4a 및 도 4b를 참조하면, 본 발명의 일 실시예에 따라 박막 봉지층(200) 내에 배치되는 터치 감지층(220a)은 제1 센싱 패턴들(41) 및 제2 센싱 패턴들(42)을 포함한다.
- [0085] 제1 센싱 패턴들(41)은 제1 방향(예컨대, X 방향)으로 연장될 수 있다. 제1 센싱 패턴들(41)은 제1 방향과 교차되는 제2 방향(예컨대, Y 방향)을 따라 복수로 배열된다. 제1 센싱 패턴(41)은 제1 방향을 따라 소정 간격으로 이격된 복수개의 제1 센싱 셀들(41c), 및 제1 센싱 셀들(41c)을 연결하는 제1 연결 패턴들(41br)을 포함할 수 있다. 제1 연결 패턴들(41br)은 제1 센싱 셀들(41c)과 다른 층에 배치될 수 있으며, 제1 연결 패턴들(41br)은 제2 무기막(223)을 관통하는 콘택 플러그(41p)를 이용하여 브릿지 형태로 제1 센싱 셀들(41c)을 전기적으로 연결할 수 있다.
- [0086] 제2 센싱 패턴들(42)은 제2 방향으로 연장될 수 있다. 제2 센싱 패턴들(42)은 제1 방향을 따라 복수로 배열된다. 제2 센싱 패턴(42)은 제2 방향을 따라 소정 간격을 이격된 복수개의 제2 센싱 셀들(42c), 및 제2 센싱 셀들(42c)을 연결하는 제2 연결 패턴들(42br)을 포함할 수 있다. 제2 센싱 셀들(42c)은 상기 제1 센싱 셀들(41c)과 중첩되지 않도록 상기 제1 센싱 셀들(41c) 사이에 분산하여 배치될 수 있다. 제2 연결 패턴들(42br)은 제2 센싱 셀들(42c)과 동일 층에 배치될 수 있으며, 제2 연결 패턴들(42br)과 제2 센싱 셀들(42c)은 일체로 형성될 수 있다.
- [0087] 도 4a에 도시된 바와 같이, 제1 센싱 셀들(41c) 및 제2 센싱 셀들(42c)은 마름모 형상을 가질 수 있지만, 이는 예시적이며, 다른 형상을 가질 수도 있다. 또한, 제1 센싱 셀들(41c)과 제2 센싱 셀들(42c)은 서로 다른 형상을 가질 수도 있다.
- [0088] 제1 센싱 셀들(41c), 제2 센싱 셀들(42c) 및 제2 연결 패턴들(42br)은 제1 유기막(213) 상에 배치될 수 있으며, 제1 터치 도전막(221a)을 구성할 수 있다. 상술한 바와 같이, 제1 터치 도전막(221a)은 투명 도전성 산화물로 형성될 수 있다.
- [0089] 제1 연결 패턴들(41br)과 콘택 플러그(41p)는 제2 터치 도전막(225a)을 구성할 수 있으며, 투명 도전성 물질로 형성되거나 몰리브덴(Mo), 은(Ag), 티타늄(Ti), 구리(Cu), 알루미늄(Al), 몰리브덴/알루미늄/몰리브덴(Mo/Al/Mo) 등과 같은 저저항 금속 물질로 형성될 수 있다. 제2 무기막(223)과 제2 터치 도전막(225a)은 제2 유기막(231)에 의해 덮일 수 있다.
- [0090] 도 4c는 본 발명의 일 실시예에 따라 박막 봉지층 내에 배치되는 터치 감지층을 형성하는 방법을 설명하기 위한 단면도들이다.
- [0091] 도 4c의 (a)를 참조하면, 제1 유기막(213) 상에 제1 터치 도전막(221a)이 형성될 수 있다. 제1 터치 도전막(221a)은 제1 센싱 셀들(41c), 제2 센싱 셀들(42c) 및 제2 연결 패턴들(42br)을 포함할 수 있다. 제1 터치 도전막(221a)은 투명 도전성 물질로 형성될 수 있다. 구체적으로, 제1 유기막(213) 상에 투명 도전성 물질층이 적층될 수 있다. 투명 도전성 물질층은 제1 포토 마스크(미 도시)를 이용한 포토 리소그래피 공정 및 식각 공정을 통해 패터닝될 수 있으며, 제1 센싱 셀들(41c), 제2 센싱 셀들(42c) 및 제2 연결 패턴들(42br)이 형성될 수 있다.
- [0092] 도 4c의 (b)를 참조하면, 제1 터치 도전막(221a) 상에 제2 무기막(223)이 형성될 수 있다. 제2 무기막(223)은 제1 센싱 셀들(41c)의 일부 상면을 노출하는 콘택 홀들(223h)을 포함할 수 있다. 상술한 바와 같이, 제2 무기막(223)은 무기 절연 물질로 형성될 수 있다. 구체적으로, 제1 터치 도전막(221a) 상에 무기 절연 물질층이 적층될 수 있다. 무기 절연 물질층은 제2 포토 마스크(미 도시)를 이용한 포토 리소그래피 공정 및 식각 공정을 통해 패터닝될 수 있으며, 제1 센싱 셀들(41c)의 일부 상면을 노출하는 콘택 홀들(223h)이 형성될 수 있다.
- [0093] 도 4c의 (c)를 참조하면, 제2 무기막(223) 상에 제2 터치 도전막(225a)이 형성될 수 있다. 제2 터치 도전막(225a)은 제1 연결 패턴들(41br) 및 제2 무기막(223)의 콘택 홀들(223h)을 매립하는 콘택 플러그(41p)를 포함할 수 있다. 제2 터치 도전막(225a)은 저저항 금속 물질로 형성될 수 있다. 구체적으로, 제2 무기막(223) 상에 콘택 홀들(223h)을 매립하도록 저저항 금속 물질층이 적층될 수 있다. 저저항 금속 물질층은 제3 포토 마스크(미 도시)를 이용한 포토 리소그래피 공정 및 식각 공정을 통해 패터닝될 수 있으며, 제1 연결 패턴들(41br) 및

콘택 플러그(41p)이 형성될 수 있다.

- [0094] 도 4c의 (d)를 참조하면, 제2 무기막(223)과 제2 터치 도전막(225a) 상에 제2 유기막(231)이 형성될 수 있다. 이러한 공정을 통해, 도 4b에 도시된 바와 같은, 박막 봉지층(200) 내에 배치되는 터치 감지층(220a)이 형성될 수 있다.
- [0095] 도 5a는 본 발명의 다른 실시예에 따라 박막 봉지층 내에 배치되는 터치 감지층의 개략적인 평면도이고, 도 5b는 도 5a의 V-V 선을 따라 절취한 단면도이다.
- [0096] 도 5a 및 도 5b를 참조하면, 본 발명의 다른 실시예에 따라 박막 봉지층(200) 내에 배치되는 터치 감지층(220b)은 제1 센싱 패턴들(51) 및 제2 센싱 패턴들(52)을 포함한다.
- [0097] 제1 센싱 패턴들(51)은 제1 방향(예컨대, X 방향)으로 연장될 수 있다. 제1 센싱 패턴들(51)은 제1 방향과 교차되는 제2 방향(예컨대, Y 방향)을 따라 복수로 배열된다. 제1 센싱 패턴(51)은 제1 방향을 따라 소정 간격으로 이격된 복수개의 제1 센싱 셀들(51c), 및 제1 센싱 셀들(51c)을 연결하는 제1 연결 패턴들(51br)을 포함할 수 있다. 제1 연결 패턴들(51br)은 제1 센싱 셀들(51c)과 다른 층에 배치될 수 있으며, 제1 센싱 셀들(51c)은 제2 무기막(223)을 관통하는 콘택 플러그(51p)를 이용하여 제1 연결 패턴들(51br)에 전기적으로 연결될 수 있다. 그 결과, 제1 방향으로 배열된 제1 센싱 셀들(51c)은 제1 연결 패턴들(51br)을 통해 서로 전기적으로 연결될 수 있다.
- [0098] 제2 센싱 패턴들(52)은 제2 방향으로 연장될 수 있다. 제2 센싱 패턴들(52)은 제1 방향을 따라 복수로 배열된다. 제2 센싱 패턴(52)은 제2 방향을 따라 소정 간격을 이격된 복수개의 제2 센싱 셀들(52c), 및 제2 센싱 셀들(52c)을 연결하는 제2 연결 패턴들(52br)을 포함할 수 있다. 제2 센싱 셀들(52c)은 상기 제1 센싱 셀들(51c)과 중첩되지 않도록 상기 제1 센싱 셀들(51c) 사이에 분산하여 배치될 수 있다. 제2 연결 패턴들(52br)은 제2 센싱 셀들(52c)과 동일 층에 배치될 수 있으며, 제2 연결 패턴들(52br)과 제2 센싱 셀들(52c)은 일체로 형성될 수 있다.
- [0099] 제1 연결 패턴들(51br)은 제1 유기막(213) 상에 배치될 수 있으며, 제1 터치 도전막(221b)을 구성할 수 있다. 제1 터치 도전막(221b)은 투명 도전성 물질로 형성되거나 몰리브덴(Mo), 은(Ag), 티타늄(Ti), 구리(Cu), 알루미늄(Al), 몰리브덴/알루미늄/몰리브덴(Mo/Al/Mo) 등과 같은 저저항 금속 물질로 형성될 수 있다.
- [0100] 제1 센싱 셀들(51c), 콘택 플러그(51p), 제2 센싱 셀들(52c) 및 제2 연결 패턴들(52br)은 제2 터치 도전막(225b)을 구성할 수 있다. 제2 터치 도전막(225b)은 투명 도전성 산화물로 형성될 수 있다. 제2 무기막(223)과 제2 터치 도전막(225b)은 제2 유기막(231)에 의해 덮일 수 있다.
- [0101] 도 5c는 본 발명의 일 실시예에 따라 박막 봉지층 내에 배치되는 터치 감지층을 형성하는 방법을 설명하기 위한 단면도들이다.
- [0102] 도 5c의 (a)를 참조하면, 제1 유기막(213) 상에 제1 터치 도전막(221b)이 형성될 수 있다. 제1 터치 도전막(221b)은 제1 연결 패턴들(51br)을 포함할 수 있다. 제1 터치 도전막(221b)은 저저항 금속 물질로 형성될 수 있다. 구체적으로, 제1 유기막(213) 상에 저저항 금속 물질층이 적층될 수 있다. 저저항 금속 물질층은 제1 포토 마스크(미 도시)를 이용한 포토 리소그래피 공정 및 식각 공정을 통해 패터닝될 수 있으며, 제1 연결 패턴들(51br)이 형성될 수 있다.
- [0103] 도 5c의 (b)를 참조하면, 제1 터치 도전막(221b) 상에 제2 무기막(223)이 형성될 수 있다. 제2 무기막(223)은 제1 연결 패턴들(51br)의 일부 상면을 노출하는 콘택 홀들(223h)을 포함할 수 있다. 상술한 바와 같이, 제2 무기막(223)은 무기 절연 물질로 형성될 수 있다. 구체적으로, 제1 터치 도전막(221b) 상에 무기 절연 물질층이 적층될 수 있다. 무기 절연 물질층은 제2 포토 마스크(미 도시)를 이용한 포토 리소그래피 공정 및 식각 공정을 통해 패터닝될 수 있으며, 제1 연결 패턴들(51br)의 일부 상면을 노출하는 콘택 홀들(223h)이 형성될 수 있다.
- [0104] 도 5c의 (c)를 참조하면, 제2 무기막(223) 상에 제2 터치 도전막(225b)이 형성될 수 있다. 제2 터치 도전막(225b)은 제1 센싱 셀들(51c), 제2 무기막(223)의 콘택 홀들(223h)을 매립하는 콘택 플러그(51p), 제2 센싱 셀들(52c) 및 제2 연결 패턴들(52br)을 포함할 수 있다. 제2 터치 도전막(225b)은 투명 도전성 물질로 형성될 수 있다. 구체적으로, 제2 무기막(223) 상에 콘택 홀들(223h)을 매립하도록 투명 도전성 물질층이 적층될 수 있다. 투명 도전성 물질층은 제3 포토 마스크(미 도시)를 이용한 포토 리소그래피 공정 및 식각 공정을 통해

패터닝될 수 있으며, 제1 센싱 셀들(51c), 콘택 플러그(51p), 제2 센싱 셀들(52c) 및 제2 연결 패턴들(52br)이 형성될 수 있다.

[0105] 도 5c의 (d)를 참조하면, 제2 무기막(223)과 제2 터치 도전막(225b) 상에 제2 유기막(231)이 형성될 수 있다. 이러한 공정을 통해, 도 5b에 도시된 바와 같은, 박막 봉지층(200) 내에 배치되는 터치 감지층(220b)이 형성될 수 있다.

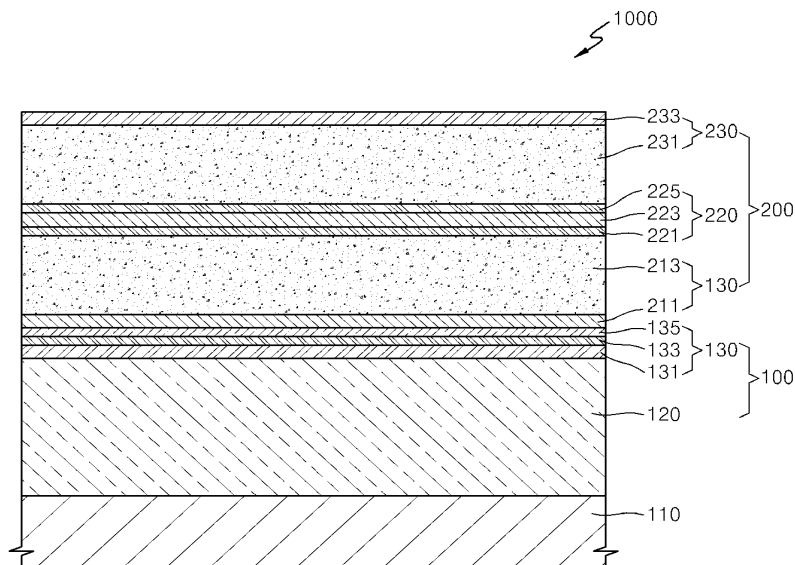
[0106] 본 명세서에서는 본 발명을 한정된 실시예를 중심으로 설명하였으나, 본 발명의 범위 내에서 다양한 실시예가 가능하다. 또한 설명되지는 않았으나, 균등한 수단도 또한 본 발명에 그대로 결합되는 것이라 할 것이다. 따라서 본 발명의 진정한 보호범위는 아래의 특허청구범위에 의하여 정해져야 할 것이다.

