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

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(54) **SEMICONDUCTOR MODULE**

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- (\*\*) Term: **15 Years**
- (21) Appl. No.: **29/757,007**
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**Related U.S. Application Data**

- (62) Division of application No. 29/666,024, filed on Oct. 9, 2018, now Pat. No. Des. 906,271.

(30) **Foreign Application Priority Data**

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- Apr. 13, 2018 (JP) ..... 2018-008229

- (51) **LOC (14) Cl.** ..... **13-03**

- (52) **U.S. Cl.**  
USPC ..... **D13/182**

(58) **Field of Classification Search**

- USPC ..... D13/182; 257/678, 684, 690, 691; 361/679.01, 713, 728, 736, 760, 761, 772, 361/775, 783, 820; 174/250, 253; 438/15, 25, 26, 51, 55, 63, 64, 106
- CPC . H01L 21/00; H01L 2224/42; H01L 2224/43; H01L 2021/00; H01L 2021/02; H01L 2021/04; H01L 21/4814; H01L 21/4846; H01L 21/4871; H01L 21/67144; H01L 23/02; H01L 23/13; H01L 23/14; H01L 23/147; H01L 2924/171; H01L 2924/1711; H01L 2924/1715; H01L

(Continued)

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

- 3,602,846 A 8/1971 Hauser
- 3,762,039 A 10/1973 Douglass et al.

(Continued)

**FOREIGN PATENT DOCUMENTS**

- JP 1145764 7/2002
- JP 1146361 7/2002

(Continued)

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(57) **CLAIM**

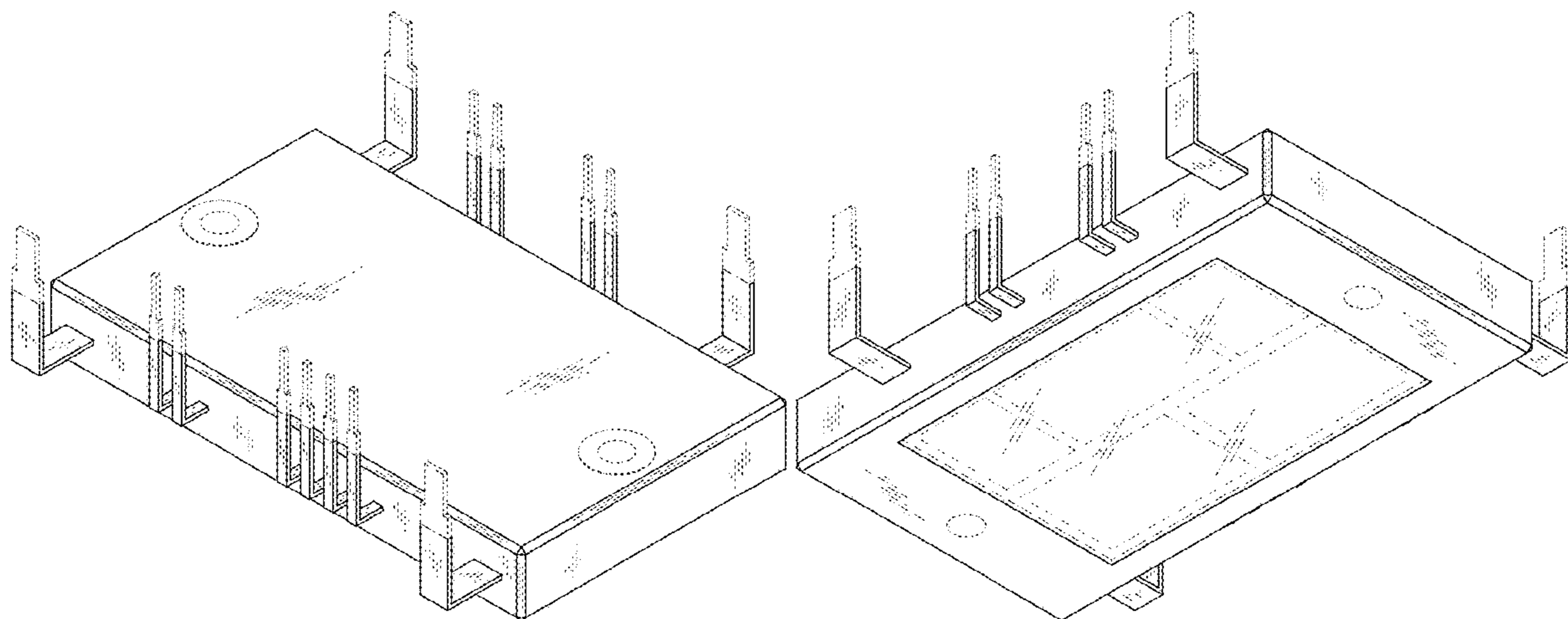
The ornamental design for a semiconductor module, as shown and described.

