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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/250,652	04/26/2023	Zheng BAO	27457US01	3056

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EXAMINER
FAROKHROOZ, FATIMA N

ART UNIT	PAPER NUMBER
2875	

NOTIFICATION DATE	DELIVERY MODE
05/18/2026	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):

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Office Action Summary	Application No. 18/250,652	Applicant(s) BAO et al.	
	Examiner FATIMA N FAROKHROOZ	Art Unit 2875	AIA (First Inventor to File) Status Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 3/17/26.

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

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

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

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-17 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-17 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

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

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

Application Papers

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

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

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

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

Attachment(s)

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

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

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

4) ☐ Other: _____.

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.

Response to Amendment

The amendment filed by the Applicant on 3/17/26 is acknowledged.

Claim Rejections - 35 USC § 103

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

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

Claims 1-8 and 10-16 are rejected under 35 U.S.C. 103 as being unpatentable over Jin (US 20180315803 A1, cited previously) in view of Zeng (CN 110709860 A, cited by Applicant, cited previously) and further in view of Wang (CN 210867853 U)

Regarding claim 1, Jin teaches a display module (at least Fig.10, 4-5,7-9), comprising: a display panel 110 having a display surface and a back surface opposite to the display surface, and having a fingerprint identification area (upper surface 111;[0025]); and a light-transmitting protective film (120 that has a light transmitting hole 121,[0032] OR 215) located on the back surface of the display panel, the light-transmitting protective film includes: a protective layer having a target area (hole area), wherein at least the target area is a light-transmitting area, and the target area at least partially overlaps with the fingerprint identification area; a light-shielding pattern (130) located on a side of the protective layer, wherein the light-shielding pattern defines a

plurality of imaging apertures (light penetrating passages 133, [0034],[0036]) , the plurality of imaging apertures are disposed at intervals, and orthogonal projections of the plurality of imaging apertures on the protective layer are at least located in the target area.

Jin teaches the display panel 110 attached to the light shielding layer 130 (fig.5), wherein the attachment has to be a bonding layer/adhesive layer that is transparent to allow light to pass through the light passages 133, since, if the surface 112 that attaches the display 110 to the light shielding pattern 130 is not transparent, then the light is blocked from passing from the display panel 110 to the opening 121 (in Fig.4).

However, Jin does not explicitly teach a light-transmitting adhesive layer located on a side of the light-shielding pattern away from the protective layer, wherein a surface of the light-transmitting adhesive layer away from the light-shielding pattern is in contact with the display panel.

Zeng explicitly teaches a light-transmitting adhesive layer 400 (at least Fig.6, Zeng: include transparent soft rubber layer 400) located on a side of the light-shielding pattern away from the protective layer 500 (fixing component that protects the upper optical layers), wherein a surface of the light-transmitting adhesive layer away from the light-shielding pattern is in contact with the display panel 120 (flexible display screen 120 of the display).

It would have been obvious to one of ordinary skill in the art, before the effective filing date of the claimed invention to use a transparent glue between the display panel and the lower layers, as disclosed in Zeng, in the device of Jin in order to robustly fix the elements together, while facilitating light transmission.

Jin in view of Zeng does not teach: an imaging aperture of the plurality of imaging apertures is configured to generate an inverted image corresponding to passed light on a side of the light-shielding pattern away from the display panel.

Wang teaches an imaging aperture of the plurality of imaging apertures is configured to generate an inverted image corresponding to passed light on a side of the light-shielding pattern away from the display panel (see in Wang: the light of the object on the other side of the small hole plate can pass through the imaging hole, forming the inverted image of the object on the image sensor AND Thus, according to the small hole imaging principle, small hole plate 101 on the other side of the object light, can pass through the imaging hole, the image sensor 102 is formed on the object of the inverted image AND Thus, according to the small hole imaging principle, the light of the object on the other side of the small hole plate can pass through the imaging hole, forming the inverted image of the object on the image sensor).

It would have been obvious to one of ordinary skill in the art, before the effective filing date of the claimed invention to add the inverted image feature, as disclosed in Wang, in the device of Jin in view of Zeng in in order to achieve a relatively complete image of the object (Thus, according to the small hole imaging principle, small hole plate 101 on the other side of the object light, can pass through the imaging hole, the image sensor 102 is formed on the object of the inverted image. through each imaging hole of the light can form a corresponding image on the image sensor 102, the plurality of images to splice, can obtain a relatively complete image of the object).

