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(12)

United States Design Patent

Tanaka et al.

(10)

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US D991,984 S

(45)

Date of Patent:

** Jul. 11, 2023

(54) **PIEZOELECTRIC PUMP**

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Yutoku Kawabata, Nagaokakyo (JP)

(73) Assignee: **Murata Manufacturing Co., Ltd.**,
Nagaokakyo (JP)

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

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(51) **LOC (14) Cl.** **15-02**

(52) **U.S. Cl.**
USPC **D15/7**

(58) **Field of Classification Search**
USPC D15/7–9; D24/108, 110, 111; D13/103;
D23/210, 225, 231, 232

(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

D489,319 S * 5/2004 Månsson D13/101
D572,158 S * 7/2008 Radecke D10/75

(Continued)

OTHER PUBLICATIONS

Tagasago Fluidic Systems, “Piezo Micro Pump SDMP/APP Series—
Takasago Fluidic System”, (uploaded Nov. 24, 2020), YouTube.

com, URL:<https://www.youtube.com/watch?v=i9ogA-_8IY&t=64s> (Year: 2020).*

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Group, LLC

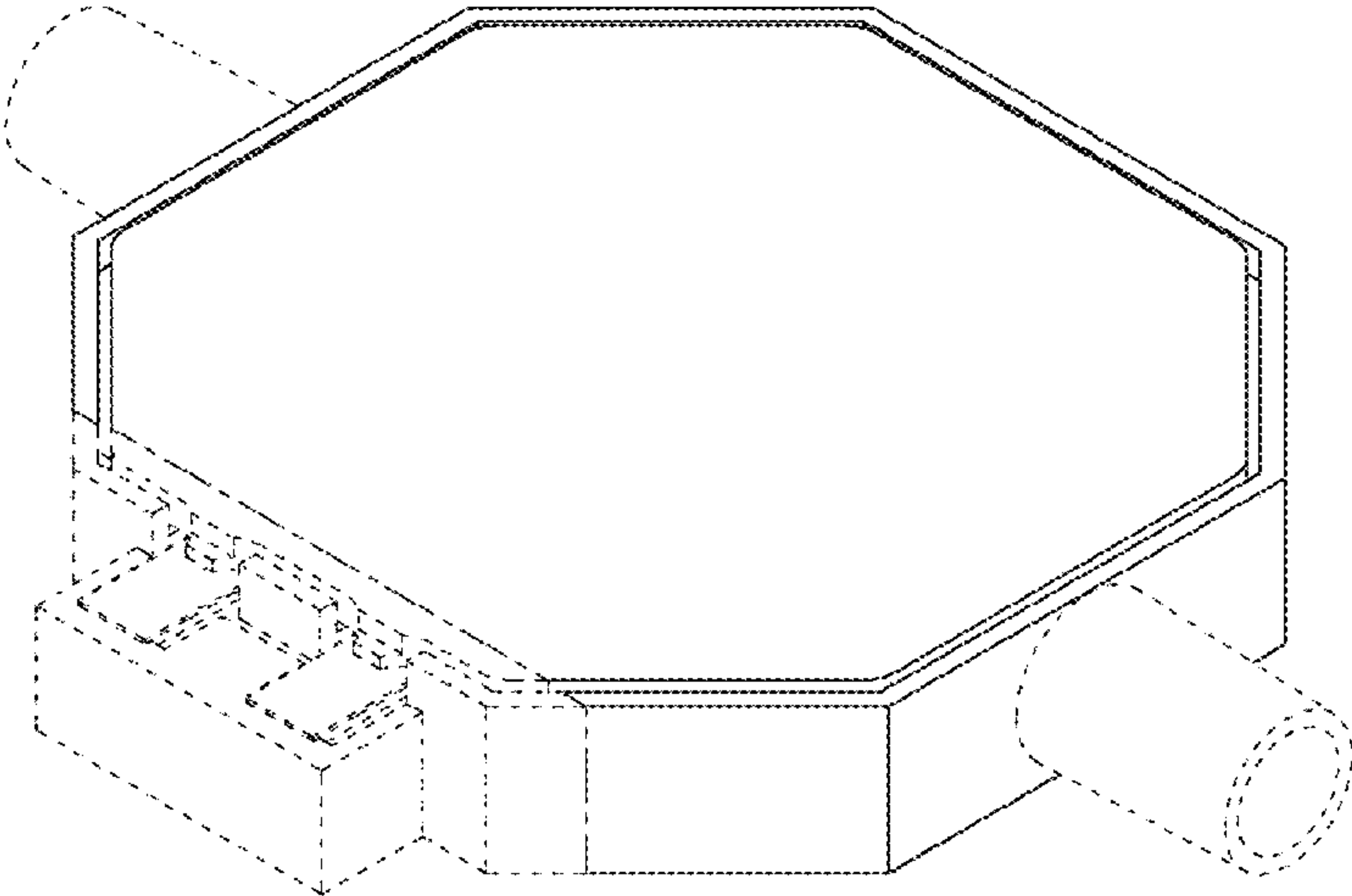
(57) **CLAIM**

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

DESCRIPTION

- 2. Piezoelectric pump
- 3. Piezoelectric pump
- 4. Piezoelectric pump
- 5. Piezoelectric pump
- 6. Piezoelectric pump
- 7. Piezoelectric pump
- 8. Piezoelectric pump
- 9. Piezoelectric pump
- 2.1 : Perspective
- 2.2 : Perspective
- 2.3 : Front
- 2.4 : Back
- 2.5 : Top
- 2.6 : Bottom
- 2.7 : Right
- 2.8 : Left
- 3.1 : Perspective
- 3.2 : Perspective
- 3.3 : Front
- 3.4 : Back
- 3.5 : Top
- 3.6 : Bottom
- 3.7 : Right
- 3.8 : Left
- 4.1 : Perspective
- 4.2 : Perspective

(Continued)



4.3 : Front
4.4 : Back
4.5 : Top
4.6 : Bottom
4.7 : Right
4.8 : Left
5.1 : Perspective
5.2 : Perspective
5.3 : Front
5.4 : Back
5.5 : Top
5.6 : Bottom
5.7 : Right
5.8 : Left
6.1 : Perspective
6.2 : Perspective
6.3 : Front
6.4 : Back
6.5 : Top
6.6 : Bottom
6.7 : Right
6.8 : Left
7.1 : Perspective
7.2 : Perspective
7.3 : Front
7.4 : Back
7.5 : Top
7.6 : Bottom
7.7 : Right
7.8 : Left
8.1 : Perspective
8.2 : Perspective
8.3 : Front
8.4 : Back
8.5 : Top
8.6 : Bottom
8.7 : Right
8.8 : Left
9.1 : Perspective
9.2 : Perspective
9.3 : Front
9.4 : Back
9.5 : Top
9.6 : Bottom
9.7 : Right
9.8 : Left

The broken lines depict portions of the piezoelectric pump which form no part of the claimed design.

The dot-dash broken lines illustrate boundaries which form no part of the claimed design.

1 Claim, 64 Drawing Sheets

(58) Field of Classification Search

CPC . B29C 73/00; B25B 21/02; B60S 5/04; B60S 5/046; F04B 1/005; F04B 25/00; F04B 27/00; F04B 35/00; F04B 35/04; F04B 37/00; F04B 39/00; F04B 43/1269; F04B 43/1276; F04B 43/08; F04B 45/04; F04B 45/08; F04B 17/03; F04B 53/00; F04B 53/92; A61M 16/0066

See application file for complete search history.

(56) References Cited

U.S. PATENT DOCUMENTS

D577,300	S *	9/2008	Radecke	.....	D10/75
D580,592	S *	11/2008	Hara	.....	D27/141
D732,613	S *	6/2015	Davies, III	.....	D21/680
D777,266	S *	1/2017	Davies, III	.....	D21/680
D793,259	S *	8/2017	Fürer	.....	D10/83
D804,347	S *	12/2017	Satoh	.....	D10/116.1
10,947,965	B2 *	3/2021	Tanaka	.....	F04B 45/04
D946,441	S *	3/2022	Chen	.....	D10/116.1
11,458,360	B2 *	10/2022	Manson	.....	A63B 23/0464
2010/0068080	A1 *	3/2010	Meng	.....	F04B 43/046 417/322
2011/0076170	A1 *	3/2011	Fujisaki	.....	F04B 45/047 417/415
2015/0071797	A1 *	3/2015	Takeuchi	.....	F04B 43/0054 417/413.2
2018/0187672	A1 *	7/2018	Tanaka	.....	F04B 43/02
2020/0398571	A1 *	12/2020	Goto	.....	H01L 41/0973
2021/0199106	A1 *	7/2021	Bartels	.....	F04B 43/0027
2022/0316467	A1 *	10/2022	Ogata	.....	F04B 45/045

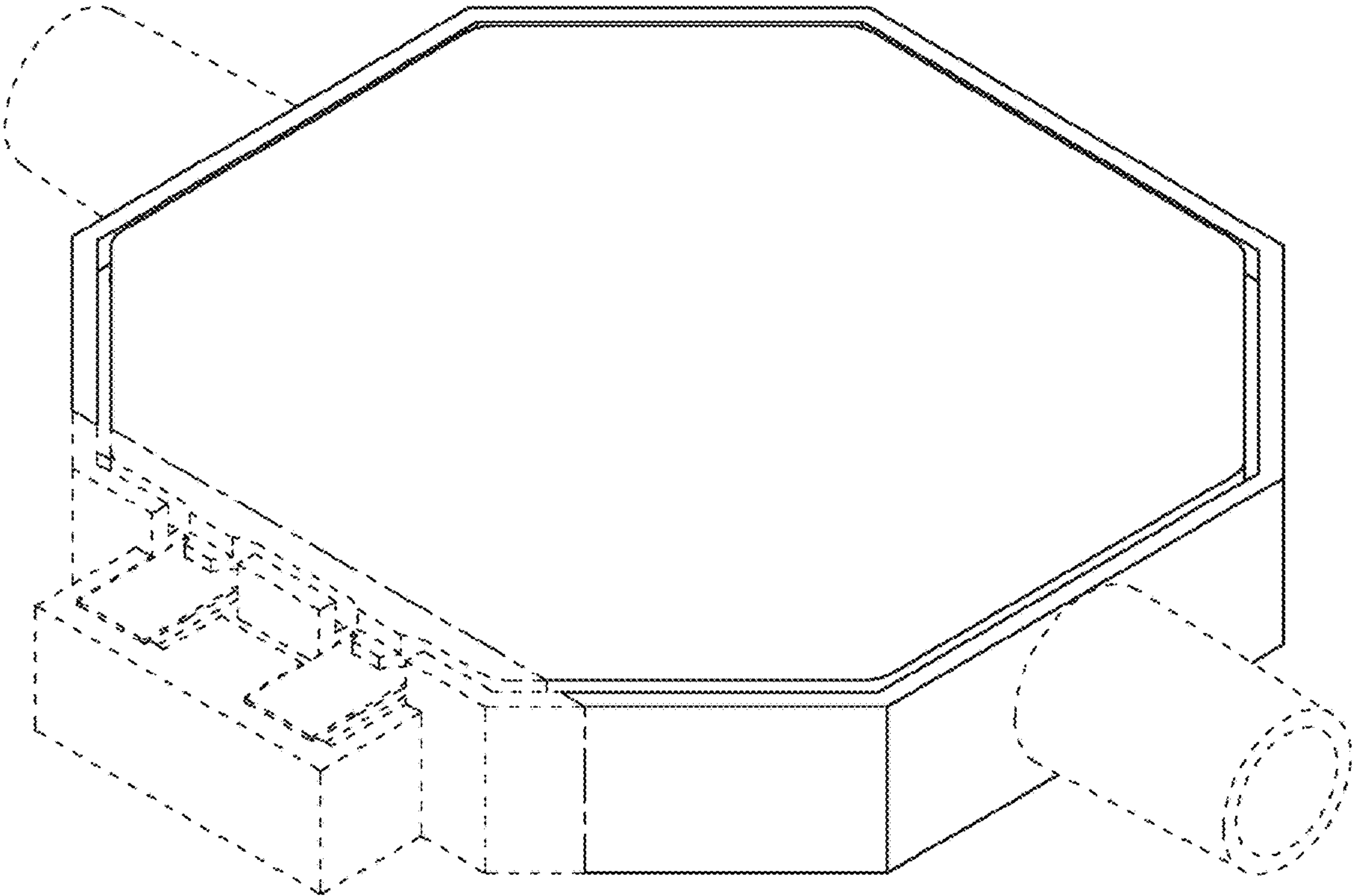
OTHER PUBLICATIONS

MuRata, Microblower MZB4001T05, (site visited Feb. 13, 2023), muRata.com website, URL:<https://www.murata.com/en-us/products/mechatronics/fluid/overview/lineup/microblower_mzb4001t05> (Year: 2023).*

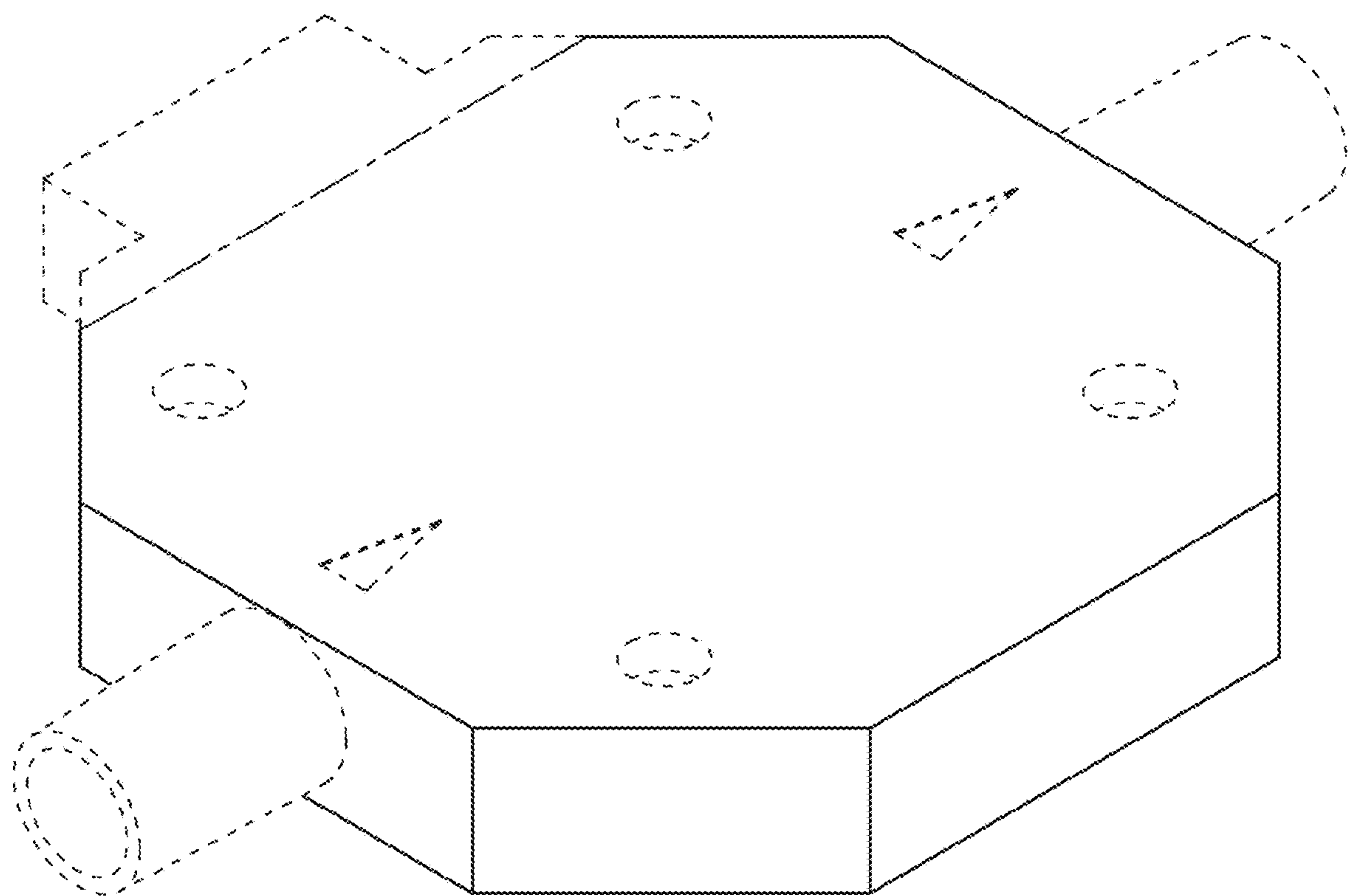
T. Fukue, "Effects of obstruction in front of a piezoelectric micro blower on performance characteristics", (2013), Semantic Scholar.org website, URL:<<https://www.semanticscholar.org/paper/Effects-of-obstruction-in-front-of-a-piezoelectric-Fukue-Hirose/815056839f192674aa6e729ca00a9243fb0f628a/figure/0>> (Year: 2013).*

