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(12) **United States Design Patent**  
**Zhou et al.**

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- (54) **BUSBAR-LESS SOLAR CELL**
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- (73) Assignee: **FLEX LTD.**, Singapore (SG)
- (\*\*) Term: **15 Years**
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- (51) **LOC (11) Cl.** ..... **13-02**
- (52) **U.S. Cl.**  
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- (58) **Field of Classification Search**  
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CPC ..... H02J 7/0042; H02J 7/0045; H02J 7/0052;  
H01R 31/06; H01R 24/38; H01L 31/042;  
H01L 31/045; H01L 31/046; H01L  
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See application file for complete search history.

(56) **References Cited**  
U.S. PATENT DOCUMENTS

3,340,096	A	9/1967	Mann et al.
3,769,091	A	10/1973	Leinkram et al.
3,811,181	A	5/1974	Leinkram et al.
3,837,924	A	9/1974	Baron
4,040,867	A	8/1977	Forestieri et al.
4,617,421	A	10/1986	Nath et al.
4,877,460	A	10/1989	Flodl
5,096,505	A	3/1992	Fraas et al.
5,547,516	A	8/1996	Luch
5,575,861	A	11/1996	Younan et al.

5,735,966	A	4/1998	Luch
6,232,545	B1	5/2001	Samaras et al.
6,414,235	B1	7/2002	Luch

(Continued)

FOREIGN PATENT DOCUMENTS

CN	102655030	A	9/2012
CN	202977481	U	6/2013

(Continued)

