



US00D751498S

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

(10) **Patent No.:** **US D751,498 S**
(45) **Date of Patent:** **** Mar. 15, 2016**

(54) **TRIFOLD SOLAR PANEL**

- (71) Applicant: **Composite Technology Development, Inc.**, Lafayette, CO (US)
- (72) Inventors: **Naseem A. Munshi**, Lafayette, CO (US); **Mark Reavis**, Berthoud, CO (US); **Doug Richardson**, Westminster, CO (US); **Robert Taylor**, Lafayette, CO (US); **Michael L. Tupper**, Lafayette, CO (US); **Dana Turse**, Broomfield, CO (US); **Paul Fabian**, Broomfield, CO (US); **Sam Hafner**, Lafayette, CO (US); **Patrick Hipp**, Lafayette, CO (US)
- (73) Assignee: **COMPOSITE TECHNOLOGY DEVELOPMENT, INC.**, Lafayette, CO (US)

- (**) Term: **14 Years**
- (21) Appl. No.: **29/504,733**
- (22) Filed: **Oct. 8, 2014**
- (51) **LOC (10) Cl.** **13-02**
- (52) **U.S. Cl.**
USPC **D13/102**
- (58) **Field of Classification Search**
USPC 126/580, 581, 611, 621, 622, 623;
136/200, 243, 244, 245, 251, 256, 291;
438/66, 72, 80; D13/101, 102, 107,
D13/184, 199; D14/432, 440
CPC Y02E 10/50; Y02E 10/544; H02S 30/20;
H01L 31/042
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

- 3,165,751 A 1/1965 Clark
 - 3,252,173 A 5/1966 Robinsky
- (Continued)

FOREIGN PATENT DOCUMENTS

- EP 2068375 6/2009
 - EP 2264783 5/2012
- (Continued)

OTHER PUBLICATIONS

Campbell D, et al., "Development of a Novel, Passively Deployed Roll-Out Solar Array", 2006 IEEE Aerospace Conference; Big Sky, Montana; Mar. 4-11, 2006, IEEE Operations Center, Piscataway, NJ, Mar. 4, 2006, pp. 1-9.

(Continued)

Primary Examiner — Derrick Holland
Assistant Examiner — Jennifer O King
(74) *Attorney, Agent, or Firm* — Maschoff Brennan

(57) **CLAIM**

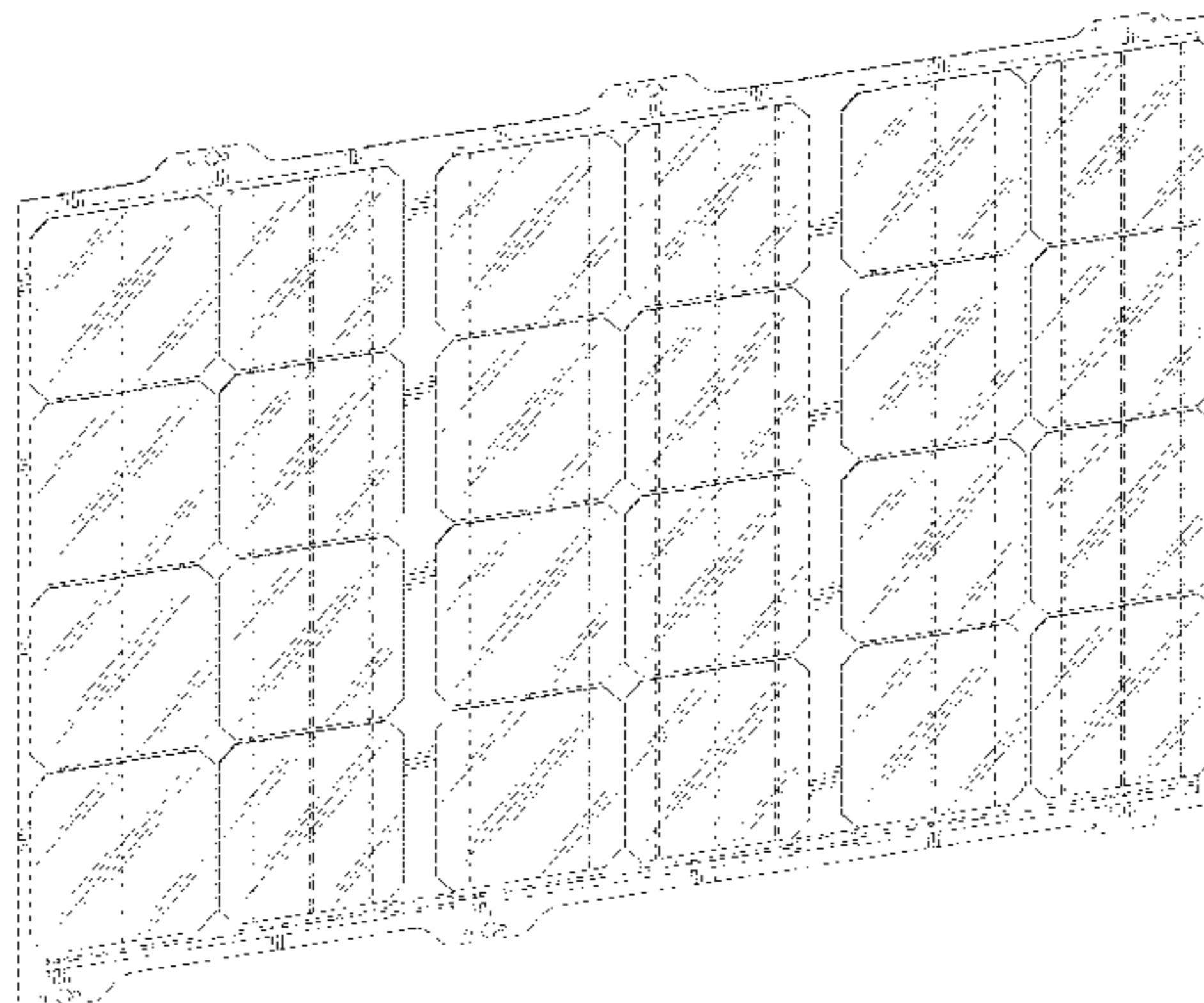
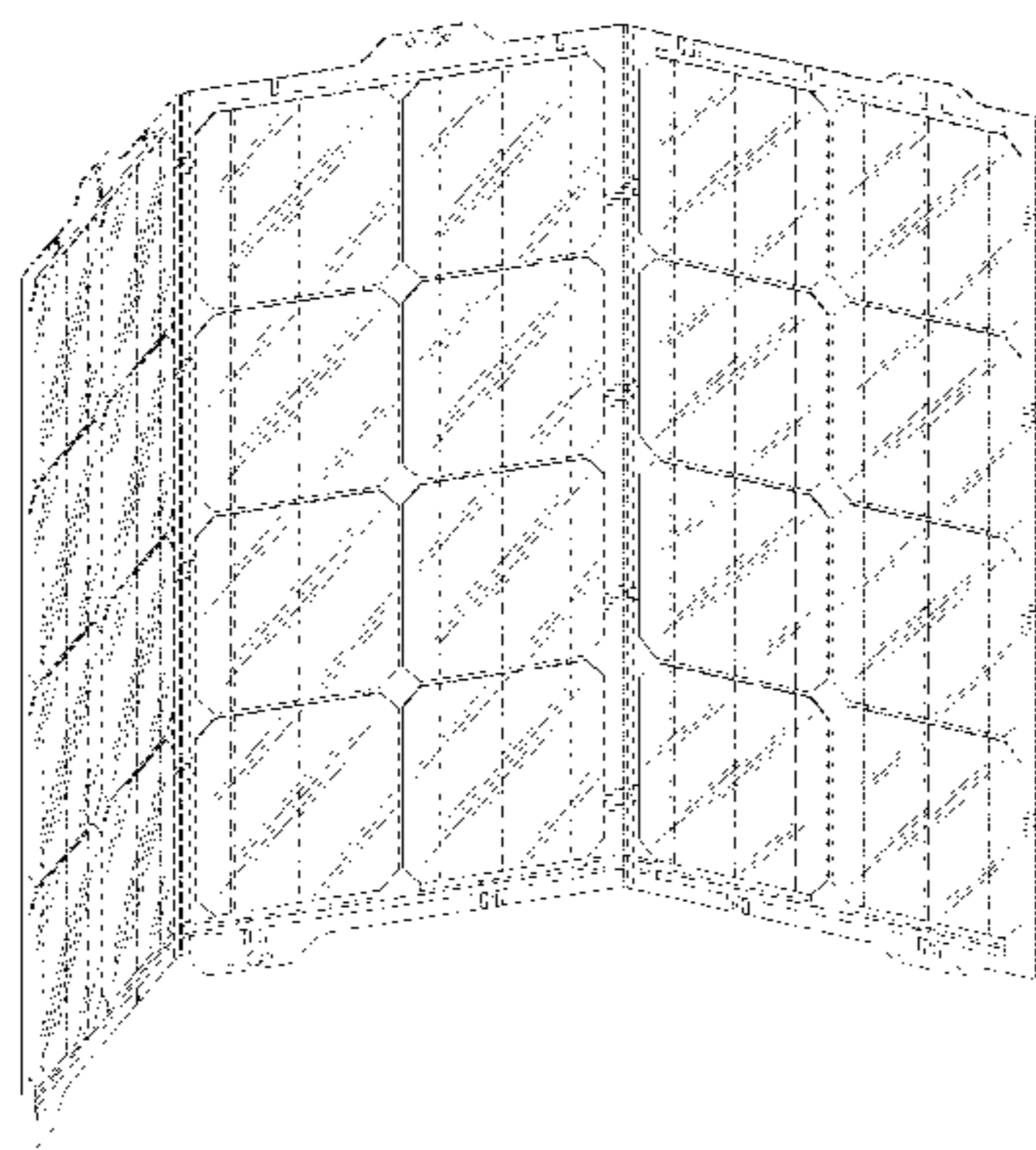
The ornamental design for a trifold solar panel, as shown and described.