Regarding claim 2, Jin in view of Zeng and Wang teaches a display module wherein an outer contour of an area of the orthogonal projections of the plurality of imaging apertures (passages 133 that face the opening 121 in Fig.4 of Jin) on the protective layer substantially coincides with an edge of the target area ((passages 133 that face the opening 121 in Fig.4 of Jin).

Regarding claim 3, Jin in view of Zeng and Wang teaches a display module, wherein the light-transmitting adhesive layer (400 in Zeng) covers the light-shielding pattern (between holes 210) and the protective layer (500 of Zeng), and the light-transmitting adhesive layer fills the imaging apertures (see in Zeng: multiple light through holes can be selected, the support structure 200 may be filled in on 210 transparent soft rubber layer 400).

Regarding claim 4, Jin in view of Zeng and Wang teaches a display module, wherein the imaging apertures are each a circular aperture:

(from the teachings of Zeng: Optionally, the plurality of light-passing holes 210 of a **diameter** greater than the first preset value, so sufficient light for imaging. the plurality of light-passing holes 210 of diameter is less than the second preset value, to ensure that light signal blocking large angle incident on the plurality of light-passing holes 210. period of period of the plurality of small light through hole 210 further to be less than the third preset value, to distinguish the fingerprint lines, convenient processing of the fingerprint image. That is, the plurality of parameters of the small light through hole 210 can be set to the light detecting array fingerprint optical signal of one fingerprint ridge incident downwards to make the optical fingerprint identification module 300 above the corresponding region is approximately vertical and/or one fingerprint Yukou maximization of 320, while maximizing the blocking other light signals).

but does not explicitly teach: and an aperture size of an imaging aperture is in a range of 100 μm to 250 μm, inclusive.

However, from the teachings of Zeng above, the aperture size has a preset value and is a result effective variable, and it would have been obvious to one of ordinary skill in the art, before the effective filing date of the claimed invention to use the dimension from the teachings of Zeng in the combined structure of Jin in view of Zeng and Wang ,in order to achieve an optimized fingerprint image.

Regarding claim 5, Jin in view of Zeng and Wang teaches a display module, wherein a distance between two adjacent imaging apertures is in a range of 200 μm to 350 μm, inclusive; Zeng (in Jin in view of Zeng) discloses:

Alternatively, the texture period length of the fingerprint is between λmin to λ max, that is, two adjacent ridge of fingerprint on or adjacent two Yukou is at least λmin of the distance between the plurality of light-passing holes 210, the plurality of light-passing holes 210 of period is less than 1/2 λmin, the 1/2 λmin is the third preset value. For example, minimum line period is 200μm, when the fingerprint of the multiple light through holes 210 as shown in FIG. 5 (a) and (b), small round light through hole and the round through central distance with the adjacent small light is less than 100μm

Therefore, with the example shown above, when the minimum line period is more than 200 μm, then the hole is greater than 100 μm).

Therefore, from the teachings of Zeng above, the period of the spacing between the apertures in Jin in view of Zeng is a result effective variable, and it would have been obvious to one of ordinary skill in the art, before the effective filing date of the claimed invention to use the dimension from the teachings of Zeng in the combined structure of Jin in view of Zeng and Wang, in order to achieve an optimized fingerprint image.

Regarding claim 6, wherein a dimension of the light-shielding pattern in a direction perpendicular to the protective layer is in a range of 200 nm to 500 nm, inclusive: Jin in view of Zeng teaches:

Optionally, the plurality of light-passing holes 210 of the depth is D, that is, the thickness of the supporting structure is D, the plurality of light-passing holes 210 of deep diameter ratio greater than or equal to 10, that is, the plurality of light-passing holes 210 of deep diameter ratio greater than or equal to 10. by calculating the multiple light through holes 210 of deep diameter ratio to determine the first preset value and the second preset value. Alternatively, the can according to the plurality of light-passing holes 210 of diameter is the thickness D of the support structure.