부호의 설명

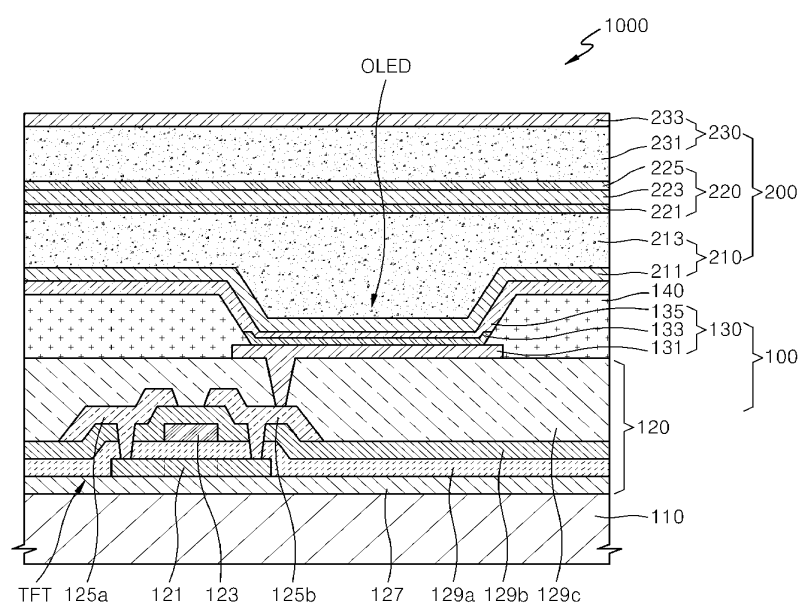
[0107] 100: 표시부	110: 기판
120: 소자/배선층	130: 유기 발광 소자층
131: 화소 전극	133: 중간층
135: 대향 전극	140: 화소 정의막
150: 보호층	200, 200a: 박막 봉지층
211, 215, 223, 233: 무기막들	213, 217, 231: 유기막들
220, 220a, 220b: 터치 감지층	221, 221a, 221b: 제1 터치 도전막
225, 225a, 225b: 제2 터치 도전막	240: 광학 부재
1000, 2000, 3000: 유기 발광 표시 장치	

도면

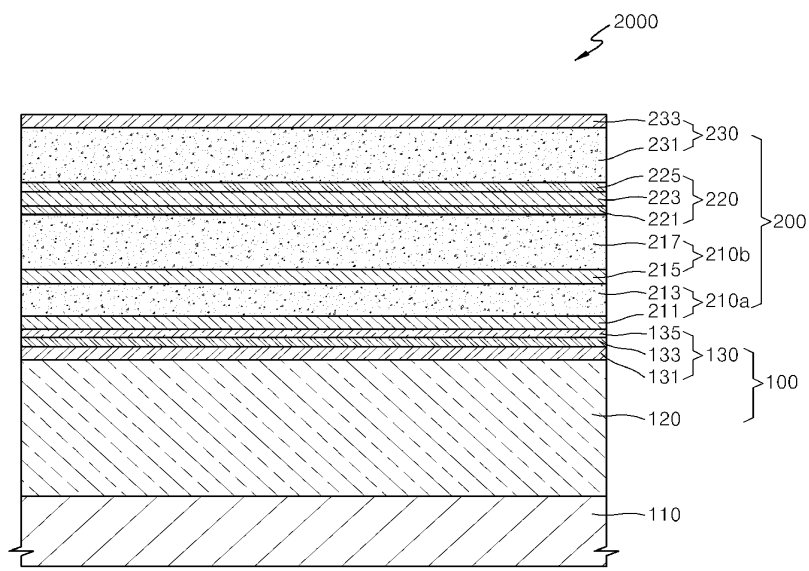
도면1



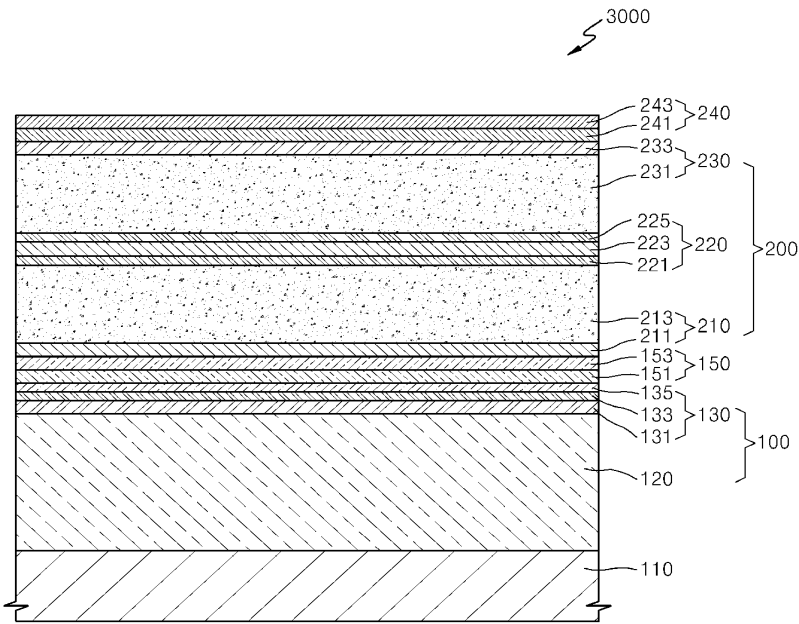
도 2



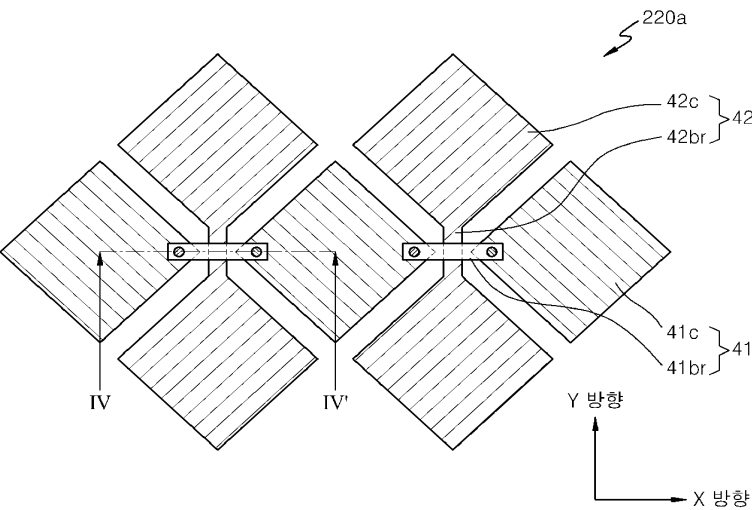
도 3a



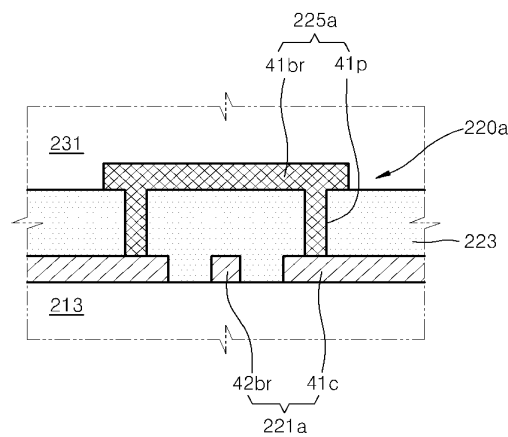
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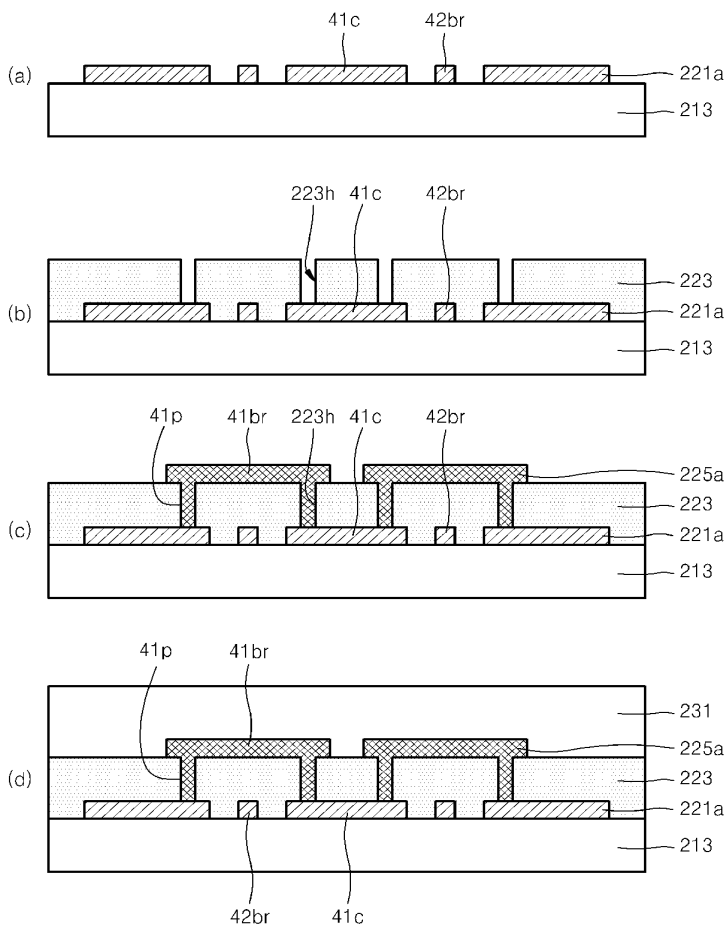
도면4a



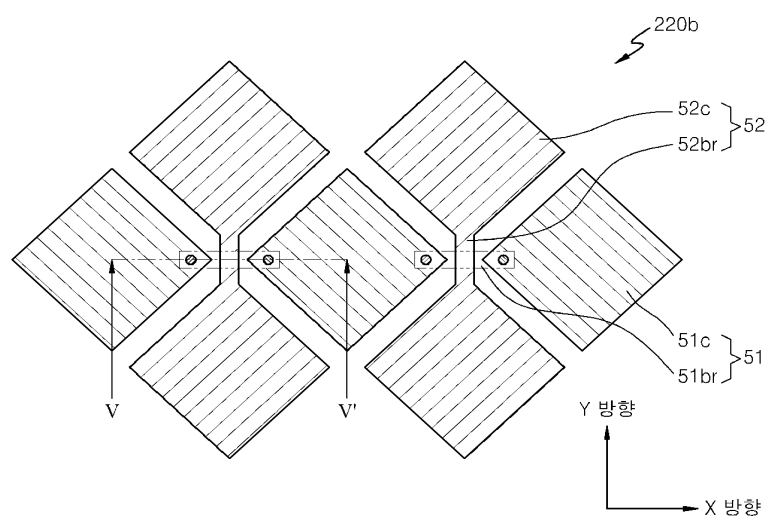
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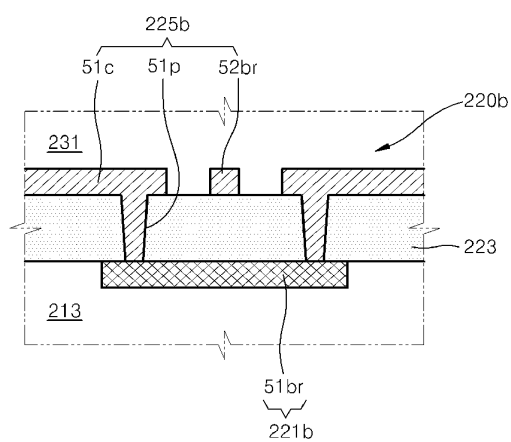
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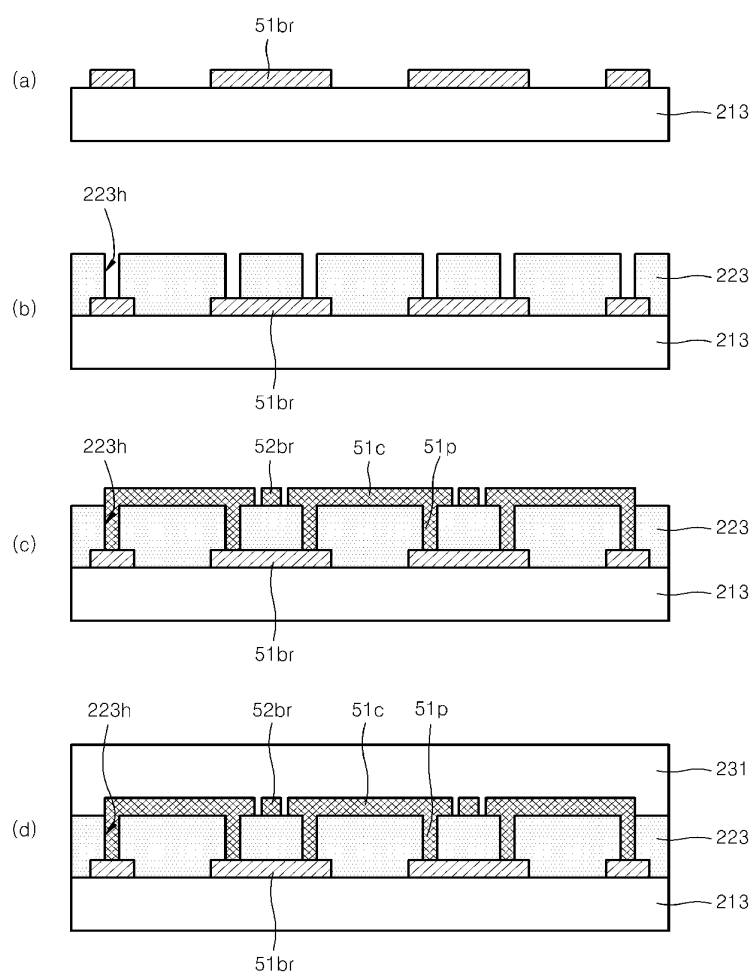
595a



E 055



도 15c





Espacenet

Bibliographic data: JP2013246723 (A) — 2013-12-09

LIGHT-TRANSMISSIVE ELECTRODE FOR CAPACITANCE TOUCH PANEL

Inventor(s): YOSHIKI TAKENOBU ± (YOSHIKI TAKENOBU)

Applicant(s): MITSUBISHI PAPER MILLS LTD ± (MITSUBISHI PAPER MILLS LTD)

Classification: - international: G06F3/041; G06F3/044
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Application number: JP20120121210 20120528 Global Dossier

Priority number(s): JP20120121210 20120528

Abstract of JP2013246723 (A)

PROBLEM TO BE SOLVED: To provide a light-transmissive electrode for a capacitance touch panel, which is favourable for a light-transmissive electrode for a touch panel using capacitance and has less visibility and high reliability. **SOLUTION:** A light-transmissive electrode for a capacitance touch panel comprises, on one surface of a light-transmissive substrate, plural columns of column electrodes extending in a first direction, and plural columns of column electrodes extending in a second direction intersecting with the first direction. The column electrodes each are composed of a mesh-like conductive part. The column electrodes extending in the first direction and the column electrodes extending in the second direction are provided with electrical insulation layers between both electrodes in at least a part of an intersection area thereof to thereby be non-conductive to each other. In addition, at least one of the column electrodes is provided with a bridge part including a light-transmissive conductive composition in the intersection area and the column electrode is made conductive.