DESCRIPTION

FIG. 1 is a front perspective view of a trifold solar panel in a partially folded configuration;
 FIG. 2 is a front view of the trifold solar panel shown in FIG. 1;
 FIG. 3 is a back view of the trifold solar panel shown in FIG. 1;
 FIG. 4 is a left side view of the trifold solar panel shown in FIG. 1;
 FIG. 5 is a right side view of the trifold solar panel shown in FIG. 1;
 FIG. 6 is a top view of the trifold solar panel shown in FIG. 1;
 FIG. 7 is a bottom view of the trifold solar panel shown in FIG. 1;
 FIG. 8 is a front perspective view of the trifold solar panel shown in FIG. 1 in a non-folded configuration;
 FIG. 9 is a front view of the trifold solar panel shown in FIG. 8;
 FIG. 10 is a front view of the trifold solar panel shown in FIG. 8;
 FIG. 11 is a left side view of the trifold solar panel shown in FIG. 8;
 FIG. 12 is a right side view of the trifold solar panel shown in FIG. 8;
 FIG. 13 is a top view of the trifold solar panel shown in FIG. 8; and,
 FIG. 14 is a bottom view of the trifold solar panel shown in FIG. 8.

The broken lines shown represent unclaimed subject matter and form no part of the claimed design.