* cited by examiner

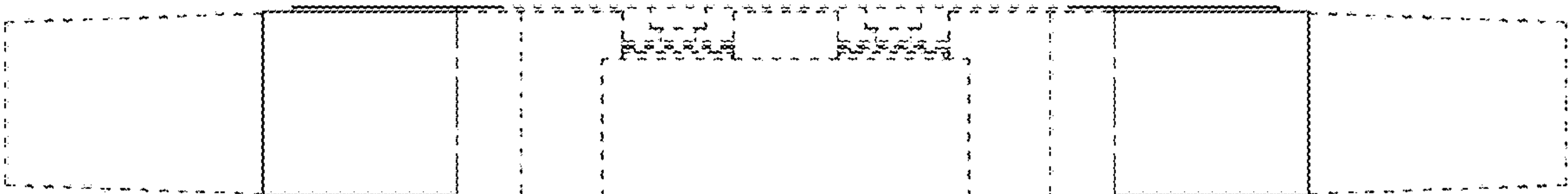
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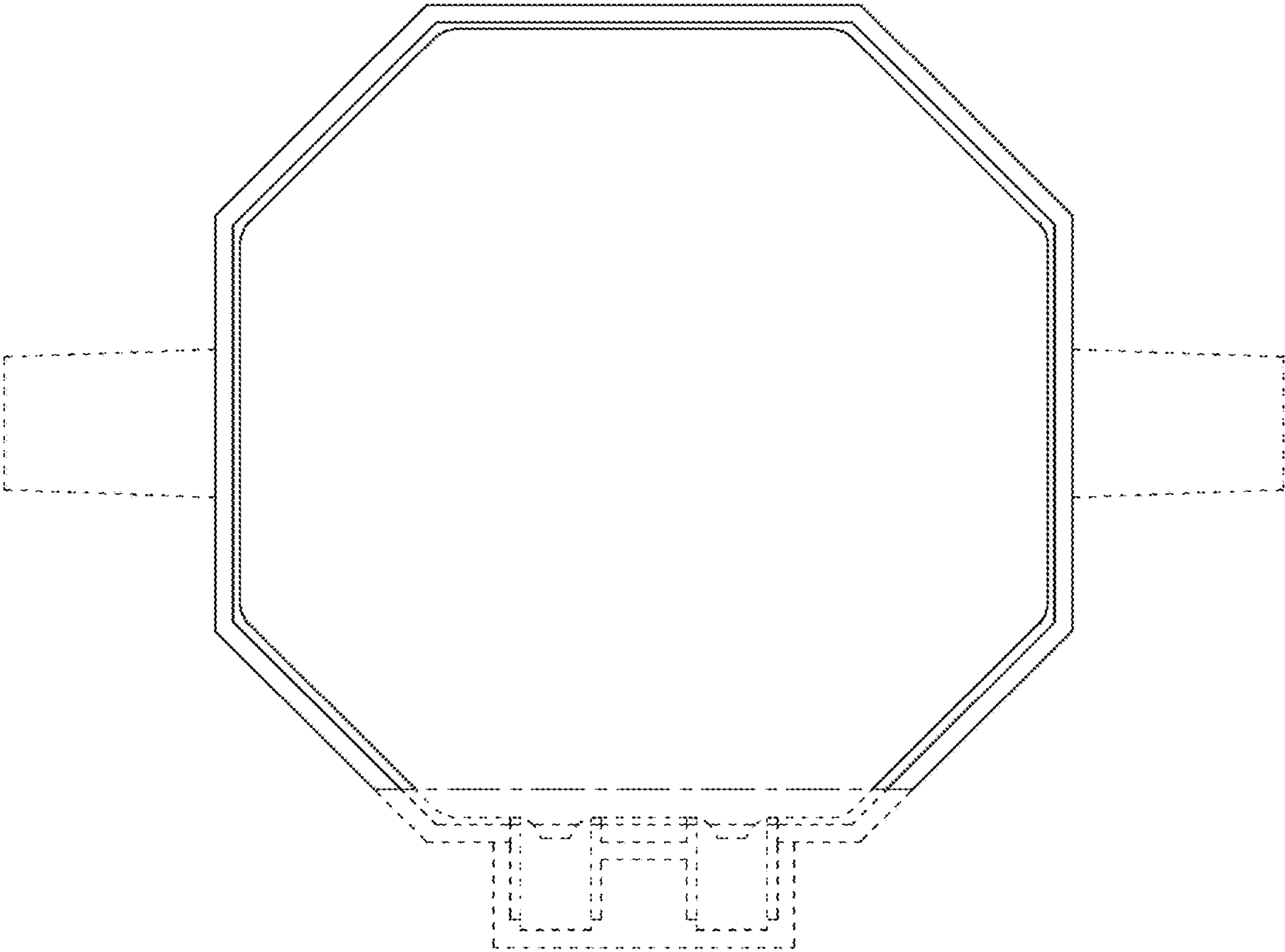
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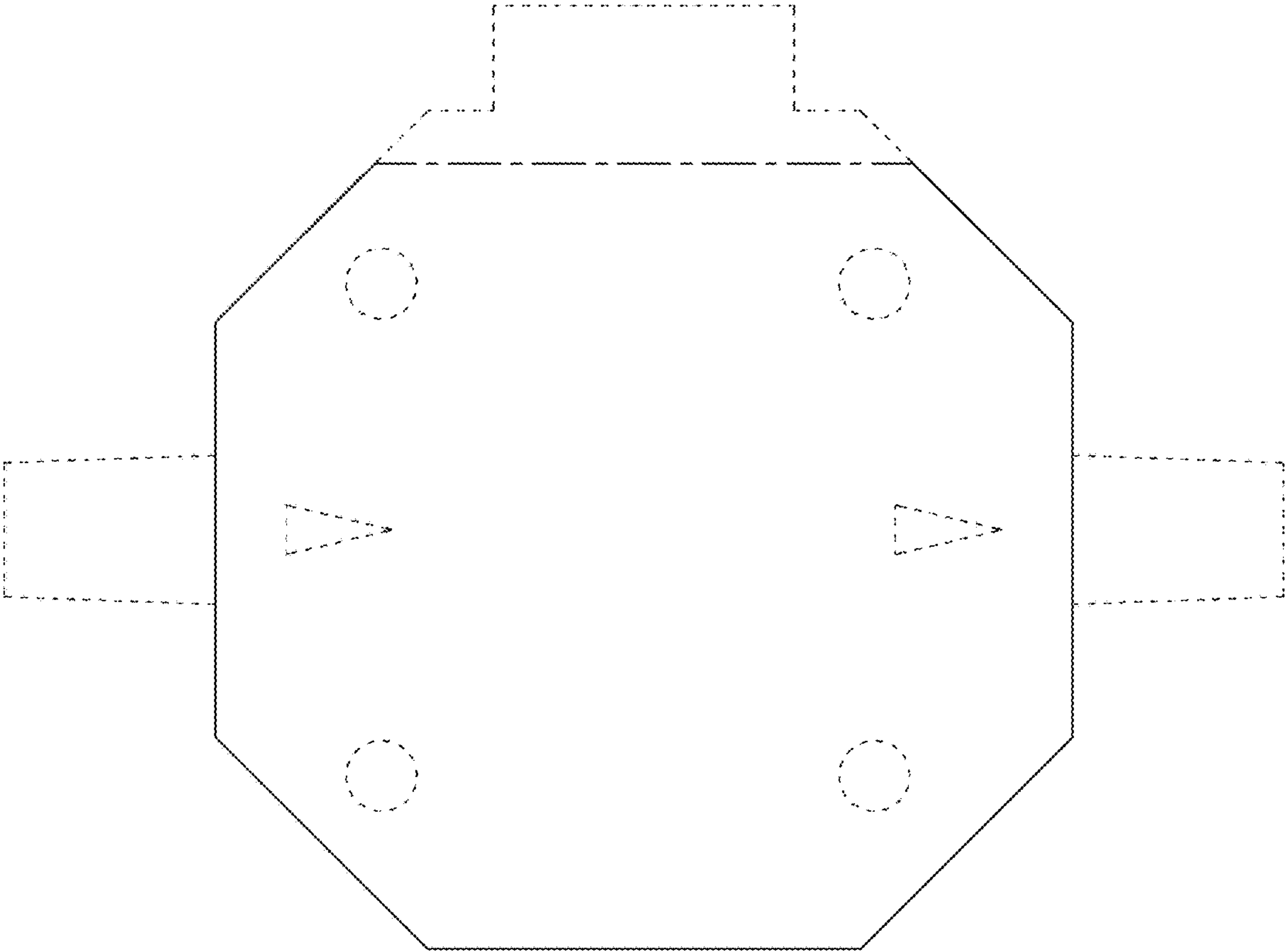
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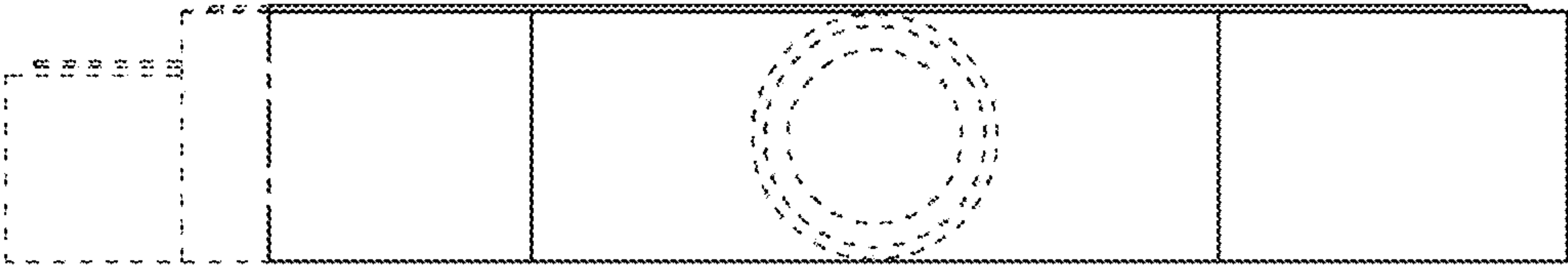
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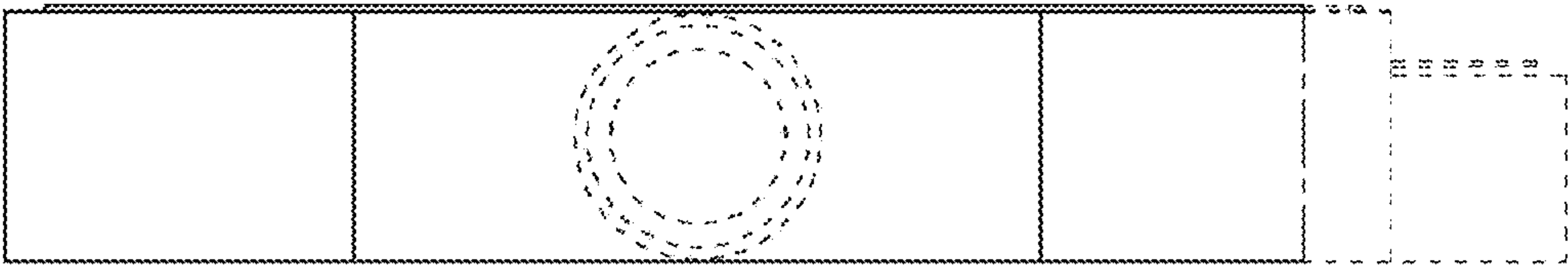
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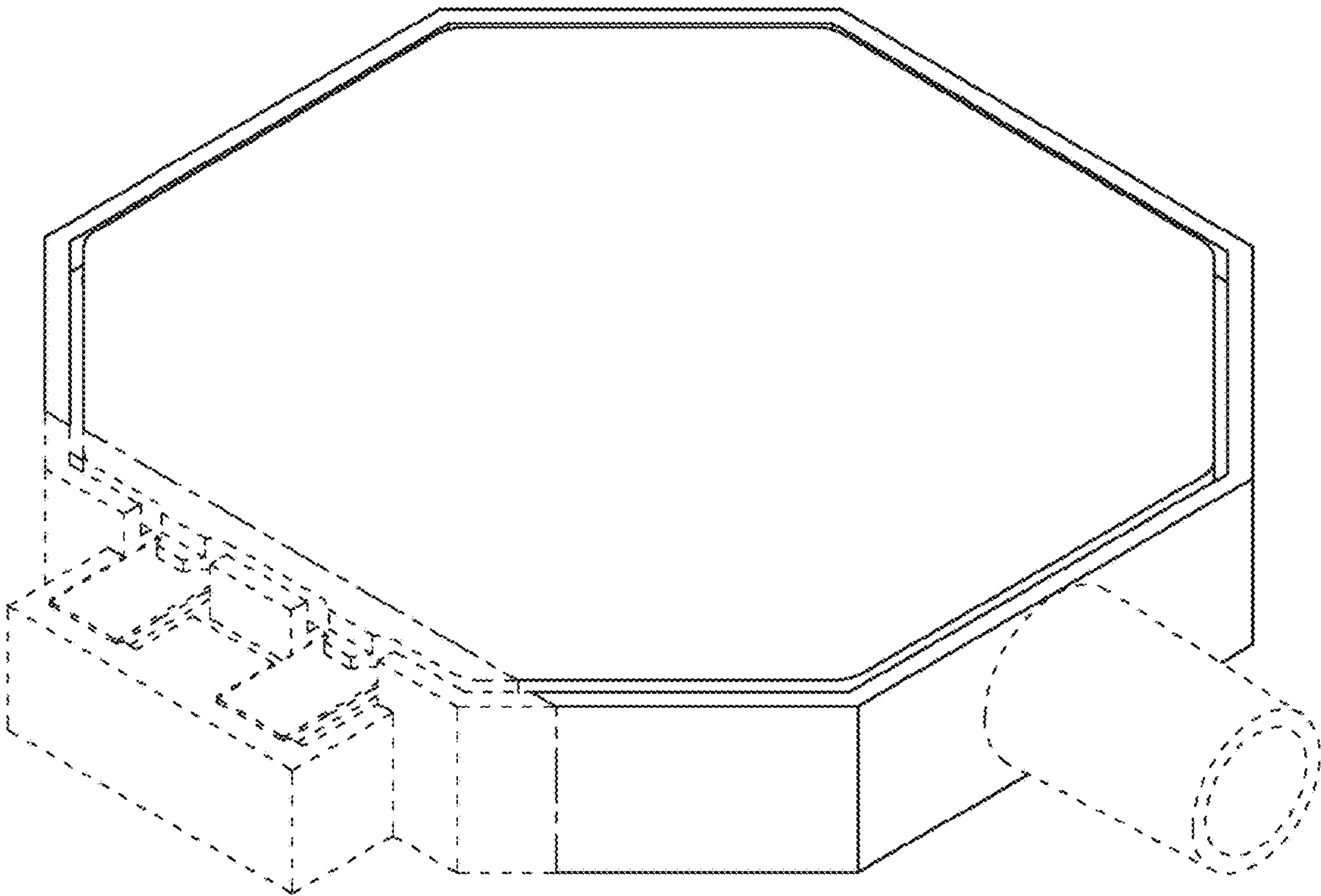