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(22) 出願日	平成24年5月28日 (2012.5.28)		三菱製紙株式会社
			東京都墨田区両国二丁目10番14号
		(72) 発明者	吉城 武宣
			東京都千代田区丸の内3丁目4番2号三菱製紙株式会社内
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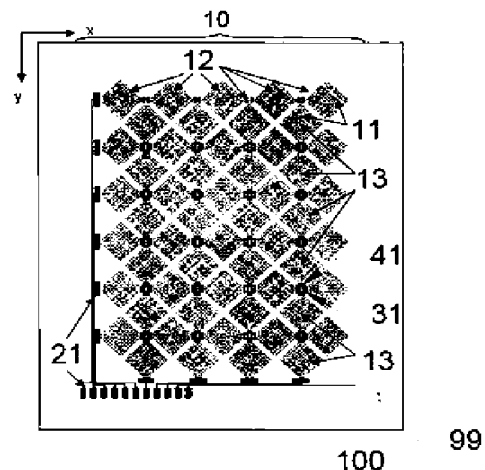
(54) 【発明の名称】 静電容量型タッチパネル用光透過性電極

(57) 【要約】

【課題】 静電容量方式を用いたタッチパネルの光透過性電極として好適な、視認性が低く、かつ信頼性の高い静電容量型タッチパネル用光透過性電極を提供する。

【解決手段】 光透過性支持体の片面に、第一の方向に伸びる複数列の列電極と、前記第一の方向と交差する方向である第二の方向に伸びる複数列の列電極を有し、前記列電極はそれぞれ網目状導電部からなり、前記第一の方向に伸びる各列電極と前記第二の方向に伸びる各列電極とは、その交差領域の少なくとも一部において両電極間に電気的絶縁層が設けられて互いに電気的非導通状態にされていると共に、前記各列電極の少なくとも一方は前記交差領域において光透過性導電性組成物からなるブリッジ部が設けられて列電極内が導通状態にされていることを特徴とする静電容量型タッチパネル用光透過性電極。

【選択図】 図1



【特許請求の範囲】

【請求項 1】

光透過性支持体の片面に、第一の方向に伸びる複数列の列電極と、前記第一の方向と交差する方向である第二の方向に伸びる複数列の列電極を有し、前記列電極はそれぞれ網目状導電部からなり、前記第一の方向に伸びる各列電極と前記第二の方向に伸びる各列電極とは、その交差領域の少なくとも一部において両電極間に電氣的絶縁層が設けられて互いに電氣的非導通状態にされていると共に、前記各列電極の少なくとも一方は前記交差領域において光透過性導電性組成物からなるブリッジ部が設けられて列電極内が導通状態にされていることを特徴とする静電容量型タッチパネル用光透過性電極。

【請求項 2】

前記第一の方向に伸びる列電極と第二の方向に伸びる列電極の間に断線部の入った断線メッシュ部を有することを特徴とする請求項 1 記載の静電容量型タッチパネル用光透過性電極。

【請求項 3】

一方の列電極の網目状導電部における、前記交差領域でもう一方の列電極のブリッジ部と重なる部分の網目状導電部の開口率が、同じ列電極内の他の部分の網目状導電部の開口率より大きいことを特徴とする請求項 1 もしくは 2 記載の静電容量型タッチパネル用光透過性電極。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、静電容量型タッチパネル用光透過性電極に関するものであり、好ましくは投影型静電容量タッチパネルに好適な静電容量型タッチパネル用光透過性電極に関する。

【背景技術】

【0002】

パーソナル・デジタル・アシスタント（PDA）、ノートPC、OA機器、医療機器、あるいはカーナビゲーションシステム等の電子機器においては、これらのディスプレイに入力手段としてタッチパネルが広く用いられている。

【0003】

タッチパネルには、位置検出の方法により光学方式、超音波方式、静電容量方式、抵抗膜方式などがある。光学方式ではカメラにより指の動きを検知する。しかしこの方法では特に屋外に設置した場合に著しいが、カメラのレンズが汚れて正常に動作しなくなるという問題を有している。また、カメラを設置する必要があり、コストが高むという問題も有していた。超音波方式はガラスの隅に超音波発生器と受信器を設け、超音波発生器で発生させた超音波をガラスに流し、ガラスを触った際の超音波の伝達の変化を検知するものである。しかしながら、この方式では2点程度までしか検知することはできず、多点同時検出はできない。抵抗膜方式のタッチパネルは、光透過性導電材料と光透過性導電層付ガラスとがスペーサーを介して対向配置されており、光透過性導電材料に電流を流し光透過性導電層付ガラスに於ける電圧を計測するような構造となっており、カメラや超音波発生ユニットなど特別な装置を不要とする点で優れている。しかし、光透過性導電材料の特定の部分を指で押すので、何度も繰り返し使用すると光透過性導電材料が劣化してくるという問題を有していた。さらに抵抗膜方式でも多点同時検出はできない。

【0004】

一方、静電容量方式のタッチパネルは、光透過性電極により、指で触った位置の静電容量の変化を検知する。可動部分がないことが特徴であり、他の方式に対し、高耐久性、高信頼性、多点同時検出ができるなど優れた点を有するため、近年利用範囲が急速に広がっている。前記光透過性電極は静電容量の変化を検知するため、光透過性支持体上にITOや金属メッシュなどからなる導電部を片面上に有する2枚の光透過性導電材料や、あるいは光透過性支持体の表面と裏面の両面上に導電部を設けた光透過性導電材料から構成される。しかし高価な光透過性導電材料を2枚用いることは高コストとなるし、光透過性支持

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体の表面と裏面の両面上に導電部を有する光透過性導電材料は、両面の位置関係を正確に合わせて導電部を設けることが困難であること、片面の導電部を設けてから、もう片面を作製するのでは2枚の光透過性導電材料を用いるのとコストがあまり変わらないこと、両面の導電部を同時に作製する場合、製造時に導電部に傷が入ったり、パターニングが同じようにできないなど、製造が困難であることなどの問題を有していた。

【0005】

これらの問題を解決する方法の一つとして、例えば特開2010-160670号公報（特許文献1）や国際公開第2010/029979号パンフレット（特許文献2）に記載されるような1枚の光透過性支持体の片面に、ある方向に並んだ列電極と、それとは別方向の列電極を同じ面に有する光透過性導電材料を用い、両電極の重なる部分には絶縁層を設け、その上にブリッジ部を設ける方法が提案されている。確かにこの方法では、上記したコストの問題や位置精度、あるいは耐傷性といった問題は改良される。しかしながら特許文献1、2で提案されているブリッジ部は不透明な金属からなり、これが目に見えるため、視認性という問題は解決できていなかった。

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【0006】

光透過性導電材料としては一般的にITOを用いたものが一般的であるが、それ以外にもZnO、IZOなどの無機透明導電材料、ポリアニリンなどの導電性高分子化合物、特開2003-77350号公報などで提案されている銀塩拡散転写法を用いた金属薄膜などが挙げられ、またブリッジに使う材料としては銀ペースト、導電性高分子化合物、銀ナノワイヤー分散物、銀ナノ粒子、金属微細メッシュなど公知の材料がそれぞれあるが、これを組み合わせた場合、湿熱条件下で材料の抵抗が上がるなど、特に信頼性の点で問題が発生する場合もあり、これらの問題を発生させることなく、かつ視認性の問題点を同時に解決する方法は知られていなかった。

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【先行技術文献】

【特許文献】

【0007】

【特許文献1】特開2010-160670号公報

【特許文献2】WO2010/029979号パンフレット

【発明の概要】

【発明が解決しようとする課題】

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【0008】

本発明の課題は、投影型静電容量方式を用いたタッチパネルの光透過性電極として好適な、視認性が低く、信頼性の高い静電容量型タッチパネル用光透過性電極を提供することである。

【課題を解決するための手段】

【0009】

本発明の上記課題は、以下の発明によって達成される。

（1）光透過性支持体の片面に、第一の方向に伸びる複数列の列電極と、前記第一の方向と交差する方向である第二の方向に伸びる複数列の列電極を有し、前記列電極はそれぞれ網目状導電部からなり、前記第一の方向に伸びる各列電極と前記第二の方向に伸びる各列電極とは、その交差領域の少なくとも一部において両電極間に電氣的絶縁層が設けられて互いに電氣的非導通状態にされていると共に、前記各列電極の少なくとも一方は前記交差領域において光透過性導電性組成物からなるブリッジ部が設けられて列電極内が導通状態にされていることを特徴とする静電容量型タッチパネル用光透過性電極。

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（2）前記第一の方向に伸びる列電極と第二の方向に伸びる列電極の間に断線部の入った断線メッシュ部を有することを特徴とする、上記（1）記載の静電容量型タッチパネル用光透過性電極。

（3）一方の列電極の網目状導電部における、前記交差領域でもう一方の列電極のブリッジ部と重なる部分の網目状導電部の開口率が、同じ列電極内の他の部分の網目状導電部の開口率より大きいことを特徴とする、上記（1）もしくは（2）記載の静電容量型タッチ

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パネル用光透過性電極。

【発明の効果】

【0010】

本発明により、視認性が低く、信頼性の高い静電容量型タッチパネル用光透過性電極を提供することができる。

【図面の簡単な説明】

【0011】

【図1】 本発明の静電容量型タッチパネル用光透過性電極の一例を示す概略図

【図2】 図1の網目状導電部の一部を拡大した拡大図

【図3】 図2のS線での概略断面図

【図4】 図2のT線での概略断面図

【図5】 本発明の静電容量型タッチパネル用光透過性電極のまた別の一例を示す概略拡大図

【図6】 図5と同じ静電容量型タッチパネル用光透過性電極の別の場所の拡大図

【図7】 実施例1で用いた透過原稿の説明図

【図8】 実施例1で用いた透過原稿の説明図

【図9】 実施例1で用いた透過原稿の説明図

【図10】 比較例1で用いた透過原稿の説明図

【図11】 比較例2で用いた透過原稿の説明図

【発明を実施するための形態】

【0012】

本発明について詳細に説明するにあたり、以下に図を用いて説明する。図1は本発明の静電容量型タッチパネル用光透過性電極の一例を示す概略図である。本発明の光透過性電極100は光透過性支持体99の片面に、第一の方向（x方向）に伸びる複数列の列電極12と、前記第一の方向と交差する方向である第二の方向（y方向）に伸びる複数列の列電極13を有し、前記列電極はそれぞれ網目状導電部11からなり、列電極12と列電極13とは、その交差領域において電氣的絶縁層31が設けられて互いに電氣的非導通状態にされていると共に、列電極13は前記交差領域において光透過性導電性組成物からなるブリッジ部41が設けられて導通状態にされている。本発明の光透過性電極100はさらに周辺配線部21を有する。なお、本発明では周辺配線部21と列電極12、13を合わせて導電部10と述べる。

【0013】

図2は図1の一部を拡大した拡大図であるが、x方向に並ぶ列電極12は大格子121と接続格子122からなり、電氣的に接続されている。一方列電極13は大格子131からなる。この図2において接続格子122の一部に四角形で31、41と図示しているが、それぞれ絶縁部31とブリッジ部41がこの部分に設けられていることを意味する。この位置関係を説明するための、図2で示されている点線Sで切断した断面図が図3である。図3において、S線上には列電極12の大格子121と接続格子122が連続して形成されており、列電極12を構成する接続部122の上に絶縁部31が設けられ、さらにその上にブリッジ部41が設けられている。ここではブリッジ部41と列電極12は絶縁部31により導通していない。一方図2で示されている点線Tで切断した断面図が図4である。図4においてT線上には列電極12の接続格子122と列電極13の大格子131が交互に設けられており、接続部122の上に絶縁部31が設けられ、さらにその上にブリッジ部41が設けられている。ブリッジ部41は絶縁部31を越える形で設けられており、列電極13と導通している。図4においては、ブリッジ部41は列電極13の一部の上のみに設けられているが、例えば列電極13の上全てに設けることもできる。

【0014】

<光透過性支持体>

次に本発明の静電容量型タッチパネル用光透過性電極を構成する要素について説明する。図1における光透過性支持体99としては、プラスチック、ガラス、ゴム、セラミック

ス等が好ましく用いられる。本発明において光透過性支持体の光透過性とは、全光線透過率が60%以上であることを意味し、80%以上であることがより好ましい。プラスチックの中でも、フレキシブル性を有する樹脂フィルムは、取扱い性が優れている点で好適に用いられる。光透過性支持体として使用される樹脂フィルムの具体例としては、ポリエチレンテレフタレート（PET）やポリエチレンナフタレート（PEN）等のポリエステル樹脂、アクリル樹脂、エポキシ樹脂、フッ素樹脂、シリコン樹脂、ポリカーボネート樹脂、ジアセテート樹脂、トリアセテート樹脂、ポリアリレート樹脂、ポリ塩化ビニル、ポリスルホン樹脂、ポリエーテルスルホン樹脂、ポリイミド樹脂、ポリアミド樹脂、ポリオレフィン樹脂、環状ポリオレフィン樹脂などからなる樹脂フィルムが挙げられ、その厚さは25～300 μm であることが好ましい。また、そのヘイズ値は2%以下であることが好ましく、より好ましくは1%以下である。光透過性支持体は易接着層など公知の層を有していても良い。また後述するように導電部10を銀塩拡散転写法にて形成する場合、光透過性支持体上には物理現像核層を設けることができる。

【0015】

<網目状導電部>

図1における列電極12と列電極13は網目状導電部からなり、網目状導電部は単位格子を網目状に配置した金属メッシュからなることが好ましい。単位格子の形状としては、例えば正三角形、二等辺三角形、直角三角形などの三角形、正方形、長方形、菱形、平行四辺形、台形などの四角形、（正）六角形、（正）八角形、（正）十二角形、（正）二十角形などの（正） n 角形、星形などを組み合わせた形状が挙げられ、またこれらの形状の単独の繰り返し、あるいは2種類以上の複数の形状の組み合わせが挙げられる。中でも単位格子の形状としては正方形もしくは菱形であることが好ましい。

【0016】

上記した列電極12と13は金属、特に金、銀、銅、ニッケル、アルミニウム、およびこれらの複合材により形成されることが好ましい。網目状導電部11を形成する方法としては、銀塩感光材料を用いる方法、同方法を用いさらに得られた銀画像に無電解めっきや電解めっきを施す方法、スクリーン印刷法を用いて銀ペーストなどの導電性インキを印刷する方法、銀インクなどの導電性インキをインクジェット法で印刷する方法、無電解めっき等で銅などの金属からなる導電性層を形成する方法、あるいは蒸着やスパッタなどで導電性層を形成し、その上にレジスト膜を形成し、露光、現像、エッチング、レジスト層除去することで得る方法、銅箔などの金属箔を貼り、さらにその上にレジスト膜を形成し、露光、現像、エッチング、レジスト層除去することで得る方法など、公知の方法を用いることができる。中でも網目状導電部11を構成する単位格子の線の厚みが薄くでき、さらに単位格子の線幅を微細にすることが容易な銀塩拡散転写法を用いることが好ましい。銀塩拡散転写法としては例えば特開2003-77350号公報や特開2005-250169号公報に記載されている。これらの手法で作製した網目状導電部11を構成する単位格子の細線厚みは薄すぎるとタッチパネルとして必要な導電性を確保し難くなる。よって、その厚みは0.05～5 μm が好ましく、より好ましくは0.07～1 μm である。

【0017】

単位格子の細線幅は20 μm 以下が好ましく、1～10 μm がさらに好ましい。また単位格子の繰り返し間隔は500 μm 以下が好ましく、350 μm 以下がさらに好ましい。さらに単位格子から構成される網目状導電部11の開口率は85%以上が好ましく、88～99%がさらに好ましい。

【0018】

図5は、本発明の静電容量型タッチパネル用光透過性導電材料のまた別の一例を示す概略拡大図である。図5に示すように x 方向に並ぶ列電極12と y 方向に並ぶ列電極の13の間の領域に、単位格子の一部が断線した断線メッシュ部14を設けることもできる。断線メッシュ部14は大格子121、131、および接続格子122と同じサイズの単位格子からなることが好ましく、かつ線の一部が電氣的に断線されている。なお、その断線部は単位格子を構成する細線に直交するように断線されていても良いし、あるいは斜めに断

線されていても良い。断線メッシュ部14の細線幅は20 μ m以下が好ましく、1～10 μ mがさらに好ましい。断線メッシュ部14の断線している部分の長さは30 μ m以下が好ましく、さらに3～15 μ mが好ましい。また断線メッシュ部14と大格子121、131、および接続格子122の開口率の差はそれぞれ1%以内であることが好ましい。なお、図5においては説明のため、断線部分は好ましい範囲より広く図示している。