1 Claim, 10 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

3,385,397 A 5/1968 Robinsky
 3,473,758 A 10/1969 Webb
 3,477,662 A 11/1969 Anderson
 3,510,086 A 5/1970 Arbeitlang et al.
 3,532,299 A 10/1970 Williamson et al.
 3,597,281 A * 8/1971 Webb 136/245
 3,627,585 A * 12/1971 Dollery et al. 136/245
 3,658,596 A 4/1972 Osborne
 3,690,080 A 9/1972 Dillard
 3,735,942 A 5/1973 Palz
 3,735,943 A 5/1973 Fayet
 3,780,424 A 12/1973 Bernatowicz et al.
 3,817,481 A 6/1974 Berks et al.
 3,819,417 A 6/1974 Haynos
 3,863,870 A 2/1975 Andrews et al.
 4,043,834 A 8/1977 Rusch
 4,133,501 A 1/1979 Pentlicki
 4,394,529 A 7/1983 Gounder
 4,475,323 A 10/1984 Schwartzberg et al.
 4,636,579 A 1/1987 Hanak et al.
 4,713,492 A 12/1987 Hanak
 4,727,932 A 3/1988 Mahefkey
 4,747,567 A 5/1988 Johnson et al.
 4,787,580 A 11/1988 Ganssle
 5,085,018 A 2/1992 Kitamura
 5,235,788 A 8/1993 Maimets
 5,296,044 A 3/1994 Harvey et al.
 5,487,791 A 1/1996 Everman et al.
 5,520,747 A 5/1996 Marks
 5,720,452 A 2/1998 Mutschler, Jr.
 5,785,280 A 7/1998 Baghdasarian
 5,833,176 A 11/1998 Rubin et al.
 5,857,648 A 1/1999 Dailey et al.
 5,927,654 A 7/1999 Foley et al.
 6,017,002 A 1/2000 Burke et al.
 6,137,454 A 10/2000 Peck
 6,228,441 B1 5/2001 Suzuki et al.
 6,256,938 B1 7/2001 Daton-Lovett
 6,340,403 B1 1/2002 Carey et al.
 6,343,442 B1 2/2002 Marks
 6,374,565 B1 4/2002 Warren
 6,437,232 B1 8/2002 Dailey et al.
 6,478,261 B2 11/2002 Laraway et al.
 6,547,190 B1 4/2003 Thompson et al.
 6,568,638 B1 5/2003 Capots
 6,581,883 B2 6/2003 McGee et al.
 6,609,683 B2 8/2003 Bauer et al.
 6,637,702 B1 10/2003 McCandless
 6,702,976 B2 3/2004 Sokolowski
 6,772,479 B2 8/2004 Hinkley et al.
 6,775,046 B2 8/2004 Hill et al.
 6,872,433 B2 3/2005 Seward et al.
 6,920,722 B2 7/2005 Brown
 6,983,914 B2 1/2006 Stribling et al.
 D581,865 S * 12/2008 Koza D13/102
 7,617,639 B1 11/2009 Pollard et al.
 7,806,370 B2 10/2010 Beidleman et al.
 7,868,246 B2 1/2011 Buechel
 8,061,660 B2 11/2011 Beidleman et al.

8,066,227 B2 11/2011 Keller et al.
 D652,375 S * 1/2012 Kannou et al. D13/102
 8,109,472 B1 2/2012 Keller et al.
 D663,261 S * 7/2012 Cheung D13/102
 D663,262 S * 7/2012 Cheung D13/102
 8,376,282 B2 2/2013 Keller et al.
 8,387,921 B2 3/2013 Taylor et al.
 8,393,581 B2 3/2013 Keller et al.
 8,394,650 B2 3/2013 Chung
 2002/0096603 A1 7/2002 Bauer et al.
 2002/0112417 A1 8/2002 Brown
 2003/0164186 A1 * 9/2003 Clark et al. 136/245
 2005/0178921 A1 8/2005 Stribling et al.
 2007/0262204 A1 11/2007 Beidleman et al.
 2008/0223431 A1 9/2008 Chu
 2008/0314434 A1 * 12/2008 Khouri et al. 136/245
 2009/0272436 A1 11/2009 Cheung
 2009/0320898 A1 * 12/2009 Gumm 136/245
 2010/0243033 A1 9/2010 Brouwer et al.
 2011/0192444 A1 8/2011 Beidleman et al.
 2011/0204186 A1 8/2011 Keller et al.
 2011/0210209 A1 9/2011 Taylor et al.
 2012/0006381 A1 1/2012 Sorgento
 2012/0012154 A1 1/2012 Keller et al.
 2012/0090659 A1 4/2012 Muchow et al.
 2012/0090660 A1 4/2012 Keller et al.
 2012/0214271 A1 * 8/2012 Ishii et al. 438/80
 2012/0285535 A1 * 11/2012 Tago et al. 136/259
 2012/0297717 A1 11/2012 Keller et al.
 2013/0008483 A1 * 1/2013 Chaney 136/245
 2013/0186011 A1 7/2013 Keller et al.
 2013/0186450 A1 * 7/2013 Smith et al. 136/245
 2013/0240015 A1 9/2013 Chaimovski et al.
 2014/0096811 A1 * 4/2014 Oppizzi 136/245
 2014/0230882 A1 8/2014 Hingley
 2014/0290744 A1 10/2014 Hood
 2015/0114464 A1 * 4/2015 Ishiguro et al. 136/256

FOREIGN PATENT DOCUMENTS

EP 2732474 5/2014
 WO WO2011109140 9/2011
 WO WO2013074224 5/2013

OTHER PUBLICATIONS

Spence, Brian R. et al., "Mars Pathfinder Rover Egress Deployable Ramp Assembly", 30th Aerospace Mechanisms Symposium, NASA Langley Research Center, May 15-17, 1996, 16 pgs.
 European Search Report, as issued in connection with International Patent Application No. 11751047.9, mailed Feb. 25, 2015, 7 pgs.
 International Search Report and Written Opinion, as issued in connection with International Patent Application No. PCT/US2011/023782, mailed Apr. 20, 2011, 7 pgs.
 International Search Report and Written Opinion, as issued in connection with International Patent Application No. PCT/US2011/026745, mailed May 10, 2011, 10 pgs.
 International Search Report and Written Opinion, as issued in connection with International Patent Application No. PCT/US2011/026437, mailed Jun. 27, 2011, 10 pgs.

