



US00D958763S

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

(10) **Patent No.:** **US D958,763 S**
(45) **Date of Patent:** **** Jul. 26, 2022**

(54) **PIEZOELECTRIC ELEMENT**

(71) Applicant: **TDK CORPORATION**, Tokyo (JP)

(72) Inventors: **Akira Satoh**, Tokyo (JP); **Kaoru Kijima**, Tokyo (JP)

(73) Assignee: **TDK CORPORATION**, Tokyo (JP)

(**) Term: **15 Years**

(21) Appl. No.: **29/713,826**

(22) Filed: **Nov. 19, 2019**

(30) **Foreign Application Priority Data**

May 20, 2019 (JP) 2019-010843
May 20, 2019 (JP) 2019-010844
May 20, 2019 (JP) 2019-010845

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

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

(58) **Field of Classification Search**
USPC D13/101, 110, 118, 121, 123, 133, 179,
D13/182, 184, 199; D14/432, 433, 435,
D14/438, 299; D10/75, 80
(Continued)

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Primary Examiner — Derrick E Holland
(74) *Attorney, Agent, or Firm* — Oliff PLC

(57) **CLAIM**

The ornamental design for a piezoelectric element, as shown and described.

DESCRIPTION

FIG. 1 is a front view of the a piezoelectric element showing our new design;

FIG. 2 is a rear view thereof;
FIG. 3 is a top plan view thereof;
FIG. 4 is a bottom view thereof;
FIG. 5 is a right side view thereof;
FIG. 6 is a left side view thereof;
FIG. 7 is a perspective view thereof;
FIG. 8 is an enlarged view showing a portion of FIG. 3 defined by the lines 8-8;
FIG. 9 is an enlarged view showing a portion of FIG. 3 defined by the line 9-9;
FIG. 10 is an enlarged view showing a portion of FIG. 4 defined by the line 10-10;
FIG. 11 is an enlarged view showing a portion of FIG. 4 defined by the line 11-11;
FIG. 12 is an enlarged view showing a portion of FIG. 5 defined by the line 12-12;
FIG. 13 is an enlarged view showing a portion of FIG. 6 defined by the line 13-13;
FIG. 14 is an enlarged sectional view taken along the line 14-14 in FIG. 1 defined by the line 1401-1401;
FIG. 15 is an enlarged sectional view taken along the line 15-15 in FIG. 1 defined by the line 1501-1501;
FIG. 16 is an enlarged sectional view taken along the line 16-16 in FIG. 1 defined by the line 1601-1601;
FIG. 17 is a front view of a second embodiment of a piezoelectric element showing our new design;
FIG. 18 is a rear view thereof;
FIG. 19 is a top plan view thereof;
FIG. 20 is a bottom view thereof;
FIG. 21 is a right side view thereof;
FIG. 22 is a left side view thereof;
FIG. 23 is a perspective view thereof;
FIG. 24 is an enlarged view showing a portion of FIG. 19 defined by the lines 24-24;
FIG. 25 is an enlarged view showing a portion of FIG. 19 defined by the lines 25-25;
FIG. 26 is an enlarged view showing a portion of FIG. 20 defined by the line 26-26;
FIG. 27 is an enlarged view showing a portion of FIG. 20 defined by the line 27-27;
FIG. 28 is an enlarged view showing a portion of FIG. 21 defined by the line 28-28;

(Continued)

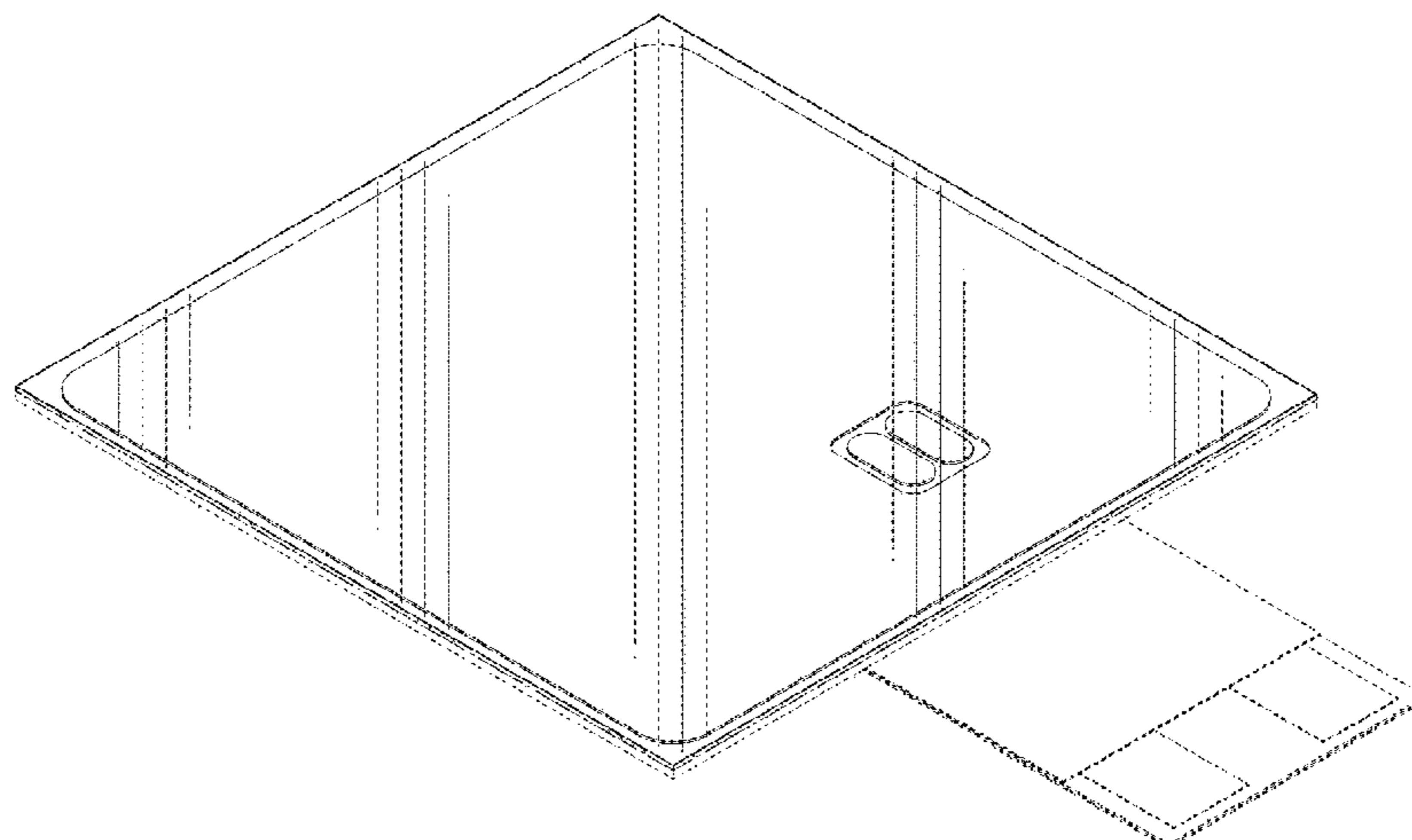


FIG. 29 is an enlarged view showing a portion of FIG. 22 defined by the line 29-29;
 FIG. 30 is an enlarged sectional view taken along the line 30-30 in FIG. 17 defined by the line 3001-3001;
 FIG. 31 is an enlarged sectional view taken along the line 31-31 in FIG. 17 defined by the line 3101-3101;
 FIG. 32 is an enlarged sectional view taken along the line 32-32 in FIG. 17 defined by the line 3201-3201;
 FIG. 33 is a front view of a third embodiment of a piezo-electric element showing our new design;
 FIG. 34 is a rear view thereof;
 FIG. 35 is a top plan view thereof;
 FIG. 36 is a bottom view thereof;
 FIG. 37 is a right side view thereof;
 FIG. 38 is a left side view thereof;
 FIG. 39 is a perspective view thereof;
 FIG. 40 is an enlarged view showing a portion of FIG. 35 defined by the lines 40-40;
 FIG. 41 is an enlarged view showing a portion of FIG. 35 defined by the lines 41-41;
 FIG. 42 is an enlarged view showing a portion of FIG. 36 defined by the line 42-42;
 FIG. 43 is an enlarged view showing a portion of FIG. 36 defined by the line 43-43;
 FIG. 44 is an enlarged view showing a portion of FIG. 37 defined by the line 44-44;
 FIG. 45 is an enlarged view showing a portion of FIG. 38 defined by the line 45-45;
 FIG. 46 is an enlarged sectional view taken along the line 46-46 in FIG. 33 defined by the line 4601-4601;
 FIG. 47 is an enlarged sectional view taken along the line 47-47 in FIG. 33 defined by the line 4701-4701; and,
 FIG. 48 is an enlarged sectional view taken along the line 48-48 in FIG. 33 defined by the line 4801-4801.

The broken lines shown represent the portions of the piezo-electric element that form no part of the claimed design. The dot-dash broken lines shown define the bounds of the claimed design and form no part thereof.