【0019】

図6は図5と同じ静電容量型タッチパネル用光透過性導電材料の別の場所の拡大図である。図6においてにおいて列電極12と列電極13の内、ブリッジ部41と重なる部分では細線の線幅が細くなっている。後述の通り、ブリッジ部は導電性高分子化合物を始めとする透明導電性組成物から形成されるが、この部分の透過率がブリッジのない部分と異なるため、それを補償する目的で、図6のように線幅を細くする、すなわち一方の列電極の網目状導電部における、前記交差領域でもう一方の列電極のブリッジ部と重なる部分の網目状導電部の開口率が、同じ列電極内の他の部分の網目状導電部の開口率より大きくすることは、本発明のより好ましい態様である。

【0020】

<周辺配線部>

図1における周辺配線部21について説明する。静電容量型タッチパネル用光透過性電極においては、網目状導電部で検知した静電容量の変化を外部に取り出し、その変化を測定する必要がある。このために網目状導電部に電氣的に接続した周辺配線部21を設ける。周辺配線部21はこのため、ある程度の太さを持った線から構成される。線の太さは網目状導電部より十分抵抗値が低くないと、網目状導電部の静電容量の変化を検知することが困難になり、一方で太すぎると周辺配線部21の占める面積が大きくなりすぎるのでタッチパネルのデザイン上好ましくない。周辺配線部21の好ましい線幅は5～200 μ mであり、タッチパネルのサイズにより適宜調整することが望ましい。また、線の間隔は狭すぎると線間の短絡の起きる場合もあるので10 μ m以上が好ましい。さらに周辺配線部21は外部からの電磁波の影響を防ぐためのシールド線、あるいはシールドメッシュや、外部端子接続するための端子部など公知の部分も設けることができる。周辺配線部21は網目状導電部と同様の方法で、特に好ましくは網目状導電部作製時に同時に作製することが好ましい。

【0021】

<絶縁部>

図1においてx方向に並ぶ列電極12とブリッジ部41を絶縁するために絶縁部31が設けられる。絶縁部31の好ましい全光線透過率は90%以上で、ヘイズは好ましくは1%以下、さらに好ましくは0.5%以下である。絶縁部31はこの条件を満たす材料であればいかなる材料でも用いることができるが、吸湿性の低い材料であることが好ましい。好ましい絶縁部31を構成する材料としてはアクリル（メタクリル）樹脂、ウレタン樹脂、オレフィン樹脂、塩化ビニル樹脂、フッ素樹脂、シリコーン樹脂などが挙げられるが、好ましくはアクリル（メタクリル）樹脂である。絶縁部31の厚みは網目状導電部11を構成する金属細線の厚み以上でないと十分な絶縁が図れない、一方で厚すぎるとブリッジ部41を設けることが困難になったり、タッチパネルのモジュール化の際に障害となる。好ましい絶縁部の厚みは金属細線の厚み以上で、かつ10 μ m以下である。絶縁部31はスクリーン印刷法、グラビア印刷法、フレキソ印刷法などで作製することができる。

【0022】

<ブリッジ部>

図1においてy方向の列電極13を電氣的に接続するため、ブリッジ部41が設けられる。本発明においてブリッジ部41は透明導電性組成物からなる。透明導電性組成物としてはPEDOT/PSS、ポリアニリン、ポリチオンなどの導電性高分子化合物、銀ナノワイヤーがバインダー中に分散された銀ナノワイヤー分散物、カーボンナノチューブがバインダー中に分散されたカーボンナノチューブ分散物などを含有する透明導電性組成物を挙げることができるが、列電極を構成する網目状金属との電氣的接続の信頼性の観点から

導電性高分子化合物を含有する透明導電性組成物が好ましく、PEDOT/ PSSを含有する透明導電性組成物がより好ましい。ブリッジ部41の厚みは0.01~2 μmが好ましい。ブリッジ部41は、例えばスクリーン印刷法、グラビア印刷法、フレキソ印刷法などで透明導電性組成物を印刷することで作製することができる。透明導電組成物には上記した成分以外に、例えば、増粘剤、界面活性剤、消泡剤、架橋剤、光反応開始剤、熱重合開始剤、光硬化性樹脂、熱硬化性樹脂、緩衝剤、防腐剤など公知の加剤を添加することができる。なお本発明の透明導電性組成物は、成膜した際の全光線透過率が60%以上である組成物であることが好ましい。また本発明の透明導電性組成物は、成膜した際のヘイズ値が2%以下である組成物であることが好ましく、成膜した際のヘイズ値が1%以下であることがより好ましい。

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【0023】

図2において、大格子121は全て接続格子122で電氣的に接続され、大格子131は全てブリッジ部41で電氣的に接続されている。しかしながら本発明においては、一部あるいは全ての大格子131を接続格子で電氣的に接続し、大格子121をブリッジ部で電氣的に接続することもできる。ただし、これらの場合でも絶縁部31により、大格子121を含んでなる列電極12と大格子131を含んでなる列電極13は絶縁されている。

【0024】

また、図1において静電容量型タッチパネル用光透過性電極100は光透過性支持体99と導電部10、接続部31、ブリッジ部41から構成されているが、それ以外にも、ハードコート層、反射防止層、粘着層、防眩層など公知の層を光透過性支持体99の導電部10側（導電部10、接続部31、ブリッジ部41の上に）、あるいは光透過性支持体99の導電部10とは反対の側に設けることができる。

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【実施例】

【0025】

以下、本発明に関し実施例を用いて詳細に説明するが、本発明は以下の実施例に限定されるものではない。

【0026】

<実施例1>

光透過性支持体として、厚み100 μmのポリエチレンテレフタレートフィルム（東レ製PETフィルムU34）を用いた。この光透過性支持体の全光線透過率は92%、ヘイズ値は0.5%であった。

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【0027】

次に下記処方に従い、物理現像核層塗液を作製し、光透過性支持体上に塗布、乾燥して物理現像核層を設けた。

【0028】

<硫化パラジウムゾルの調製>

A液	塩化パラジウム	5 g
	塩酸	40 ml
	蒸留水	1000 ml
B液	硫化ソーダ	8.6 g
	蒸留水	1000 ml

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A液とB液を攪拌しながら混合し、30分後にイオン交換樹脂の充填されたカラムに通し硫化パラジウムゾルを得た。

【0029】

<物理現像核層塗液の調製>各1 m²あたり

前記硫化パラジウムゾル	0.4 mg
2質量%グリオキザール水溶液	0.2 ml
界面活性剤（S-1）	4 mg
デナコールEX-830	50 mg

（ナガセケムテックス（株）製ポリエチレングリコールジグリシジルエーテル）

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0.5 mg

【 0 0 3 0 】

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0.5 g

5 mg

0.1 g

【化 1】

CCCCCCCCCCCc1ccc(OCCOCCOCCOCCOCCOS(=O)(=O)[Na])cc1

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【化 2】

染料1

The chemical structure of Dye 1 consists of two benzimidazole rings connected by a trans-vinyl bridge (-CH=CH-). The left benzimidazole ring has a methyl group (CH₃) at position 2, a carbonyl group (=O) at position 7, and a 4-sulfonatephenyl group (-N-C₆H₄-SO₃K) at position 8. The right benzimidazole ring has a methyl group (H₃C) at position 2, a hydroxyl group (-OH) at position 7, and a 4-sulfonatephenyl group (-N-C₆H₄-SO₃K) at position 8.

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0.5 g

3.0 g 銀相当

3 mg

20 mg

1 g

10 mg

10 mg

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部 1 1、断線メッシュ部 1 4 は一辺の長さ（格子間隔）が 0.3 mm の正方形からなる単位格子から構成される。また網目状導電部 1 1 の単位格子は幅 7 μ m の細線により構成されている。また断線メッシュ部 1 4 の単位格子 2 0 は幅 8 μ m の細線により構成されている。なお断線メッシュ部 1 4 は網目状導電部との間に 10 μ m の断線部を有し、また交点位置に 14 μ m の断線部が存在する。透過原稿 A 1 において、網目状導電部 1 1 と断線メッシュ部 1 4 は、位置関係が連続した単位格子から形成されている。

【0037】

上記のようにして得られた銀塩感光材料 1 のハロゲン化銀乳剤層を有する面と透過原稿 A 1 のパターンを有する側の面を密着し、水銀灯を光源とする密着プリンターを用いて、400 nm 以下の波長の光をカットする樹脂フィルターを介して露光した。

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【0038】

その後、下記拡散転写現像液中に 20℃ で 60 秒間浸漬した後、続いてハロゲン化銀乳剤層、中間層、および保護層を水洗、除去し、その後乾燥して A 1 と同様のパターンを銀パターンとして有する光透過性導電材料 1 を得た。なお、得られた光透過性導電材料 1 の線幅、線間隔は透過原稿 A 1 全く同じ形状、線幅の画像であった。なお、共焦点顕微鏡で網目状導電部の厚みを測定したところ、0.1 μ m であった。

【0039】

< 拡散転写現像液組成 >

水酸化カリウム	25 g
ハイドロキノン	18 g
1-フェニル-3-ピラゾリドン	2 g
亜硫酸カリウム	80 g
N-メチルエタノールアミン	15 g
臭化カリウム	1.2 g

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全量を水で 1000 ml

pH = 12.2 に調整する。

【0040】

得られた光透過性導電材料 1 の上にスクリーン印刷法で、6540 MA（大成ファインケミカル（株）製アクリル樹脂）を乾燥後の厚みが 5 μ m となるよう図 8 のパターンで印刷し、乾燥した。続いてスクリーン印刷法でエノコート HC1307（（有）ケミトレック社製 PEDOT/PSS 水分散物）を乾燥後の厚みが 0.1 μ m となるよう図 9 のパターンで印刷し、本発明の光透過性電極 1 を作製した。何れの印刷でも、透過原稿 A 1 にあるトンボをカメラで見て、絶縁部、ブリッジ部の位置が接続格子の上に来るよう調整した。

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【0041】

< 比較例 1 >

実施例 1 で作製した光透過性導電材料 1 の上に実施例 1 と同様にして絶縁部を設けた。続いてスクリーン印刷法により、ECM-100AF（太陽インキ（株）製銀ペースト、成膜した際の全光線透過率は 0%）を乾燥後の厚みが 5 μ m となるよう図 10 のパターンを印刷し、120℃ で 20 分間焼成し、比較の光導電性電極 1 を作製した。なお、この乾燥後のブリッジ部は線幅 30 μ m を有していた。

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【0042】

< 比較例 2 >

東洋紡績（株）製 KD300（ITO フィルム）の上に厚み 15 μ m のドライフィルムレジスト（旭化成（株）製 SUNFORT シリーズ SPG）を塗工し、乾燥後、図 11 のパターンをマスクを介して露光し、30℃ の 1% 炭酸ナトリウム水溶液で 40 秒現像した。続いて ITO07N（関東化学（株）製 ITO エッチング液）でエッチングし、水洗の後、40℃ の 3% 水酸化ナトリウム水溶液で残っているレジストを剥離し、導電性材料 2 を得た。続いて導電性材料 2 の ITO 面の上に実施例 1 と同様にして、絶縁部、ブリッジ部を設け、比較の光透過性電極 2 を作製した。

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【0043】

<実施例2>

実施例1で使用した透過原稿A1の代わりに、ブリッジ部の印刷後、ブリッジ部と重なる部分の網目状導電部の線幅を6 μ mとし、同じ列電極内でブリッジ部と重ならない部分より開口率を大きくした以外は透過原稿Aと同じパターンを有する透過原稿A2を用い、その他は実施例1と同様にして、本発明の光透過性電極2を作製した。

【0044】

得られた本発明の光透過性電極1、2、および比較の光透過性電極1、2の視認性を確認した。パターンがはっきり判るものを1、少し見れば判るものを2、良く見れば判るものを3、注視しないと判らないものを4、全く判らないものを5とした。また、2方向ある列電極の端から端までの抵抗値を測定した後、60℃90%R.H.の環境下に500時間放置し、その後同じ位置の放置後の抵抗値を測定した。結果を表1に示す。

【0045】

【表1】

	視認性	放置前電極抵抗値		放置後電極抵抗値	
		x方向	y方向	x方向	y方向
本発明の光透過性電極1	4	3k Ω	5k Ω	3k Ω	5k Ω
本発明の光透過性電極2	5	4k Ω	5k Ω	4k Ω	5k Ω
比較の光透過性電極1	1	3k Ω	8k Ω	3k Ω	10k Ω
比較の光透過性電極2	1	9k Ω	12k Ω	9k Ω	測定不可

【0046】

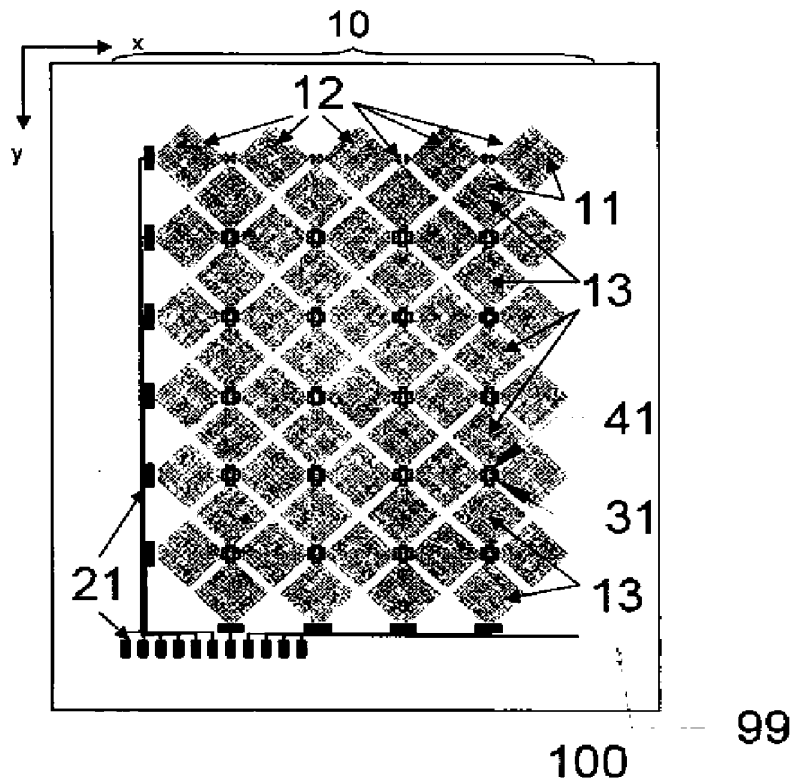
表1の結果から、本発明により視認性が低く、かつ信頼性の高い静電容量型タッチパネル用光透過性電極が得られることが判る。