* cited by examiner

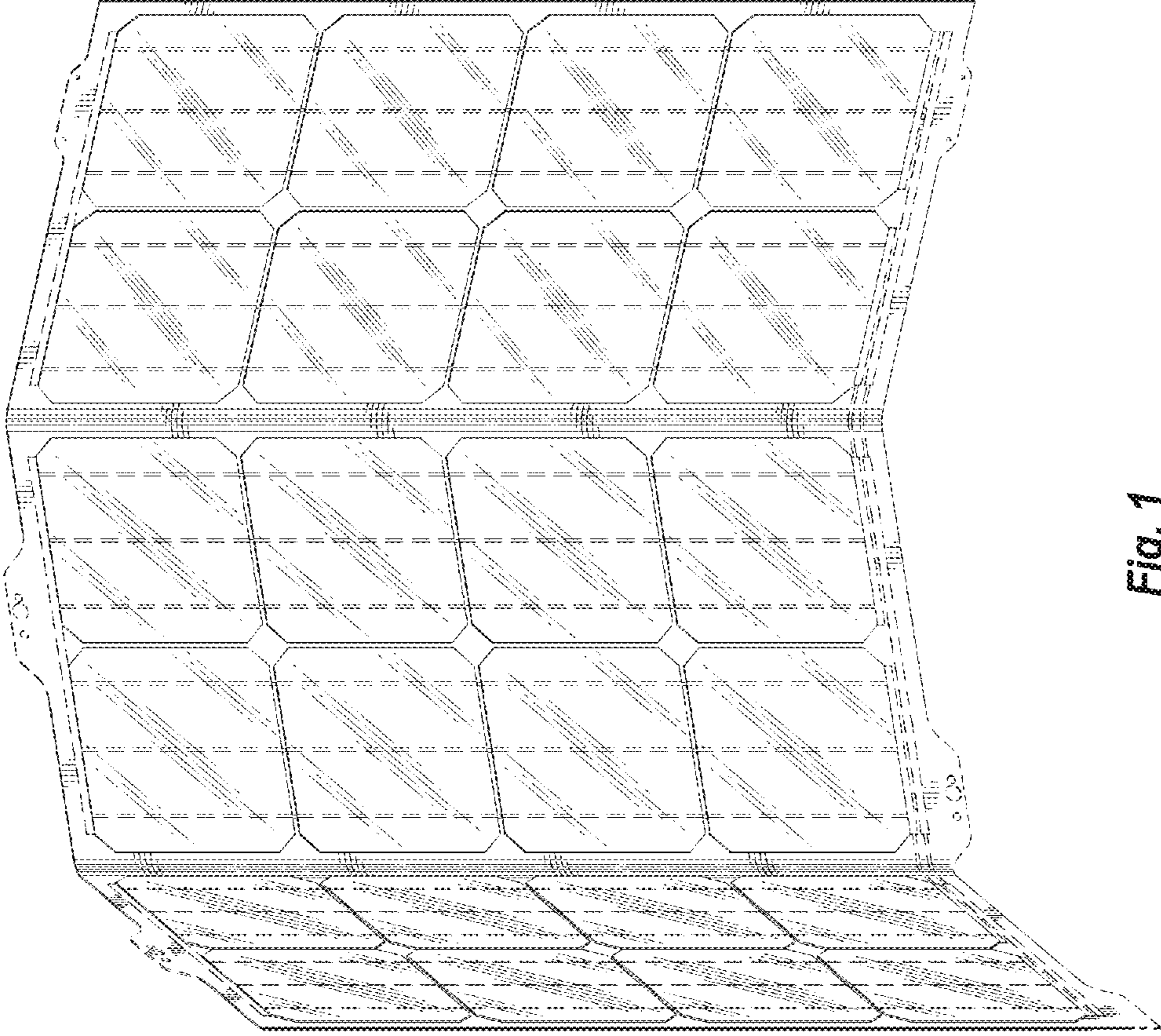


Fig. 1

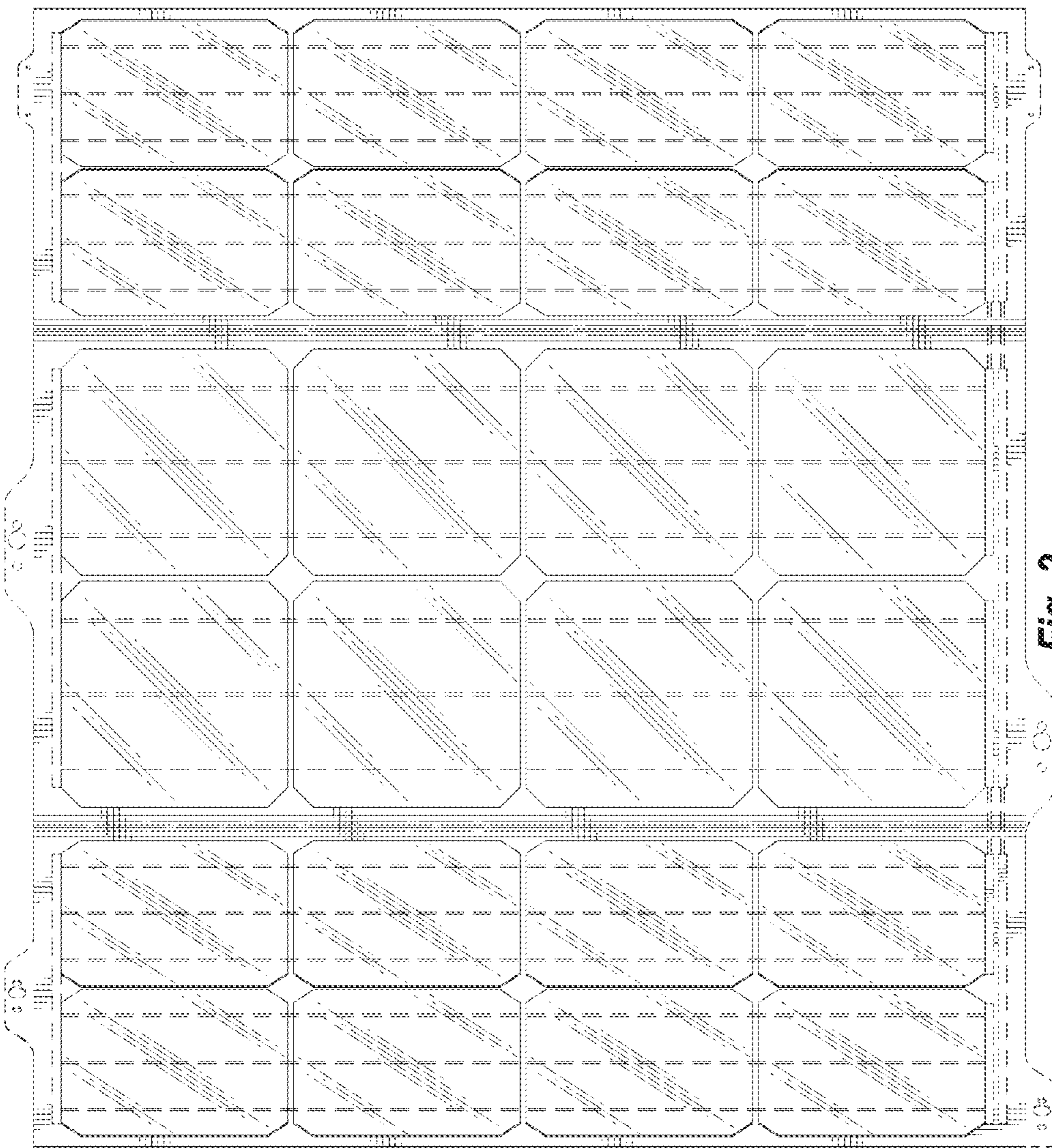


Fig. 2