1 Claim, 48 Drawing Sheets

(58) **Field of Classification Search**

CPC H03H 9/02; H03H 9/21; H03H 9/0547;
 H03H 9/1021; H03H 9/215; H03H
 2003/022; H03H 2003/0485; H01L
 2224/48091; H01L 2224/73265; H01L
 41/047; H01L 41/0471; H01L 41/0838;
 H05K 7/005; H05K 7/026; H05K 7/02;
 H05K 7/04; H05K 7/10

See application file for complete search history.

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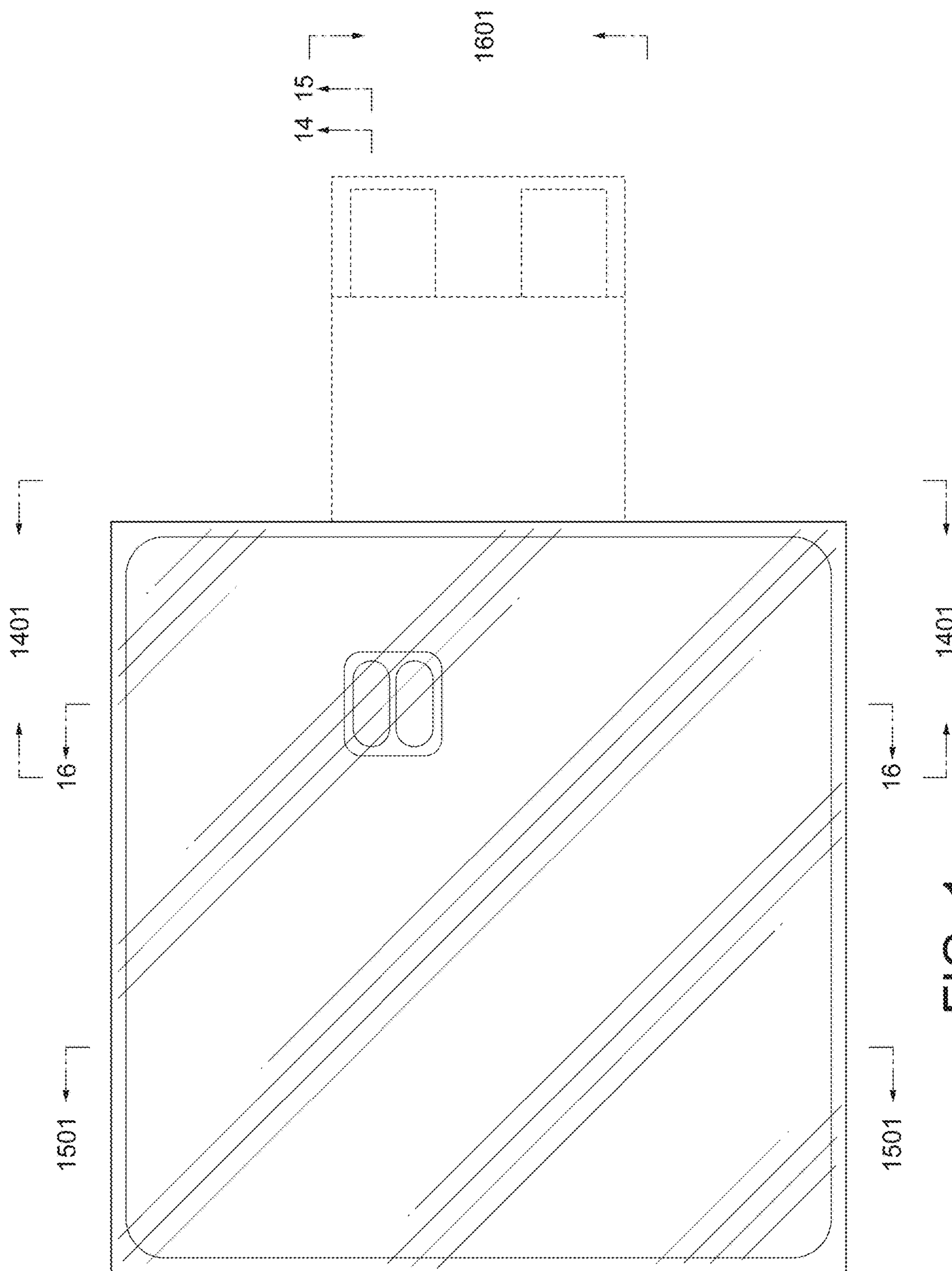