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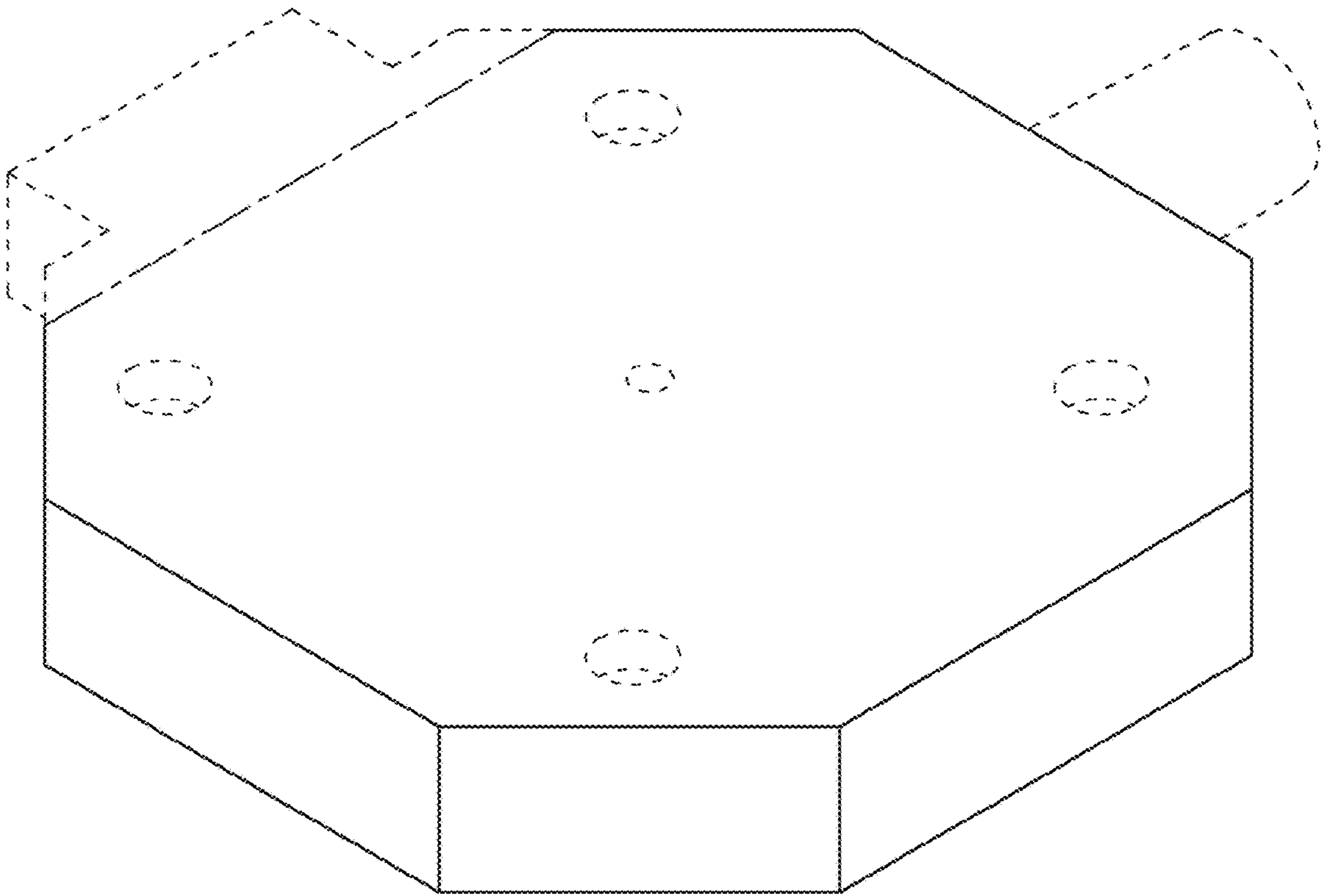
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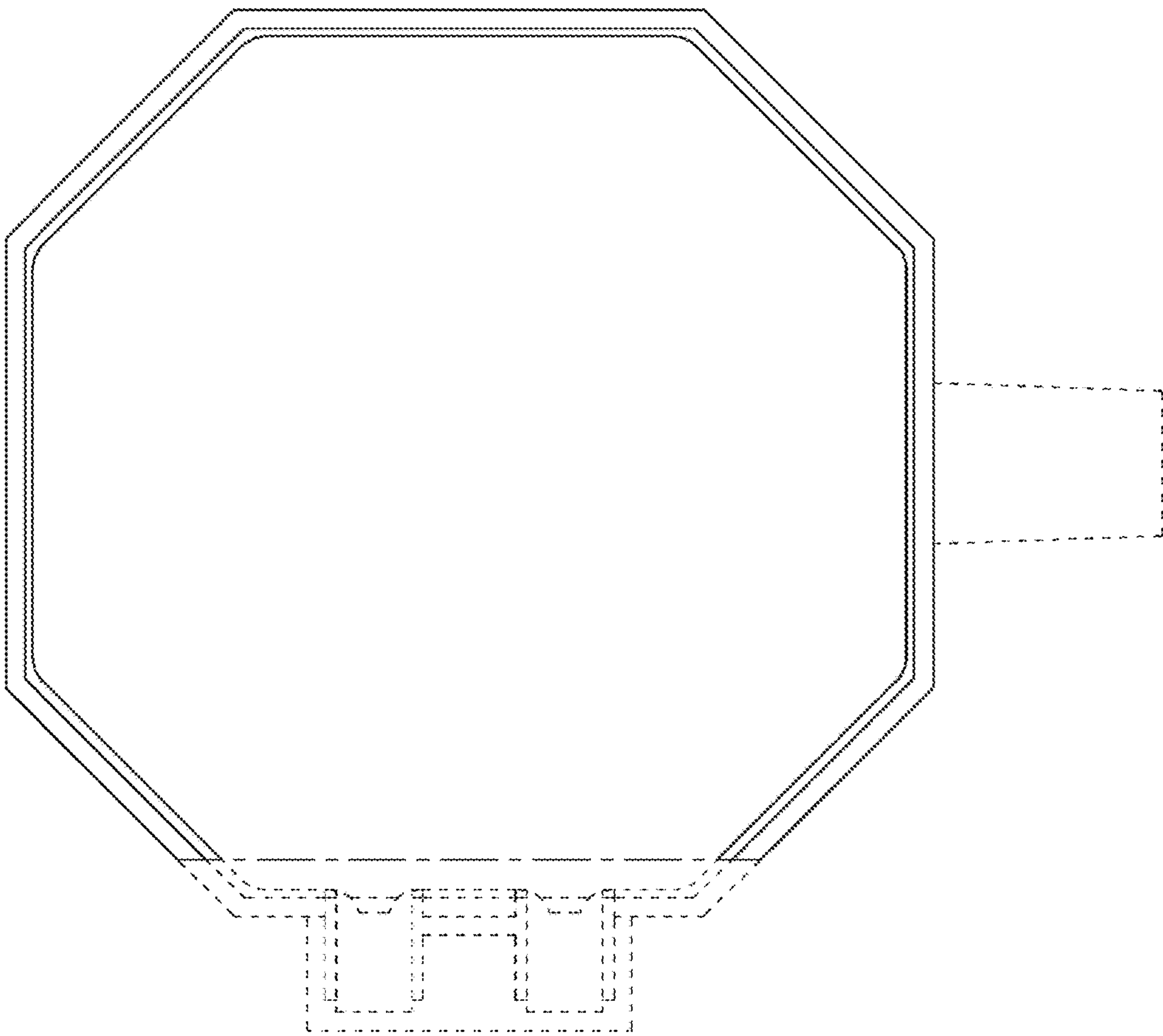
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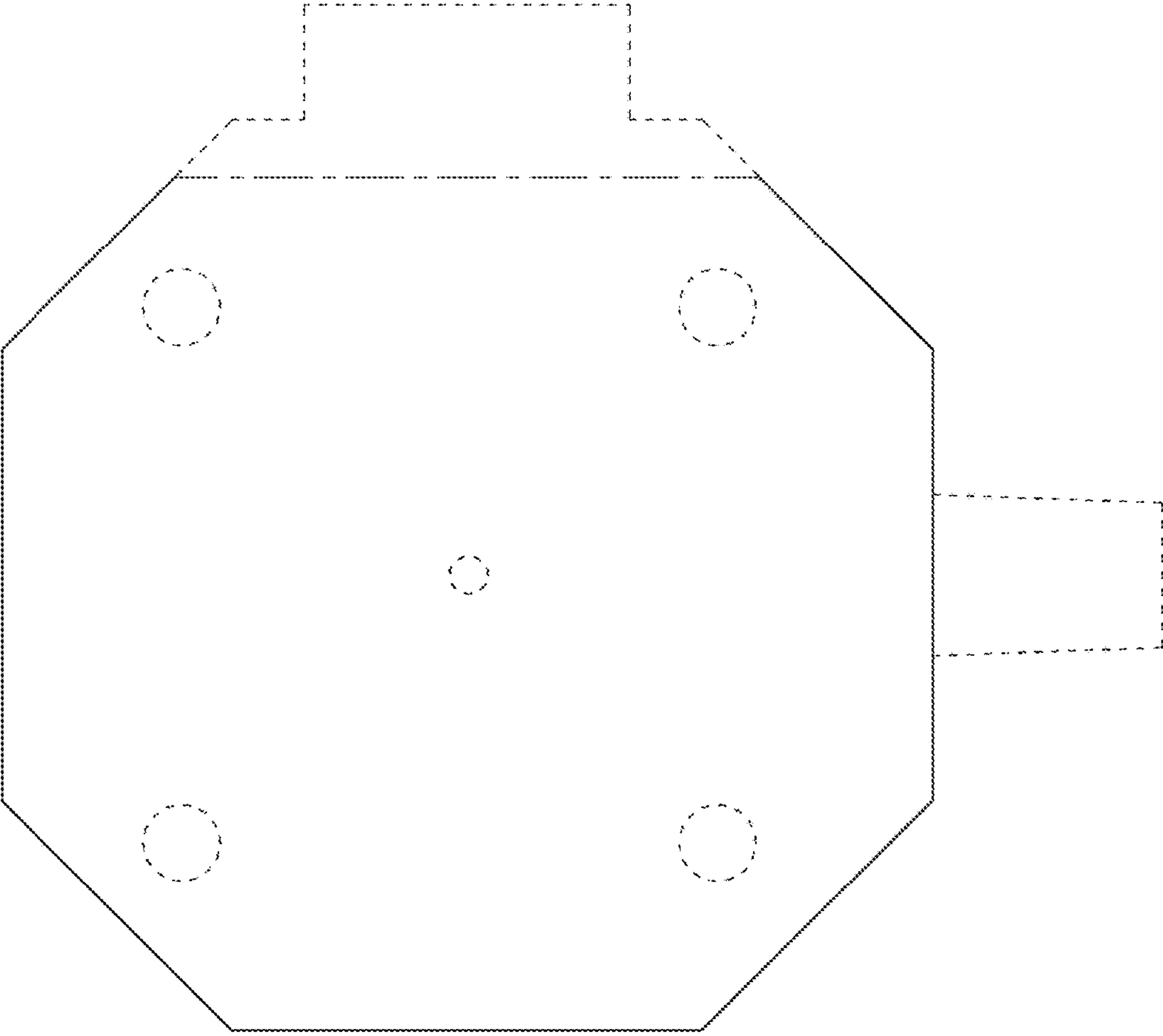
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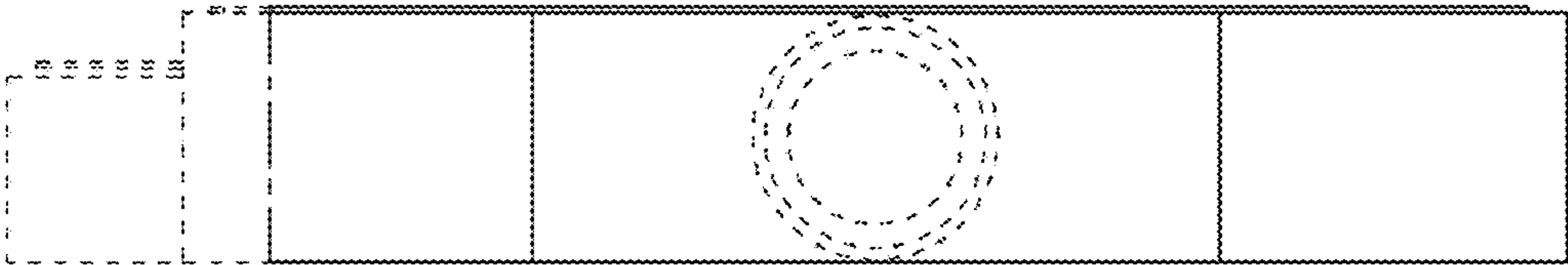
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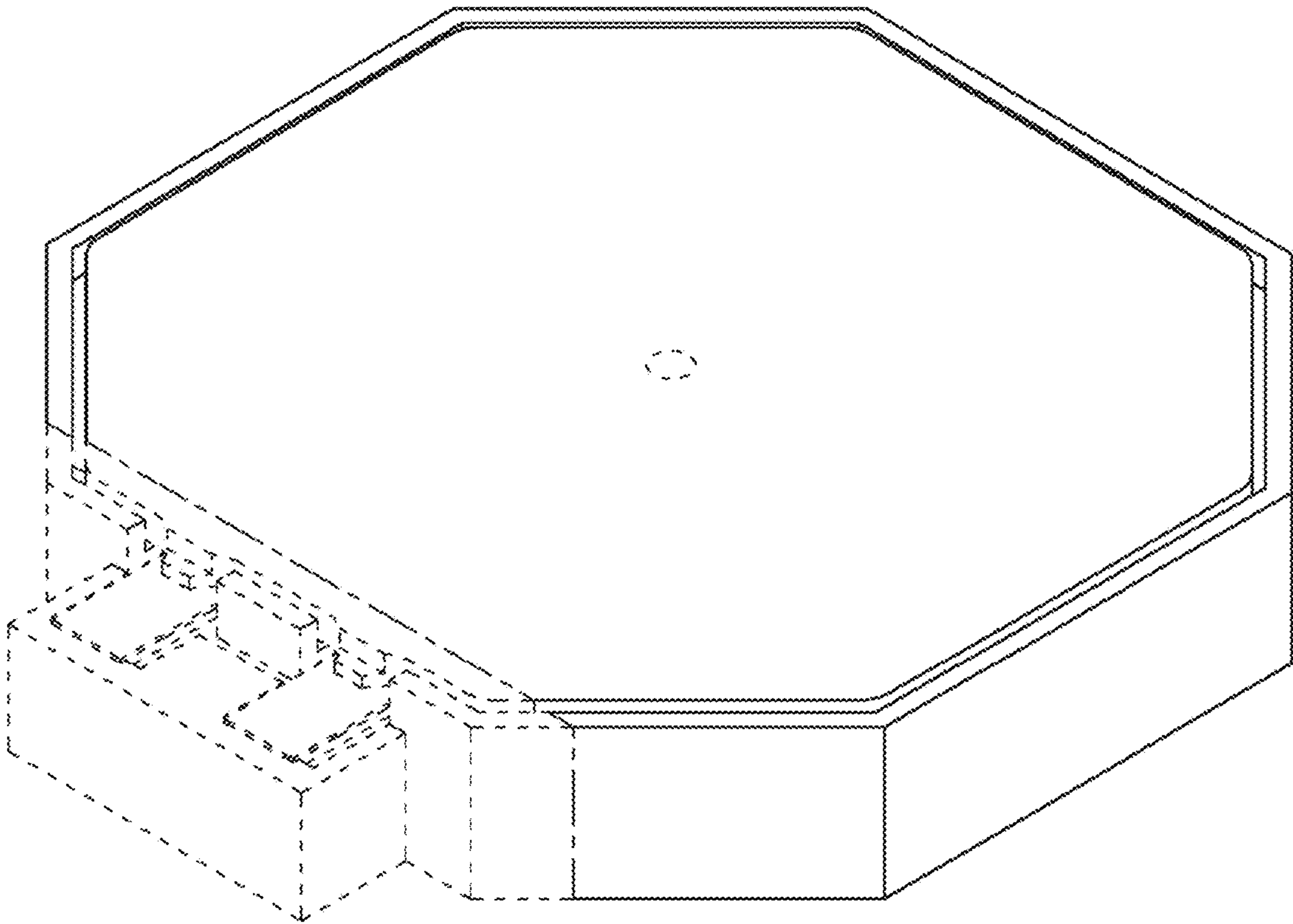
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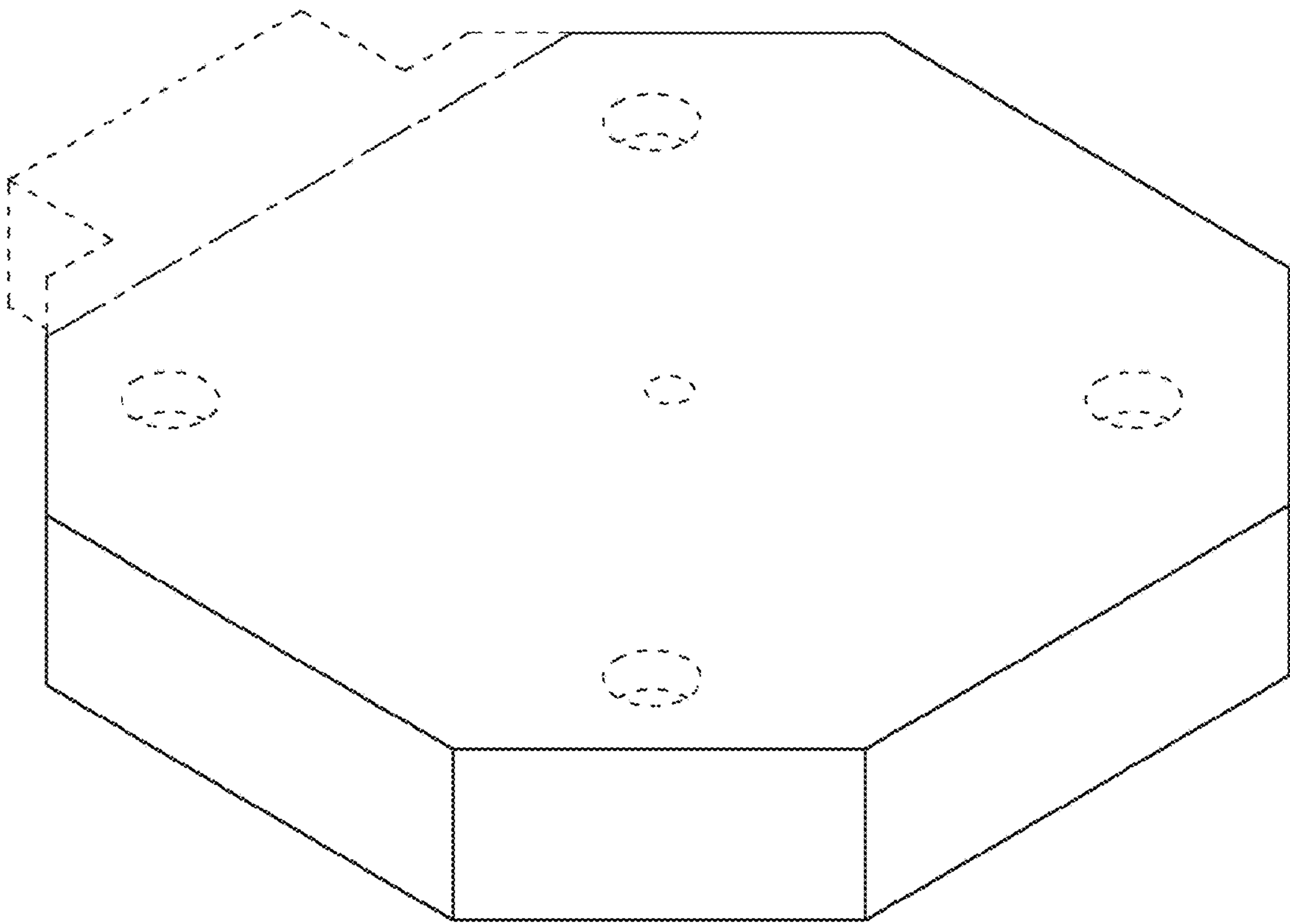