【符号の説明】

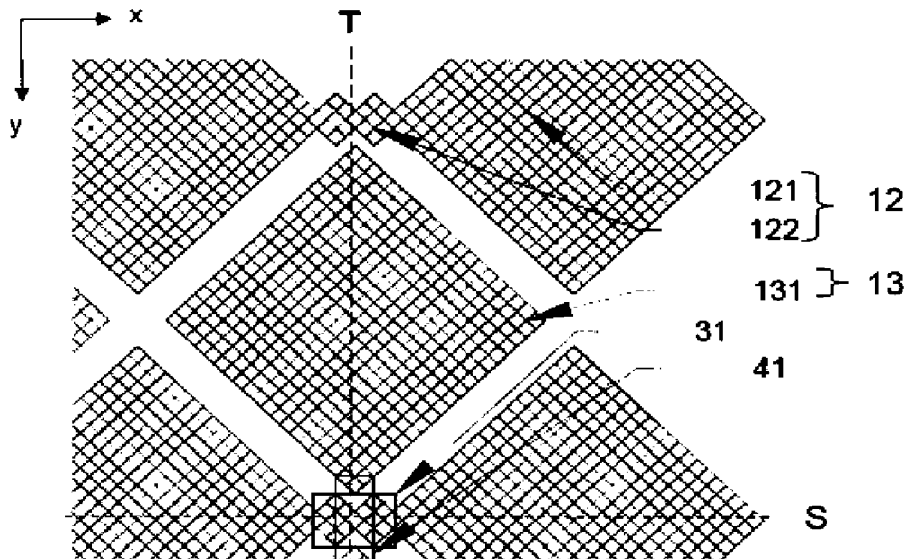
【0047】

- 10 導電部
- 11 網目状導電部
- 12、13 列電極
- 14 断線メッシュ部
- 21 周辺回路部
- 31 絶縁部
- 41 ブリッジ部
- 99 光透過性支持体
- 100 静電容量型タッチパネル用光透過性電極
- 121、131 大格子
- 122 接続格子

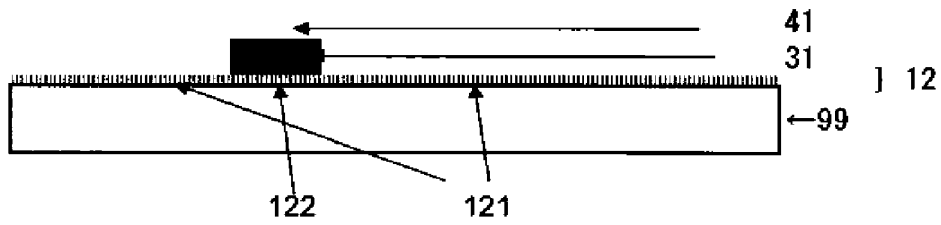
【図 1】



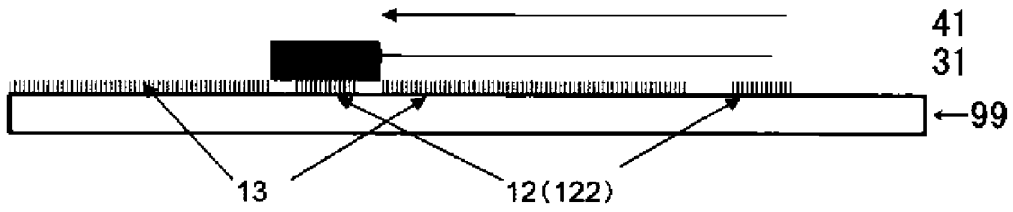
【図 2】



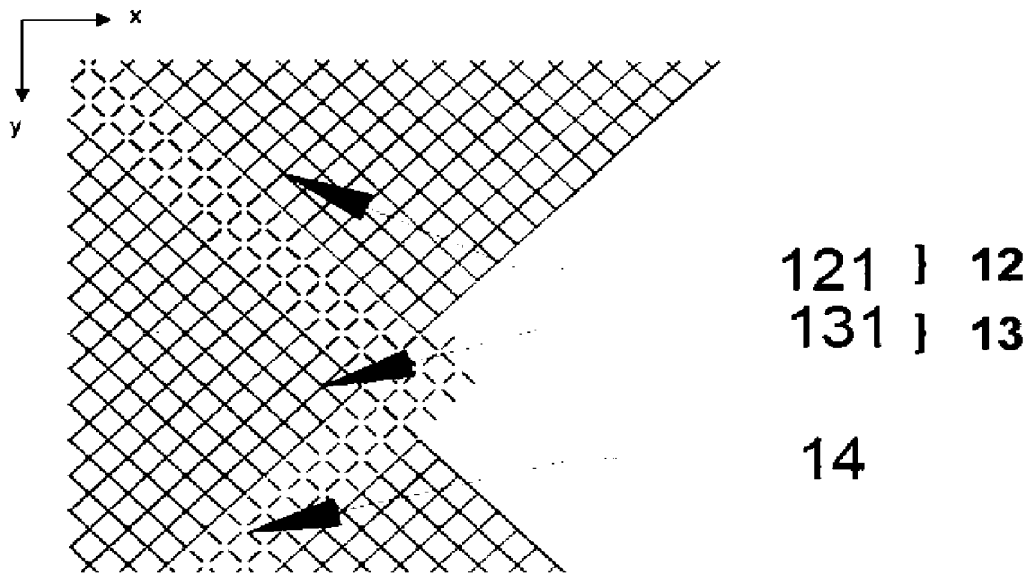
【図 3】



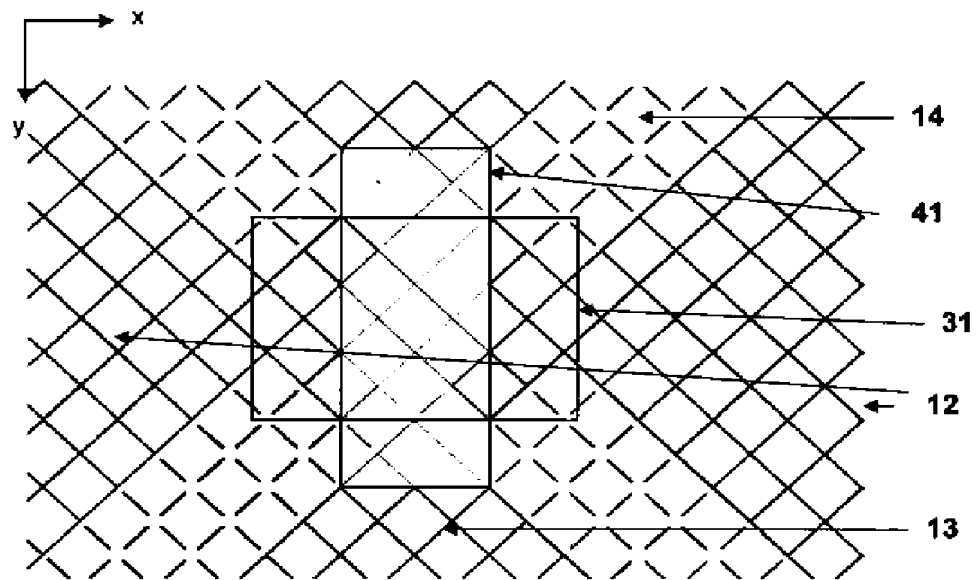
【図 4】



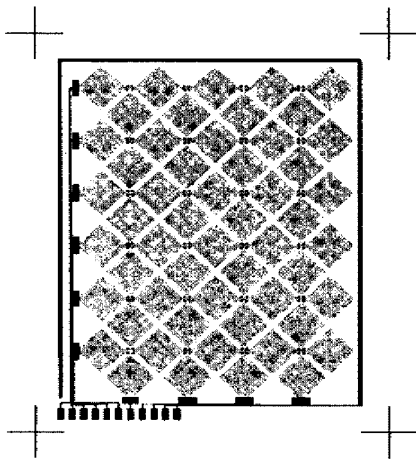
【図 5】



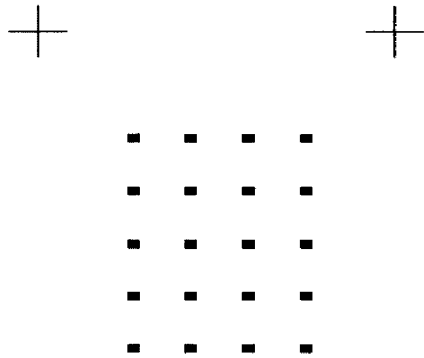
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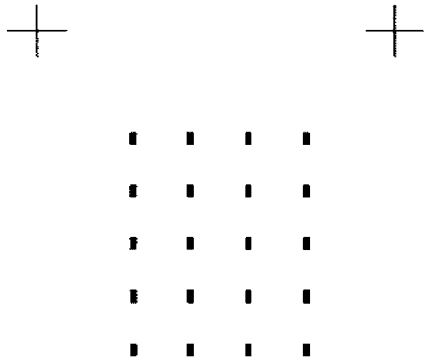
【図 7】



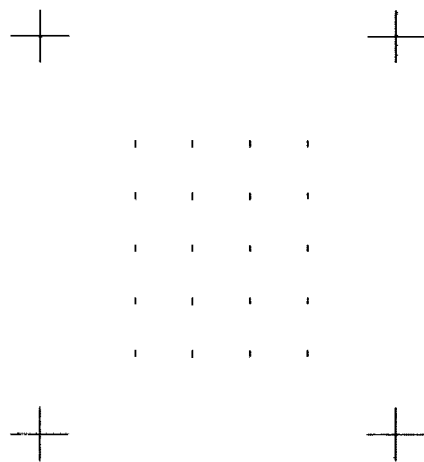
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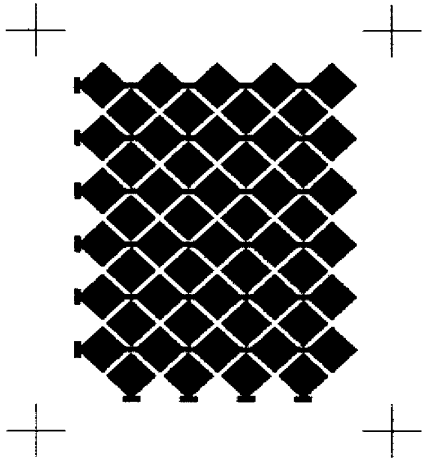
【図 9】



【図 10】



【図 11】





ELECTRONIC PAYMENT RECEIPT

APPLICATION #
16/742,230

RECEIPT DATE / TIME
05/19/2022 02:30:45 PM ET

ATTORNEY DOCKET #
183539/411598-04552

Title of Invention

DISPLAY DEVICE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7917

FILED BY Diana Figueeroa

PATENT CENTER # 60677576

AUTHORIZED BY Kurt Prange

CUSTOMER # 23363

FILING DATE 01/14/2020

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Chiwook AN

Payment Information

PAYMENT METHOD
CARD / 4748

PAYMENT TRANSACTION ID
E202251E35390470

PAYMENT AUTHORIZED BY
Diana Figueeroa

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1806	SUBMISSION OF AN INFORMATION DISCLOSURE STATEMENT	260.00	1	260.00
TOTAL AMOUNT:				\$260.00

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 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

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

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INVENTOR Chiwook AN

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ADDRESS -

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Documents

TOTAL DOCUMENTS: 3

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
183539-IDS.pdf	4	Information Disclosure Statement (IDS) Form (SB08)	1010 KB
JP2013-246723.pdf	16	Foreign Reference	648 KB
KR20140069708A.pdf	20	Foreign Reference	1056 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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JP2013-246723.pdf BE347DDD178E481FFFF298A389487C7604C3A033C1DD8919F
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/742,230		Filing Date 01/14/2020		☐ To be Mailed				
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO												
APPLICATION AS FILED - PART I												
		(Column 1)	(Column 2)									
FOR		NUMBER FILED	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), (j), 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	06/22/2022	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)			
	Total (37 CFR 1.16(i))	* 17	Minus	** 20	= 0		x \$100 =		0			
	Independent (37 CFR 1.16(h))	* 1	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		
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".								/TRINA RIDDICK/				
*** 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.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

I hereby certify that this correspondence is being EFS-Web transmitted to the United States Patent and Trademark Office on June 22, 2022 at or before 11:59 p.m. Pacific Time under the Rules of 37 CFR § 1.8.

/Diana Figueroa/
Diana Figueroa

Appl No.	: 16/742,230	Confirmation No. 7917
Inventor	: Chiwook An, et al.	
Filed	: January 14, 2020	
Title	: DISPLAY DEVICE	
TC/A.U.	: 2625	
Examiner	: ELAHI, TOWFIQ	
Docket No.	: 183539	
Customer No.	: 23363	

AMENDMENT ACCOMPANYING REQUEST FOR CONTINUED EXAMINATION

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

Post Office Box 29001
Glendale, CA 91209-9001
June 22, 2022

Commissioner:

This paper is in response to the Office action of February 1, 2022, which set an initial period for reply to expire on May 1, 2022, and replaces the response filed on April 27, 2022. Any extension of time fee required by this paper is paid concurrently herewith. As such, this response is timely filed. Please amend the above-identified application as follows:

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

Remarks/Arguments begin on page 7 of this paper.

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Amdt date June 22, 2022
Reply to Office action of February 1, 2022

Amendments to the Claims:

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

Listing of Claims:

1-19. (Canceled)

20. (New) A display device comprising:

a display panel, the display panel comprising:

a base layer;

a circuit layer on the base layer;

an organic light emitting device layer on the circuit layer, and the organic light emitting device layer comprising:

a plurality of first light emitting areas to emit red light;

a plurality of second light emitting areas to emit green light; and

a plurality of third light emitting areas to emit blue light,

wherein, viewed in a plan view, the second light emitting areas are a different size than at least one of the first light emitting areas and the third light emitting areas;

a thin film encapsulation layer on the organic light emitting device layer, the thin film encapsulation layer comprising an inorganic layer and an organic layer; and

a touch sensing unit on the display panel, the touch sensing unit comprising:

a first conductive pattern formed directly on a surface of the display panel;

an insulating layer covering the first conductive pattern; and

a second conductive pattern on the insulating layer, and having a thickness above the first conductive pattern in a thickness direction of the display device that is greater than a thickness of the first conductive pattern in the thickness direction of the display device, the second conductive pattern comprising:

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first touch sensor parts comprising a plurality of metal mesh lines defining a plurality of mesh holes;

second touch sensor parts comprising a plurality of metal mesh lines defining a plurality of mesh holes; and

first connection parts connecting respective ones of the first touch sensor parts,

wherein, viewed in a plan view, at least one of the plurality of first light emitting areas, at least one of the plurality of second light emitting areas, or at least one of the plurality of third light emitting areas is located within a mesh hole defined by first touch sensor parts such that the metal mesh lines of the first touch sensor parts do not overlap the light emitting areas, and at least one of the plurality of first light emitting areas, at least one of the plurality of second light emitting areas, or at least one of the plurality of third light emitting areas is located within a mesh hole defined by second touch sensor parts such that the metal mesh lines of the second touch sensor parts do not overlap the light emitting area,

wherein the first conductive pattern comprises electrically conductive second connection parts connecting respective ones of the second touch sensor parts, and

wherein a conductive contact hole through the insulating layer connects respective ones of the second connection parts and the second touch sensor parts.

21. (New) The display device of claim 20, wherein the thin film encapsulation layer comprises:

a first inorganic layer;

an organic layer on the first inorganic layer; and

a second inorganic layer on the organic layer.

22. (New) The display device of claim 21, wherein the first inorganic layer comprises silicon oxynitride, silicon oxide, or silicon nitride.

23. (New) The display device of claim 21, wherein the display panel further comprises a buffer layer on the thin film encapsulation layer.

24. (New) The display device of claim 23, wherein the buffer layer is formed directly on the second inorganic layer of the thin film encapsulation layer.

25. (New) The display device of claim 21, wherein the second conductive pattern has a thickness above the first conductive pattern in a thickness direction of the display device that is greater than a thickness of the second connection parts in the thickness direction of the display device.