AND
Optionally, the plurality of light-passing holes 210 of viewing angle greater than the viewing angle of the optical lens assembly 313. In this embodiment of the invention, the plurality of light-passing holes 210 of the depth diameter ratio determines the field of view of the plurality of small light through angle, depth of the small light through hole 210 is smaller, the larger the diameter, the small light through hole 210 of viewing angle is larger. determined by the viewing angle of the plurality of light-passing holes 210 of deep diameter ratio, so as to determine the fourth preset value.

Therefore, from the teachings of Zeng above, the depth of the apertures in Jin in view of Zeng is a result effective variable, and it would have been obvious to one of ordinary skill in the art, before the effective filing date of the claimed invention to use the dimension from the teachings of Zeng in the combined structure of Jin in view of Zeng and Wang, in order to optimize the field of view (see from the teachings of Zeng in rejection of claim 6 above).

Regarding claim 7, Jin in view of Zeng and Wang teaches a display module, wherein a dimension of the protective layer 500 (in Fig.6 of Zeng) in a direction perpendicular to the protective layer is larger than a dimension of the light-transmitting

adhesive layer (200 in Fig.6 of Zeng) in the direction perpendicular to the protective layer.

Regarding claim 8, Jin in view of Zeng and Wang teaches a display module, wherein a ratio of a dimension of the light-transmitting adhesive layer in a direction perpendicular to the protective layer to a dimension of the protective layer in the direction perpendicular to the protective layer is lower than one, as the light-transmitting adhesive layer (400 in Zeng) is shown to be thinner than protective layer (500 in Zeng) but does not teach the ratio is in a range of 1:10 to 3:10. However, it would have been obvious to one of ordinary skill in the art, before the effective filing date of the claimed invention to use the ratio as claimed, in the combined structure of Jin in view of Zeng and Wang, in order to optimize the size and durability of the display module.

Regarding claim 10, Jin in view of Zeng and Wang teaches a display apparatus, comprising: the display module; and a fingerprint sensor (212 in Fig.9 of Jin) located on a side of the light-transmitting protective film of the display module away from the display panel, wherein an orthogonal projection of the fingerprint sensor on the display panel of the display module is at least located in the fingerprint identification area (214 in Fig. 9 of Jin) of the display panel.

Regarding claim 11, Jin in view of Zeng and Wang teaches a display module, wherein the target area (opening 120 of Jin) of the protective layer substantially coincides with the fingerprint identification area (214 of Jin) of the display panel.

Regarding claim 12, Jin in view of Zeng and Wang teaches a display module, wherein a light transmittance of an area of the protective layer (500 in Zeng or 120 in Jin) other than the target area is smaller than a light transmittance of the target area.

Regarding claim 13, Jin in view of Zeng and Wang teaches a display module, wherein the surface of the light-transmitting adhesive layer (400 in Zeng) away from the light-shielding pattern (200 in Zeng) is a plane.

Regarding claim 14, Jin in view of Zeng and Wang teaches a display module, wherein the light-transmitting adhesive layer (400 in Zeng) is made of a material with adhesivity (transparent glue layer 400 in Zeng); a surface of the light-transmitting adhesive layer proximate to the protective layer (when 400 fills the apertures 210 in Fig 6 of Zeng, it touches the protective layer 500) and the light-shielding pattern 200 is bonded to the protective layer and the light-shielding pattern; and the surface of the light-transmitting adhesive layer away from the light-shielding pattern and the protective layer is bonded to the display panel (120 in Zeng).

Regarding claims 15 and 16, Jin in view of Zeng and Wang teaches the invention set forth in claim 1 above, but is silent regarding a dimension of the protective layer in a direction perpendicular to the protective layer is in a range of 50 to 100 micrometer inclusive (for claim 15) and a dimension of the light-transmitting adhesive layer in a

direction perpendicular to the protective layer is in a range of 10 to 15 micrometer, inclusive (for claim 16).

However, the claimed parameters are design criteria and result effective variables wherein Zeng in the combined structure of Jin in view of Zeng discloses:

1. Alternatively, multiple light through holes can be **micro-nano** processing technique or **nanometer** printing technology to prepare the opening area 201 is 210. Specifically, using the **micro-nano** processing technology, performing small pattern photoetching on the support structure, the support structure material pinhole pattern are etched to form a plurality of small light through hole.
2. In the above case, under the same process conditions, can reduce the ratio of depth to diameter of small light through hole on the opening area, increasing through fingerprint small light received light signal.