FIG. 1

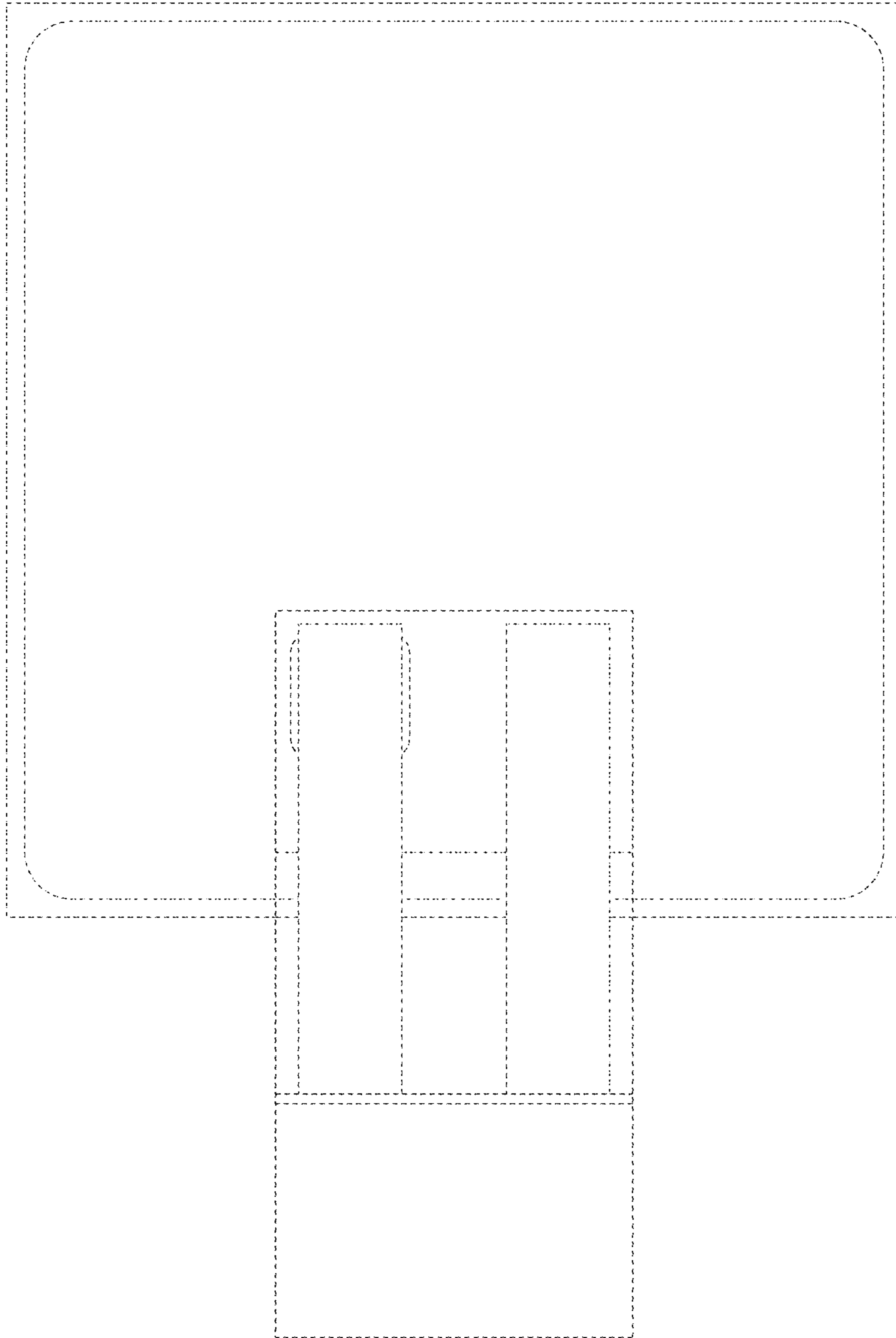


FIG. 2

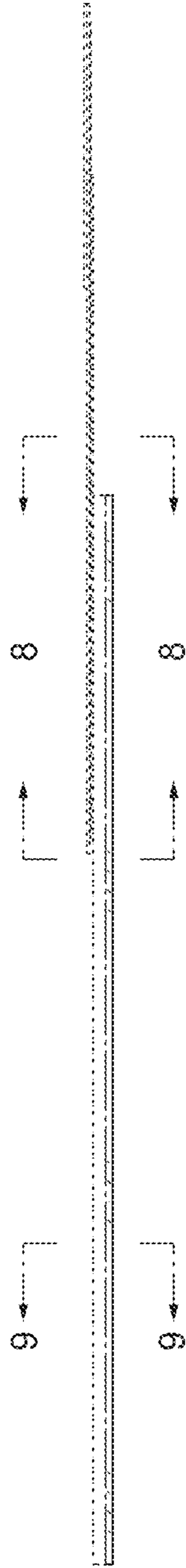


FIG. 3

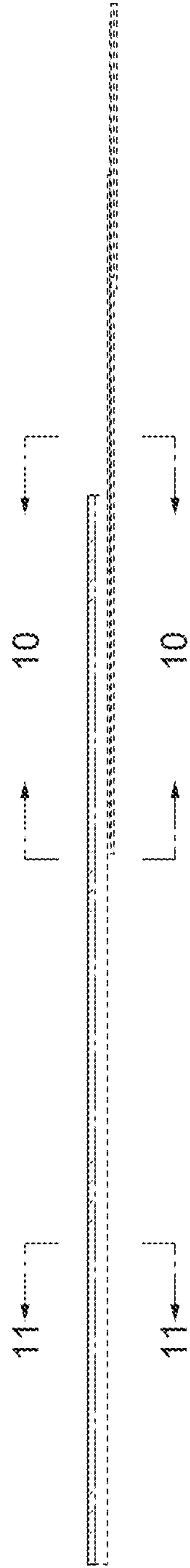


FIG. 4

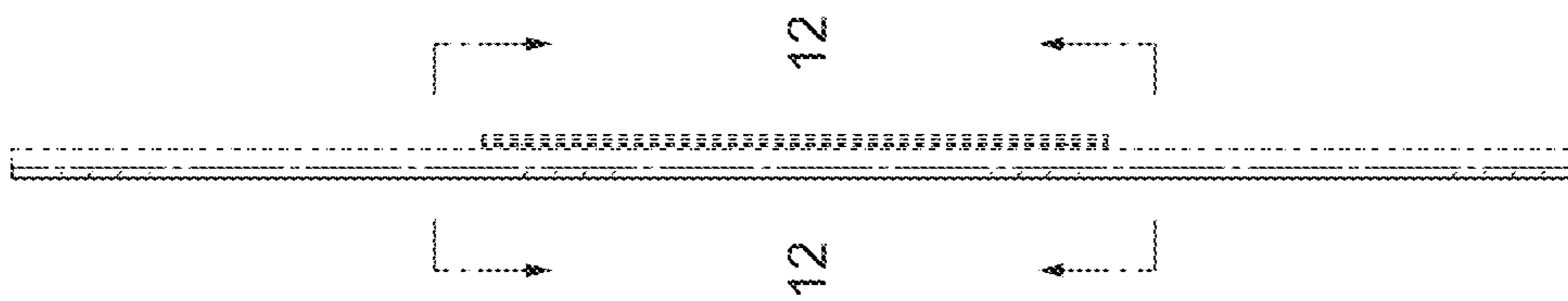


FIG. 5

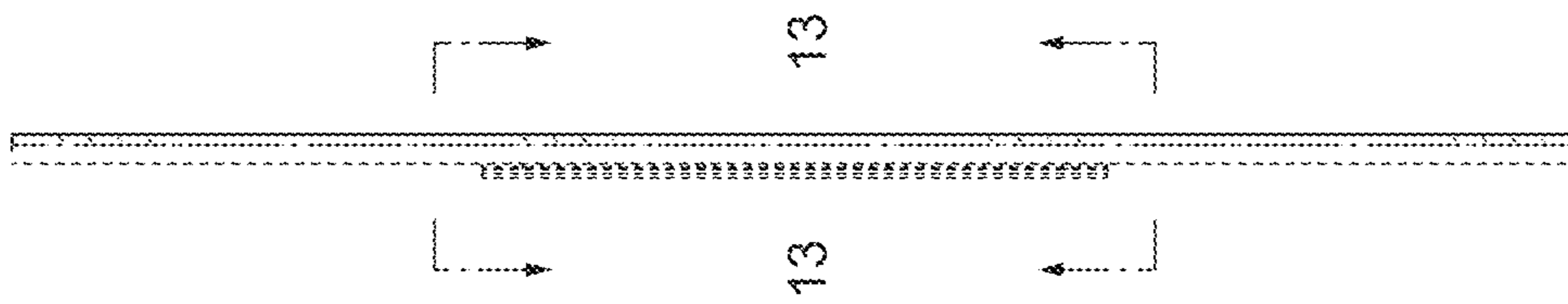


FIG. 6

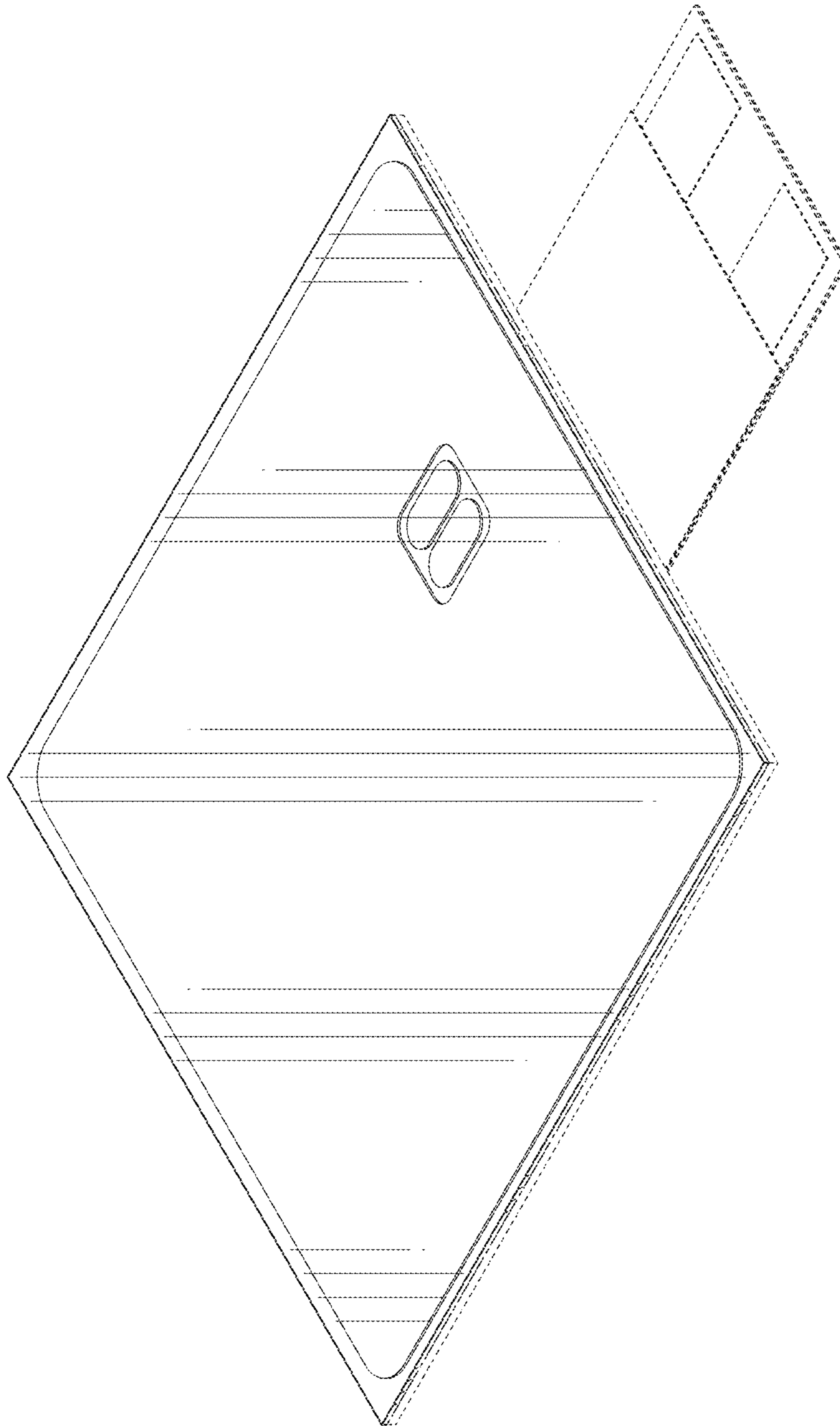


FIG. 7

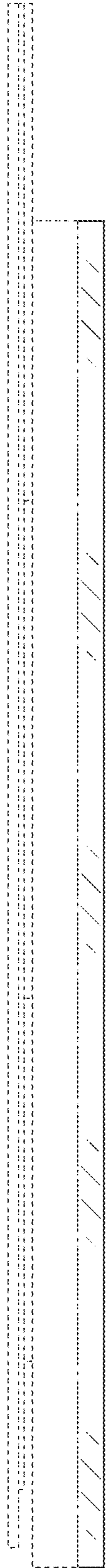


FIG. 8

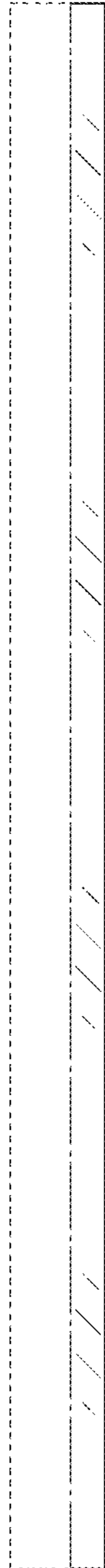