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(57) **CLAIM**

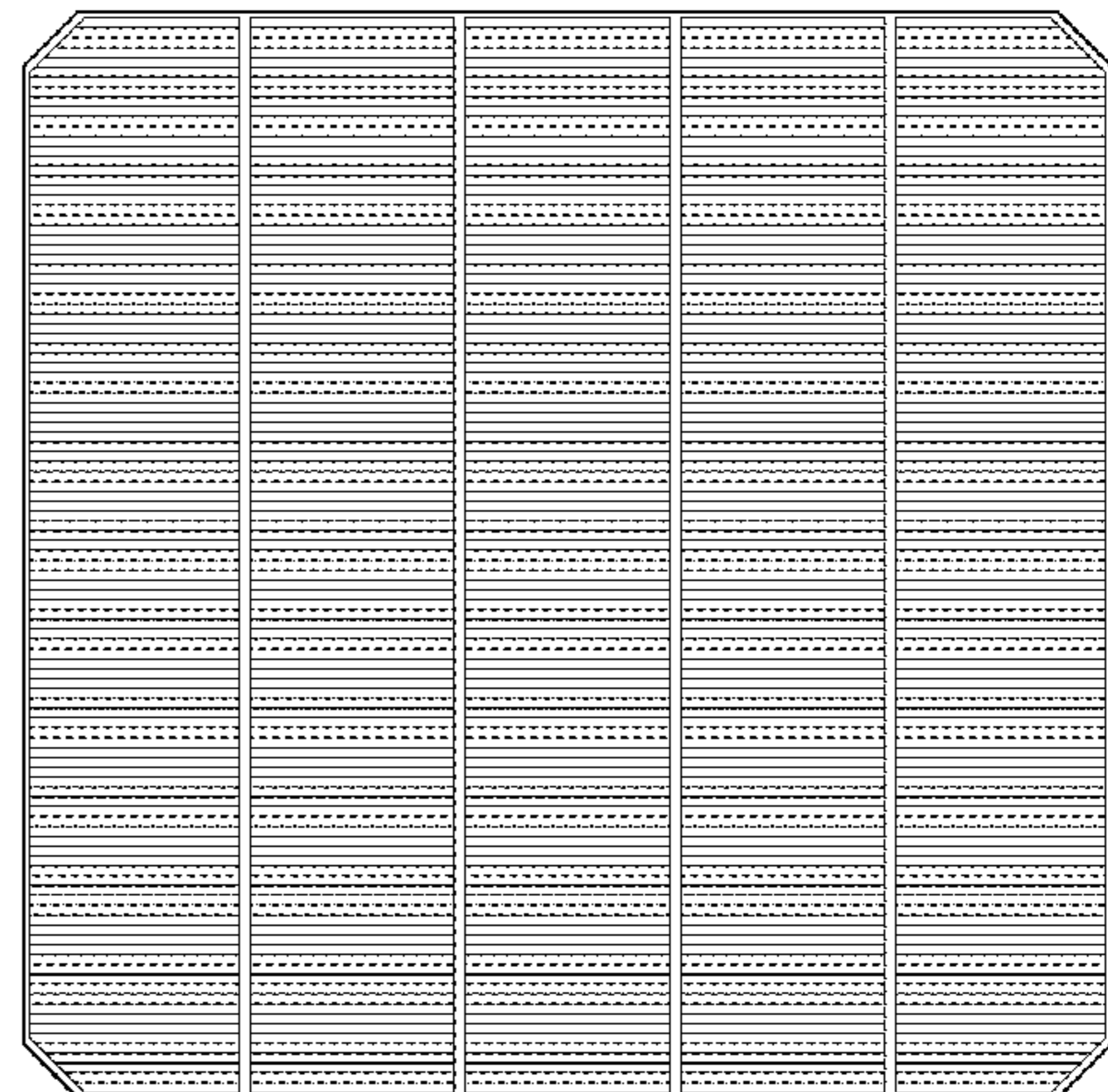
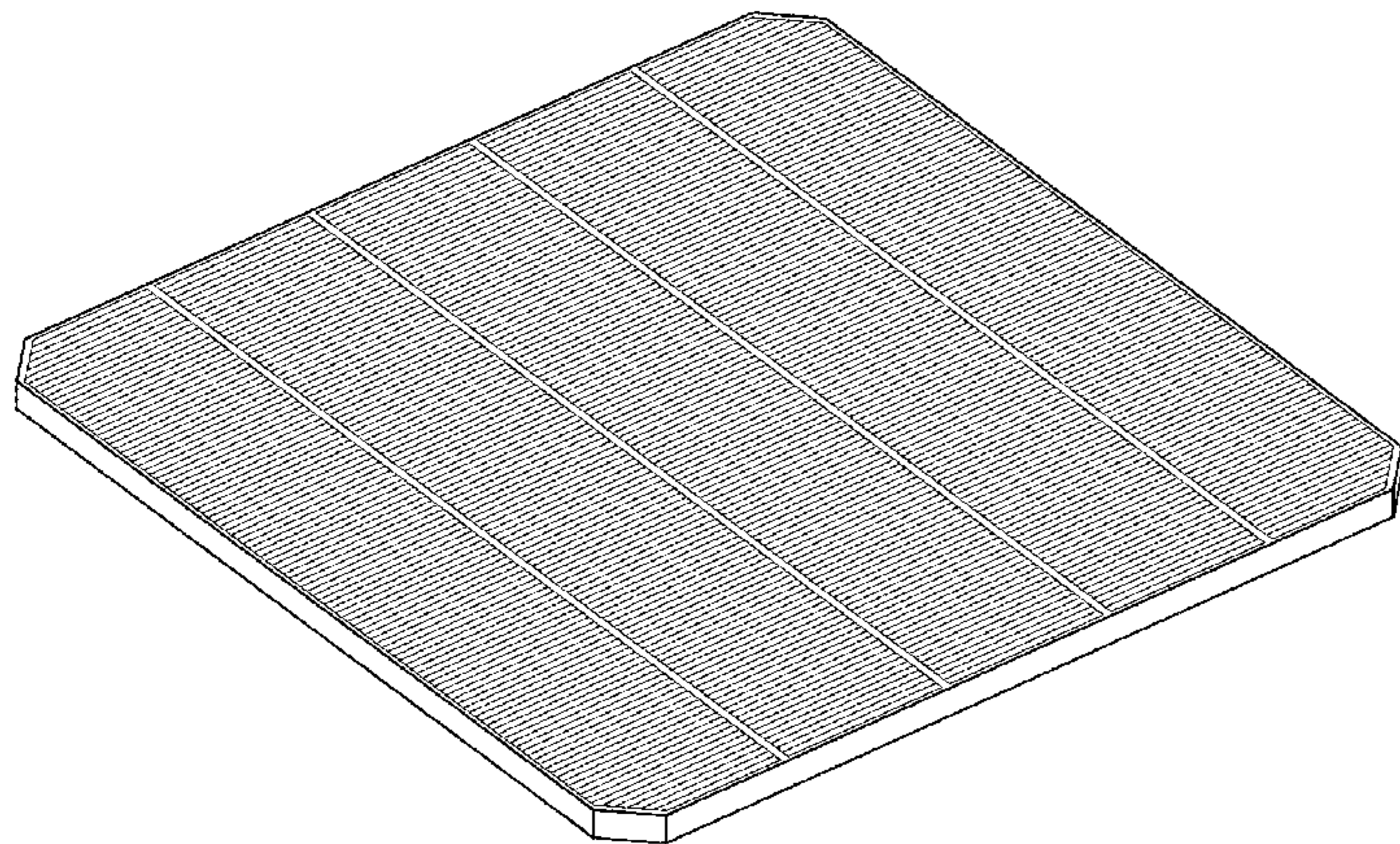
The ornamental design for a busbar-less solar cell, as shown and described.

**DESCRIPTION**

FIG. 1 is a top perspective view of the first embodiment of a bussbar-less solar cell showing our new design; FIG. 2 is a top plan view thereof; FIG. 3 is a bottom plan view thereof; FIG. 4 is a right side elevation view thereof; FIG. 5 is a left side elevation view thereof; FIG. 6 is a back elevation view thereof; FIG. 7 is a front elevation view thereof; FIG. 8 is a top perspective view of the second embodiment of a bussbar-less solar cell showing our new design; FIG. 9 is a top plan view thereof; FIG. 10 is a bottom plan view thereof; FIG. 11 is a right side elevation view thereof; FIG. 12 is a left side elevation view thereof; FIG. 13 is a back elevation view thereof; and, FIG. 14 is a front elevation view thereof.