3. Optionally, the plurality of light-passing holes 210 of the depth is D, that is, the thickness of the supporting structure is D, the plurality of light-passing holes 210 of deep diameter ratio greater than or equal to 10, that is, the plurality of light-passing holes 210 of deep diameter ratio greater than or equal to 10. by calculating the multiple light through holes 210 of deep diameter ratio to determine the first preset value and the second preset value. Alternatively, the can according to the plurality of light-passing holes 210 of diameter is the thickness D of the support structure.

4. Optionally, the plurality of light-passing holes 210 of viewing angle greater than the viewing angle of the optical lens assembly 313. In this embodiment of the invention, the plurality of light-passing holes 210 of the depth diameter ratio determines the field of view of the plurality of small light through angle, depth of the small light through hole 210 is smaller, the larger the diameter, the small light through hole 210 of viewing angle is larger. determined by the viewing angle of the plurality of light-passing holes 210 of deep diameter ratio, so as to determine the fourth preset value.

Therefore, from the teachings of Zeng, the elements are manufactured with micro-nano technologies, implying micro-nano dimensions and it would have been obvious to one of ordinary skill in the art, before the effective filing date of the invention, to use the micro-nano dimensions, from the teachings of Zeng, for the height and

dimensions as claimed, in the device of Jin in view of Zeng and Wang in order to achieve an easy-to-handle miniature display device.

Claims 9 and 17 are rejected under 35 U.S.C. 103 as being unpatentable over Jin in view of Zeng and Wang and further in view of Seo (US 20190087630 A1,cited previously)

Regarding claim 9, Jin in view of Zeng and Wang teaches the invention set forth in claim 1 above, but is silent regarding a heat dissipation film, wherein the heat dissipation film includes a light-shielding material; the heat dissipation film is located on a side of the light-transmitting protective film away from the display panel, and the heat dissipation film is provided with a light- transmitting opening therein, wherein a contour of an orthogonal projection of the light-transmitting opening on the protective layer of the light-transmitting protective film surrounds an area of the orthogonal projections of the plurality of imaging apertures of the light-transmitting protective film on the protective layer.

Seo teaches a display device (at least Fig.1B) comprising a heat dissipation film 116 ([0037]), wherein the heat dissipation film includes a light-shielding material ([0043]); the heat dissipation film is located on a side of the light-transmitting protective film (112 that has a transmitting opening) away from the display panel 140, and the heat dissipation film is provided with a light- transmitting opening therein (central opening of 116), and it would have been obvious to one of ordinary skill in the art, before the effective filing date of the invention, to use the heat dissipation layer, as disclosed in Seo, in the device of Jin in view of Zeng and Wang such that a contour of an orthogonal projection of the light-transmitting opening on the protective layer of the light-

transmitting protective film surrounds an area of the orthogonal projections of the plurality of imaging apertures of the light-transmitting protective film on the protective layer in order to efficiently dissipate heat.

Regarding claim 17, Jin in view of Zeng and Wang teaches the invention set forth in claim 1 above but is silent regarding the heat dissipation film includes an adhesive layer, a buffer layer and a heat dissipation layer that are stacked in sequence in a direction away from the back surface of the display panel.

Seo teaches a display device wherein the heat dissipation film 116 includes an adhesive layer 114 ([0037]), a buffer layer 115 and a heat dissipation layer that are stacked in sequence in a direction away from the back surface of the display panel and it would have been obvious to one of ordinary skill in the art, before the effective filing date of the invention, to use the heat dissipation layer, as disclosed in Seo, in the device of Jin in view of Zeng and Wang in order to efficiently dissipate heat.

Other art

CN 107994034 A: teaches a Display Panel With Fingerprint Recognition Function Wherein:

the size so the light transmission hole on the metal shielding layer cannot be too big, small imaging image is an **inverted image.**

Response to Arguments

The arguments filed by the Applicant on 3/17/26 is acknowledged, however it is moot in view of new grounds of rejection for the amended claims.

Further, regarding the inverted image feature, another prior art teaches the feature as described under other art above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any nonprovisional extension fee (37 CFR 1.17(a)) pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fatima Farokhrooz whose telephone number is (571)-272-6043. The examiner can normally be reached on Monday- Friday, 9 am - 5 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James Greece can be reached on (571) 270-3711. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Fatima N Farokhrooz/
Examiner, Art Unit 2875