**DESCRIPTION**

FIG. 1 is a front, top and right side perspective view of a semiconductor module, showing our new design;  
 FIG. 2 is a rear, bottom, and left side perspective view thereof;  
 FIG. 3 is a front view thereof;  
 FIG. 4 is a rear view thereof;  
 FIG. 5 is a top plan view thereof;  
 FIG. 6 is a bottom plan view thereof;  
 FIG. 7 is a right side view thereof, the left side view being identical to FIG. 7;  
 FIG. 8 is a cross-sectional view taken along line 8-8 in FIG. 5; and,  
 FIG. 9 is a cross-sectional view taken along line 9-9 in FIG. 5.

The even broken lines illustrate portions of the semiconductor module and form no part of the claimed design. The dash-dotted lines denote the boundary of the claim and form no part of the claimed design. The member illustrated with fine, diagonal, parallel lines in FIG. 2 and FIG. 6 is transparent.

**1 Claim, 9 Drawing Sheets**



(58) **Field of Classification Search**

CPC ..... 2924/17151; H01L 2924/181; H01L  
2924/1811; H01L 2924/1815; H01L  
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2224/08054; H01L 23/58; H05B 41/14;  
G02B 6/4201; G02B 6/4256; G02B  
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G02B 6/428; G02B 6/4281; H05K 1/14;  
H05K 1/141; H05K 1/142; H05K 1/144;  
H05K 1/18; H05K 1/181; H05K 1/182;  
H05K 1/026

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,825,876 A 7/1974 Damon et al.  
3,846,734 A \* 11/1974 Pauza ..... H05K 7/1076  
174/559  
4,391,408 A 7/1983 Hanlon et al.  
4,441,119 A \* 4/1984 Link ..... H05K 7/1053  
439/70  
D288,557 S \* 3/1987 Du Bois ..... D13/182  
D288,922 S 3/1987 Olla  
4,663,833 A 5/1987 Tanaka et al.  
4,951,122 A \* 8/1990 Tsubosaki ..... H01L 23/4951  
257/796  
D317,592 S 6/1991 Yoshizawa  
5,172,213 A \* 12/1992 Zimmerman ..... H01L 23/49531  
257/796  
5,347,160 A \* 9/1994 Sutrina ..... H01L 24/73  
257/691  
D357,462 S 4/1995 Terasawa et al.  
D357,671 S 4/1995 Terasawa et al.  
5,410,450 A 4/1995 Iida et al.  
D358,806 S \* 5/1995 Siegel ..... D13/182  
D359,028 S \* 6/1995 Siegel ..... D13/182  
5,434,357 A \* 7/1995 Belcher ..... H01L 23/04  
257/684  
5,486,720 A \* 1/1996 Kierse ..... H01L 23/4334  
257/796  
5,594,282 A \* 1/1997 Otsuki ..... H01L 23/4334  
257/796  
5,646,443 A \* 7/1997 Takahashi ..... H01L 23/04  
257/730  
D394,244 S 5/1998 Majumdar et al.  
D396,211 S \* 7/1998 Enomoto ..... D13/182  
D396,212 S \* 7/1998 Enomoto ..... D13/182  
D396,213 S \* 7/1998 Enomoto ..... D13/182  
5,798,570 A \* 8/1998 Watanabe ..... H01L 23/4334  
257/713  
D401,912 S 12/1998 Majumdar et al.  
5,910,681 A \* 6/1999 Kozono ..... H01L 23/49575  
257/676  
5,959,842 A \* 9/1999 Leonard ..... H05K 7/1092  
361/767

D418,485 S 1/2000 Kawafuji et al.  
D421,969 S 3/2000 Kawafuji et al.  
D427,977 S \* 7/2000 Takizawa ..... D13/182  
D428,859 S 8/2000 Kawafuji et al.  
D448,739 S 10/2001 Iwasaki et al.  
D466,485 S 12/2002 Maehara et al.  
D470,825 S 2/2003 Iwasaki et al.  
6,716,670 B1 \* 4/2004 Chiang ..... H01L 25/105  
438/126  
D505,399 S 5/2005 Yoshida et al.  
D505,400 S 5/2005 Kawafuji et al.  
6,992,386 B2 \* 1/2006 Hata ..... H01L 24/33  
257/E23.044  
D539,761 S 4/2007 Takahashi et al.  
D548,202 S 8/2007 Takahashi  
D548,203 S 8/2007 Takahashi  
D606,951 S 12/2009 Soyano et al.  
8,107,255 B2 1/2012 Sakamoto et al.  
D653,633 S 2/2012 Soyano  
D653,634 S 2/2012 Soyano  
D705,184 S 5/2014 Takahashi et al.  
D712,853 S 9/2014 Nakamura  
D717,253 S 11/2014 Jo et al.  
D717,254 S 11/2014 Jo et al.  
D717,255 S 11/2014 Lim et al.  
D717,256 S 11/2014 Sohn et al.  
D719,113 S 12/2014 Sohn et al.  
D719,537 S 12/2014 Kawase et al.  
D719,926 S 12/2014 Sohn et al.  
D721,048 S 1/2015 Nakamura  
D721,340 S 1/2015 Nakamura  
D766,851 S 9/2016 Yoneyama et al.  
D767,516 S 9/2016 Yoneyama et al.  
D770,994 S 11/2016 Hasegawa et al.  
D772,182 S 11/2016 Hasegawa et al.  
D773,412 S 12/2016 Yoneyama et al.  
D773,413 S 12/2016 Yoneyama et al.  
D810,036 S 2/2018 Sawayanagi et al.  
D852,765 S \* 7/2019 Nii ..... D13/182  
D856,947 S \* 8/2019 Nii ..... D13/182  
D859,334 S \* 9/2019 Yokoyama ..... D13/182  
D864,135 S \* 10/2019 Yokoyama ..... D13/182  
D932,452 S \* 10/2021 McBride ..... D13/182  
D934,187 S \* 10/2021 Cheng ..... D13/182  
D937,231 S \* 11/2021 Saxena ..... D13/182  
2003/0042584 A1 3/2003 Yamaguchi  
2010/0149774 A1 6/2010 Matsumoto et al.  
2011/0044012 A1 2/2011 Matsumoto