Applicant reserves the right to amend the claimed invention by showing in solid lines any and all features or portions thereof originally shown in broken lines and/or by showing in broken lines any and all features or portions thereof originally shown in solid lines.

**1 Claim, 6 Drawing Sheets**



(56)

References Cited

U.S. PATENT DOCUMENTS

6,459,032 B1 10/2002 Luch  
 7,732,243 B2 6/2010 Luch  
 7,740,497 B2 6/2010 Nightingale  
 7,898,053 B2 3/2011 Luch  
 7,898,054 B2 3/2011 Luch  
 7,989,692 B2 8/2011 Luch  
 7,989,693 B2 8/2011 Luch  
 8,007,306 B2 8/2011 Nightingale et al.  
 8,033,857 B2 10/2011 Nightingale et al.  
 D658,119 S \* 4/2012 Bamberg ..... D13/102  
 8,198,696 B2 6/2012 Luch  
 8,242,351 B2 8/2012 Gibson et al.  
 D670,239 S \* 11/2012 Kannou ..... D13/102  
 D679,650 S \* 4/2013 Farris, III ..... D13/102  
 8,563,848 B1 10/2013 Wen et al.  
 D699,176 S 2/2014 Salomon et al.  
 D741,793 S \* 10/2015 Lim ..... H01L 31/02243  
 D13/102  
 D742,306 S \* 11/2015 Tohoda ..... D13/102  
 D762,163 S \* 7/2016 Parilla ..... D13/102  
 D763,787 S \* 8/2016 Parilla ..... D13/102  
 D781,230 S 3/2017 Gibson et al.  
 D784,254 S 4/2017 Parilla et al.  
 D788,027 S 5/2017 Gibson et al.  
 9,935,222 B1 \* 4/2018 Zhou ..... H01L 31/042  
 2003/0121228 A1 7/2003 Stoehr et al.  
 2007/0235077 A1 10/2007 Nagata et al.  
 2008/0011350 A1 1/2008 Luch  
 2008/0216887 A1 9/2008 Hacke et al.  
 2008/0314433 A1 12/2008 Luch  
 2009/0107538 A1 4/2009 Luch  
 2009/0120484 A1 5/2009 Nightingale  
 2009/0293941 A1 12/2009 Luch  
 2010/0024881 A1 2/2010 Hacke et al.  
 2010/0078058 A1 4/2010 Nightingale et al.  
 2010/0108118 A1 5/2010 Luch  
 2010/0175743 A1 7/2010 Gonzalez et al.  
 2011/0067754 A1 3/2011 Luch  
 2011/0126878 A1 6/2011 Hacke et al.  
 2011/0168238 A1 7/2011 Metin et al.  
 2011/0186104 A1 8/2011 Shugar et al.

2011/0186107 A1 8/2011 Gibson et al.  
 2011/0197947 A1 8/2011 Croft  
 2011/0240096 A1 10/2011 Maheshwari  
 2011/0315196 A1 12/2011 Gibson et al.  
 2012/0031461 A1 2/2012 Luch  
 2012/0125391 A1 5/2012 Pinarbasi et al.  
 2012/0167945 A1 7/2012 Shugar et al.  
 2012/0167946 A1 7/2012 Maheshwari et al.  
 2012/0167947 A1 7/2012 Battaglia, Jr. et al.  
 2012/0167948 A1 7/2012 Marathe et al.  
 2012/0171802 A1 7/2012 Luch et al.  
 2012/0204938 A1 8/2012 Hacke et al.  
 2012/0211052 A1 8/2012 Marathe et al.  
 2012/0318318 A1 12/2012 Metin et al.  
 2012/0318319 A1 12/2012 Pinarbasi et al.  
 2012/0325282 A1 12/2012 Snow et al.  
 2013/0032194 A1 2/2013 Gibson et al.  
 2013/0068827 A1 3/2013 Akimoto  
 2014/0102502 A1 4/2014 Luch et al.  
 2016/0172515 A1 6/2016 Shugar et al.  
 2016/0226438 A1 8/2016 Gibson et al.  
 2016/0226439 A1 8/2016 Gibson  
 2017/0301802 A1 10/2017 Gibson  
 2017/0301821 A1 10/2017 Gibson et al.  
 2017/0301822 A1 10/2017 Gibson et al.  
 2017/0336105 A1 11/2017 Au

FOREIGN PATENT DOCUMENTS

CN 203242643 U 10/2013  
 CN 203445139 U 2/2014  
 CN 104201227 A 12/2014  
 CN 104810412 A 7/2015  
 CN 205609546 U 9/2016  
 CN 205609547 U 9/2016  
 CN 205609548 U 9/2016  
 ES 1073379 U 12/2010  
 JP 2013140841 A 7/2013  
 WO 2012091781 A1 7/2012  
 WO 2012091782 A1 7/2012  
 WO 2012106003 A1 8/2012  
 WO 2014/112424 A1 7/2014  
 WO 2016123559 A1 8/2016