FIG. 9

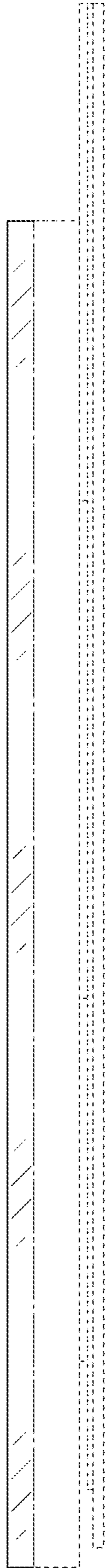


FIG. 10

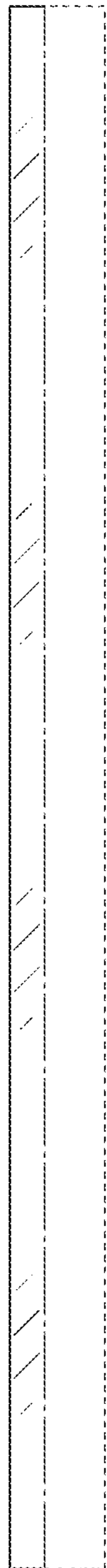


FIG. 11

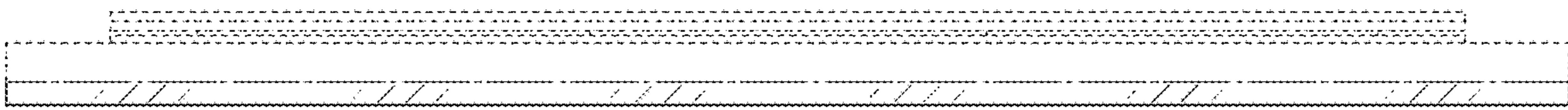


FIG. 12

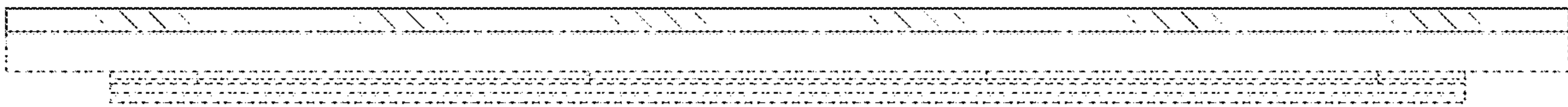


FIG. 13

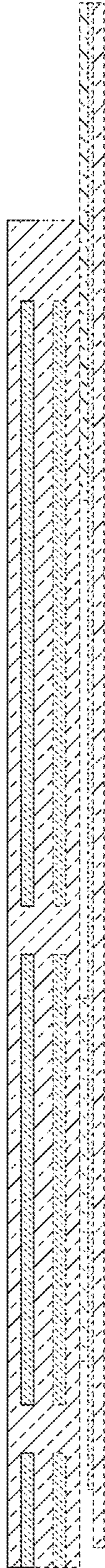


FIG. 14

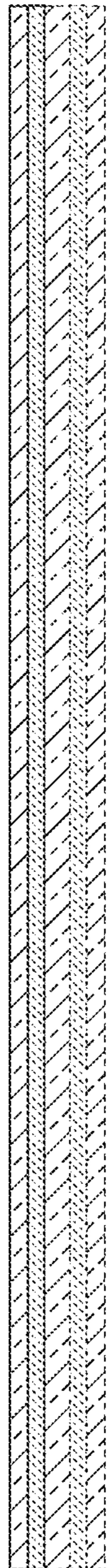


FIG. 15

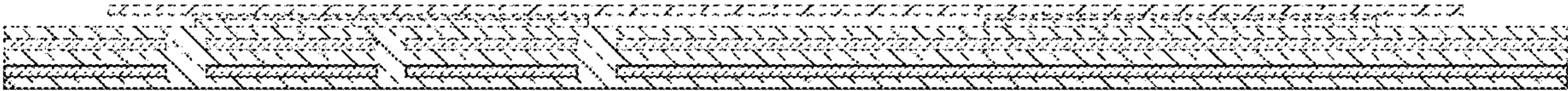


FIG. 16