FOREIGN PATENT DOCUMENTS

JP 1146362 7/2002  
JP 1146363 7/2002  
JP 1305812 7/2007  
JP 1551590 6/2016  
JP 1565636 12/2016  
JP 1578687 6/2017

\* cited by examiner



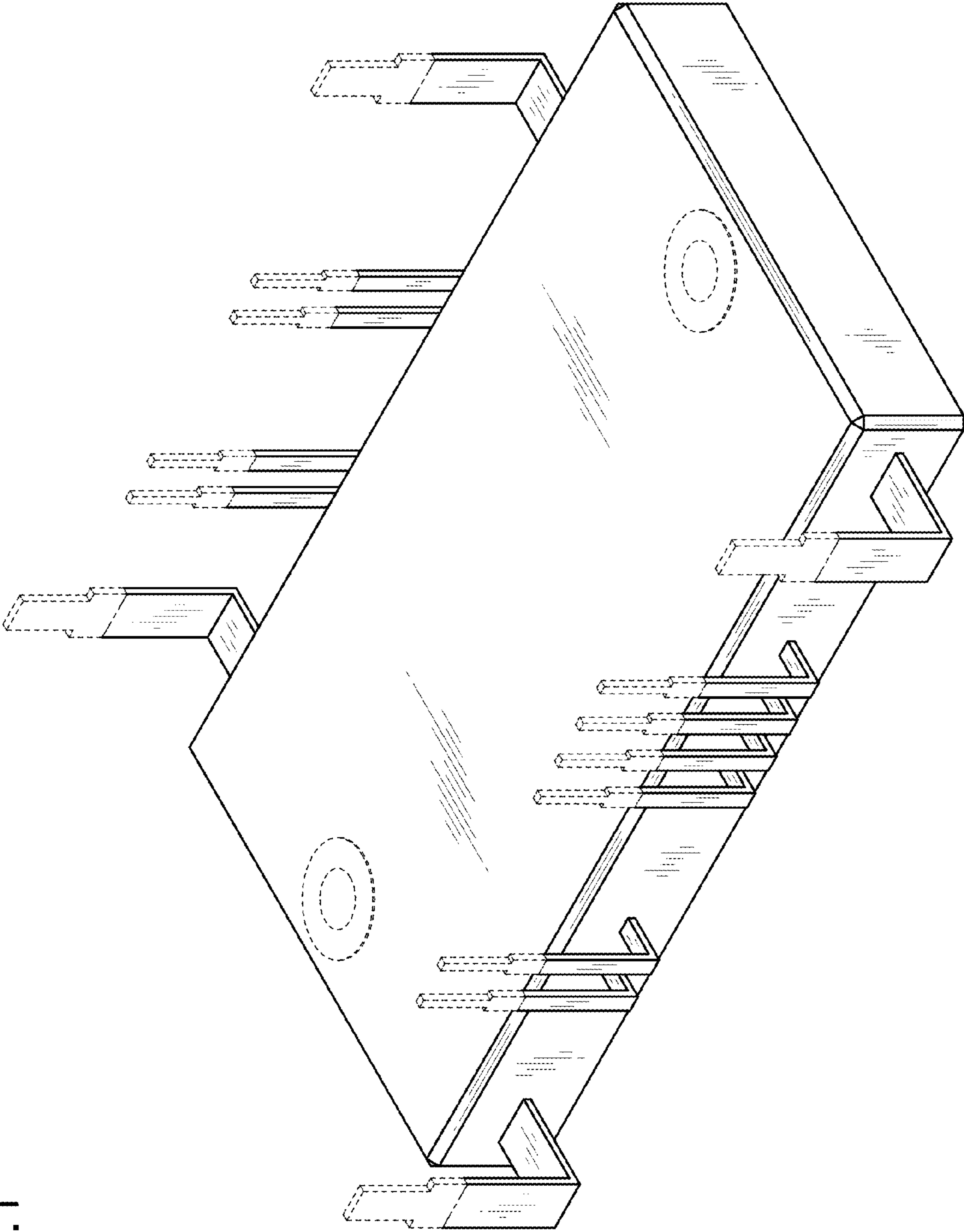


FIG.1