26. (New) The display device of claim 20, wherein, viewed in a plan view:
each of the first light emitting areas is located within a first mesh hole defined by a plurality of metal mesh lines of first touch sensor parts or a plurality of metal mesh lines of second touch sensor parts;

each of the second light emitting areas is located within a second mesh hole defined by a plurality of metal mesh lines of first touch sensor parts or a plurality of metal mesh lines of second touch sensor parts;

each of the third light emitting areas is located within a third mesh hole defined by a plurality of metal mesh lines of first touch sensor parts or a plurality of metal mesh lines of second touch sensor parts; and

the second mesh hole is a different size than one of the first mesh hole and the third mesh hole.

27. (New) The display device of claim 26, wherein, viewed in a plan view, the second light emitting areas are of a different size than the first light emitting areas and

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Amdt date June 22, 2022
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the third light emitting areas, and the first light emitting areas are of a different size than the third light emitting areas.

28. (New) The display device of claim 27, wherein, viewed in a plan view, no more than one first light emitting area is located in a first mesh hole, no more than one second light emitting area is located in a second mesh hole, and no more than one third light emitting area is located in a third mesh hole.

29. (New) The display device of claim 27, wherein the second conductive pattern has a thickness above the first conductive pattern in a thickness direction of the display device that is greater than a thickness of the second connection parts in the thickness direction of the display device.

30. (New) The display device of claim 27, wherein the circuit layer comprises a pixel driving circuit for each light-emitting area comprising a first thin film transistor, a second thin film transistor, a third thin film transistor, a fourth thin film transistor, a fifth thin film transistor, a sixth thin film transistor, a seventh thin film transistor, and a storage capacitor.

31. (New) The display device of claim 20, wherein the base layer is a flexible plastic substrate.

32. (New) The display device of claim 31, wherein the display device is a foldable display device.

33. (New) The display device of claim 31, further comprising an adhesive layer directly on a surface of the base layer and a protective film on the opposite surface of the adhesive layer.

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Amdt date June 22, 2022
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34. (New) The display device of claim 20, wherein the display panel is configured to be flexed along a predetermined axis.

35. (New) The display device of claim 20, further comprising an organic adhesive layer on the touch sensing unit and a window.

36. (New) The display device of claim 20, wherein the circuit layer comprises a pixel driving circuit for each light-emitting area comprising a first thin film transistor, a second thin film transistor, a third thin film transistor, a fourth thin film transistor, a fifth thin film transistor, a sixth thin film transistor, a seventh thin film transistor, and a storage capacitor.

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REMARKS/ARGUMENTS

Claims 20-36 are in the present application, of which claim 20 is independent. Claims 1-19 are canceled herein without prejudice. New claims 20-36 are added herein. No new matter is added. In view of the remarks that follow, Applicant respectfully requests allowance of claims 20-36.

1. Claim Rejections Under 35 U.S.C. § 103

Claims 1-5 and 14-19

Claims 1-5, 14, 15, and 17-19 were rejected under 35 U.S.C. § 103 as allegedly being unpatentable over Zhu et al. (U.S. Pub. No. 2016/0313837, hereinafter “Zhu”) in view of Kwon et al. (U.S. Pub. No. 2014/0232956, hereinafter “Kwon”) and Ha et al. (WO 2015/026071, hereinafter “Ha”).

Claim 16 was rejected under 35 U.S.C. as allegedly being unpatentable over Zhu in view of Kwon and Ha and further in view of Lee et al. (U.S. Pub. No. 2016/0103549, hereinafter “Lee”).

Without admitting to the propriety of the rejection, and to clarify the scope of the claimed subject matter to facilitate examination of the application, Applicant has canceled claims 1-19 without prejudice, and has added new claims 20-36.

Applicant submits that the cited references, including Zhu, Kwon, Ha, and Lee, alone or in combination, do not appear to teach or suggest all of the features of new independent claim 20.

Applicant, therefore, respectfully submits that there is no apparent reason why one of ordinary skill in the art prior to the effective filing date of the present application would have combined the disclosures of the cited references to arrive at the claimed embodiment of claim 20, and that this claim would not have been obvious over the art of record to one skilled in the art at the time prior to the effective filing date of the present application. Accordingly, Applicant respectfully requests the rejection of claim 20 be withdrawn and that this claim be allowed.

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Furthermore, because claims 21-36 depend, directly or indirectly, from claim 20, they each incorporate all of the terms and features of their base claim, in addition to other features, which together further patentably distinguish these claims over the art of record when considered as a whole. Therefore, Applicant requests that the rejections of these claims also be withdrawn, and that these claims be allowed as well.

2. New Claims

Claims 20-36 are new.

Support for these claims can be found, for example, in paragraphs [0066], [0068], [0078], [0083], [00100], [00101], [00104], [00105], [00110], [00144], [00157], [00158], [00161], [00162], and [00166] and the non-limiting embodiments of FIGS. 1A-1C, 2, 5B, 6A, 8A, 8B, 8D, 8F, 9, 10A, and 10B of the present application as originally filed.

3. Concluding Remarks

In view of the foregoing amendments and remarks, Applicant earnestly solicits a timely issuance of a Notice of Allowance with claims 20-36. If there are any remaining issues that can be addressed over the telephone, the Examiner is cordially invited to call Applicant's attorney at the number listed below.

Payment of any fee required to enter and process this response is provided. The Director is authorized to charge any underpayment of fees or credit any overpayment of fees to Deposit Account No. 03-1728.

Respectfully submitted,
LEWIS ROCA ROTHGERBER CHRISTIE LLP

By /Kurt S. Prange/
Kurt S. Prange
Reg. No. 75,137
626/795-9900

-8-

118003696.2



ELECTRONIC ACKNOWLEDGEMENT RECEIPT

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PATENT CENTER # 60734290

FILING DATE 01/14/2020

CUSTOMER # 23363

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CORRESPONDENCE
ADDRESS -

AUTHORIZED BY Kurt Prange

Documents

TOTAL DOCUMENTS: 4

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
183539-Amendment-NFOA-2-1-22.pdf	8	-	121 KB
183539-Amendment-NFOA-2-1-22-AMSB.pdf	(1-1) 1	Amendment Submitted/Entered with Filing of Continued Prosecution Application (CPA)/Request for Continued Examination(RCE)	107 KB
183539-Amendment-NFOA-2-1-22-CLM.pdf	(2-6) 5	Claims	91 KB
183539-Amendment-NFOA-2-1-22-REM.pdf	(7-8) 2	Applicant Arguments/Remarks Made in an Amendment	88 KB

183539-RCE.pdf	3	Request for Continued Examination (RCE)	1318 KB
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Digest

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CONFIRMATION # 7917

FILED BY Diana Figueeroa

PATENT CENTER # 60734290

AUTHORIZED BY Kurt Prange

CUSTOMER # 23363

FILING DATE 01/14/2020

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Chiwook AN

Payment Information

PAYMENT METHOD
CARD / 4748

PAYMENT TRANSACTION ID
E20226LI18263970

PAYMENT AUTHORIZED BY
Diana Figueeroa

PRE-AUTHORIZED ACCOUNT
031728

PRE-AUTHORIZED CATEGORY
37 CFR 1.21 (Miscellaneous fees and charges)

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1820	REQUEST FOR CONTINUED EXAMINATION (RCE)- 2ND AND SUBSEQUENT REQUEST (SEE 37 CFR 1.114)	2000.00	1	2000.00
			TOTAL AMOUNT:	\$2,000.00

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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.



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.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/742,230	01/14/2020	Chiwook AN	183539/411598-04552	7917
23363	7590	06/30/2022	EXAMINER	
Lewis Roca Rothgerber Christie LLP			ELAHI, TOWFIQ	
PO BOX 29001			ART UNIT	
Glendale, CA 91209-9001			PAPER NUMBER	
			2625	
			NOTIFICATION DATE	
			DELIVERY MODE	
			06/30/2022	
			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):

PLPrivatePair@lrrc.com
pto@lewisroca.com

NOTICE OF IMPROPER REQUEST FOR CONTINUED EXAMINATION (RCE)	Application No. 16/742,230	Applicant(s) AN et al.
	Art Unit 2625	AIA Status Yes

The request for continued examination (RCE) under 37 CFR 1.114 filed on 22 June 2022 is improper for reason(s) indicated below:

- ☐ Continued examination under 37 CFR 1.114 does not apply to an application for a design patent. Applicant may wish to consider filing a continuing application under 37 CFR 1.53(b) or a CPA under 37 CFR 1.53(d). A CPA cannot be filed in an international design application. See 37 CFR 1.53(d)(1)(ii). An RCE cannot be treated as a CPA.
- ☐ Continued examination under 37 CFR 1.114 does not apply to an application that was filed before June 8, 1995. Applicant may wish to consider filing a continuing application under 37 CFR 1.53(b).
- ☒ Continued examination under 37 CFR 1.114 does not apply to an application unless prosecution in the application is closed. If the RCE was accompanied by a reply to a non-final Office action, the reply will be entered and considered under 37 CFR 1.111. If the RCE was not accompanied by a reply, the time period set forth in the last Office action continues to run from the mailing date of that action.
- ☐ The request was not filed before payment of the issue fee, and no petition under 37 CFR 1.313 was granted. If this application has not yet issued as a patent, applicant may wish to consider filing either a petition under 37 CFR 1.313 to withdraw this application from issue, or a continuing application under 37 CFR 1.53(b).
- ☐ The request was not filed before abandonment of the application. The application was abandoned, or proceedings terminated on _____. Applicant may wish to consider filing a petition under 37 CFR 1.137 to revive this abandoned application.
- ☐ The request was not accompanied by the fee set forth in 37 CFR 1.17(e) as required by 37 CFR 1.114. Since the application is not under appeal, the time period set forth in the final Office action or notice of allowance continues to run from the mailing date of that action or notice.
- ☐ The request was not accompanied by a submission as required by 37 CFR 1.114. Since the application is not under appeal, the time period set forth in the final Office action or notice of allowance continues to run from the mailing date of that action or notice.
- ☐ Continued examination under 37 CFR 1.114 does not apply in a national stage application under 35 U.S.C. 371 unless the requirements of 35 U.S.C. 371(c) have been complied with, including the requirement for the inventor's oath or declaration (35 U.S.C. 371(c)(4)). See 37 CFR 1.114(e)(3). Applicant may wish to consider filing a continuing application under 37 CFR 1.53(b), or an RCE accompanied by a submission as required under 37 CFR 1.114 and complying with the requirements under 35 U.S.C. 371.

Note: A continued prosecution application (CPA) under 37 CFR 1.53(d) cannot be filed in a utility or plant application. A CPA filed in a utility or plant application that has a filing date **on or after June 8, 1995** will be treated as an RCE under 37 CFR 1.114. The request for a CPA in the instant application, however, has been treated as an improper RCE for the reason(s) indicated above.

A copy of this Notice MUST be returned with the reply.

Direct any questions concerning this notice to

TRINA RIDDICK Technology Center 2600

Telephone Number: (571)272-7277

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

I hereby certify that this correspondence is being EFS-Web transmitted to the United States Patent and Trademark Office on July 21, 2022 at or before 11:59 p.m. Pacific Time under the Rules of 37 CFR § 1.8.

/Diana Figueroa/
Diana Figueroa

Inventor(s) : Chiwook An, et al. Confirmation No. 7917
Application No. : 16/742,230
Filed : January 14, 2020
Title : DISPLAY DEVICE

Grp./Div. : 2625
Examiner : ELAHI, TOWFIQ

Docket No. : 183539

REQUEST FOR REFUND

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

Post Office Box 29001
Glendale, CA 91209-9001
July 21, 2022

Commissioner:

In response to the February 1, 2022 Non-Final Rejection, Applicant filed a Request for Continued Examination (RCE) with Accompanying Amendment on June 22, 2022. Per the Notice of Improper RCE dated June 30, 2022, the RCE was improper because continued examination under 37 CFR 1.114 does not apply to an application unless prosecution in the application is closed.

Application No. 16/742,230

The fee submitted with the RCE was \$2,000.00. Accordingly, Applicant hereby respectfully requests that a refund in the amount of \$2,000.00 be credited to Deposit Account No. 03-1728. Please reference our **Attorney Docket No. 183539/411598-04552** for this transaction.

Respectfully submitted,
LEWIS ROCA ROTHGERBER CHRISTIE LLP

By /Kurt S. Prange/
Kurt S. Prange
Reg. No. 75,137
626/795-9900

KSP/dsf



ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/742,230

RECEIPT DATE / TIME
07/21/2022 11:53:50 AM ET

ATTORNEY DOCKET #
183539/411598-04552

Title of Invention

DISPLAY DEVICE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7917

FILED BY Diana Figueeroa

PATENT CENTER # 60801344

FILING DATE 01/14/2020

CUSTOMER # 23363

FIRST NAMED
INVENTOR Chiwook AN

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY Kurt Prange

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
183539-Request-for-Refund.pdf	2	Refund Request	103 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
183539-Request-for-Refund.pdf	945D5F9648CFBC10756EA974F050E64D334D10BA824E902B66 B2B4F516AB0FA010A8219EBD69F4606667D9C89967B070699F 4897FF34736780D5144D7AEE7AFC

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 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.



United States Patent and Trademark Office

Office of the Chief Financial Officer

Document Code:WFEE

User :Lynnell Johnson

Refund Accounting Date:08/02/2022

Effective Date	Sale Item Reference Number	Refund Total
06/22/2022	16742230	\$2,000.00

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method	Account Number
I202282827393766	1820	RCE- 2ND AND SUBSEQUENT REQUEST	\$2,000.00		*****4748



United States Patent and Trademark Office

Office of the Chief Financial Officer

Document Code:WFEE

User :Lynnell Johnson

Sale Adjustment Accounting Date:08/02/2022

Effective Date	Sale Accounting Date	Sale Item Reference Number
06/22/2022	08/02/2022	16742230

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
I202282827393766	1820	RCE- 2ND AND SUBSEQUENT REQUEST	\$2,000.00	



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/742,230	01/14/2020	Chiwook AN	183539/411598-04552	7917
23363	7590	08/10/2022	EXAMINER	
Lewis Roca Rothgerber Christie LLP			ELAHI, TOWFIQ	
PO BOX 29001				
Glendale, CA 91209-9001			ART UNIT	PAPER NUMBER
			2625	
			NOTIFICATION DATE	DELIVERY MODE
			08/10/2022	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):

PLPrivatePair@lrrc.com
pto@lewisroca.com



United States Patent and Trademark Office

Office of the Chief Financial Officer

August 02, 2022

LEWIS ROCA ROTHGERBER CHRISTIE LLP
Attn: KURT PRANGE
P.O. BOX 29001
GLENDALE, CA 91209-9001

Dear Sir/Madam,

The United States Patent and Trademark Office (USPTO) has reviewed your refund request for Reference Number **16742230** - Refund Request ID **REFND-20220722-93067**. Below is the current status of your refund request assigned to the following processing area: Office of Patent Examination Support Services

Fee code	Decision	Decision Reason(s)	Refund Amount
1820	Approved	Other - see attached page(s)	\$2,000.00

Generally, approved refunds will be issued in the form that the original payment was provided. You will receive a separate decision letter for any additional fee codes assigned to other processing areas, if applicable. Decisions may be subject to change if an error is identified.

For questions related to this decision, contact the Case Resolution Team at (571) 272-1720 or case.resolution@USPTO.GOV.