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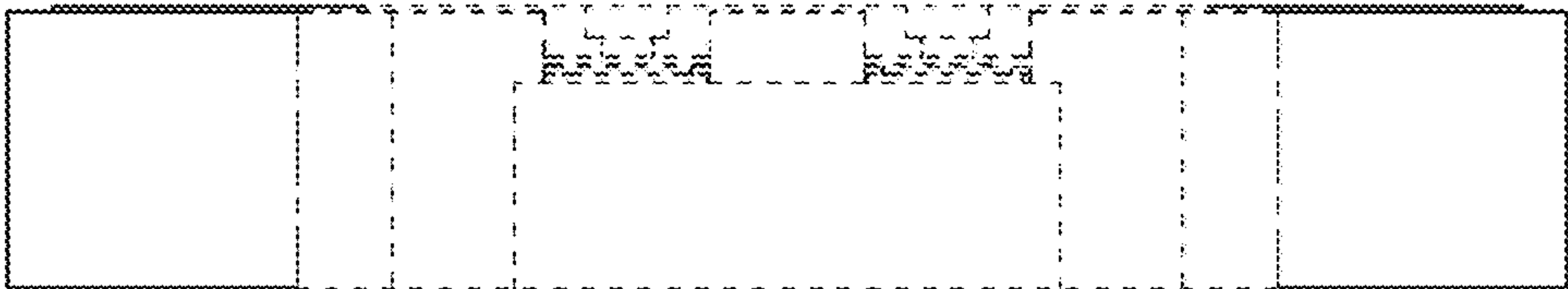
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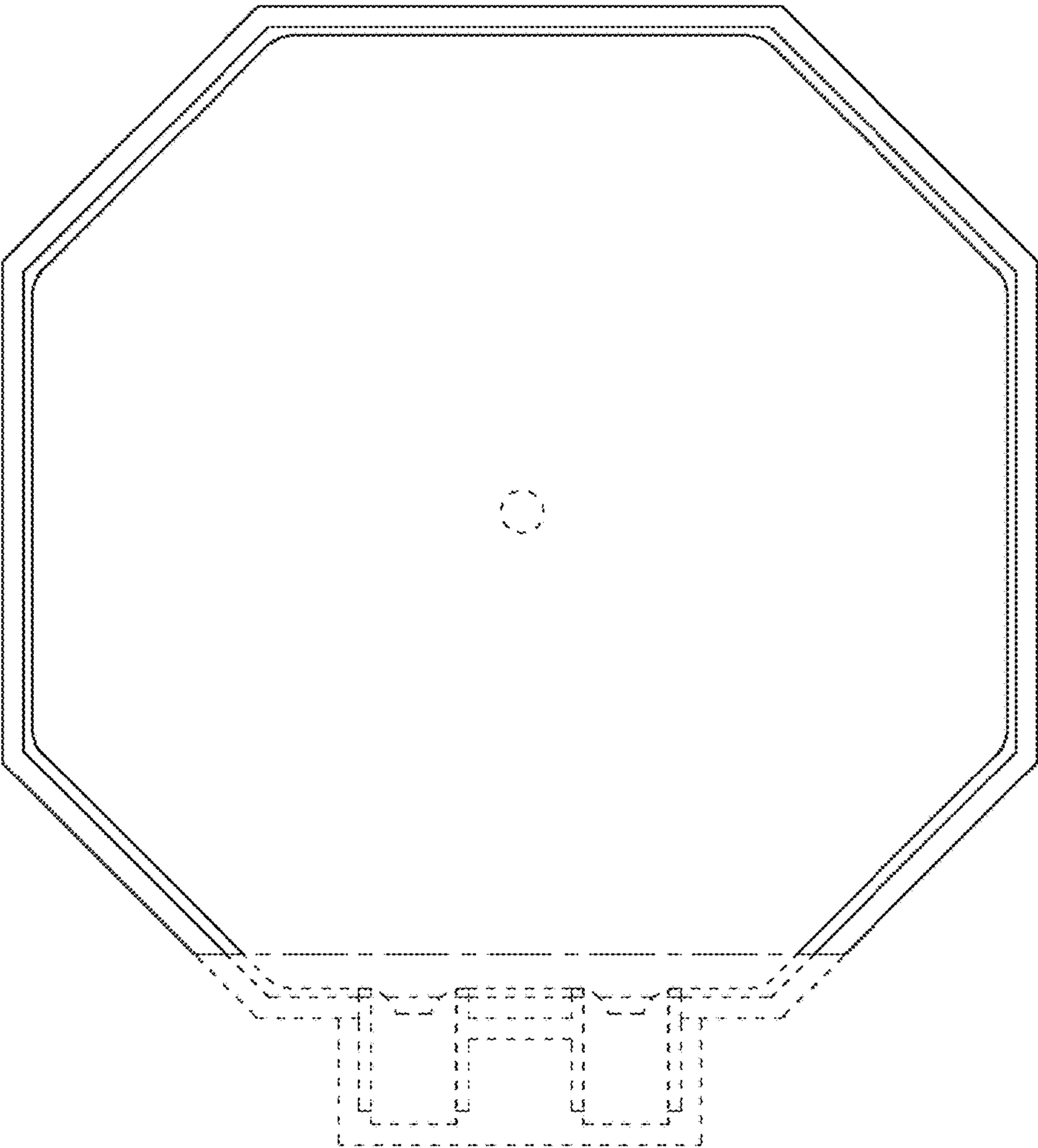
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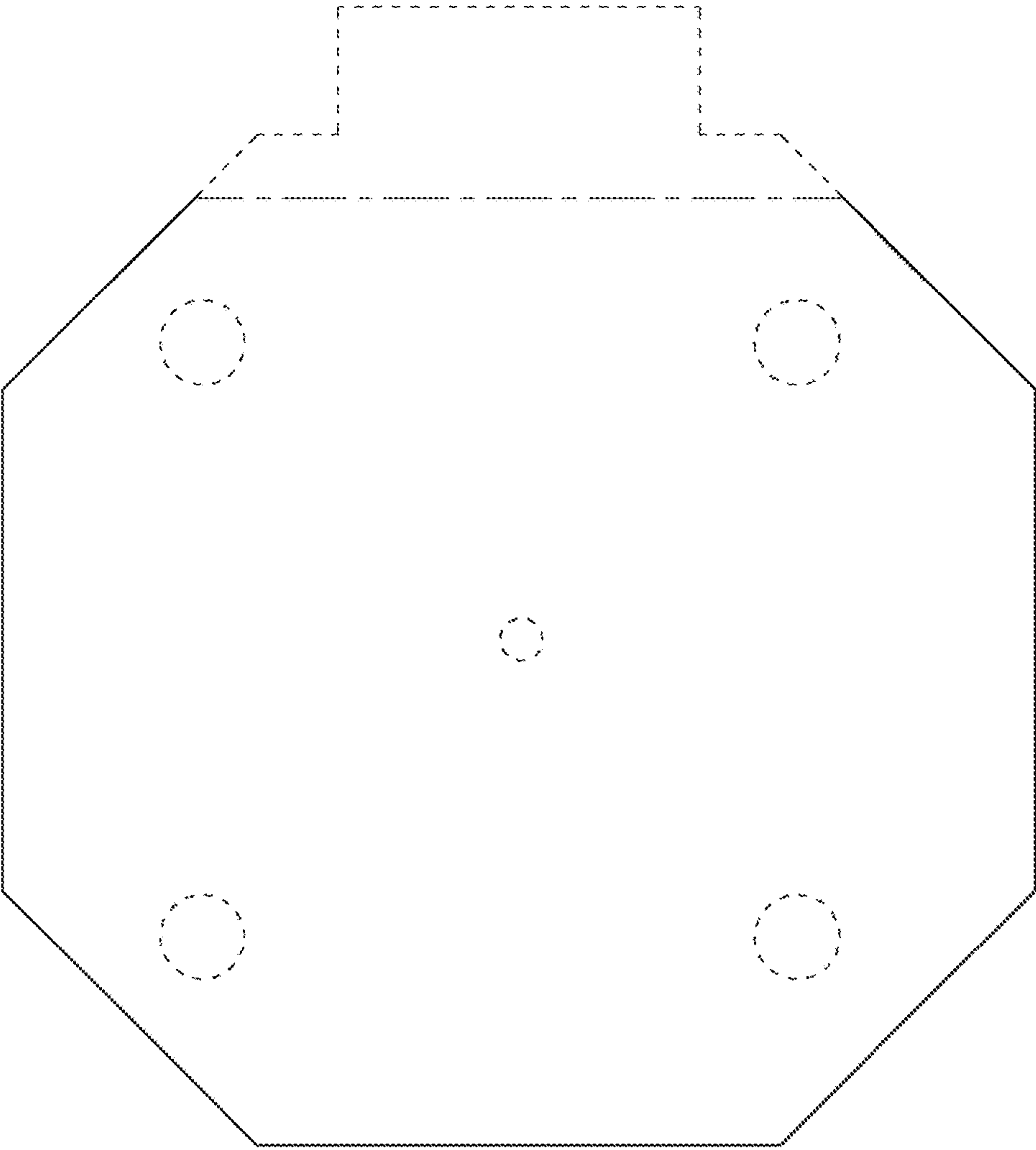
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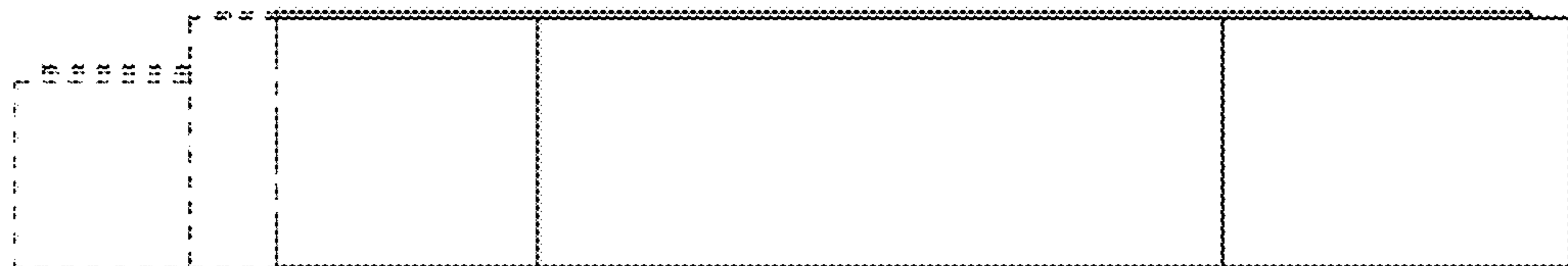
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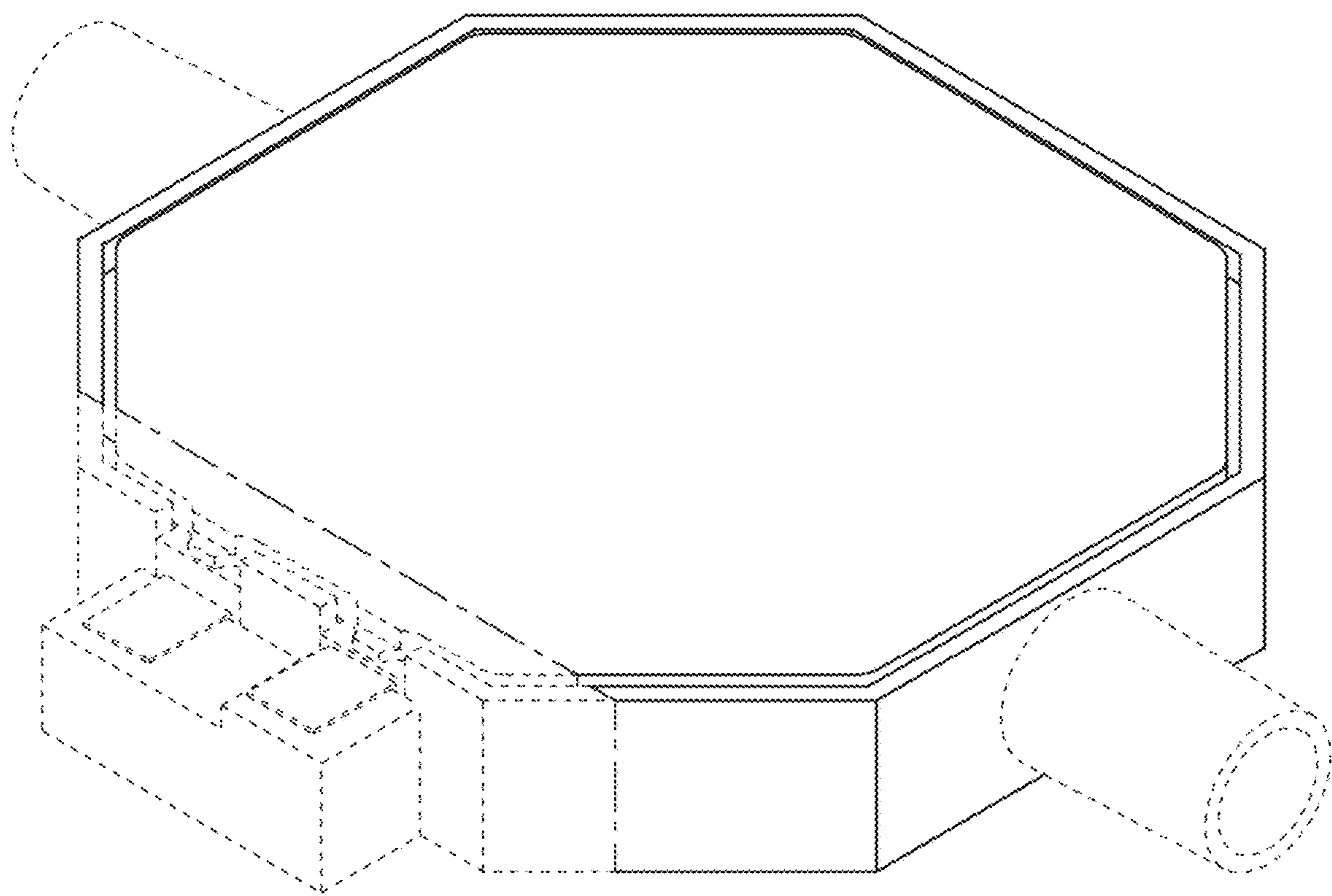
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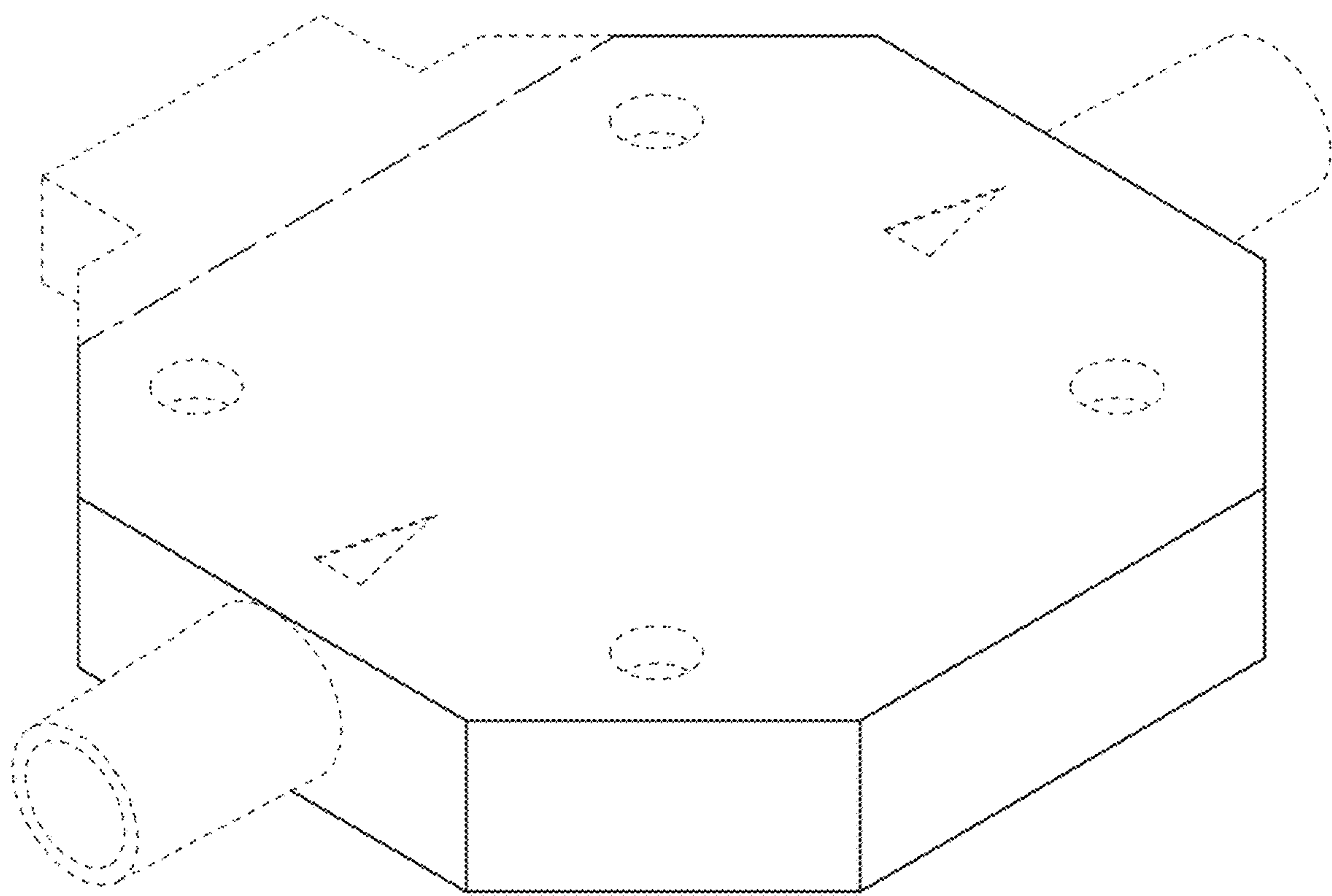