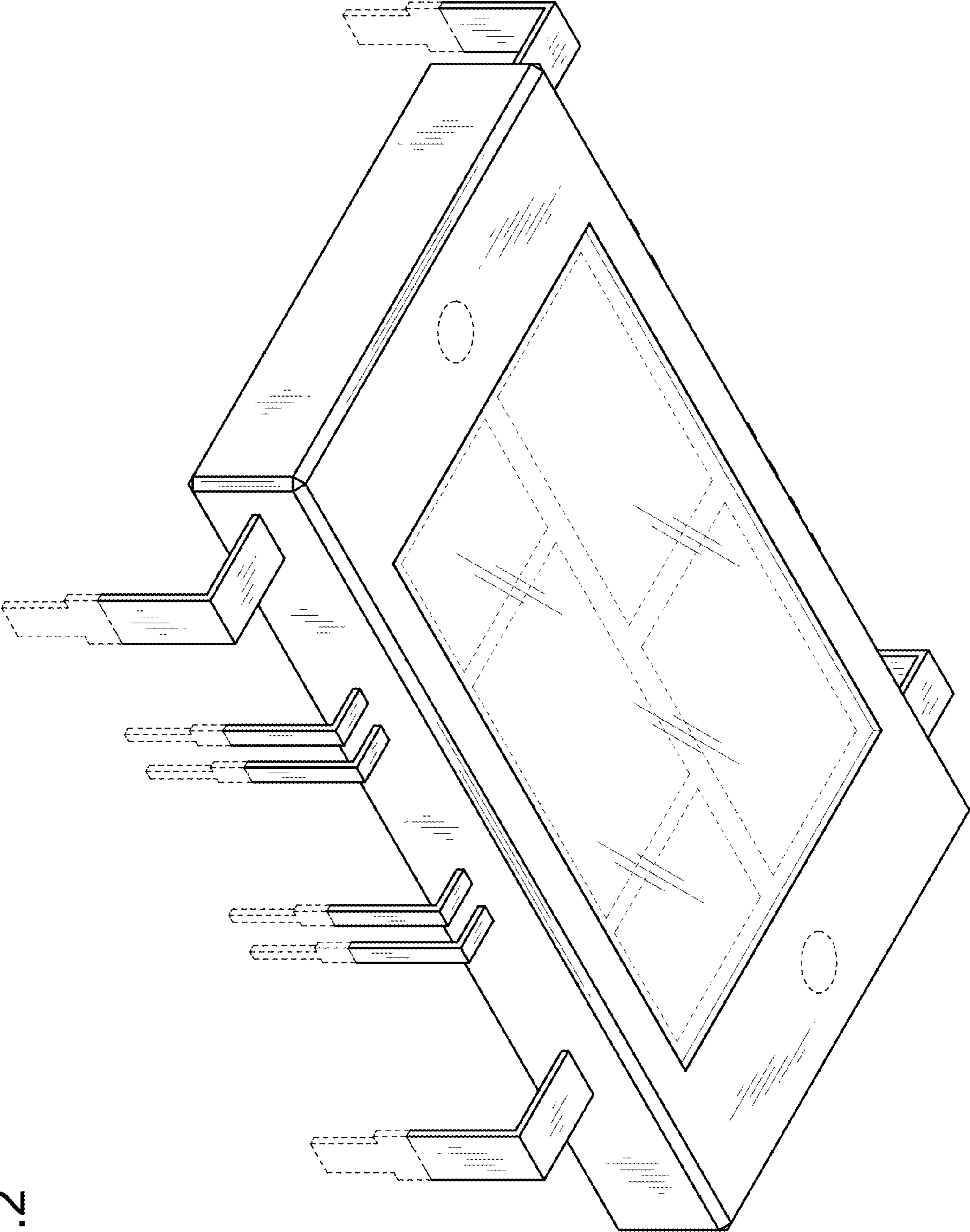


FIG.2

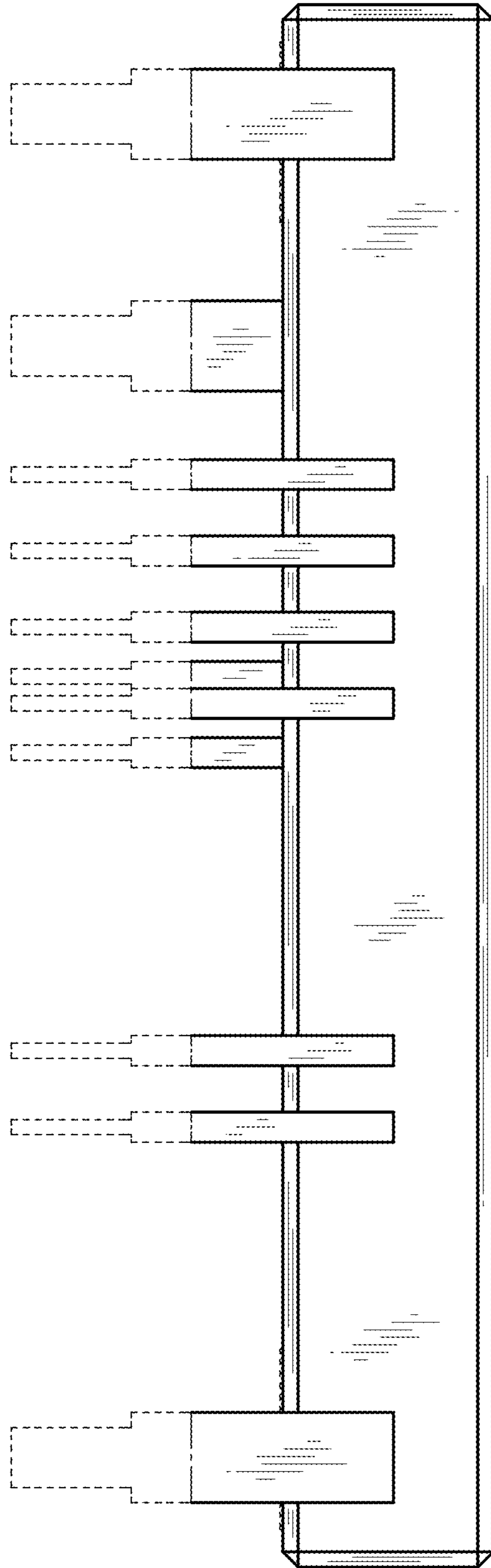


FIG.3