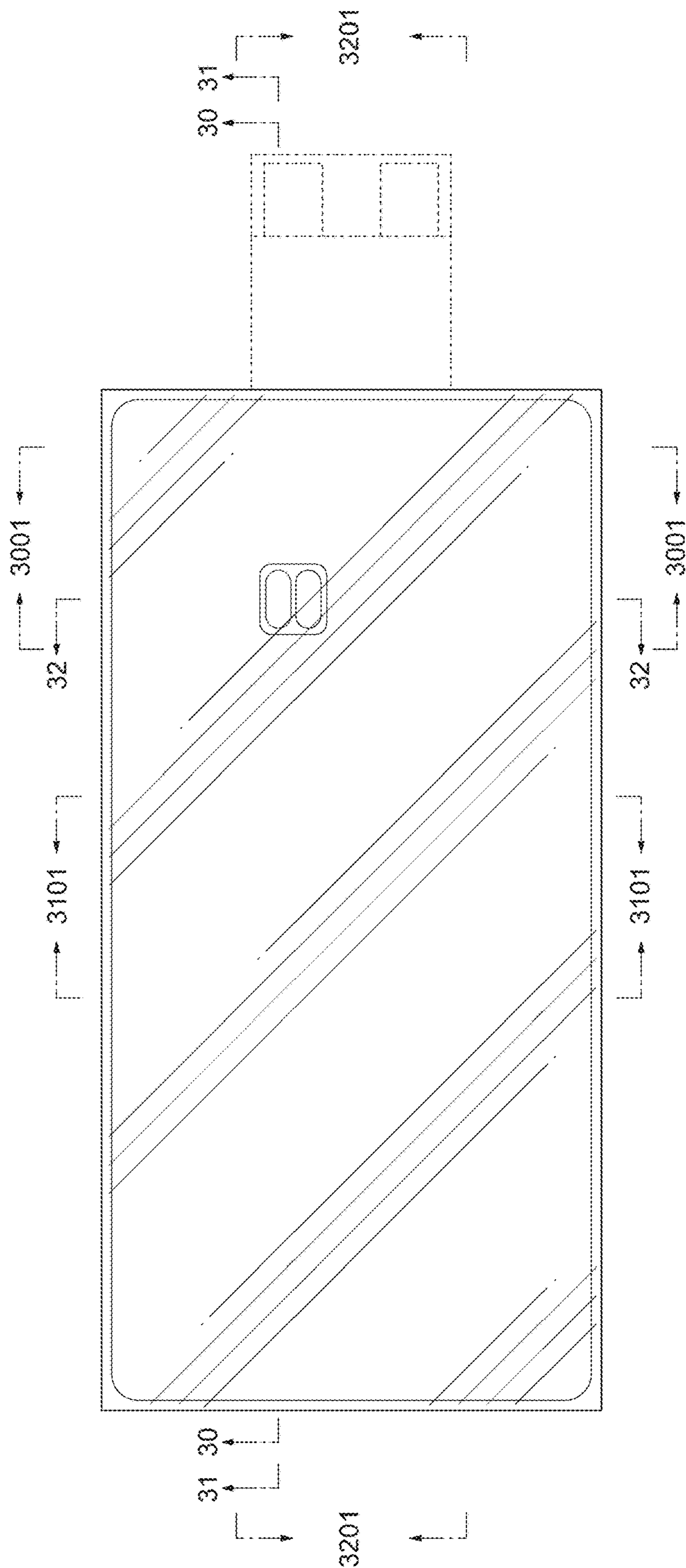


FIG. 17

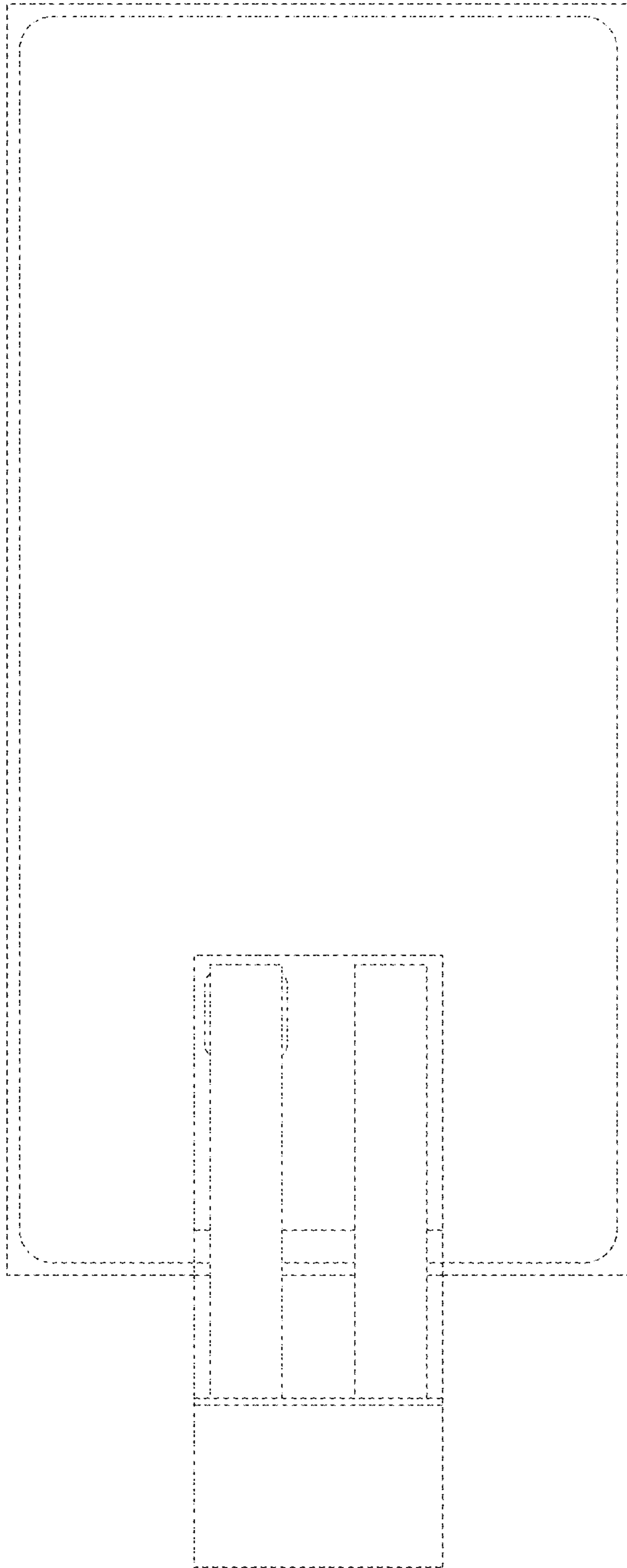


FIG. 18

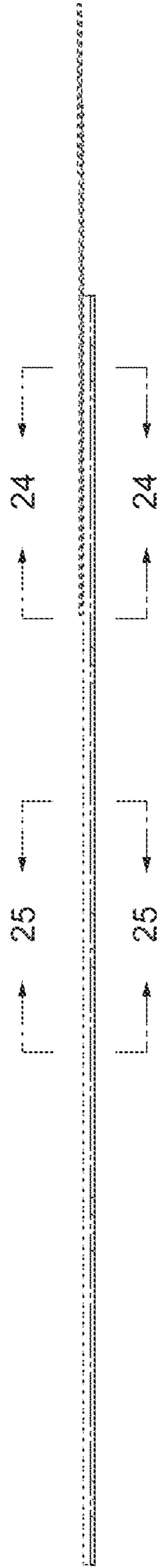


FIG. 19

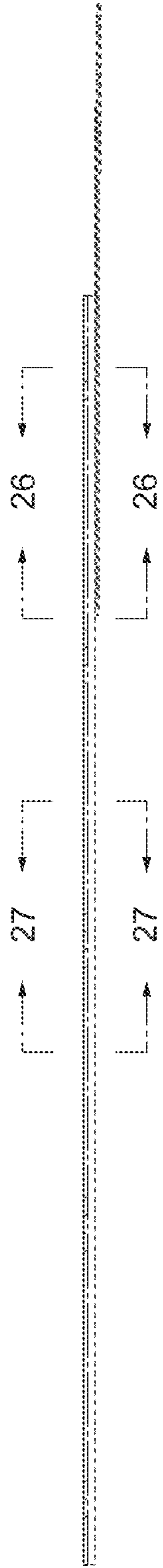


FIG. 20

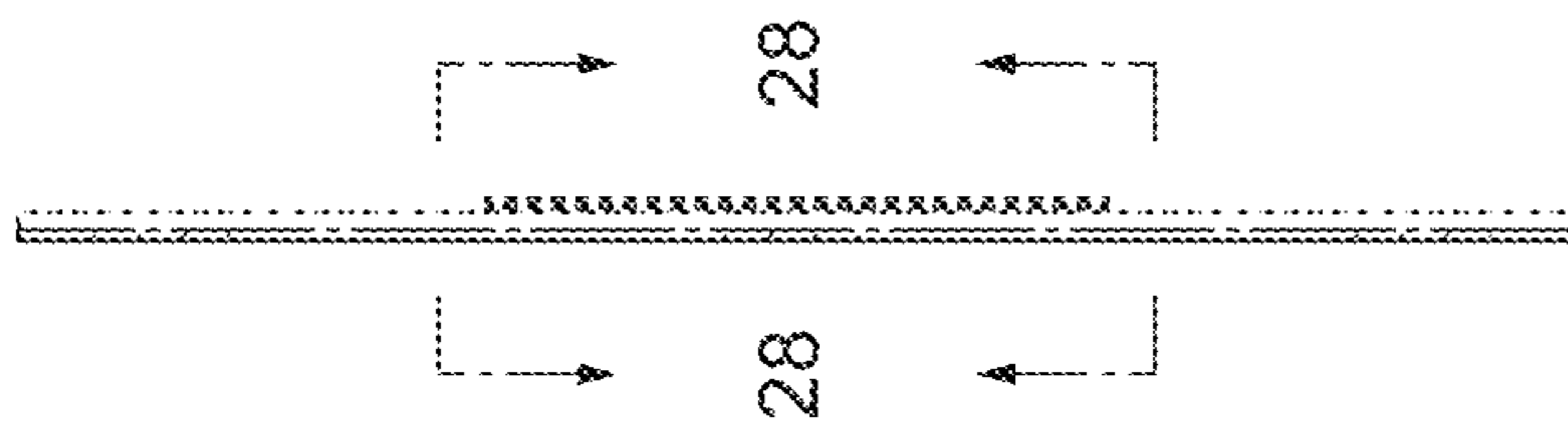


FIG. 21

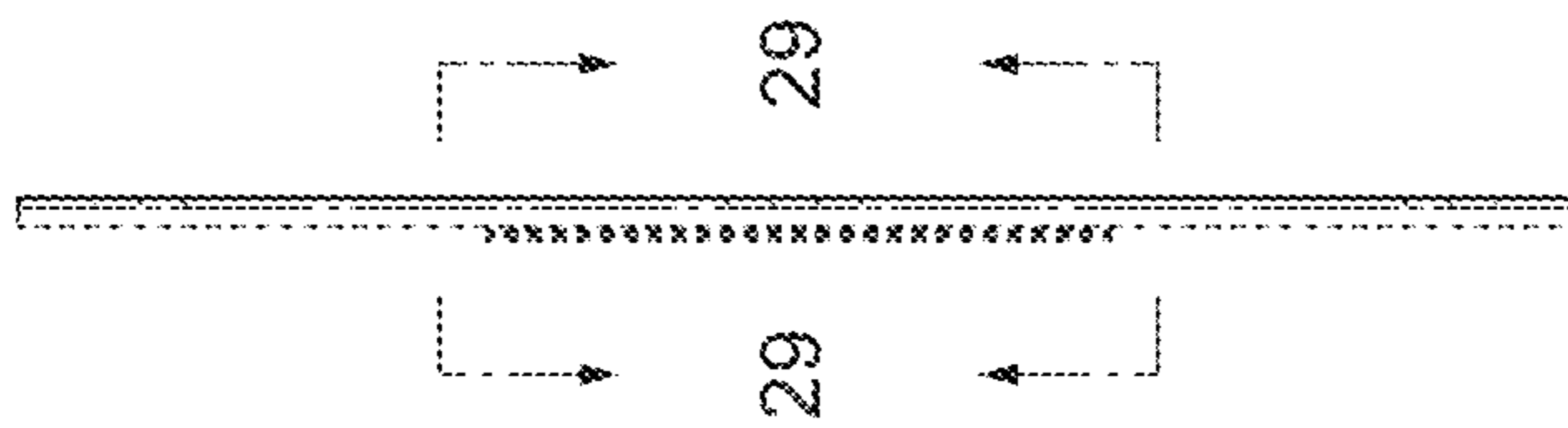


FIG. 22

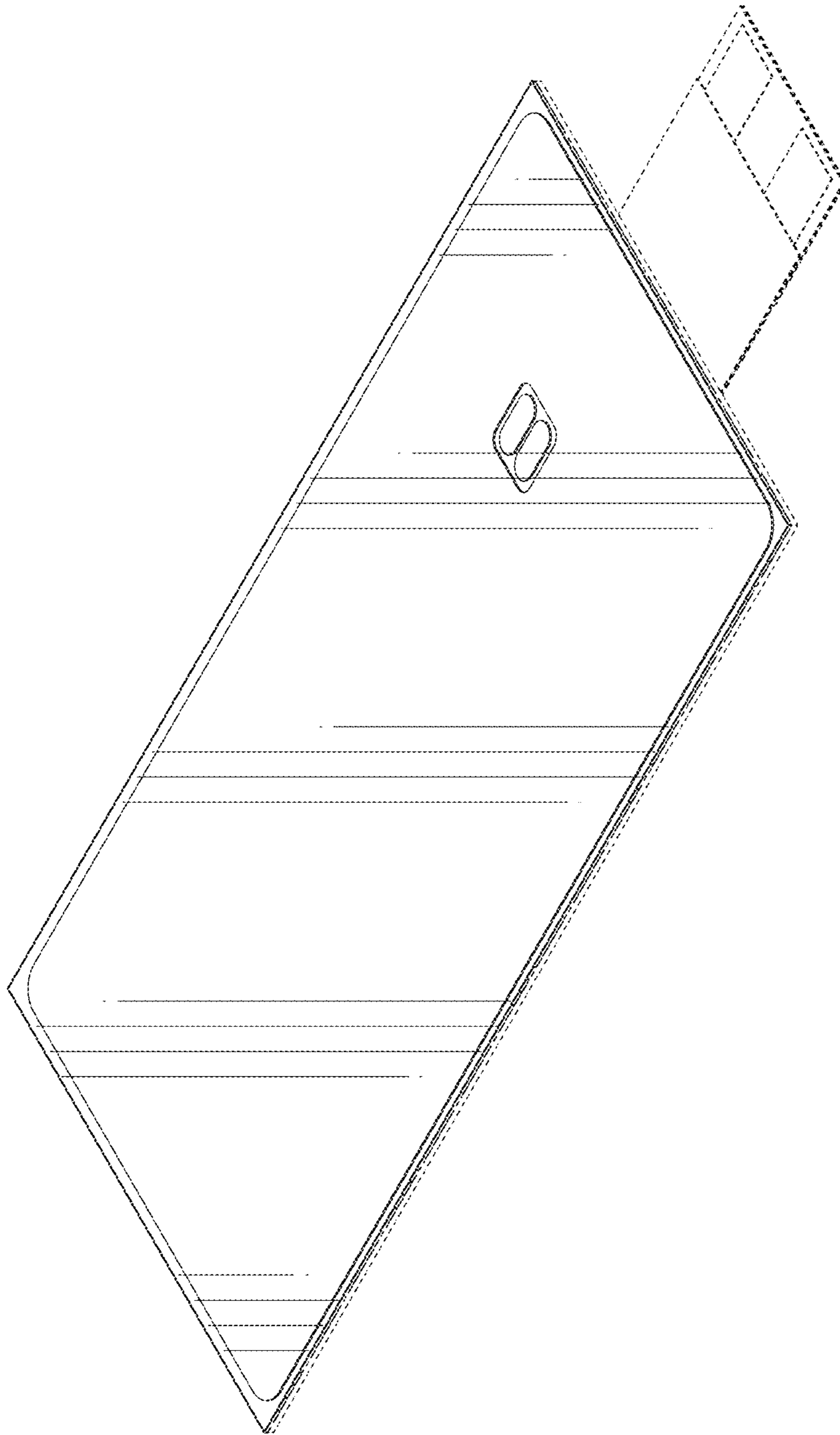


FIG. 23

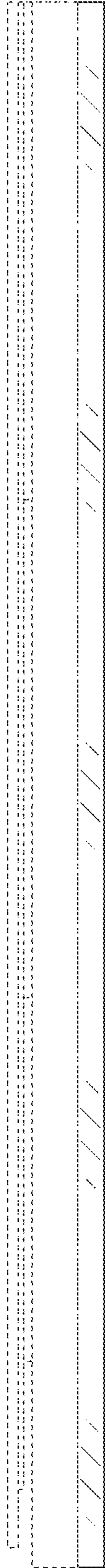