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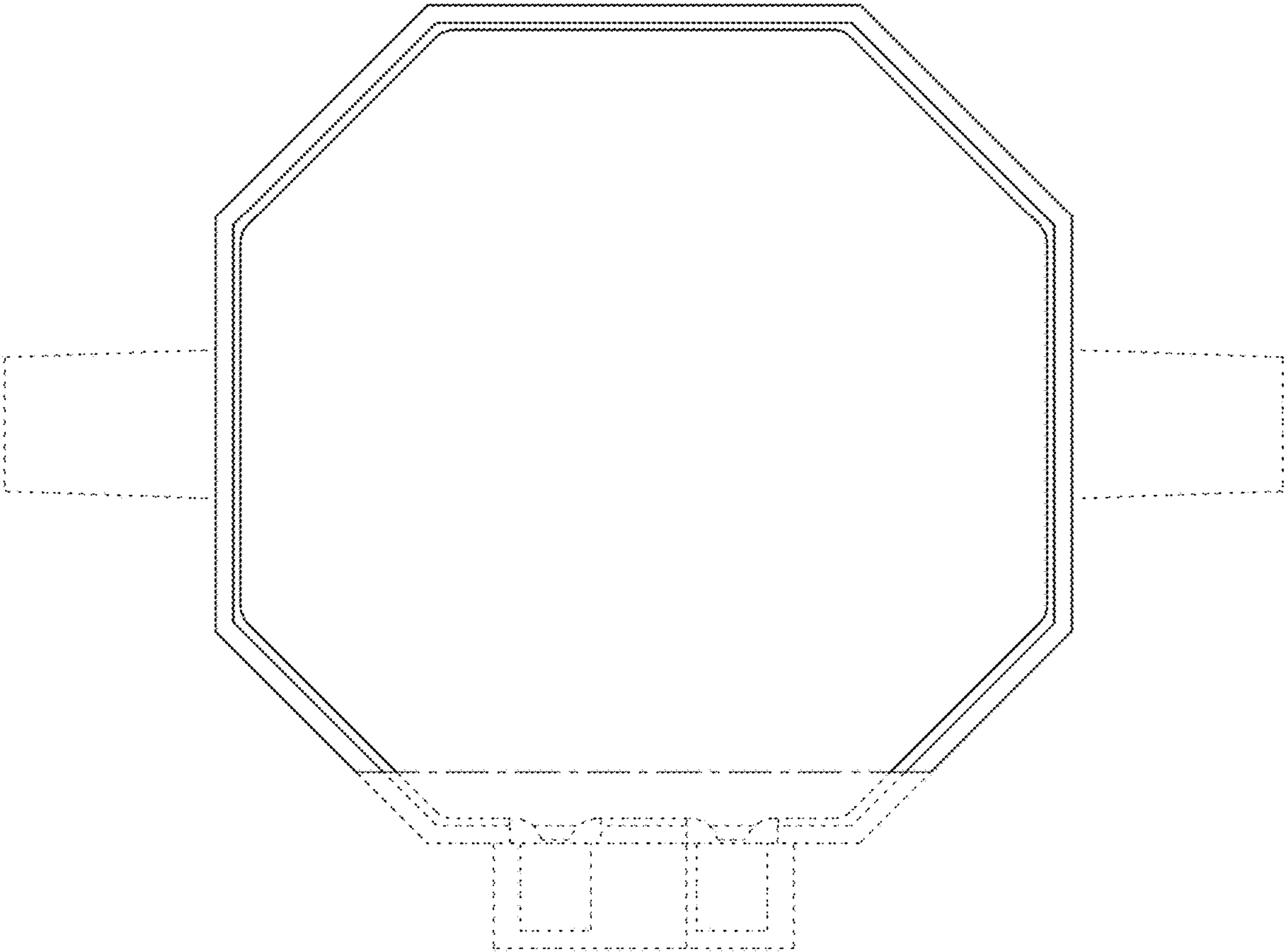
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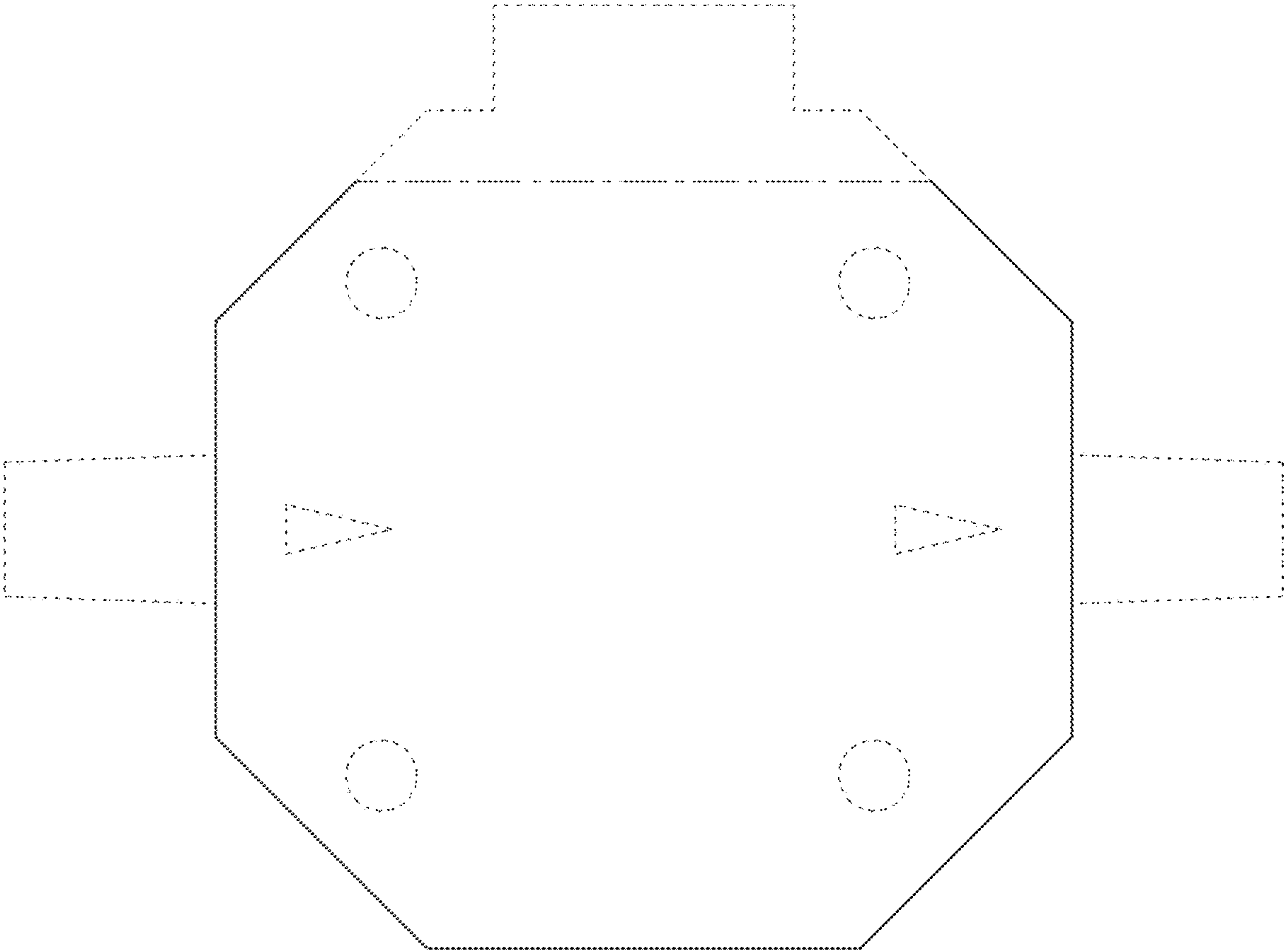
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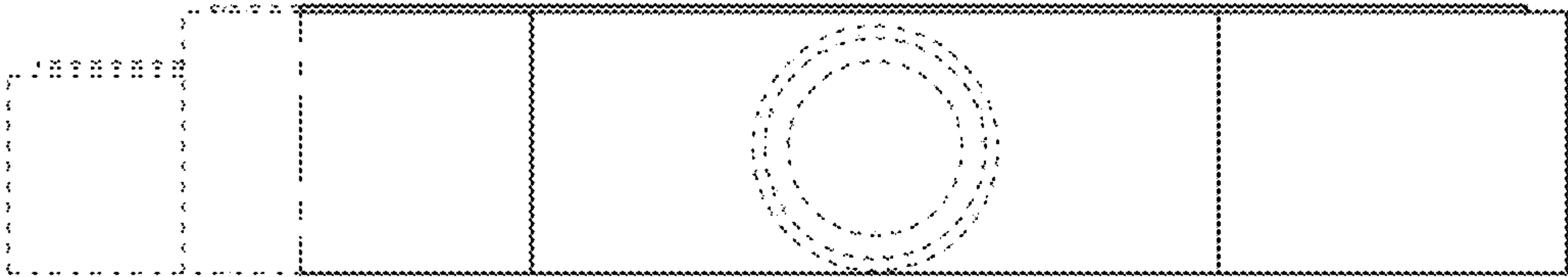
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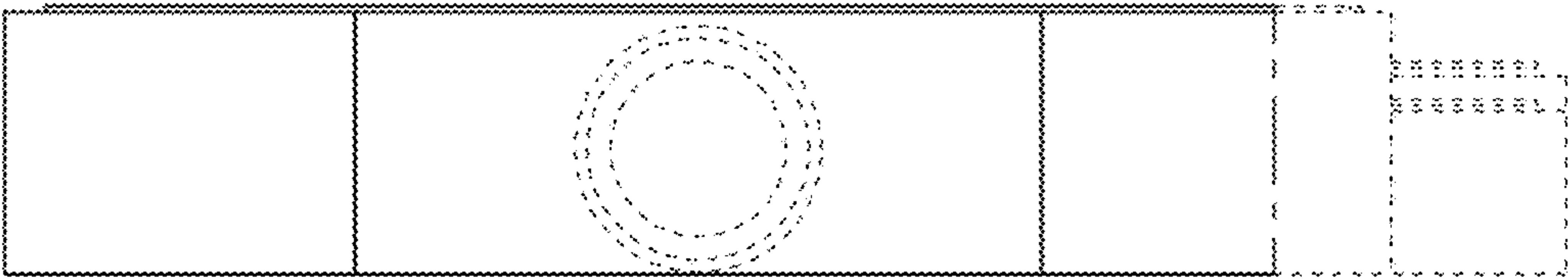
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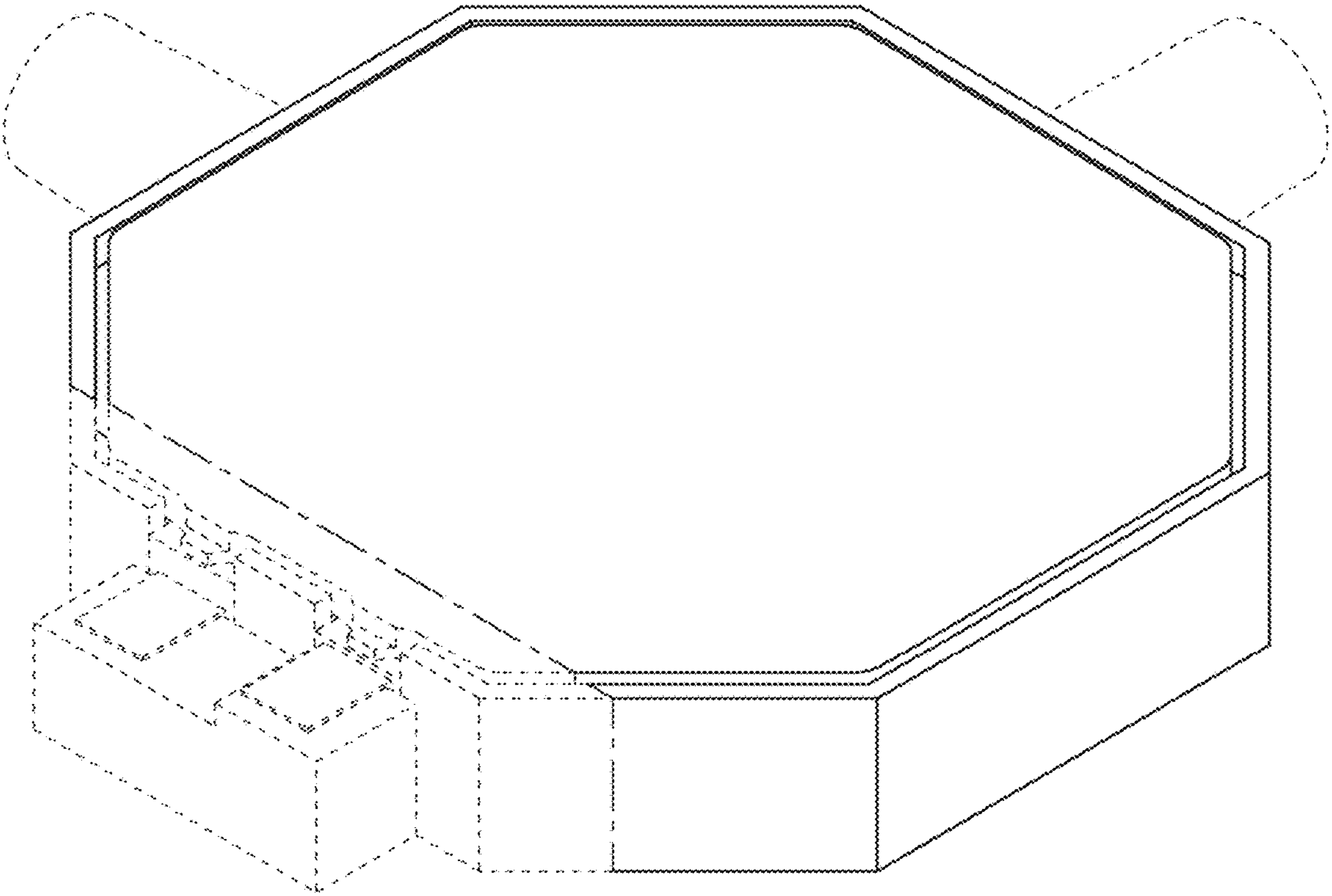