Thank you,
Refund Branch

Enclosure: Refund Approval "Other" Reason(s)

Refund Approval Reason for fee code 1820:

- Other - Improper RCE



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

23363 7590 09/08/2022
Lewis Roca Rothgerber Christie LLP
PO BOX 29001
Glendale, CA 91209-9001

EXAMINER

ELAHI, TOWFIQ

ART UNIT

PAPER NUMBER

2625

DATE MAILED: 09/08/2022

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/742,230	01/14/2020	Chiwook AN	183539/411598-04552	7917

TITLE OF INVENTION: DISPLAY DEVICE

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	12/08/2022

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. 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.

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)

23363 7590 09/08/2022
Lewis Roca Rothgerber Christie LLP
PO BOX 29001
Glendale, CA 91209-9001

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.
16/742,230	01/14/2020	Chiwook AN	183539/411598-04552	7917

TITLE OF INVENTION: DISPLAY DEVICE

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	12/08/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
ELAHI, TOWFIQ	2625	345-173000

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/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 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, 1 _____

(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. 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. _____



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.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/742,230	01/14/2020	Chiwook AN	183539/411598-04552	7917
23363	7590	09/08/2022	EXAMINER	
Lewis Roca Rothgerber Christie LLP			ELAHI, TOWFIQ	
PO BOX 29001			ART UNIT	
Glendale, CA 91209-9001			PAPER NUMBER	
			2625	
DATE MAILED: 09/08/2022				

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.

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. 16/742,230	Applicant(s) AN et al.	
	Examiner TOWFIQ ELAHI	Art Unit 2625	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 06/22/2022.
☐ 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 20-36. 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. 15/660,827.

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

/TOWFIQ ELAHI/ Primary Examiner, Art Unit 2625	
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Notice of Pre-AIA or AIA Status

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

After a thorough search, examination, persuasive amendment and arguments and in light of the prior art made of record claims 20-36 are allowed. The following is an Examiner's statement of reasons for allowance:

The Applicants' replies make evident the reasons for allowance, satisfying the "record as a whole" proviso of the rule 37 CFR 1.104(e). Specifically, the substance of applicants' remarks, filed 06/22/2022 with newly amended claims, are persuasive, as such the reasons for allowance are in all probability evident from the record and no statement is deemed necessary (see MPEP 1302.14).

"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 submission should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TOWFIQ ELAHI whose telephone number is (571)270-1687. The examiner can normally be reached M-F: 10AM-3PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an

interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Boddie can be reached on (571)272-0666. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: <https://patentcenter.uspto.gov>. Visit <https://www.uspto.gov/patents/apply/patent-center> for more information about Patent Center and <https://www.uspto.gov/patents/docx> for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TOWFIQ ELAHI/
Primary Examiner, Art Unit 2625

Issue Classification 	Application/Control No. 16/742,230	Applicant(s)/Patent Under Reexamination AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625

CPC						
Symbol					Type	Version
G06F	/	3	/	0443	F	2019-05-01
G06F	/	3	/	0446	I	2019-05-01
G06F	/	3	/	0412	I	2013-01-01
G09G	/	3	/	3225	I	2013-01-01
H01L	/	27	/	323	I	2013-01-01
H01L	/	51	/	5256	I	2013-01-01
G06F	/	2203	/	04102	A	2013-01-01
G06F	/	2203	/	04111	A	2013-01-01
G06F	/	2203	/	04103	A	2013-01-01
H01L	/	27	/	3244	A	2013-01-01

CPC Combination Sets					
Symbol				Type	Version
	/		/		

NONE (Assistant Examiner)		Total Claims Allowed: 17	
/TOWFIQ ELAHI/ Primary Examiner, Art Unit 2625 (Primary Examiner)		31 August 2022 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 10A

U.S. Patent and Trademark Office

Part of Paper No.: 20220831

Issue Classification 	Application/Control No. 16/742,230	Applicant(s)/Patent Under Reexamination AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625

INTERNATIONAL CLASSIFICATION			
CLAIMED			
G06F	/	3	/ 044

NON-CLAIMED			
/	/	/	/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	17	
/TOWFIQ ELAHI/ Primary Examiner, Art Unit 2625 (Primary Examiner)	31 August 2022 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 10A

U.S. Patent and Trademark Office

Part of Paper No.: 20220831

Issue Classification 	Application/Control No. 16/742,230	Applicant(s)/Patent Under Reexamination AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625

☐ 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	20	10	29												
2	21	11	30												
3	22	12	31												
4	23	13	32												
5	24	14	33												
6	25	15	34												
7	26	16	35												
8	27	17	36												
9	28														

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 17	
/TOWFIQ ELAHI/ Primary Examiner, Art Unit 2625 (Primary Examiner) _____ (Date) 31 August 2022		O.G. Print Claim(s) 1	O.G. Print Figure 10A

U.S. Patent and Trademark Office

Part of Paper No.: 20220831

<i>Search Notes</i> 	Application/Control No. 16/742,230	Applicant(s)/Patent Under Reexamination AN et al.
	Examiner TOWFIQ ELAHI	Art Unit 2625

CPC - Searched*		
Symbol	Date	Examiner
H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256	07/30/2020	TE

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

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

Search Notes		
Search Notes	Date	Examiner
Text searched in EAST	07/30/2020	TE
Updated search in EAST	04/14/2021	TE
Updated search in EAST	09/09/2021	TE
Updated search in pe2e search.	01/27/2022	TE
Updated search in pe2e.	08/31/2022	TE

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
345/G06F3	173/0446	09/09/2021	TE

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1	"15660827"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:03 PM
L2	13	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:06 PM
L3	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern same touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:06 PM
L4	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:07 PM
L5	14	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:09 PM
L6	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:10 PM
L7	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 02:22 PM
L8	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 03:02 PM
L9	1	"20170336907"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 03:05 PM
L10	2	"20140160066"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/04 03:14 PM
L11	0	((("AN") near3 ("Chiwook"))).INV.	(USPAT)	OR	OFF	OFF	2018/09/04 03:18 PM
L12	12	((("KIM") near3 ("Doyeon"))).INV.	(US-PGPUB)	OR	OFF	OFF	2018/09/04 03:18 PM
L13	8	((("PARK") near3 ("Sunghyun"))).INV.	(USPAT)	OR	OFF	OFF	2018/09/04 03:19 PM
L14	21	((("LEE") near3 ("Jaehyun"))).INV.	(USPAT)	OR	OFF	OFF	2018/09/04 03:19 PM

L15	0	((("CHO") near3 ("Sung-woong"))).INV.	(USPAT)	OR	OFF	OFF	2018/09/04 03:19 PM
L16	0	((("CHO") near3 ("Sung-woong"))).INV.	(USPAT)	OR	OFF	OFF	2018/09/04 03:20 PM
L17	4	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and display	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 10:04 AM
L18	0	touch near3 (sens\$3 detect\$3) near3 on near3 display near3 (part section substrate)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 10:06 AM
L19	196	touch near3 (sens\$3 detect\$3) near3 display near3 (part section substrate) same insulat\$3	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 10:07 AM
L20	35861	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 10:09 AM
L21	170	L19 and L20	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 10:10 AM
L22	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/05 01:37 PM
L23	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 08:59 AM
L24	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 08:59 AM
L25	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 08:59 AM
L26	0	(first second third) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:55 AM
L27	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:56 AM
L28	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:57 AM

L29	0	conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:57 AM
L30	0	conductive near3 layer near3 resistivi near3 (less lower different) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:57 AM
L31	1122191	(first second third other another) near3 layer conductive near3 layers near3 resistivi near3 (less lower different)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:58 AM
L32	35893	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:59 AM
L33	15461	L31 and L32	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 09:59 AM
L34	1122172	(first second third) near3 layer conductive near3 layers near3 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:00 AM
L35	15461	L32 and L34	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:00 AM
L36	1556030	(first second third one) near3 layer conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:02 AM
L37	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:03 AM
L38	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:03 AM
L39	0	(first second third one)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06

08/31/2022 03:37:38 PM

Workspace: 16742230CON15660827

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TE

		near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) and (first second third other another)					10:03 AM
L40	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:04 AM
L41	0	(first second third one) near3 layer near3 conduct\$3 near3 layers near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:07 AM
L42	0	(first second third one) near3 layer near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:07 AM
L43	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:07 AM
L44	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:08 AM
L45	0	conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:08 AM
L46	206361	second near2 conductive layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:09 AM
L47	0	second near2 conductive near3 layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:09 AM
L48	0	second near2 conductive near3 layer near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:10 AM
L49	21	second near2 conductive near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:11 AM

08/31/2022 03:37:38 PM

Workspace: 16742230CON15660827

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TE

L50	7	same electrical near3 resistivity same less middle near2 conductive near3 layer near3 (thicker)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 10:34 AM
L51	22	(middle mid center centre) near2 conductive near3 (layer section part) near3 (thicker wider fatter)	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 01:56 PM
L52	35893	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 01:56 PM
L53	0	L51 and L52	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/06 01:56 PM
L55	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:29 AM
L56	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:29 AM
L57	1	"6504202".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:29 AM
L58	1	"20160103549".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:32 AM
L59	0	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:34 AM
L60	5389	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:34 AM
L61	35893	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:35 AM
L62	4524	first same third same conduct\$3 same layer same titanium and aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:35 AM
L63	3038	first same third same conduct\$3 same layer same titanium same aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:35 AM
L64	122	L61 and L63	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:36 AM
L65	1108	first near2 conduct\$3 same second near2 conduct\$3 same third near2 conduct\$3 same layer same Titanium same Aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:42 AM
L66	28	L61 and L65	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07

L67	1153	aluminum near2 layer same (between sorrounded) near3 Titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	09:43 AM 2018/09/07 09:50 AM
L68	641	aluminum near2 layer same (between sorrounded) near3 Titanium near2 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:50 AM
L69	66	L61 and L68	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 09:51 AM
L70	183	towfiq near elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 10:31 AM
L71	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 10:36 AM
L72	1	"20170076502"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/07 12:39 PM
L73	1	"20180095581"	(US-PGPUB; USPAT)	OR	OFF	OFF	2018/09/10 09:54 AM
L74	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/27 03:40 PM
L75	204	towfiq near2 elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/27 03:47 PM
L76	5	("20100060602" "20110102370" "20120118614" "20120212449" "20120312677").PN. OR ("9323370").URPN.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2019/02/27 04:04 PM
L77	75	"20060097991"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2019/02/27 04:06 PM
L78	1	"15660827" and (thickness near3 second near2 connection part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 08:51 AM
L79	0	"15660827" and (thickness near3 second near2 connection near2 part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 08:52 AM
L80	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 02:48 PM
L81	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 02:58 PM
L82	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 03:21 PM
L83	1	"15660827"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L84	14	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM

L85	0	second near3 conduct\$3 near2 pattern insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern same touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L86	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L87	15	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L88	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L89	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L90	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L91	2	"20170336907"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L92	2	"20140160066"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L93	0	((("AN") near3 ("Chiwook"))).INV.	(USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L94	12	((("KIM") near3 ("Doyeon"))).INV.	(US-PGPUB)	OR	OFF	OFF	2019/02/28 05:00 PM
L95	10	((("PARK") near3 ("Sunghyun"))).INV.	(USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L96	22	((("LEE") near3 ("Jaehyun"))).INV.	(USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L97	0	((("CHO") near3 ("Sung- woong"))).INV.	(USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L98	0	((("CHO") near3 ("Sung- woong"))).INV.	(USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L99	4	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and display	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM

L100	0	touch near3 (sens\$3 detect\$3) near3 on near3 display near3 (part section substrate)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L101	222	touch near3 (sens\$3 detect\$3) near3 display near3 (part section substrate) same insulat\$3	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L102	39064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L103	193	L101 and L102	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L104	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L105	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L106	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L107	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L108	0	(first second third) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L109	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L110	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L111	0	conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L112	0	conductive near3 layer near3 resistivi near3 (less lower different) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM

L113	1162602	(first second third other another) near3 layer conductive near3 layers near3 resistivi near3 (less lower different)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L114	39064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L115	17063	L113 and L114	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L116	1162583	(first second third) near3 layer conductive near3 layers near3 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L117	17063	L114 and L116	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L118	1612494	(first second third one) near3 layer conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L119	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L120	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L121	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) and (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L122	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM

L123	0	resistivi near3 (less lower different more) (first second third one) near3 layer near3 conduct\$3 near3 layers near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L124	0	(first second third one) near3 layer near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L125	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L126	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L127	0	conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L128	214000	second near2 conductive layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L129	0	second near2 conductive near3 layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L130	0	second near2 conductive near3 layer near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L131	22	second near2 conductive near3 layer same electrical near3 resistivity same less	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L132	8	middle near2 conductive near3 layer near3 (thicker)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L133	23	(middle mid center centre) near2 conductive near3 (layer section part) near3 (thicker wider fatter)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM

L134	39064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L135	0	L133 and L134	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L136	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L137	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L138	1	"6504202".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L139	1	"20160103549".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L140	0	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L141	5648	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L142	39064	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L143	4756	first same third same conduct\$3 same layer same titanium and aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L144	3209	first same third same conduct\$3 same layer same titanium same aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L145	145	L142 and L144	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L146	1129	first near2 conduct\$3 same second near2 conduct\$3 same third near2 conduct\$3 same layer same Titanium same Aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L147	33	L142 and L146	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L148	1191	aluminum near2 layer same (between sorrounded) near3 Titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L149	667	aluminum near2 layer same (between sorrounded) near3 Titanium near2 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28 05:00 PM
L150	73	L142 and L149	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/02/28

L151	204	towfiq near elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L152	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L153	1	"20170076502"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L154	1	"20180095581"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L155	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L156	204	towfiq near2 elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L157	5	("20100060602" "20110102370" "20120118614" "20120212449" "20120312677").PN. OR ("9323370").URPN.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	05:00 PM 2019/02/28
L158	75	"20060097991"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	05:00 PM 2019/02/28
L159	1	"15660827" and (thickness near3 second near2 connection part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L160	0	"15660827" and (thickness near3 second near2 connection near2 part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L161	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L162	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L163	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/02/28
L164	0	second near3 conductive near3 pattern near4 thickness near4 (greater bigger (more adj than)) near3 thickness near3 second near3 connection near3 part	(US-PGPUB; USPAT)	OR	OFF	OFF	05:00 PM 2019/05/09
L165	0	conductive near3 pattern near4 thickness near4 (greater bigger (more adj than)) near3 thickness near3 connection near3 part	(US-PGPUB; USPAT)	OR	OFF	OFF	11:04 AM 2019/05/09
L166	263	second near3 conductive near3 pattern near4 thickness	(US-PGPUB; USPAT)	OR	OFF	OFF	11:05 AM 2019/05/09

L167	1006	near4 (greater bigger (more adj than)) samr thickness near3 second near3 connection near3 part second near3 conduct\$3 near3 pattern near4 (thickness width) near4 (greater bigger (more adj than)) samr (thickness width) near3 second near3 connect\$3 near3 (part section)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/05/09 11:10 AM
L168	0	second near3 conduct\$3 near3 pattern near4 (thickness width) near4 (greater bigger (more adj than)) same (thickness width) near3 second near3 connect\$3 near3 (part section)	(US-PGPUB; USPAT)	OR	OFF	OFF	2019/05/09 11:10 AM
L169	9	"201508587"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/27 09:27 AM
L170	0	"TW201508587"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/27 09:28 AM
L171	21	"2015026071"	(US-PGPUB; USPAT;	OR	ON	ON	2022/01/27

			USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				09:31 AM
L172	3	"20160313837"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/27 10:26 AM
L173	3	"20140232956"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/27 10:28 AM
L174	2	"20200152710"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL,	OR	ON	ON	2022/01/27 10:46 AM