\* cited by examiner

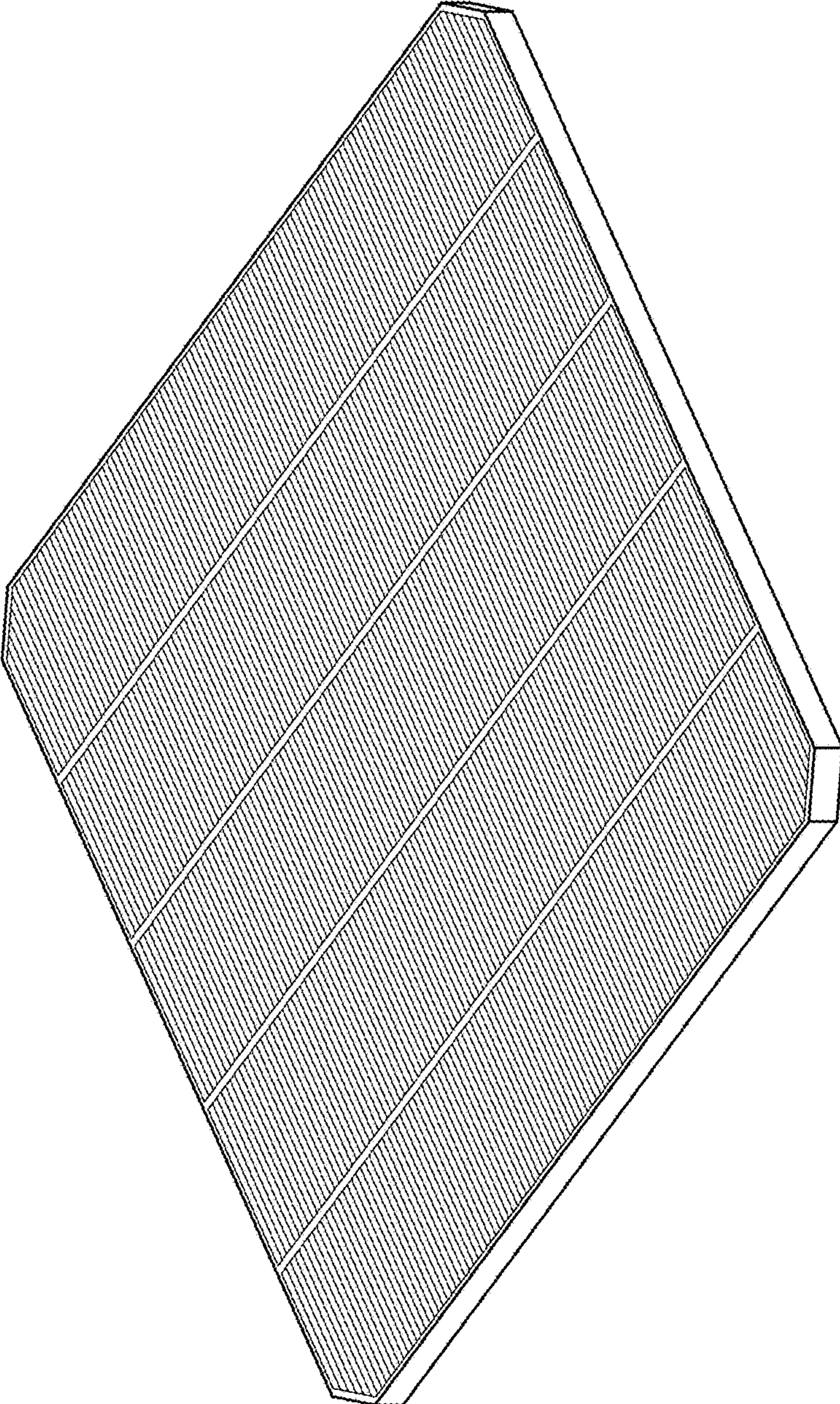


FIG. 1

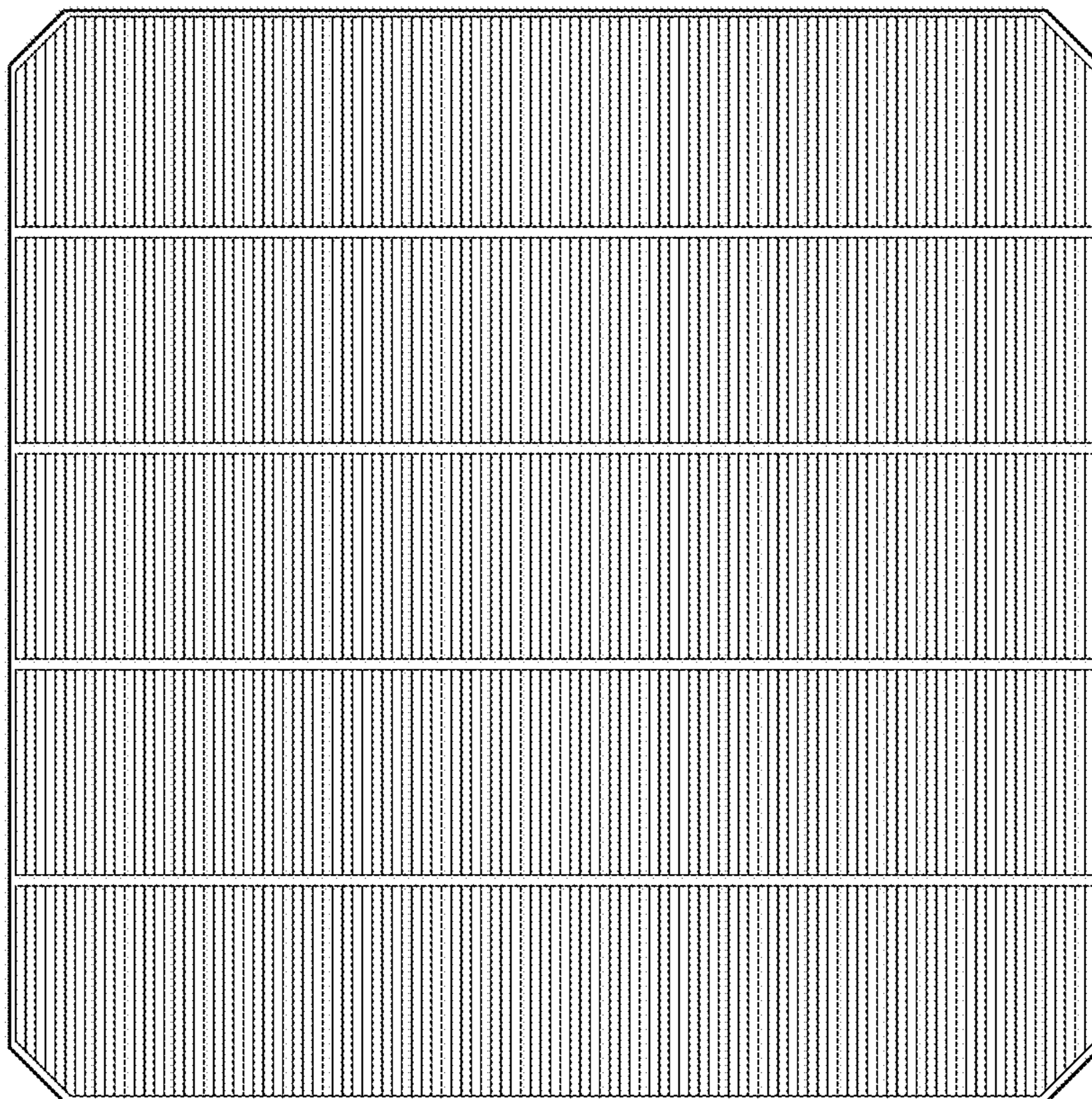