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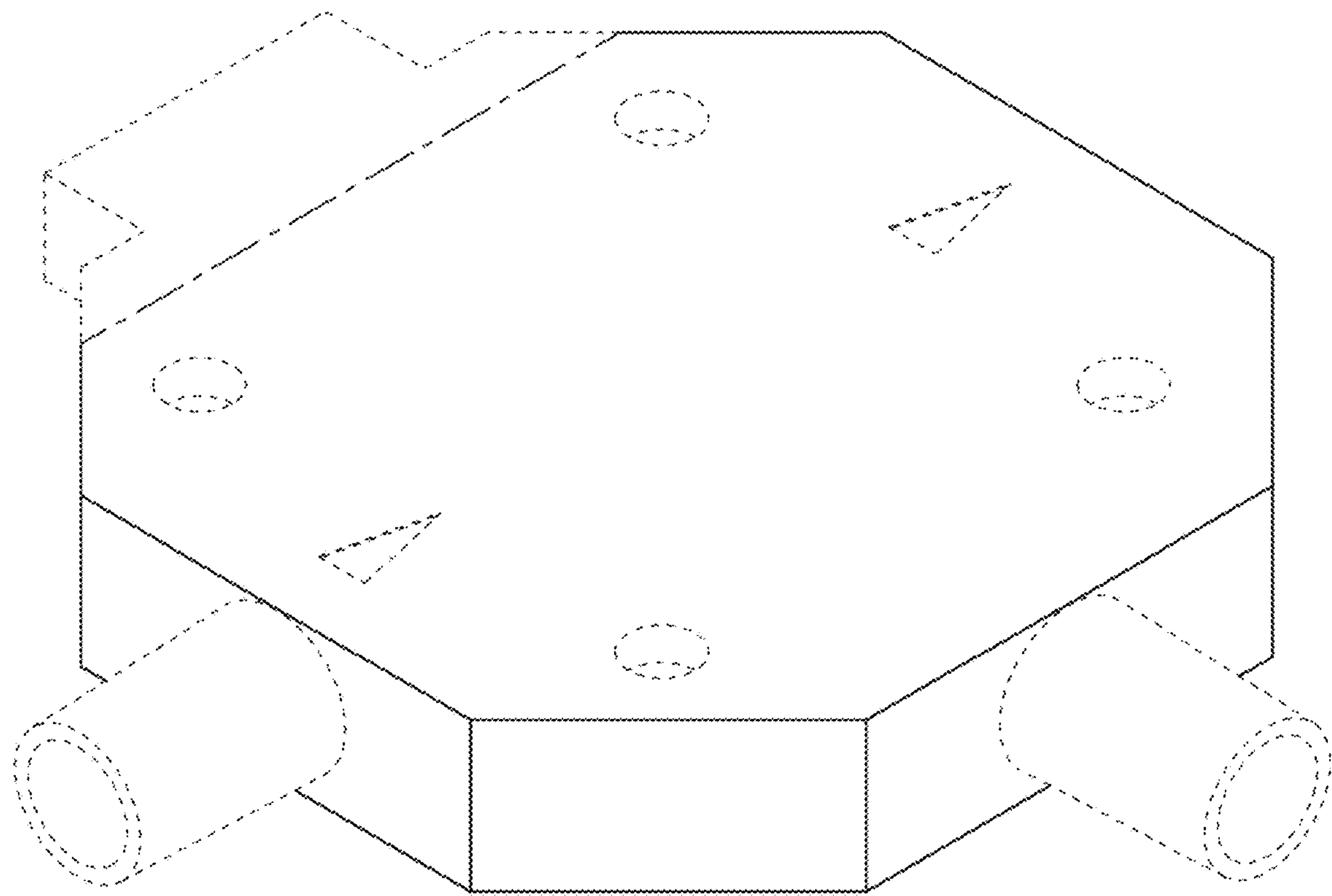
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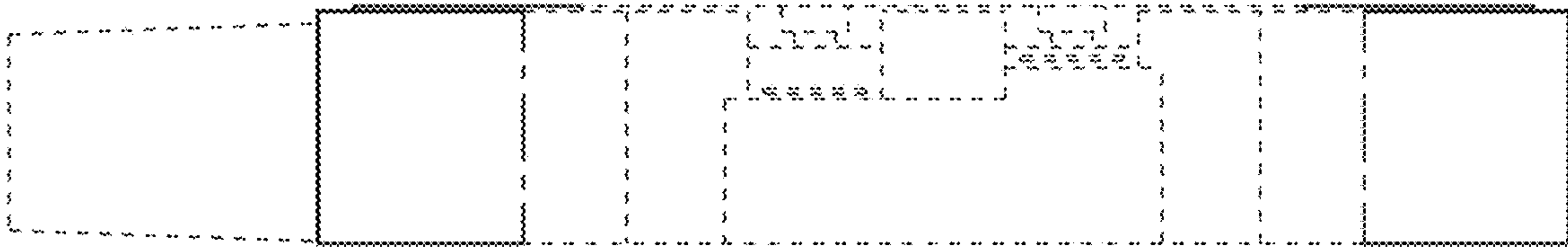
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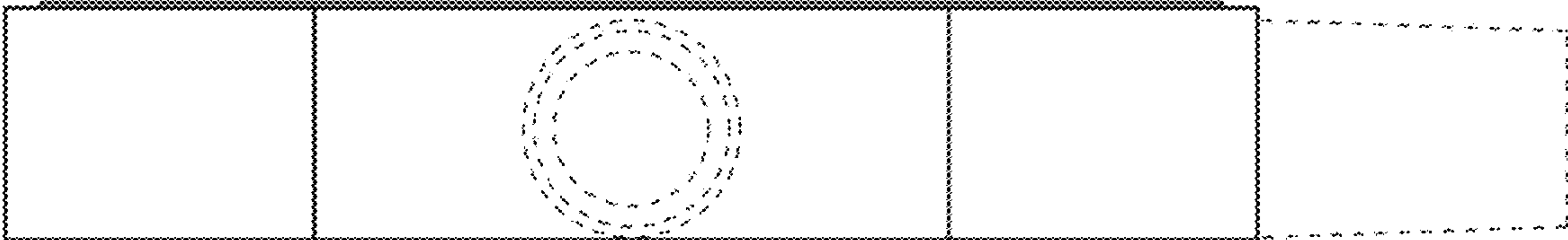
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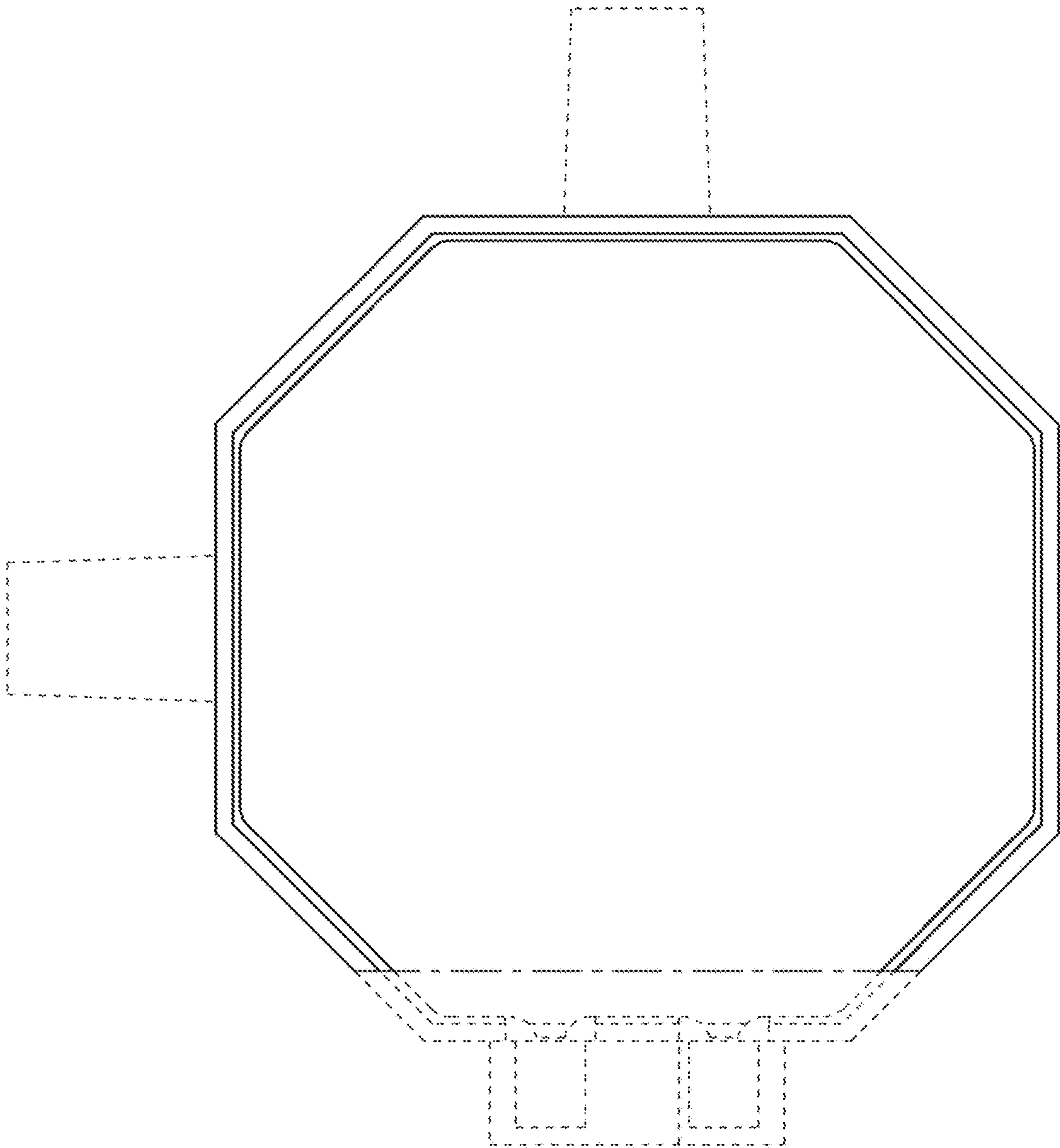
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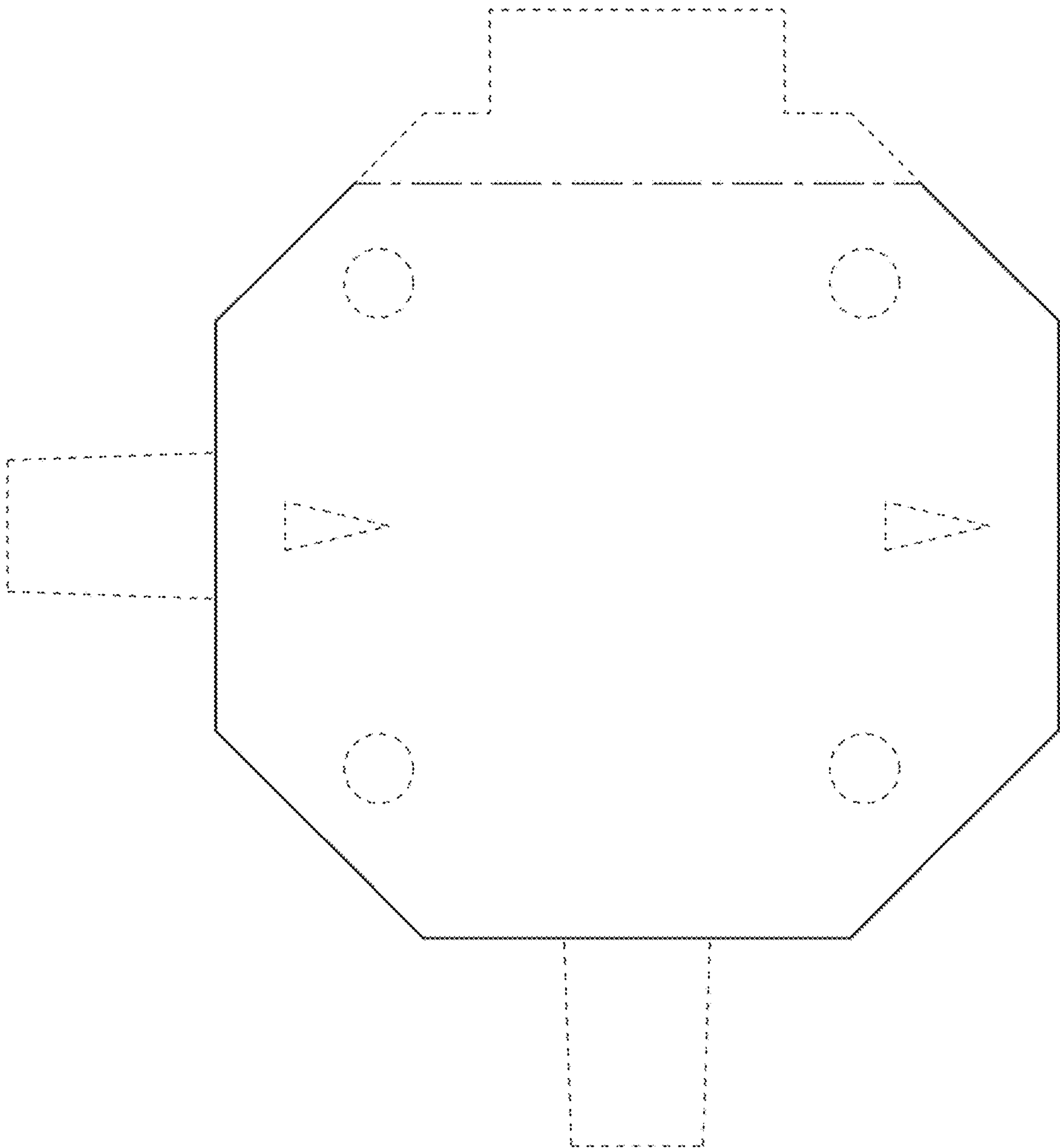
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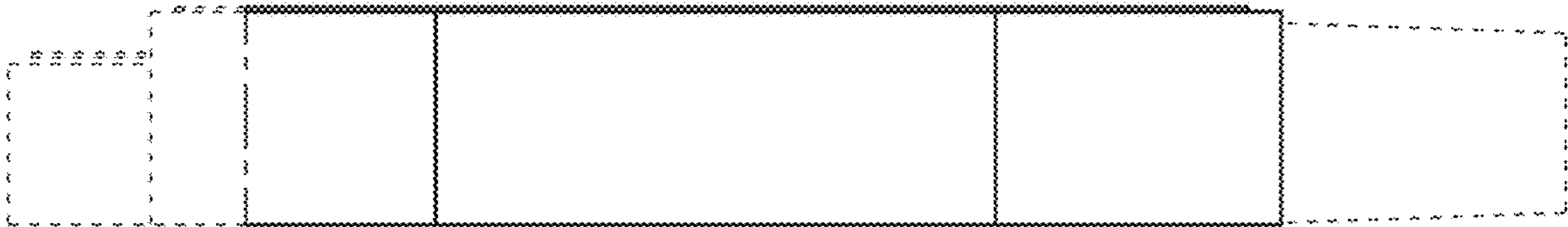