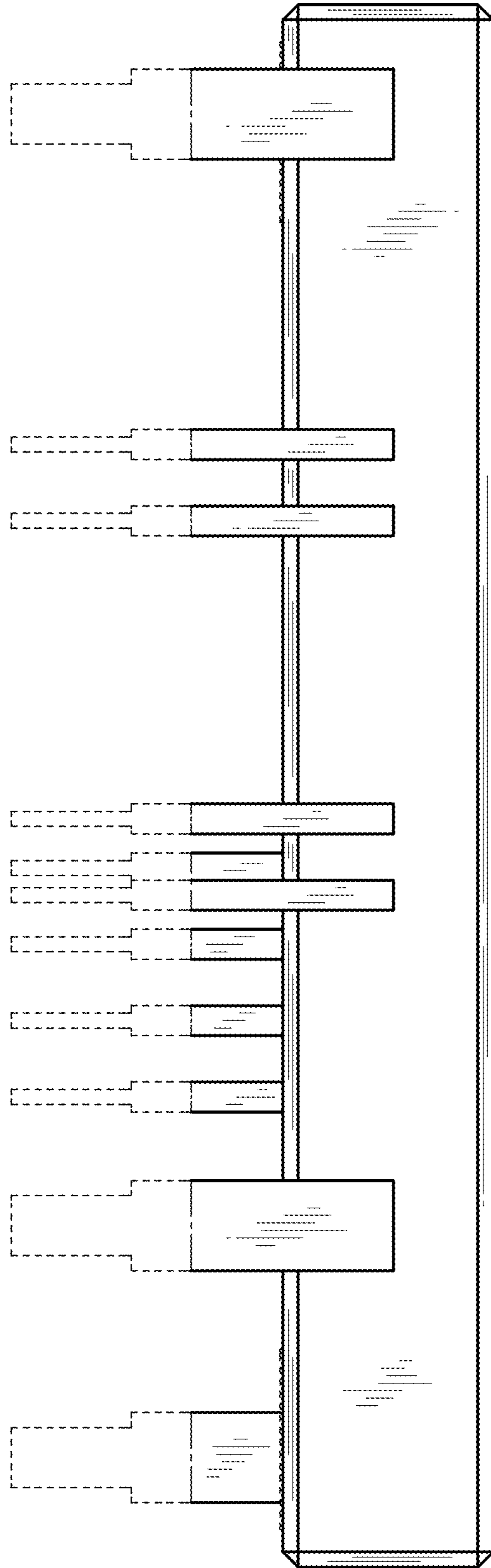


FIG.4

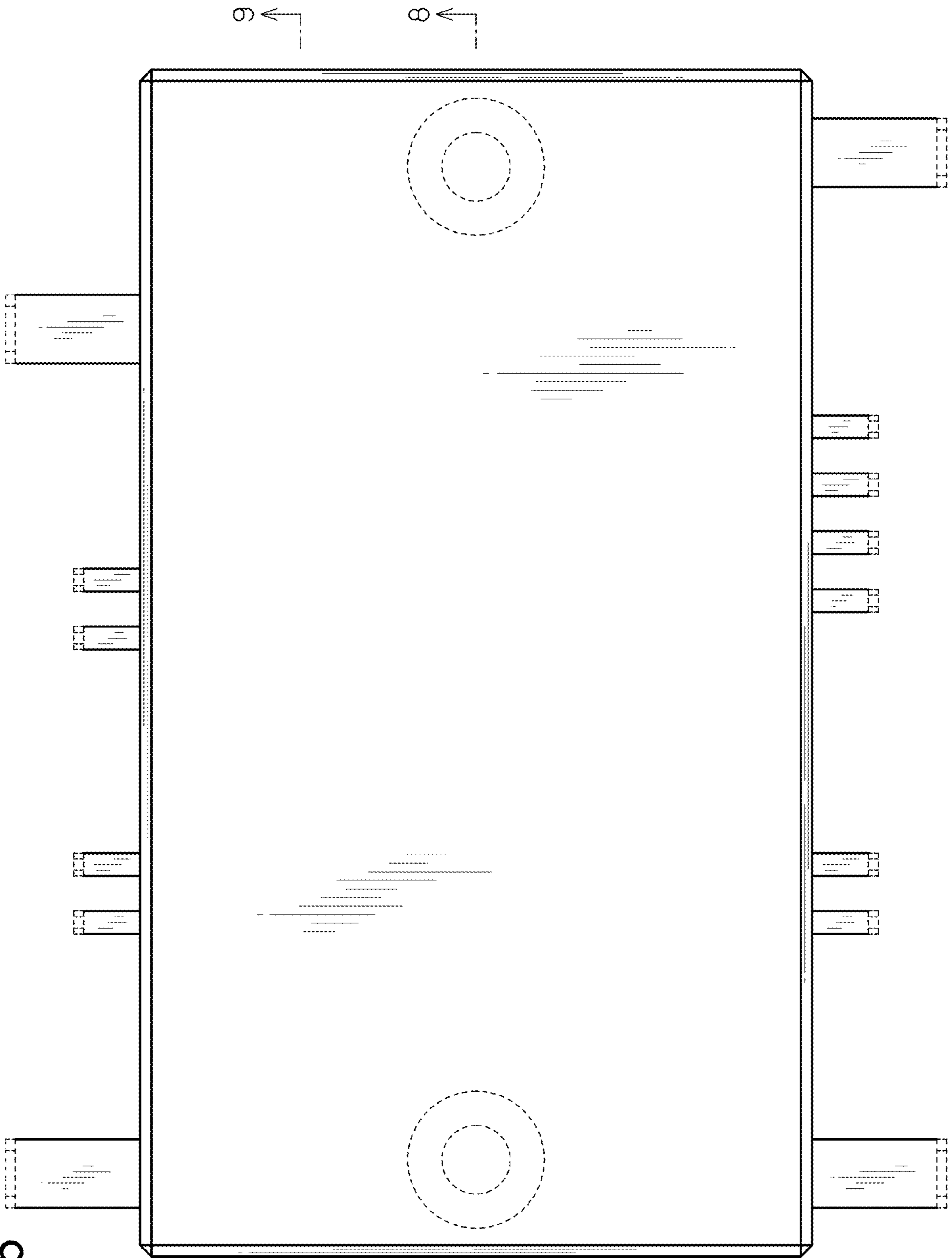


FIG. 5

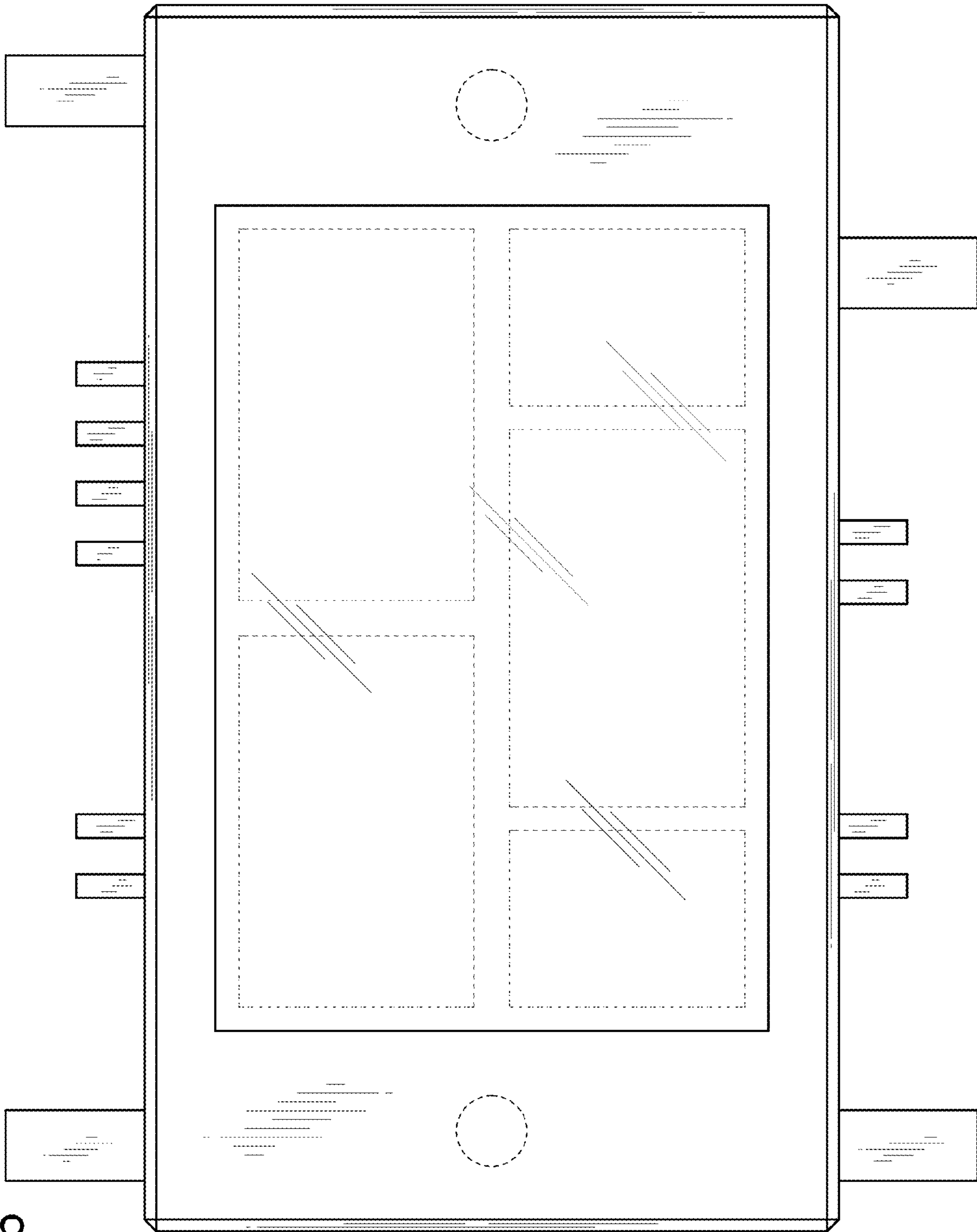