FIG. 3

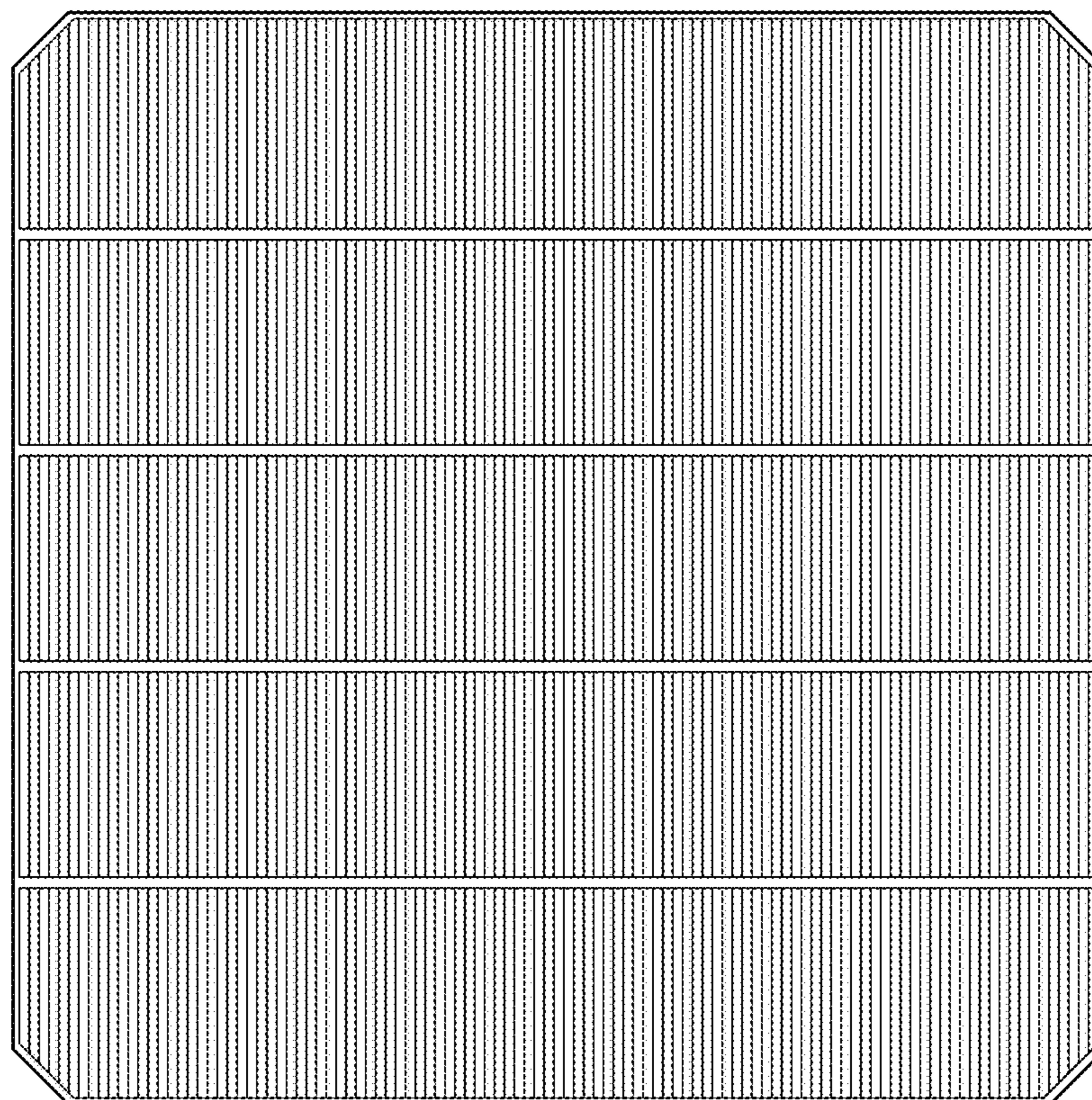


FIG. 2



FIG. 4

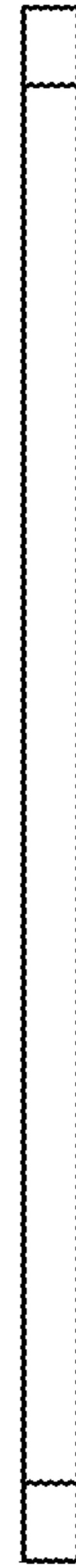