FIG. 24

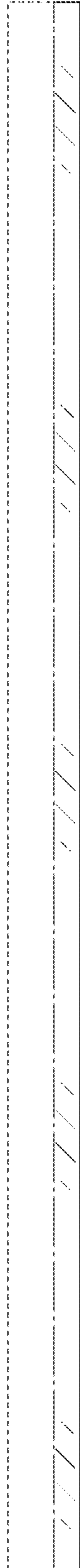


FIG. 25

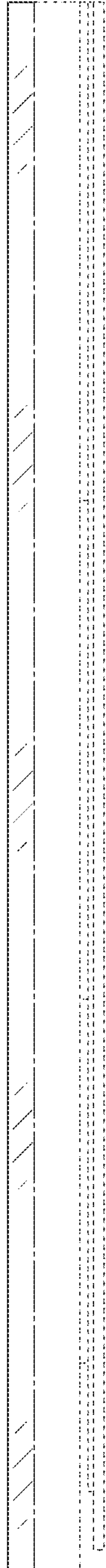


FIG. 26

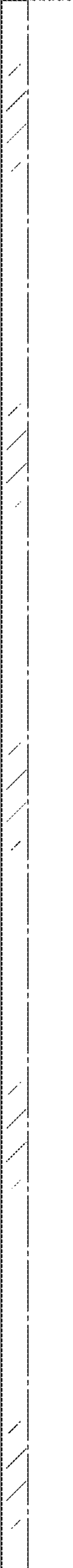


FIG. 27

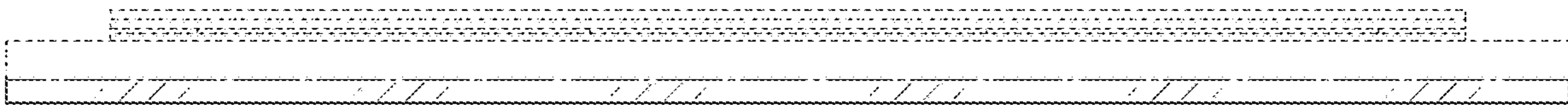


FIG. 28



FIG. 29

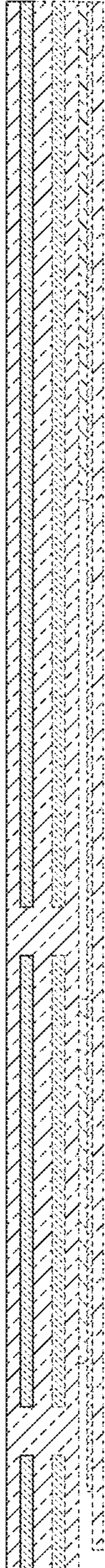


FIG. 30

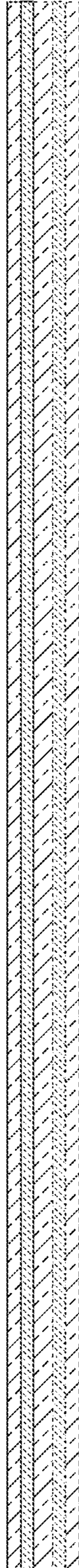


FIG. 31

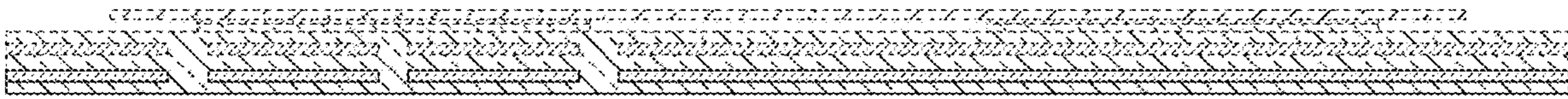


FIG. 32