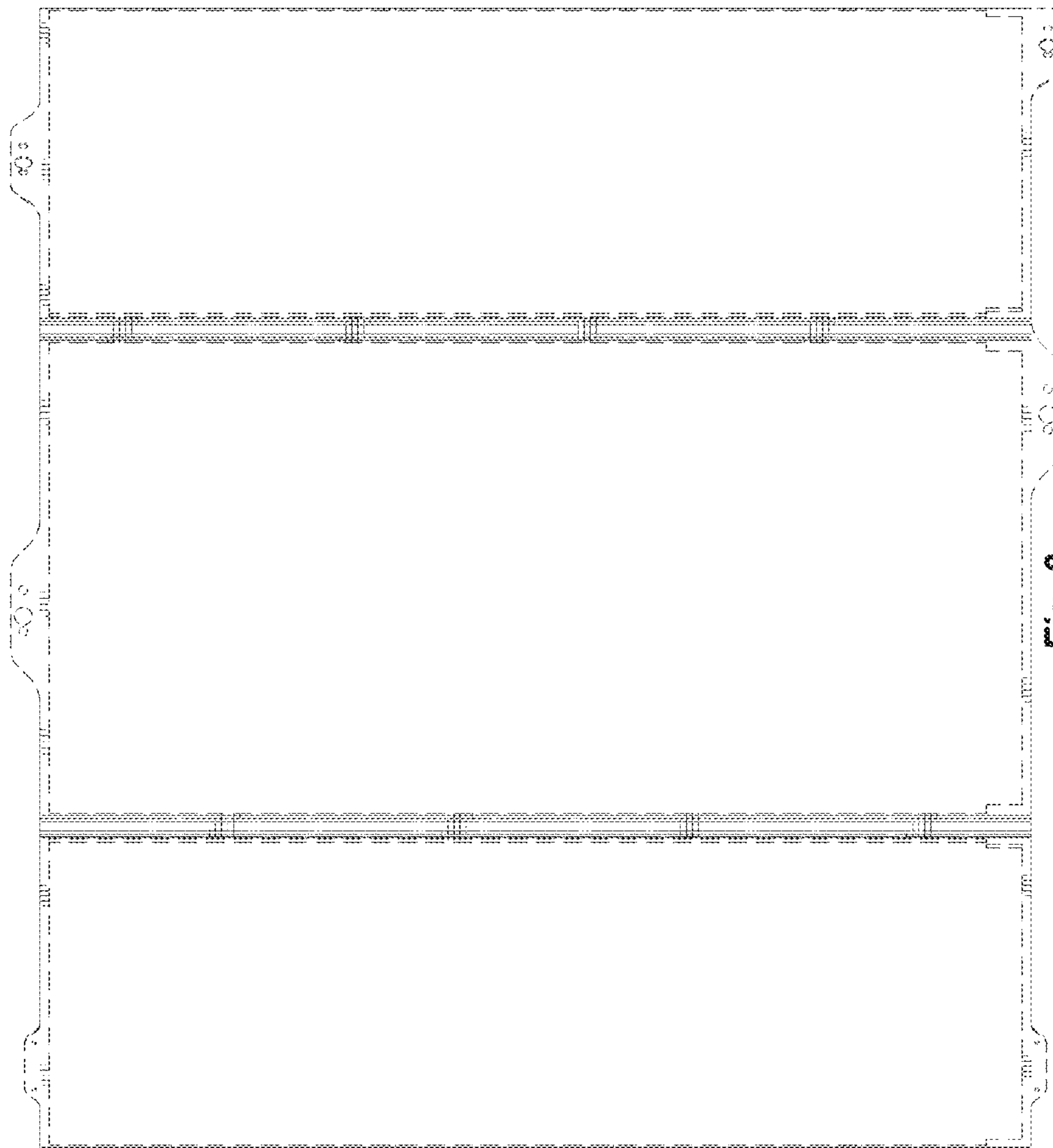


Fig. 3

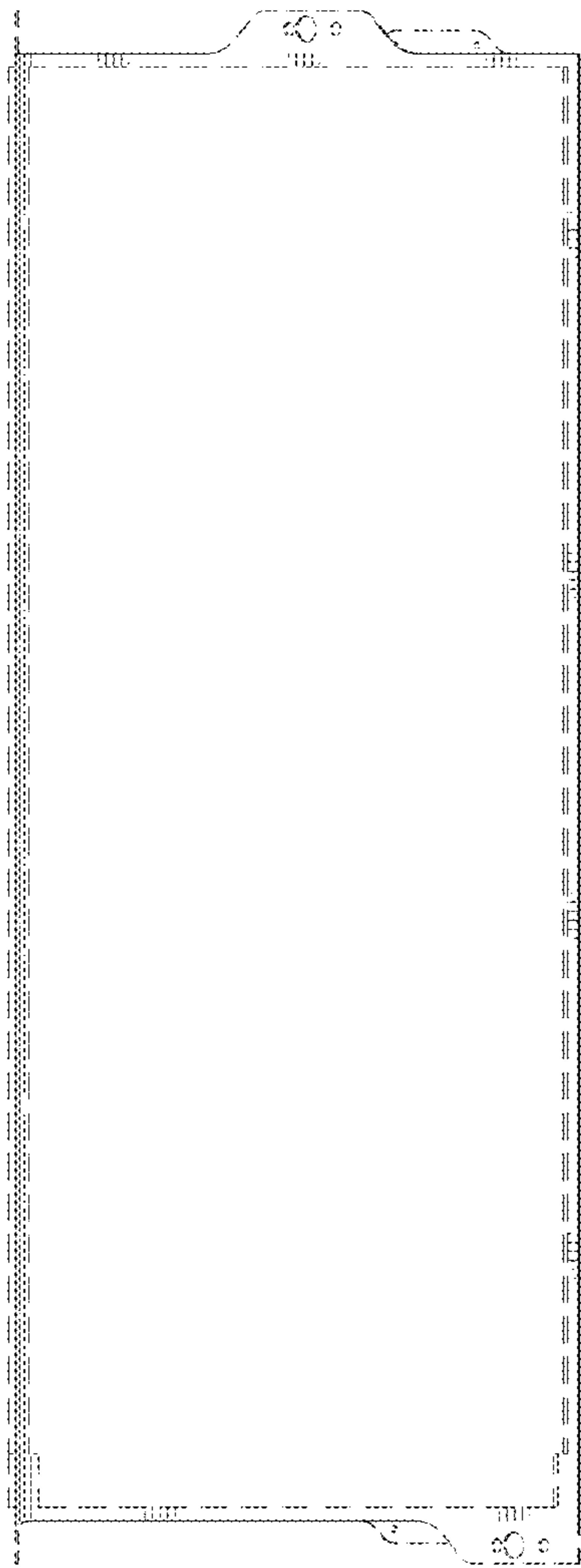


Fig. 4

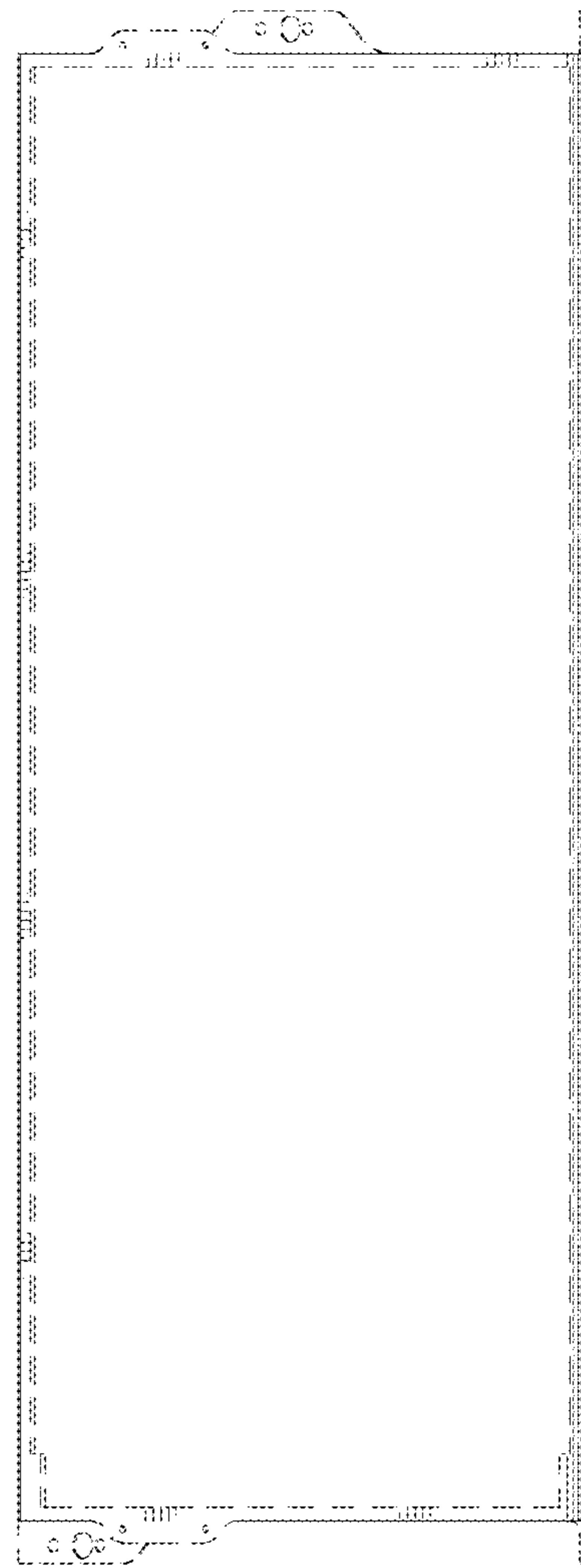


Fig. 5