FIG. 5

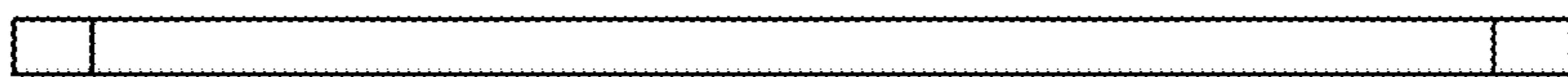


FIG. 6

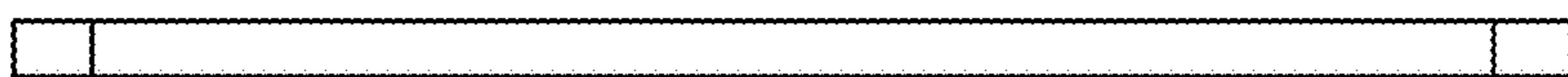


FIG. 7

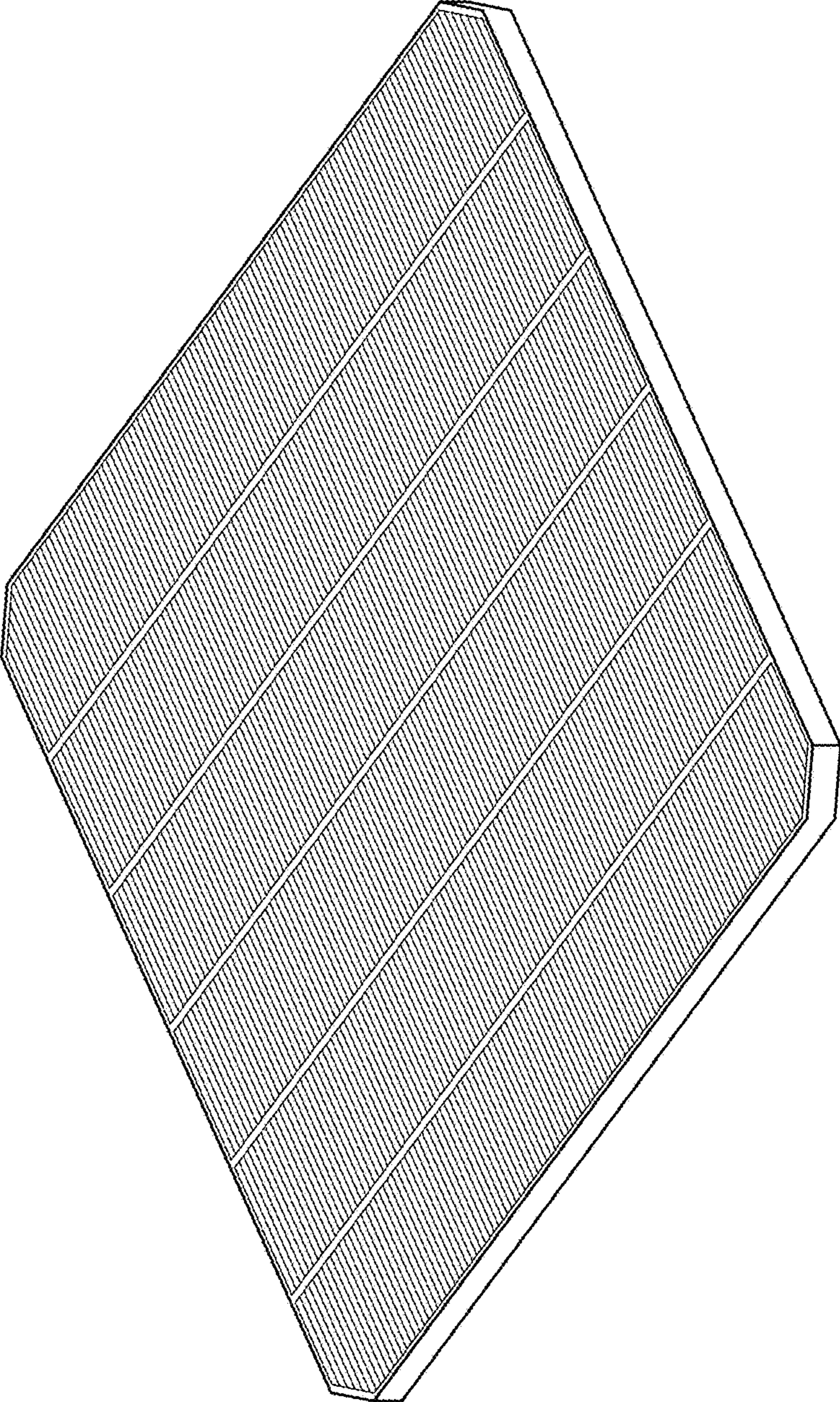


FIG. 8

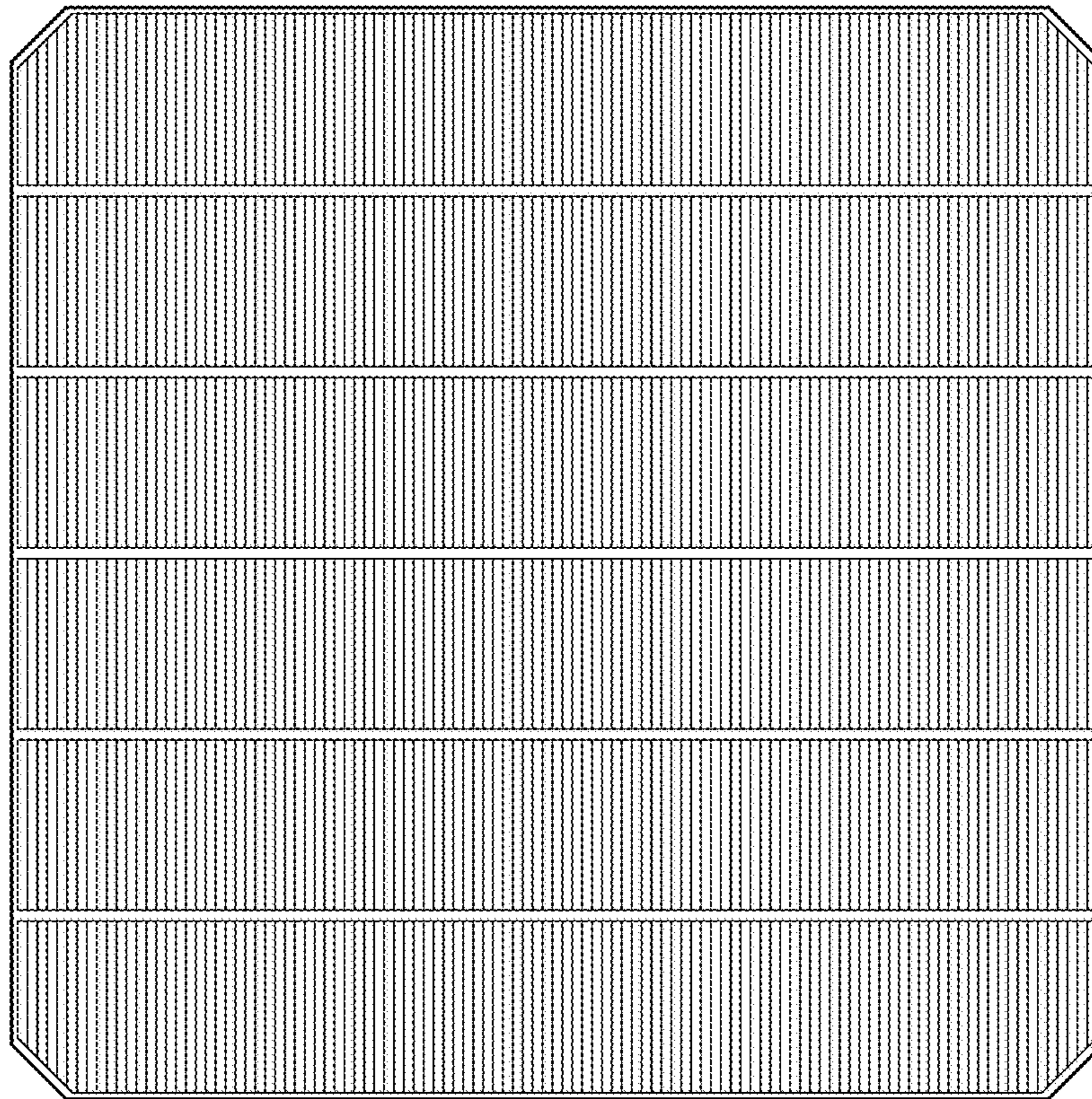