FIG. 6



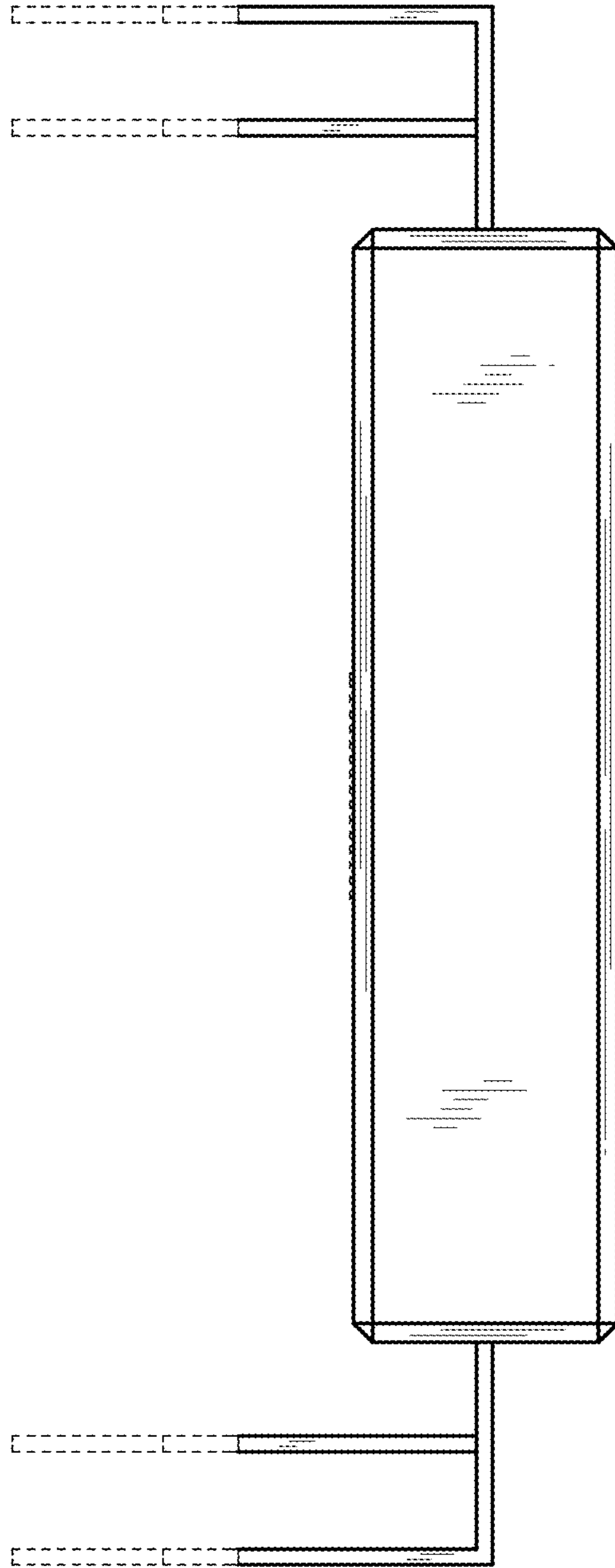
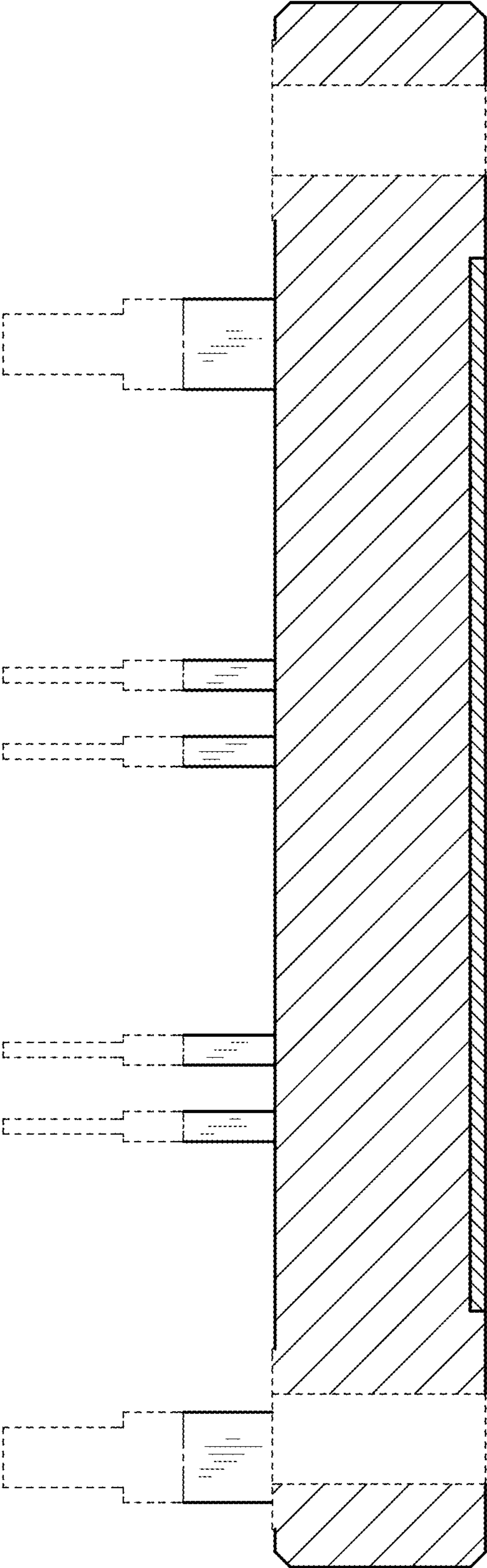