Fig. 6

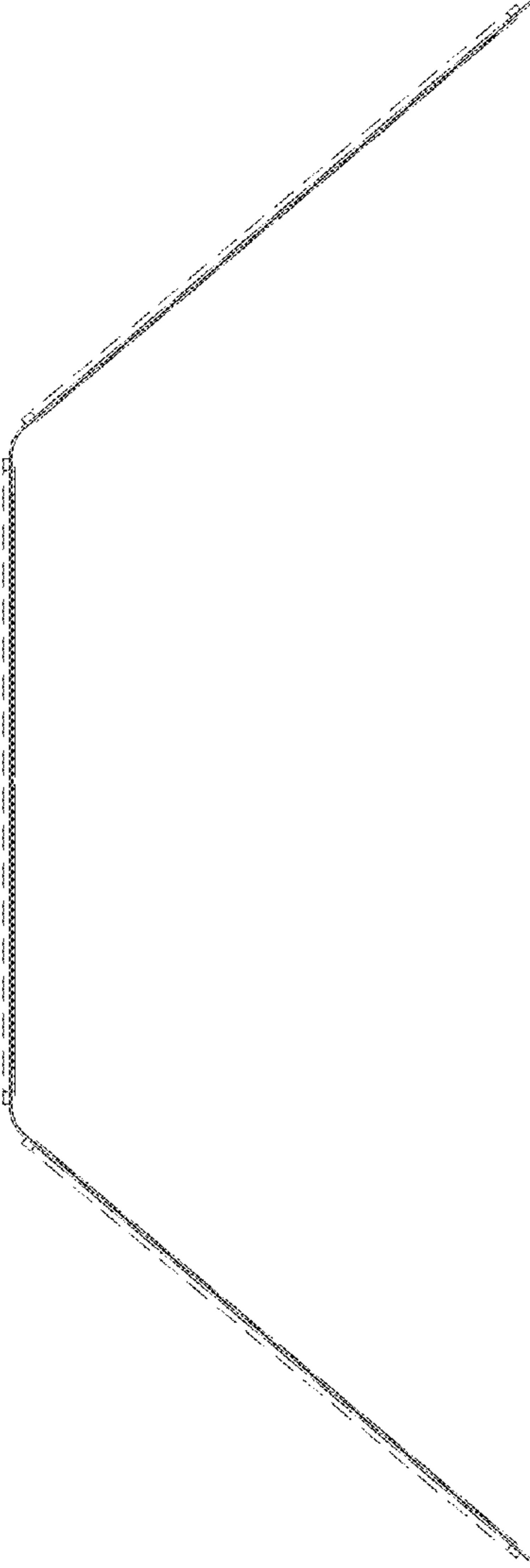


Fig. 7

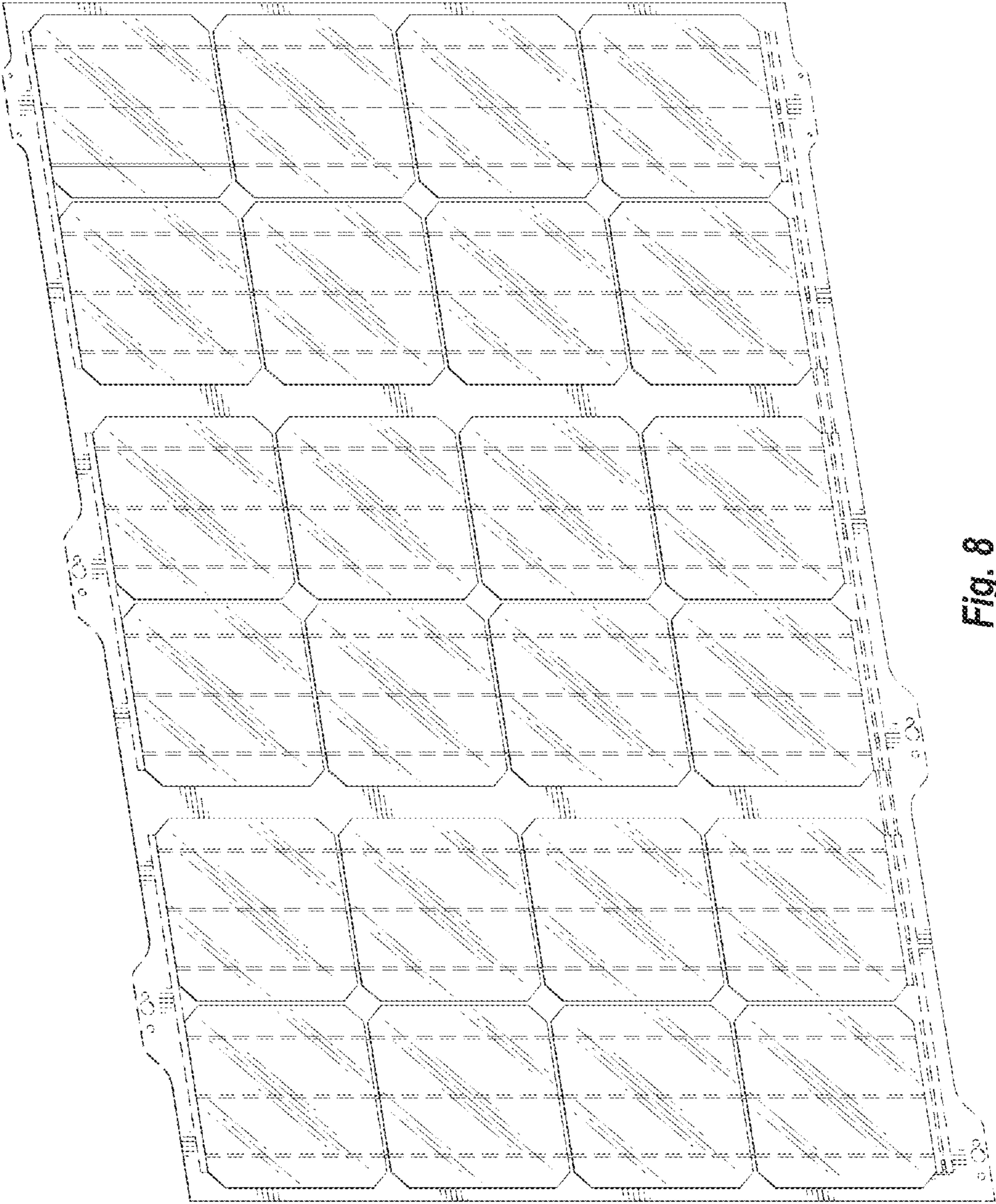


Fig. 8

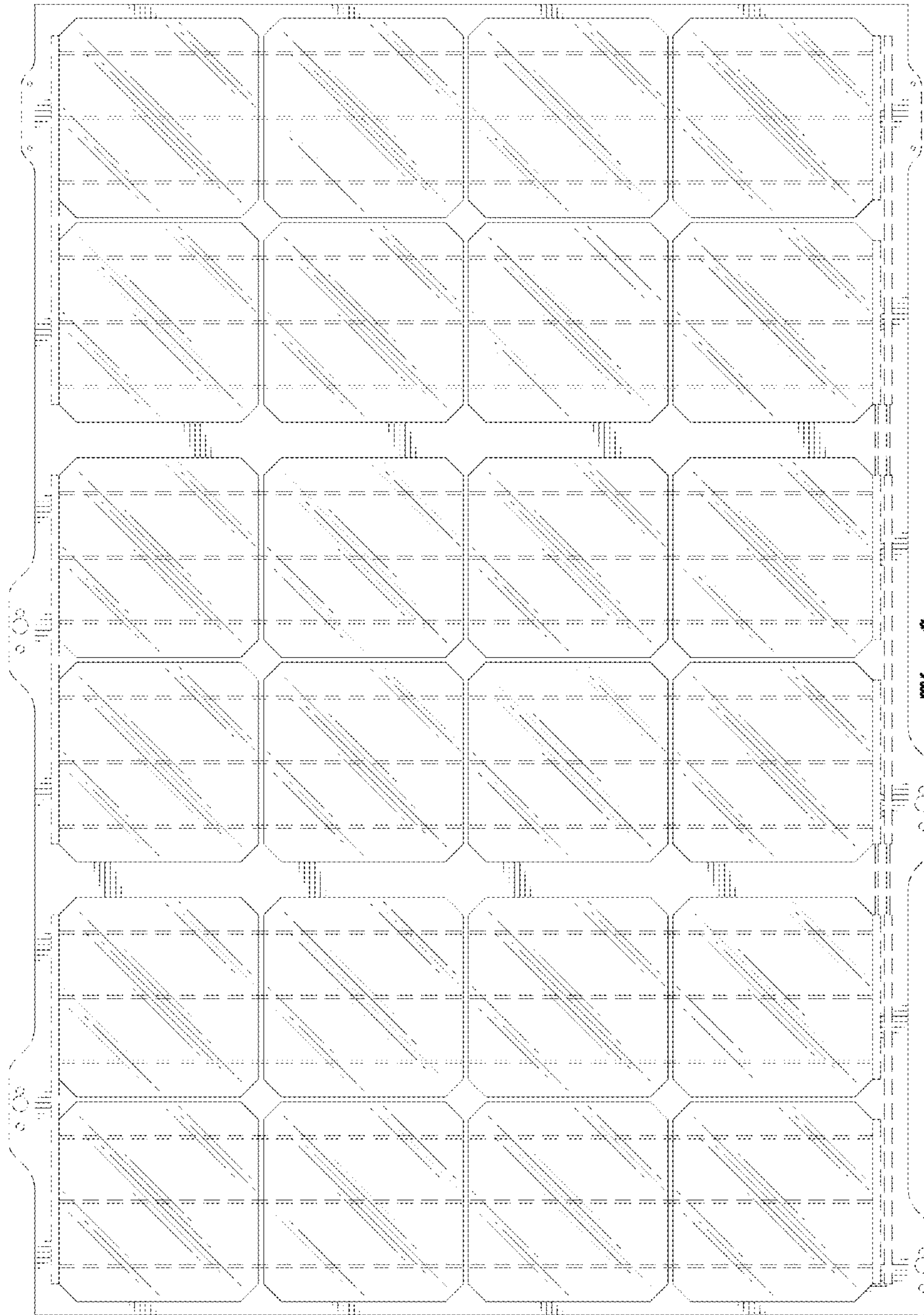