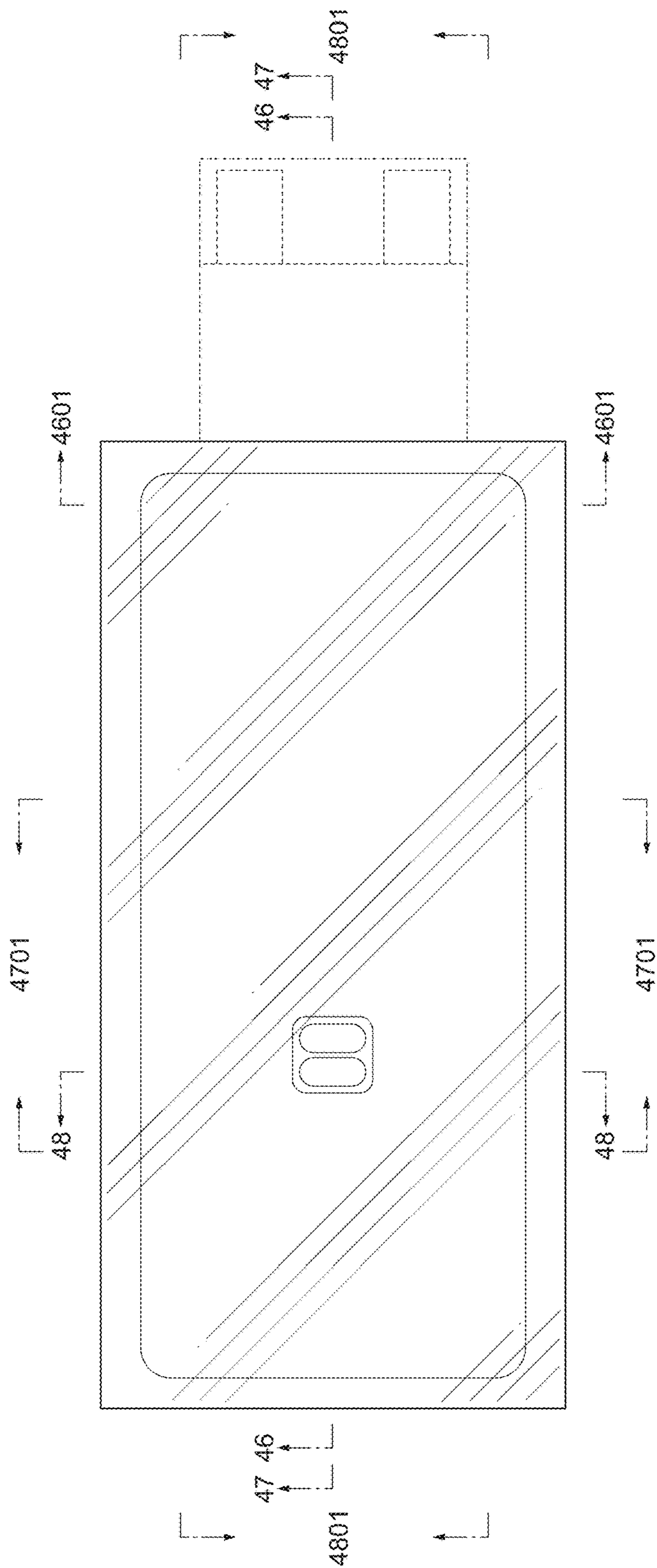


FIG. 33

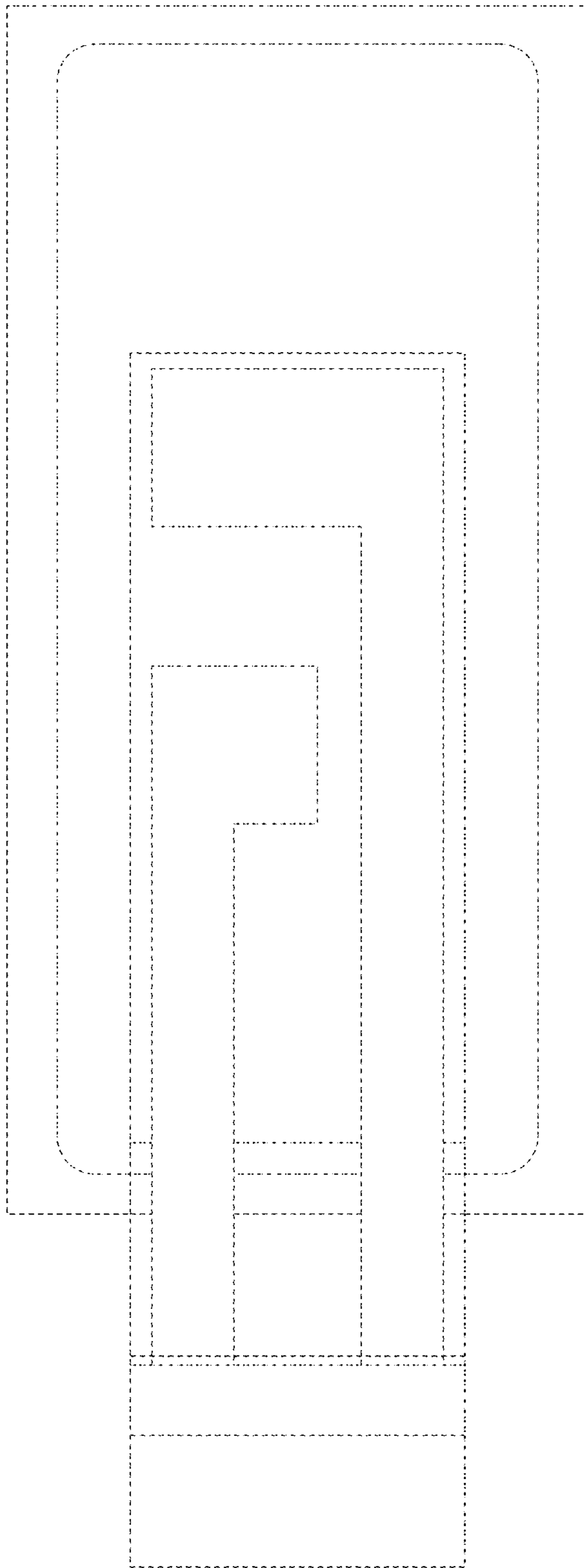


FIG. 34

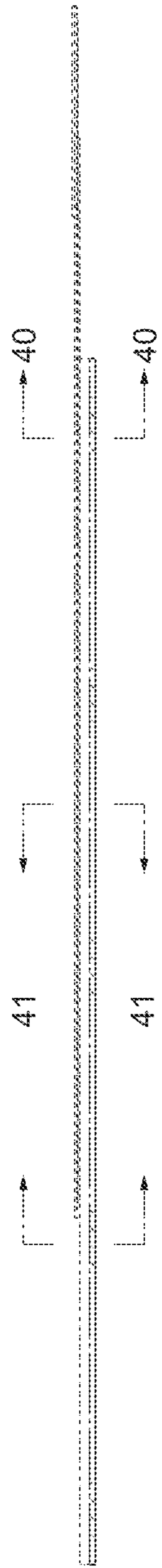


FIG. 35

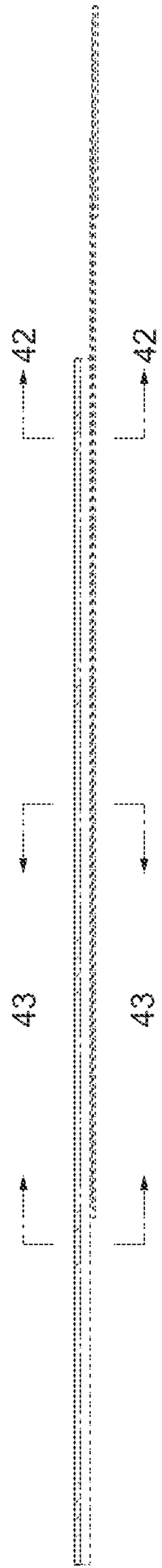


FIG. 36

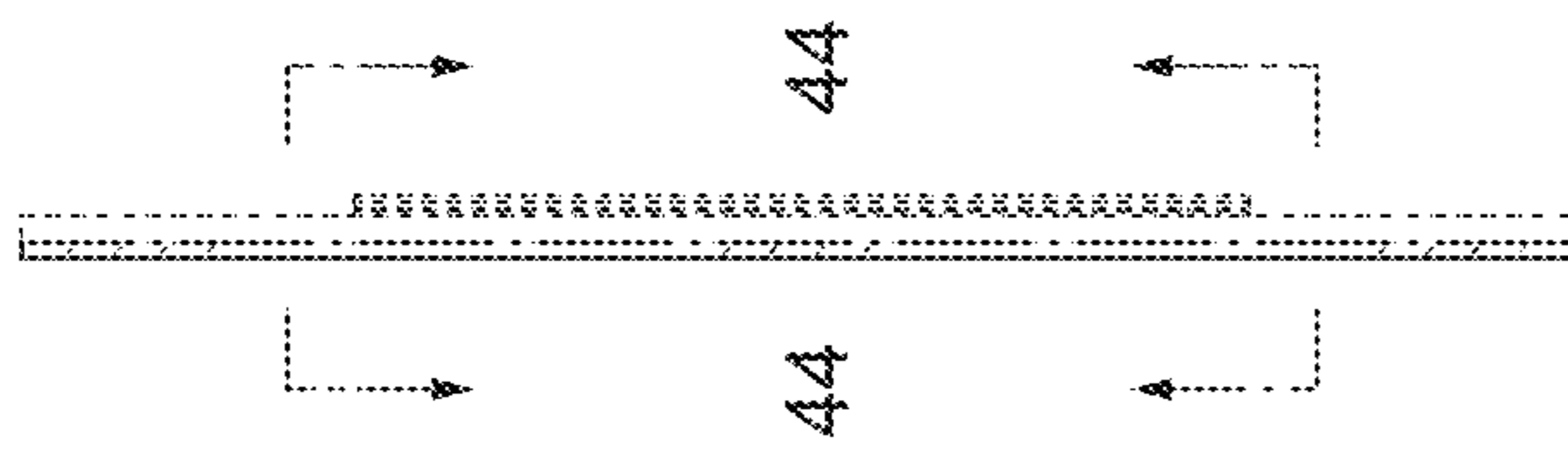


FIG. 37

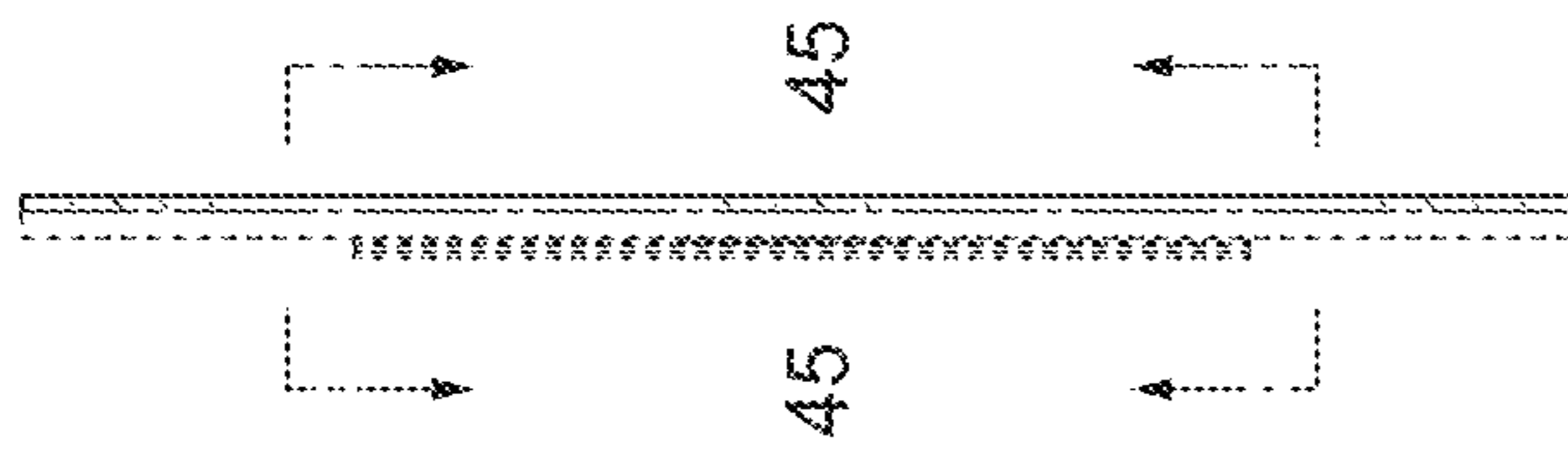


FIG. 38

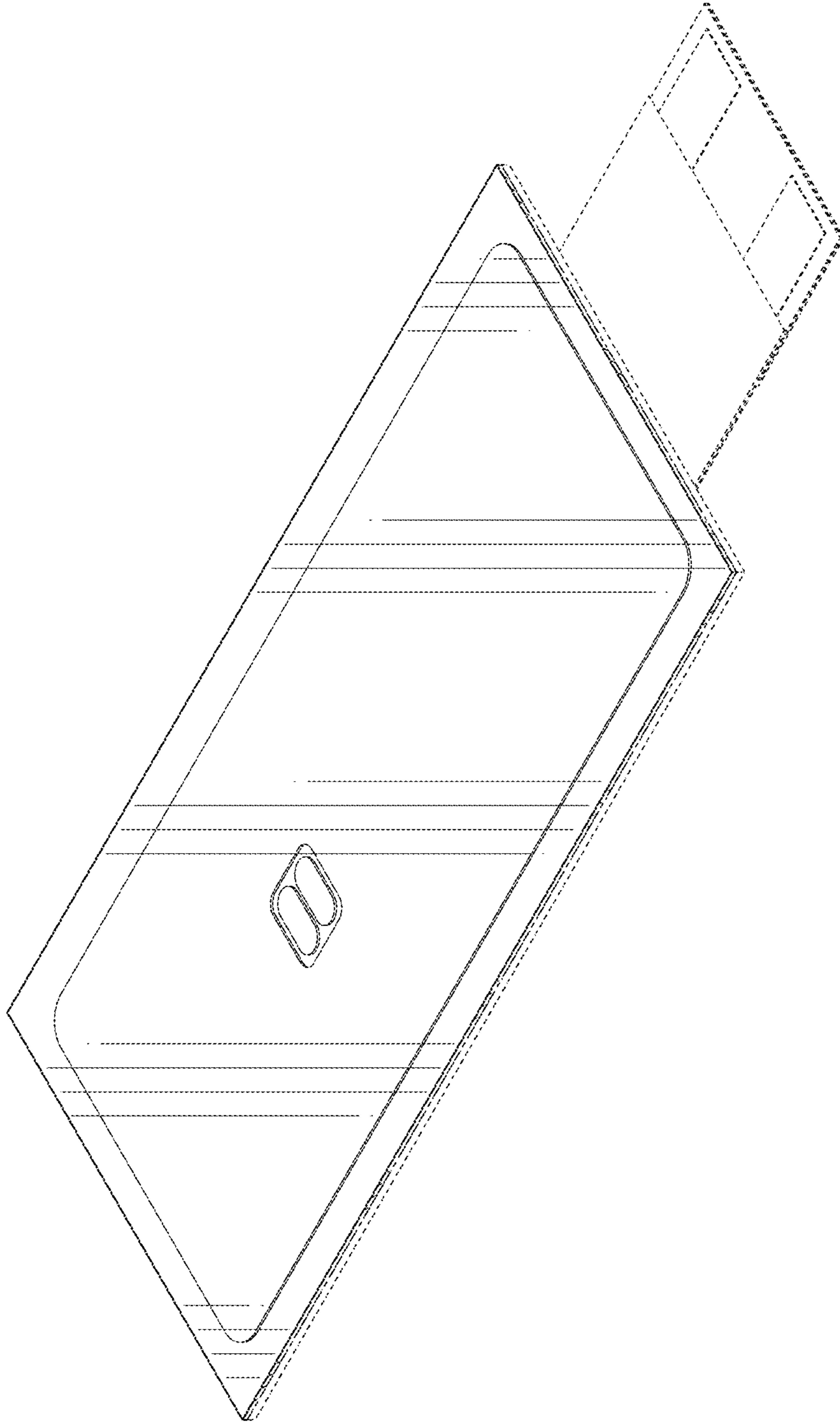


FIG. 39

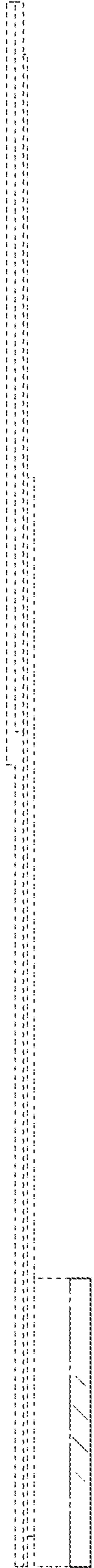