FIG.7

FIG. 8



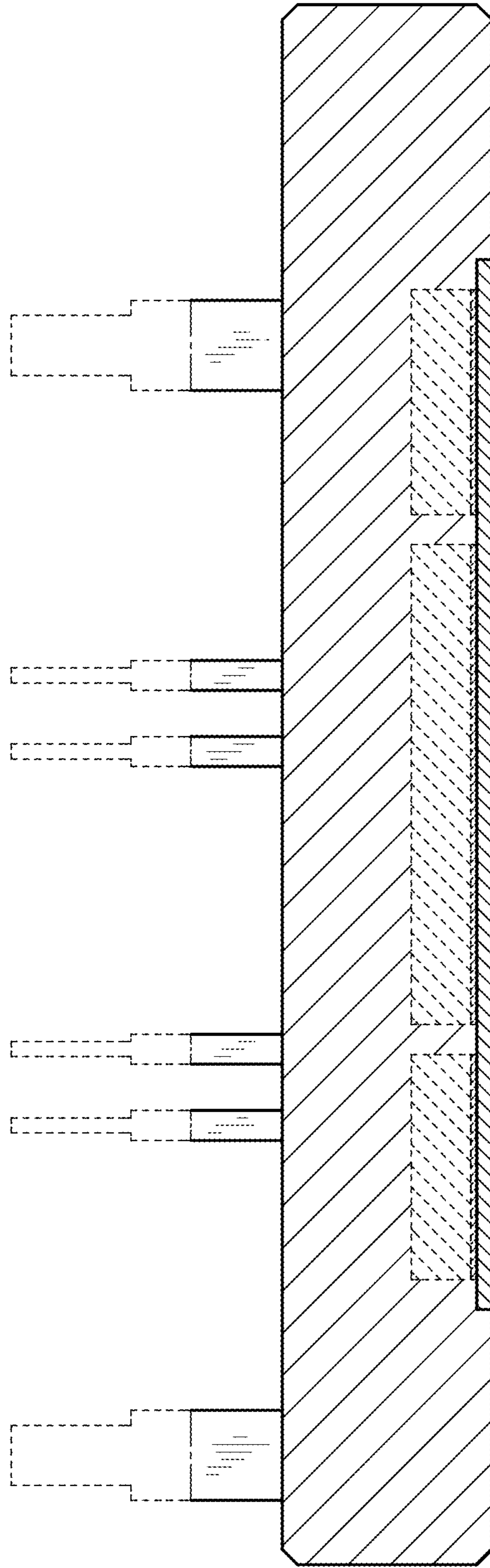


FIG.9