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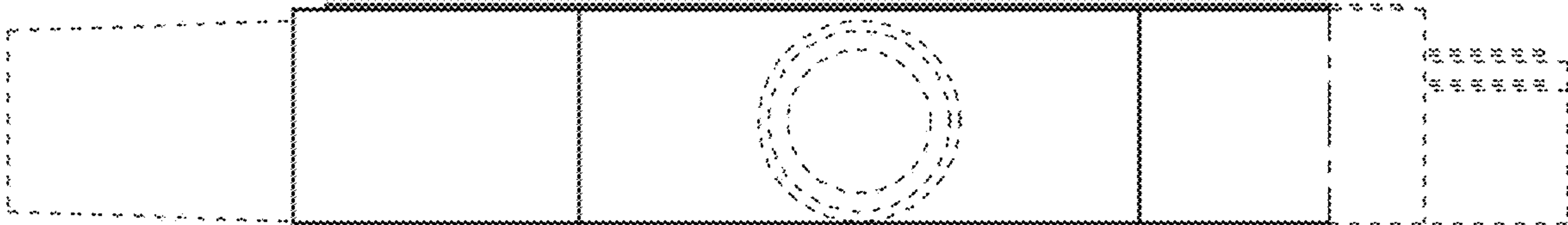
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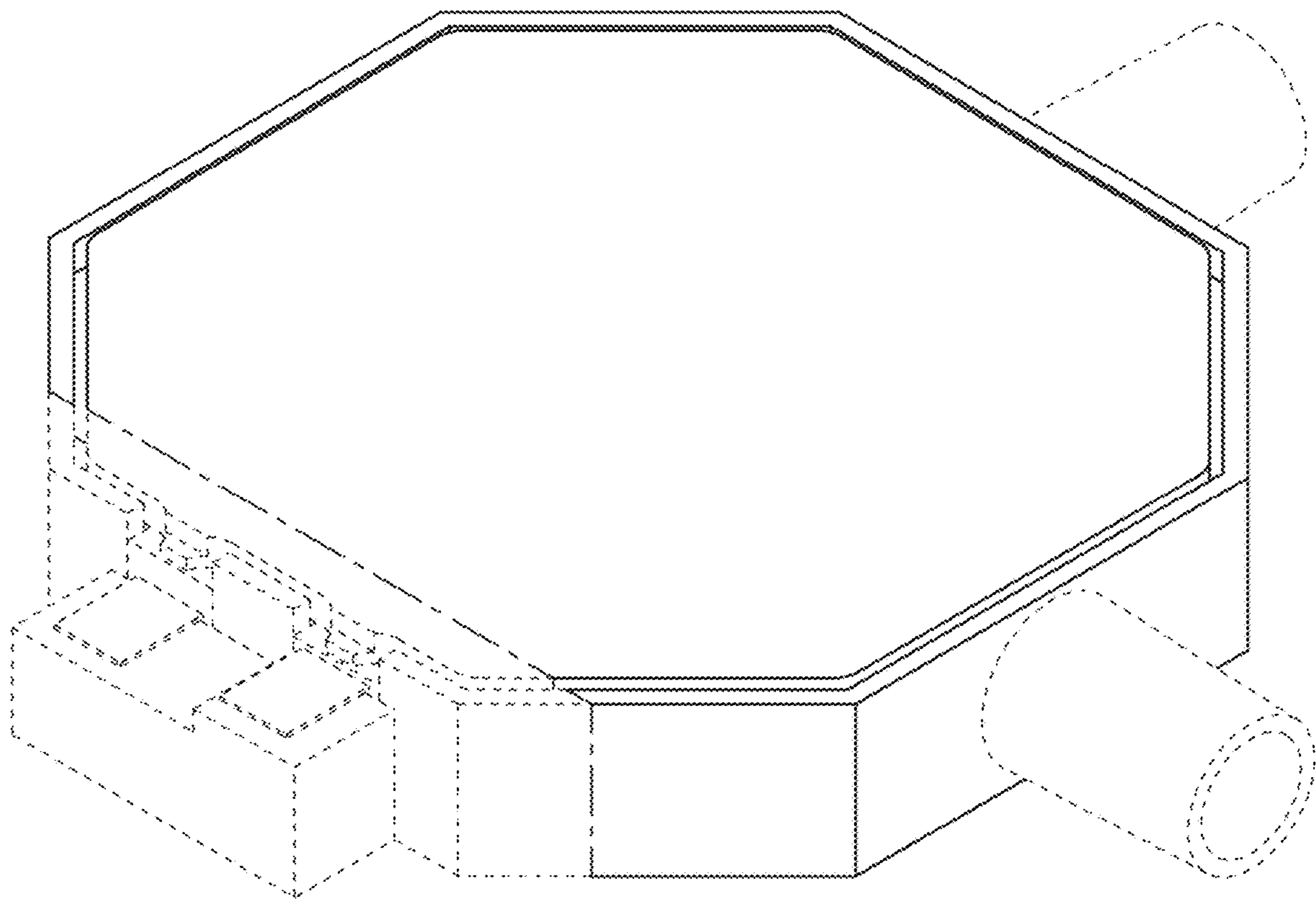
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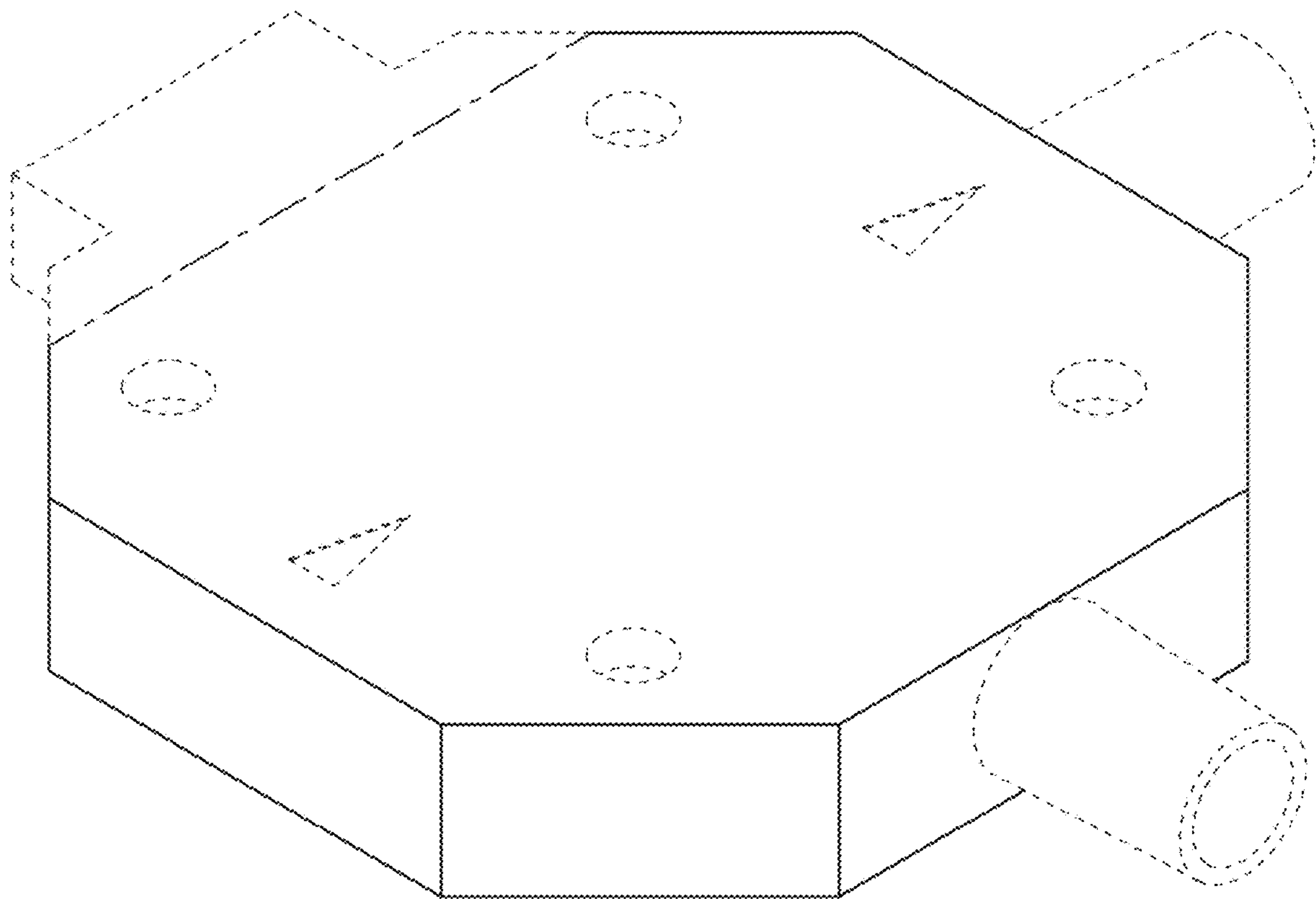
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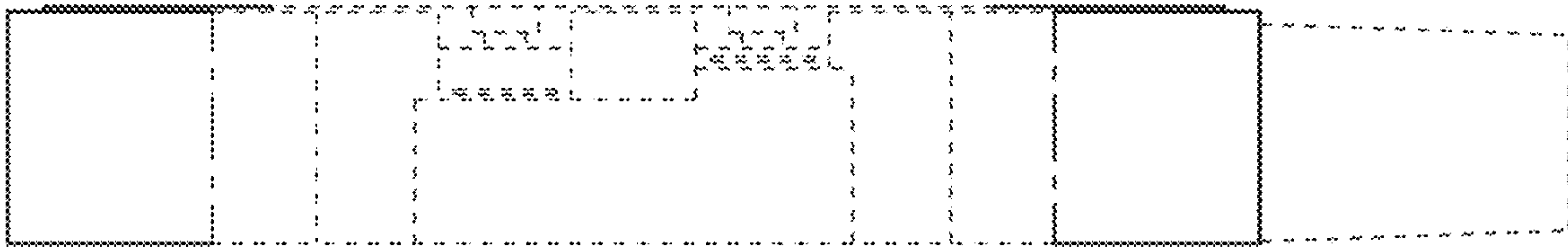
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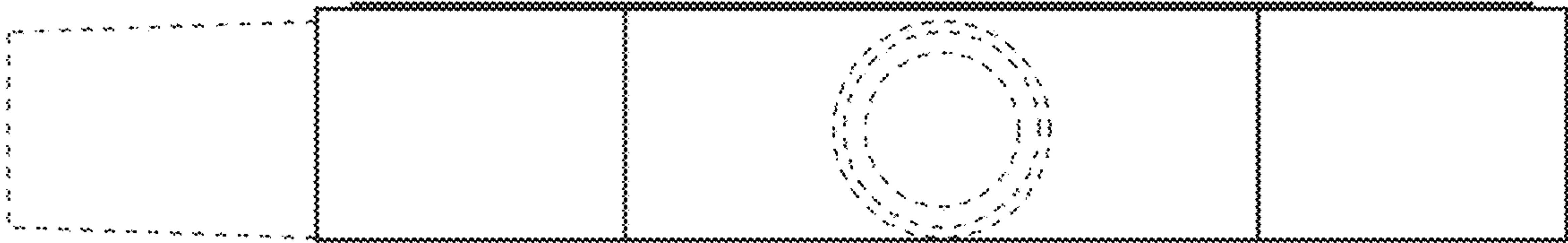
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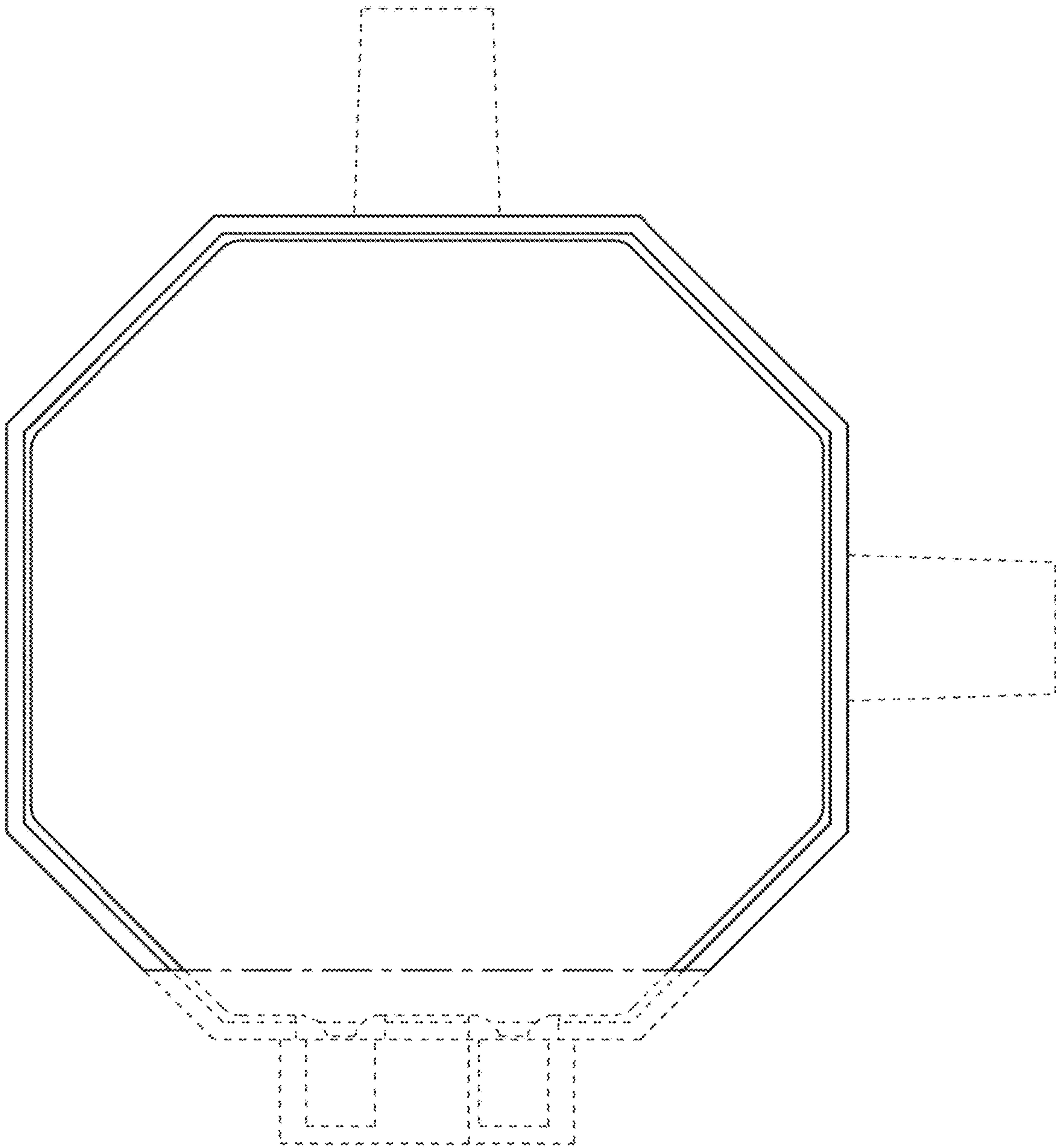