FIG. 40

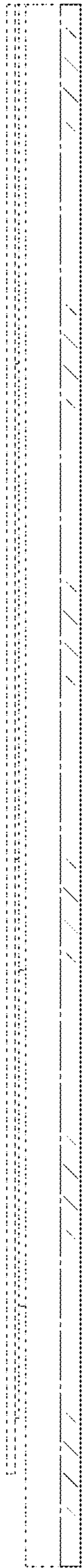


FIG. 41

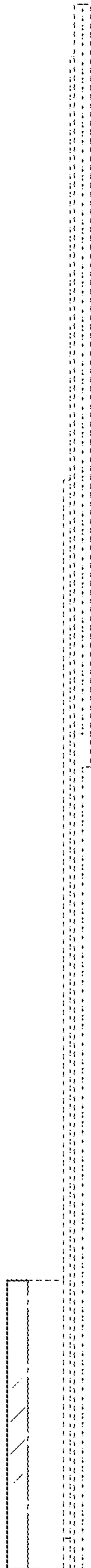


FIG. 42

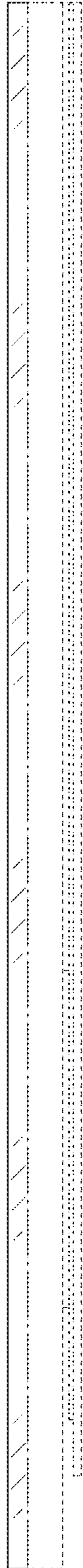


FIG. 43

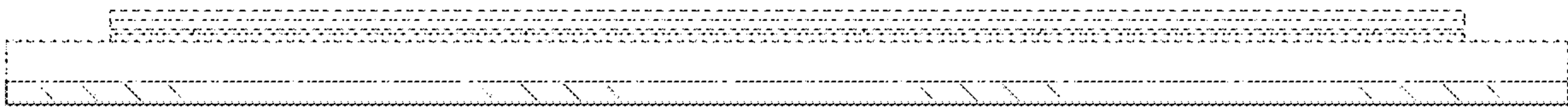


FIG. 44

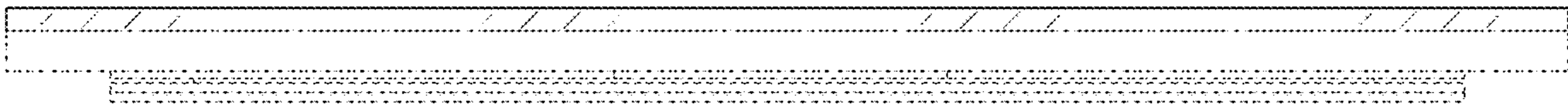


FIG. 45



FIG. 46

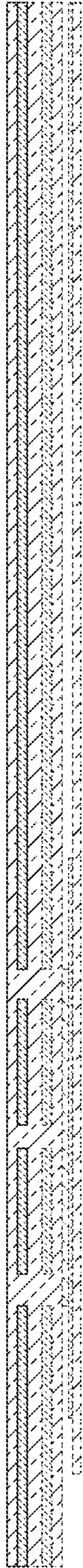


FIG. 47

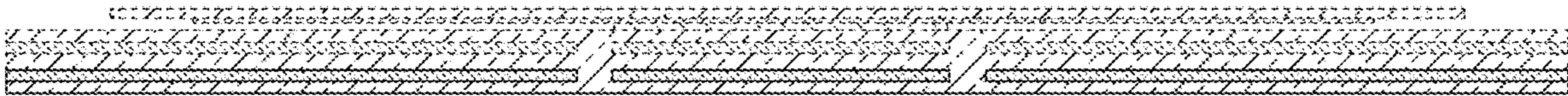


FIG. 48