FIG. 10

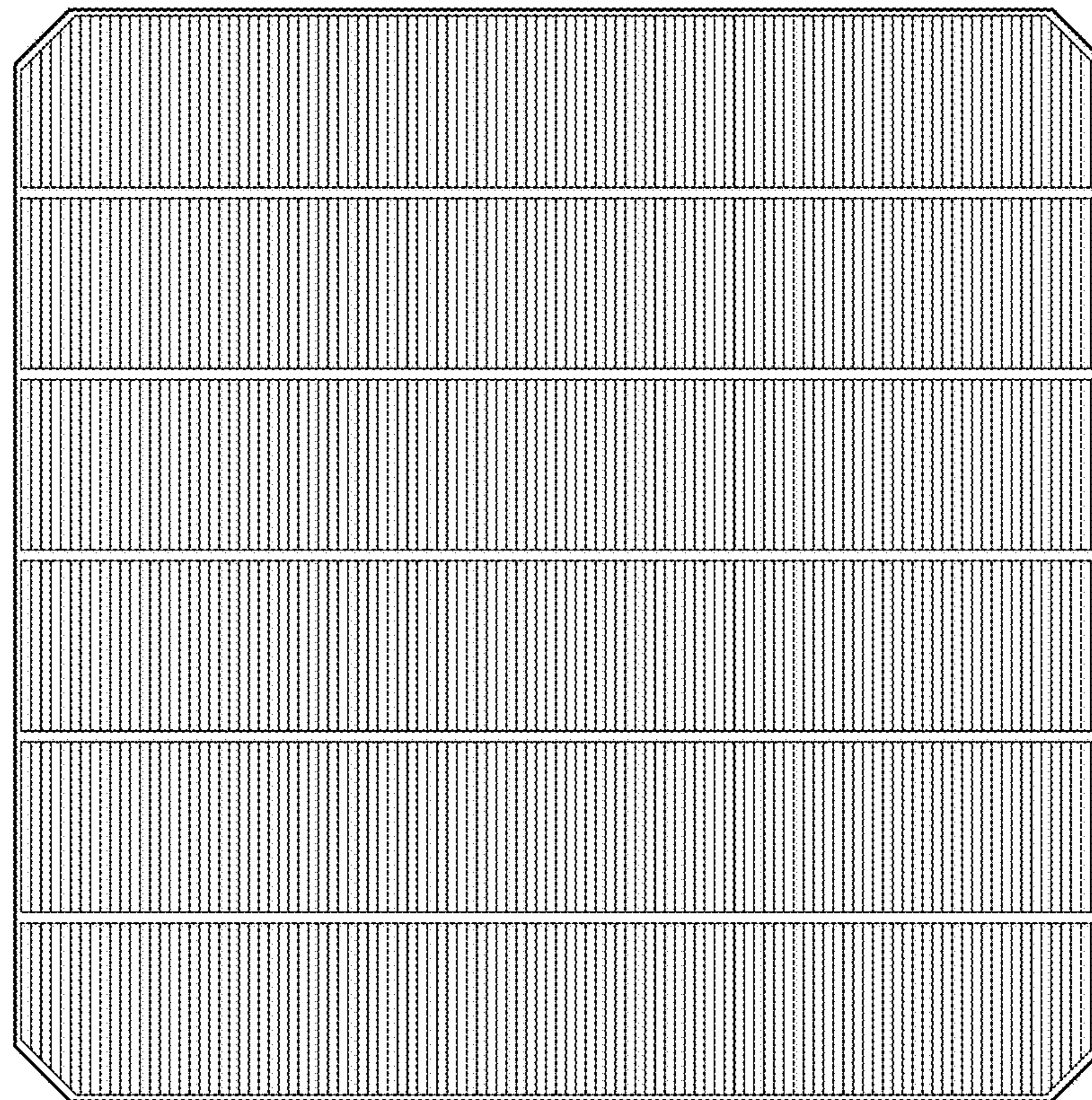


FIG. 9



FIG. 11



FIG. 12



FIG. 13



FIG. 14