L175	1	((WO-2015026071-A1).did. AND FTDB.dbnm.)	PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/01/27 11:49 AM
L176	3	"15660827"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L177	13	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L178	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern same touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L179	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and touch	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L180	17	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L181	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L182	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31

L183	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L184	2	"20170336907"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L185	2	"20140160066"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L186	10	((("AN") near3 ("Chiwook"))).INV.	(USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L187	30	((("KIM") near3 ("Doyeon"))).INV.	(US-PGPUB)	OR	OFF	OFF	03:12 PM 2022/08/31
L188	19	((("PARK") near3 ("Sunghyun"))).INV.	(USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L189	45	((("LEE") near3 ("Jaehyun"))).INV.	(USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L190	1	((("CHO") near3 ("Sung- woong"))).INV.	(USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L191	1	((("CHO") near3 ("Sung- woong"))).INV.	(USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L192	7	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and display	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L193	0	touch near3 (sens\$3 detect\$3) near3 on near3 display near3 (part section substrate)	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L194	256	touch near3 (sens\$3 detect\$3) near3 display near3 (part section substrate) same insulat\$3	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L195	47766	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L196	200	L19 and L20	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L197	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L198	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L199	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L200	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L201	0	(first second third)	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31

		near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer					03:12 PM
L202	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L203	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L204	0	conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L205	0	conductive near3 layer near3 resistivi near3 (less lower different) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L206	1895455	(first second third other another) near3 layer conductive near3 layers near3 resistivi near3 (less lower different)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L207	47766	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L208	26511	L31 and L32	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L209	1464249	(first second third) near3 layer conductive near3 layers near3 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L210	23300	L32 and L34	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L211	2015601	(first second third one) near3 layer conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM

L213	0	than near3 (first second third other another) (first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L214	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) and (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L215	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L216	0	(first second third one) near3 layer near3 conduct\$3 near3 layers near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L217	0	(first second third one) near3 layer near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L218	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L219	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L220	0	conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L221	261988	second near2 conductive layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM

L222	6	second near2 conductive near3 layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L223	23	second near2 conductive near3 layer near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L224	26	second near2 conductive near3 layer same electrical near3 resistivity same less	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L225	9	middle near2 conductive near3 layer near3 (thicker)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L226	23	(middle mid center centre) near2 conductive near3 (layer section part) near3 (thicker wider fatter)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L227	47766	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L228	0	L51 and L52	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L229	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L230	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L231	1	"6504202".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L232	1	"20160103549".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L233	0	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L234	8486	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L235	47766	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L236	7308	first same third same conduct\$3 same layer same titanium and aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L237	5174	first same third same conduct\$3 same layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM

L238	513	same titanium same aluminum L61 and L63	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L239	1494	first near2 conduct\$3 same second near2 conduct\$3 same third near2 conduct\$3 same layer same Titanium same Aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L240	86	L61 and L65	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L241	1265	aluminum near2 layer same (between sorrounded) near3 Titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L242	751	aluminum near2 layer same (between sorrounded) near3 Titanium near2 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L243	95	L61 and L68	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L244	383	towfiq near elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L245	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L246	2	"20170076502"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L247	2	"20180095581"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L248	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L249	383	towfiq near2 elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L250	5	("20100060602" "20110102370" "20120118614" "20120212449" "20120312677").PN. OR ("9323370").URPN.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2022/08/31 03:12 PM
L251	77	"20060097991"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2022/08/31 03:12 PM
L252	3	"15660827" and (thickness near3 second near2 connection part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L253	1	"15660827" and (thickness near3 second near2 connection near2 part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L254	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31

L255	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L256	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L257	3	"15660827"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L258	13	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L259	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern same touch	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L260	0	insula\$3 near2 pattern near3 between near3 first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and touch	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L261	17	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L262	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L263	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L264	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L265	2	"20170336907"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L266	2	"20140160066"	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L267	10	((("AN") near3 ("Chiwook"))).INV.	(USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L268	30	((("KIM") near3 ("Doyeon"))).INV.	(US-PGPUB)	OR	OFF	OFF	03:12 PM 2022/08/31
L269	19	((("PARK") near3 ("Sunghyun"))).INV.	(USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31
L270	45	((("LEE") near3 ("Jaehyun"))).INV.	(USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31

08/31/2022 03:37:38 PM

Workspace: 16742230CON15660827

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L271	1	((("CHO") near3 ("Sung-woong"))).INV.	(USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L272	1	((("CHO") near3 ("Sung-woong"))).INV.	(USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L273	7	insula\$3 near2 pattern near3 between same first near3 conduct\$3 near3 pattern near5 second near3 conduct\$3 near2 pattern and display	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L274	0	touch near3 (sens\$3 detect\$3) near3 on near3 display near3 (part section substrate)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L275	256	touch near3 (sens\$3 detect\$3) near3 display near3 (part section substrate) same insulat\$3	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L276	47766	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L277	200	L101 and L102	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L278	1	"20160147335"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L279	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L280	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L281	2	"20160103549"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L282	0	(first second third) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L283	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L284	0	(first second third one) near3 conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM

L285	0	conductive near3 layer near3 resistivi near3 (less lower) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L286	0	conductive near3 layer near3 resistivi near3 (less lower different) near3 (first second third other another) near3 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L287	1895455	(first second third other another) near3 layer conductive near3 layers near3 resistivi near3 (less lower different)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L288	47766	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L289	26511	L113 and L114	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L290	1464249	(first second third) near3 layer conductive near3 layers near3 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L291	23300	L114 and L116	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L292	2015601	(first second third one) near3 layer conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L293	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same than near3 (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L294	0	(first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) same (first second third other another)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L295	0	(first second third one)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31

L296	0	near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different) and (first second third other another) (first second third one) near3 layer near3 conductive near3 layers near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31 03:12 PM
L297	0	(first second third one) near3 layer near3 conduct\$3 near3 layers near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L298	0	(first second third one) near3 layer near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L299	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi near3 (less lower different more)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L300	0	(first second third one) near3 conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L301	0	conduct\$3 near3 layer\$1 near3 electrical near2 resistivi	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L302	261988	second near2 conductive layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L303	6	second near2 conductive near3 layer near3 electrical near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L304	23	second near2 conductive near3 layer near3 resistivity near3 less near3 than	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L305	26	second near2	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31

L306	9	conductive near3 layer same electrical near3 resistivity same less middle near2 conductive near3 layer near3 (thicker)	(US-PGPUB; USPAT)	OR	OFF	OFF	03:12 PM 2022/08/31 03:12 PM
L307	23	(middle mid center centre) near2 conductive near3 (layer section part) near3 (thicker wider fatter)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L308	47766	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L309	0	L133 and L134	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L310	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L311	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L312	1	"6504202".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L313	1	"20160103549".pn.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L314	0	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L315	8486	first same third same conduct\$3 same layer same titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L316	47766	(H01L27/323 G06F3/0412 G06F3/044 G09G3/3225 H01L51/5256).cpc.	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L317	7308	first same third same conduct\$3 same layer same titanium and aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L318	5174	first same third same conduct\$3 same layer same titanium same aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L319	513	L142 and L144	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L320	1494	first near2 conduct\$3 same second near2 conduct\$3 same third near2 conduct\$3 same layer same Titanium same Aluminum	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM

L321	86	L142 and L146	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L322	1265	aluminum near2 layer same (between sorrounded) near3 Titanium	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L323	751	aluminum near2 layer same (between sorrounded) near3 Titanium near2 layer	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L324	95	L142 and L149	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L325	383	towfiq near elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L326	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L327	2	"20170076502"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L328	2	"20180095581"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L329	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L330	383	towfiq near2 elahi	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L331	5	("20100060602" "20110102370" "20120118614" "20120212449" "20120312677").PN. OR ("9323370").URPN.	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2022/08/31 03:12 PM
L332	77	"20060097991"	(US-PGPUB; USPAT; USOCR)	OR	OFF	OFF	2022/08/31 03:12 PM
L333	3	"15660827" and (thickness near3 second near2 connection part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L334	1	"15660827" and (thickness near3 second near2 connection near2 part\$1)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L335	2	"20100182273"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L336	2	"20160041644"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L337	2	"20140320769"	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L338	0	second near3 conductive near3 pattern near4 thickness near4 (greater bigger (more adj than)) near3	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM

L339	0	thickness near3 second near3 connection near3 part conductive near3 pattern near4 thickness near4 (greater bigger (more adj than)) near3 thickness near3 connection near3 part	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L340	369	second near3 conductive near3 pattern near4 thickness near4 (greater bigger (more adj than)) samr thickness near3 second near3 connection near3 part	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L341	1245	second near3 conduct\$3 near3 pattern near4 (thickness width) near4 (greater bigger (more adj than)) samr (thickness width) near3 second near3 connect\$3 near3 (part section)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L342	0	second near3 conduct\$3 near3 pattern near4 (thickness width) near4 (greater bigger (more adj than)) same (thickness width) near3 second near3 connect\$3 near3 (part section)	(US-PGPUB; USPAT)	OR	OFF	OFF	2022/08/31 03:12 PM
L343	8	"201508587"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/08/31 03:12 PM
L344	0	"TW201508587"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2022/08/31 03:12 PM

L345	21	"2015026071"	EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/08/31 03:12 PM
L346	3	"20160313837"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/08/31 03:12 PM
L347	3	"20140232956"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/08/31 03:12 PM

L348	4	"20200152710"	JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/08/31 03:12 PM
L349	1	((WO-2015026071- A1).did. AND FTDB.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/08/31 03:12 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

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

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16742230
	Filing Date	2020-01-14
	First Named Inventor	Chiwook AN
	Art Unit	2625
	Examiner Name	ELAHI, TOWFIQ
	Attorney Docket Number	183539/411598-04552

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	1	9367162	B2	2016-06-14	Lee			
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	1	1020140069708	KR	A	2014-06-10	Lee	Corresponds to US Patent No. 9367162 as shown above	
	2	2013246723	JP	A	2013-12-09	Takenobu	English Abstract	
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NON-PATENT LITERATURE DOCUMENTS							Remove	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16742230
	Filing Date		2020-01-14
	First Named Inventor	Chiwook AN	
	Art Unit	2625	
	Examiner Name	ELAHI, TOWFIQ	
	Attorney Docket Number	183539/411598-04552	

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1		
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Examiner Signature	/TOWFIQ ELAHI/		Date Considered 08/31/2022
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			
¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.			

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16742230
	Filing Date		2020-01-14
	First Named Inventor	Chiwook AN	
	Art Unit	2625	
	Examiner Name	ELAHI, TOWFIQ	
	Attorney Docket Number	183539/411598-04552	

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Kurt S. Prange/	Date (YYYY-MM-DD)	2022-05-19
Name/Print	Kurt S. Prange	Registration Number	75137

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

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 the Freedom of Information Act requires disclosure of these records.
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.

Bibliographic Data

Application No: 16/742,230

Foreign Priority claimed: ☒ Yes ☐ No

35 USC 119 (a-d) conditions met: ☒ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /TOWFIQ ELAHI/

Examiner's Signature

Initials

Title: DISPLAY DEVICE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
01/14/2020	345	2625	183539/411598-04552
RULE			

APPLICANTS

SAMSUNG DISPLAY CO., LTD., Yongin-si, KOREA, REPUBLIC OF

INVENTORS

Chiwook AN, Hwaseong-si, KOREA, REPUBLIC OF

Doyeon KIM, Seoul, KOREA, REPUBLIC OF

Sunghyun PARK, Seongnam-si, KOREA, REPUBLIC OF

Jaehyun LEE, Seoul, KOREA, REPUBLIC OF

Sung-woong CHO, Asan-si, KOREA, REPUBLIC OF

CONTINUING DATA

This application is a CON of 15660827 07/26/2017 PAT 10541279

FOREIGN APPLICATIONS

KOREA, REPUBLIC OF KR10-2016-0097493 07/29/2016

IF REQUIRED, FOREIGN LICENSE GRANTED**

02/03/2020

STATE OR COUNTRY

KOREA, REPUBLIC OF

ADDRESS

Lewis Roca Rothgerber Christie LLP

PO BOX 29001

Glendale, CA 91209-9001

UNITED STATES

FILING FEE RECEIVED

\$1,720

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)

23363 7590 09/08/2022
Lewis Roca Rothgerber Christie LLP
PO BOX 29001
Glendale, CA 91209-9001

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.

Si Vuong	(Typed or printed name)
/Si Vuong/	(Signature)
October 17, 2022 (E-filed)	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/742,230	01/14/2020	Chiwook AN	183539/411598-04552	7917

TITLE OF INVENTION: DISPLAY DEVICE

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	12/08/2022

EXAMINER	ART UNIT	CLASS-SUBCLASS
ELAHI, TOWFIQ	2625	345-173000

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/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 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 Lewis Roca Rothgerber
Christie LLP

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

Samsung Display Co., Ltd.

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

Yongin-si, Republic of Korea

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 0

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. 03-1728

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 /Peter Hsueh/

Date October 17, 2022

Typed or printed name Peter C. Hsueh

Registration No. 45,574



UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/742,230

RECEIPT DATE / TIME
10/17/2022 02:04:13 PM ET

ATTORNEY DOCKET #
183539/411598-04552

Title of Invention

DISPLAY DEVICE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7917

FILED BY Si Vuong

PATENT CENTER # 61072824

FILING DATE 01/14/2020

CUSTOMER # 23363

FIRST NAMED
INVENTOR Chiwook AN

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY Jun-Young Jeon

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
183539_IssueFeeTransmittal.pdf	1	Issue Fee Payment (PTO-85B)	260 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
183539_IssueFeeTransmittal.pdf	061CC3009A29C8B9C80005A6B43C2E0D53D3C6ED85F9F1A6 A6195D3C58130D6C8E6C245A9D9ADF2982642EF32277FD064 0E4AC68DF5651E20F36C346F669F88B

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 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.



ELECTRONIC PAYMENT RECEIPT

APPLICATION #
16/742,230

RECEIPT DATE / TIME
10/17/2022 02:04:13 PM ET

ATTORNEY DOCKET #
183539/411598-04552

Title of Invention

DISPLAY DEVICE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7917

FILED BY Si Vuong

PATENT CENTER # 61072824

AUTHORIZED BY Jun-Young Jeon

CUSTOMER # 23363

FILING DATE 01/14/2020

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Chiwook AN

Payment Information

PAYMENT METHOD
CARD / 4748

PAYMENT TRANSACTION ID
E20220GE05182630

PAYMENT AUTHORIZED BY
Si Vuong

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
1501	UTILITY ISSUE FEE	1200.00	1	1200.00
TOTAL AMOUNT:				\$1,200.00

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 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.



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.
16/742,230	11/15/2022	11500496	183539/411598-04552	7917
23363	7590	10/26/2022		
Lewis Roca Rothgerber Christie LLP PO BOX 29001 Glendale, CA 91209-9001				

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 0 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 Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional inventors):

Chiwook AN, Hwaseong-si, KOREA, REPUBLIC OF;
Doyeon KIM, Seoul, KOREA, REPUBLIC OF;
Sunghyun PARK, Seongnam-si, KOREA, REPUBLIC OF;
Jaehyun LEE, Seoul, KOREA, REPUBLIC OF;
Sung-woong CHO, Asan-si, KOREA, REPUBLIC OF;

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

SAMSUNG DISPLAY CO., LTD., Yongin-si, KOREA, REPUBLIC OF;

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IR103 (Rev. 10/09)