Fig. 9

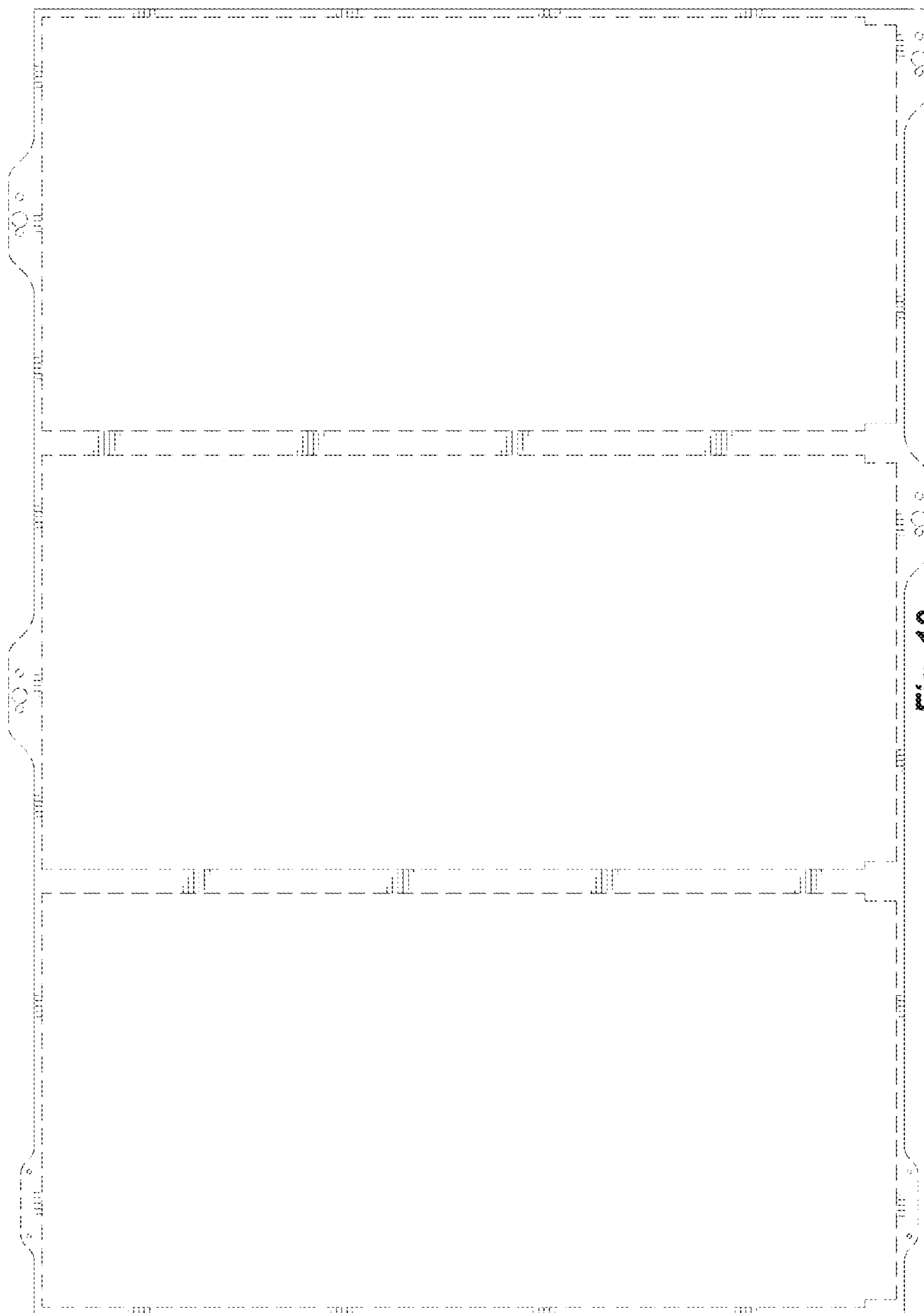


Fig. 10

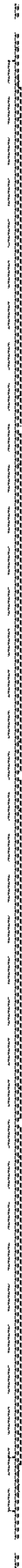


Fig. 11

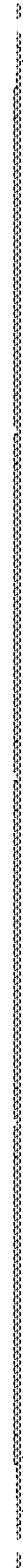


Fig. 12

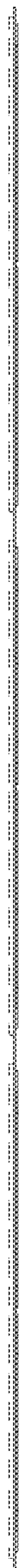


Fig. 13

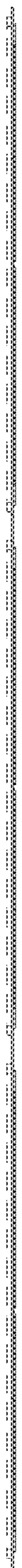


Fig. 14