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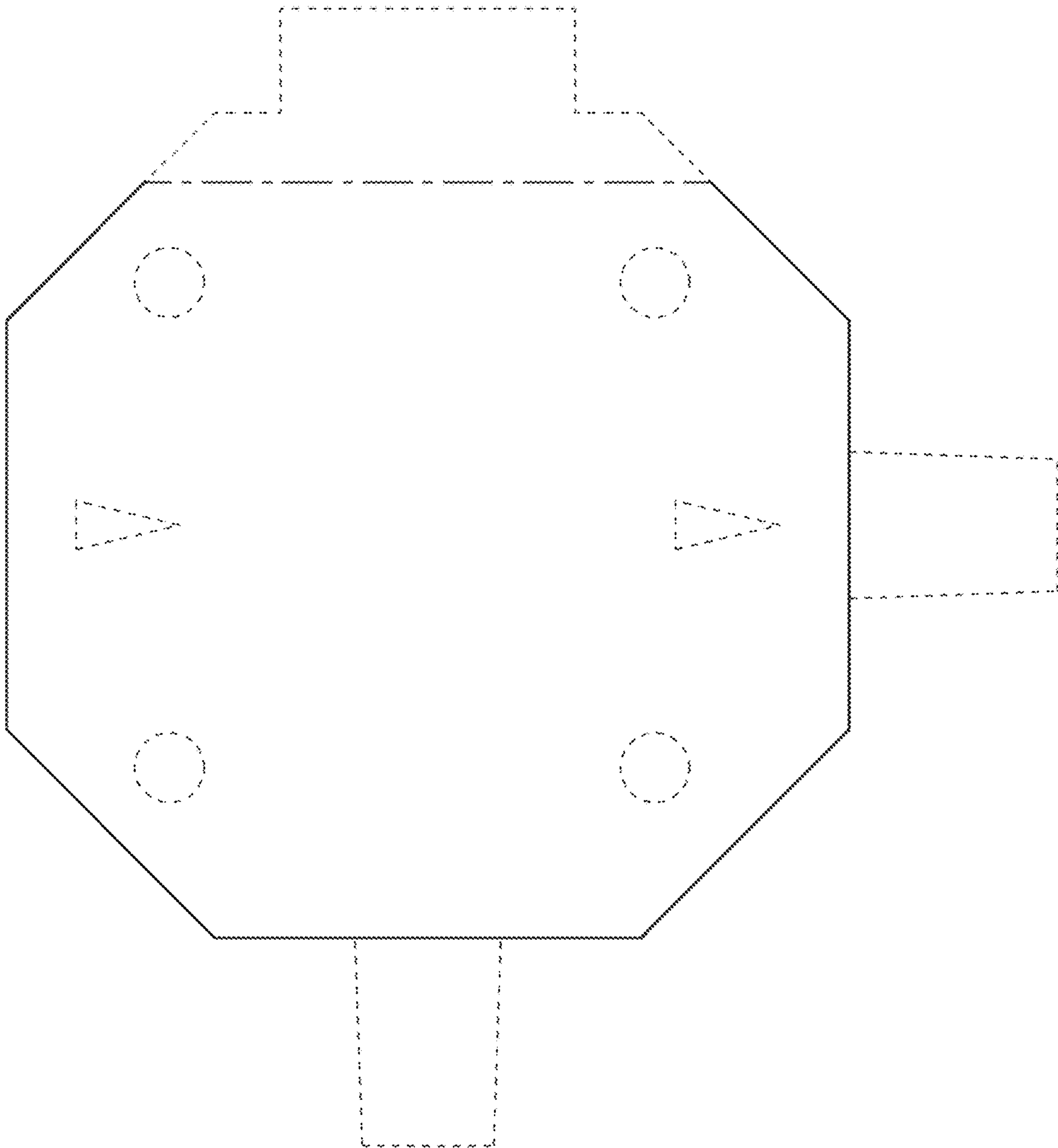
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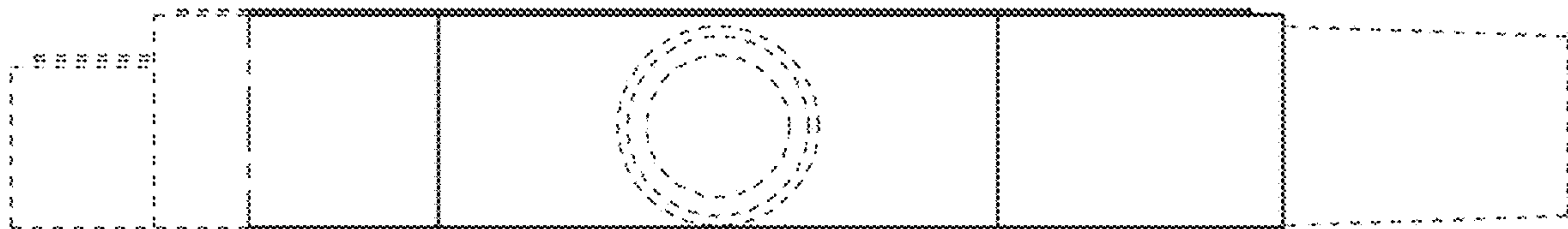
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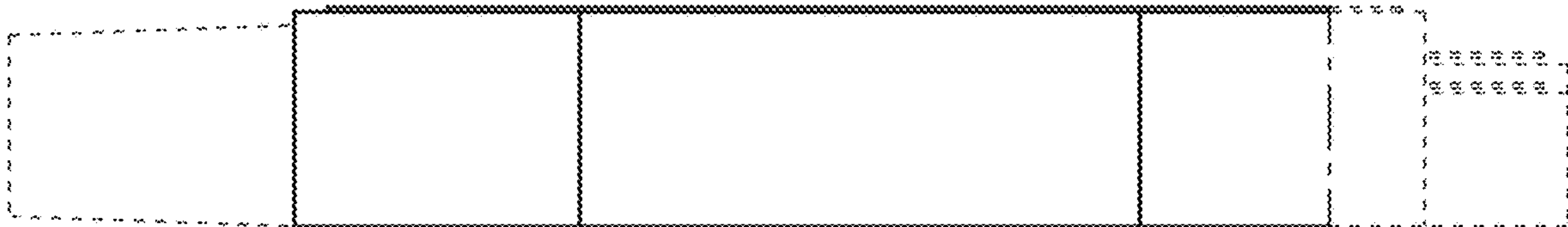
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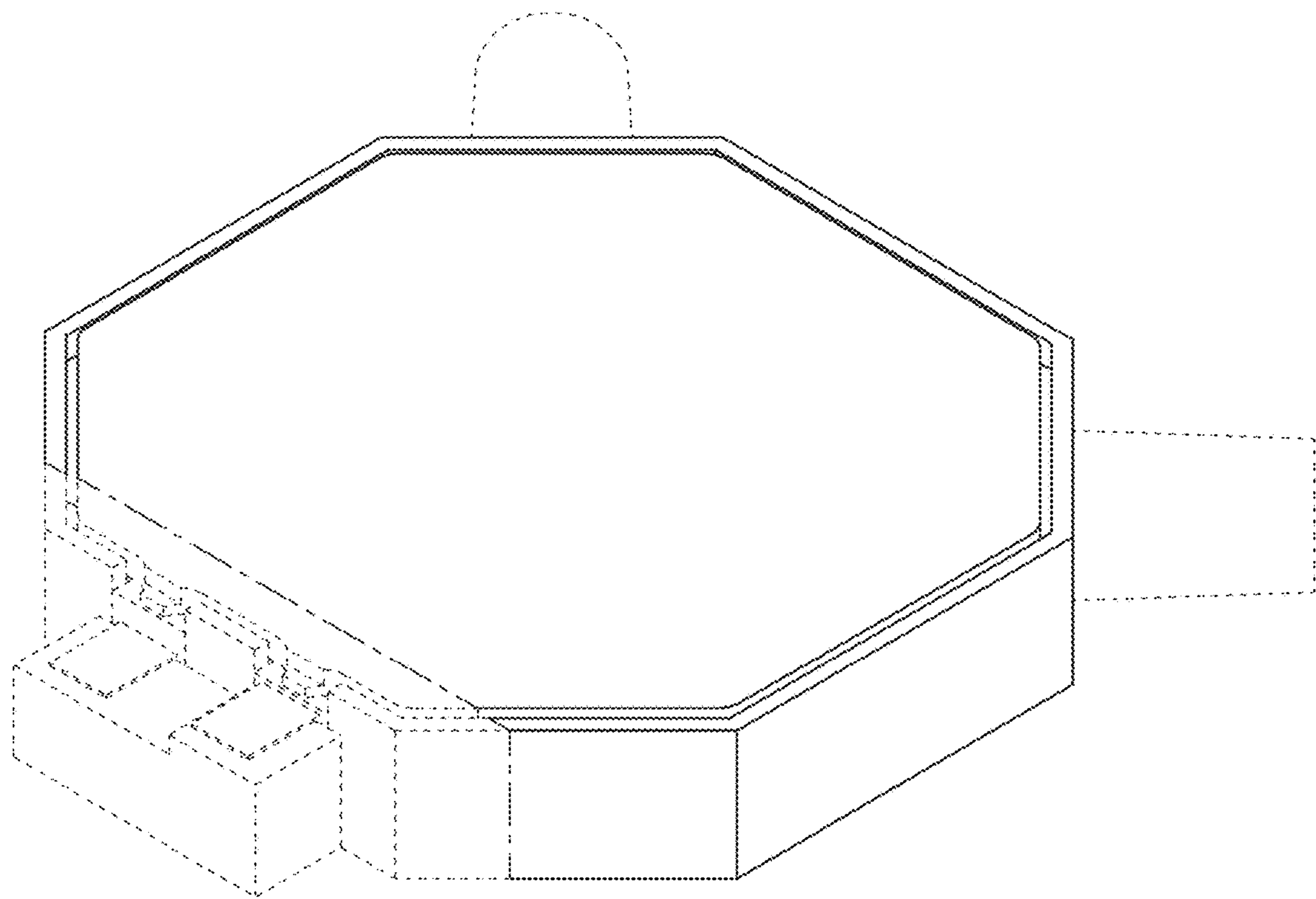
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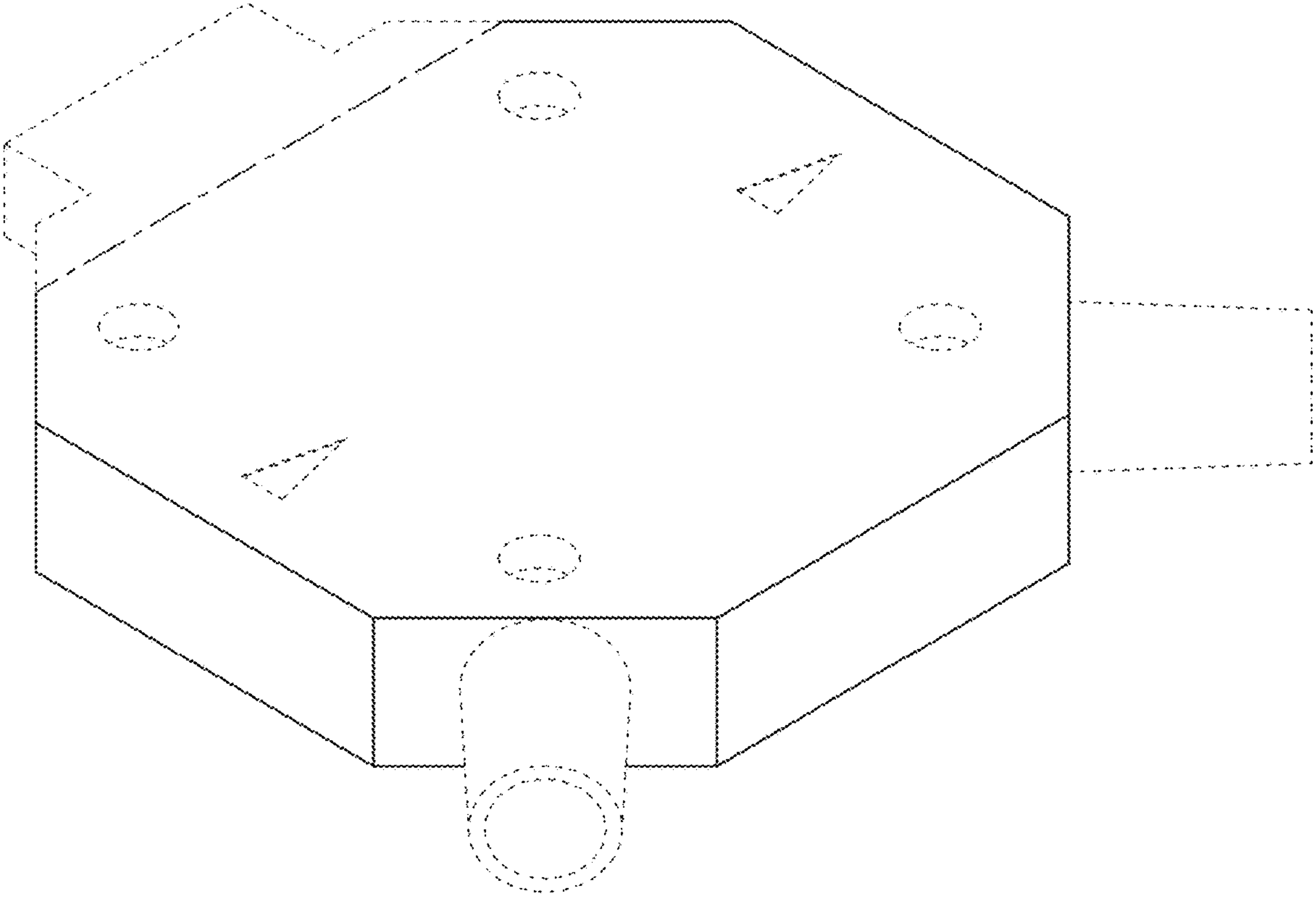
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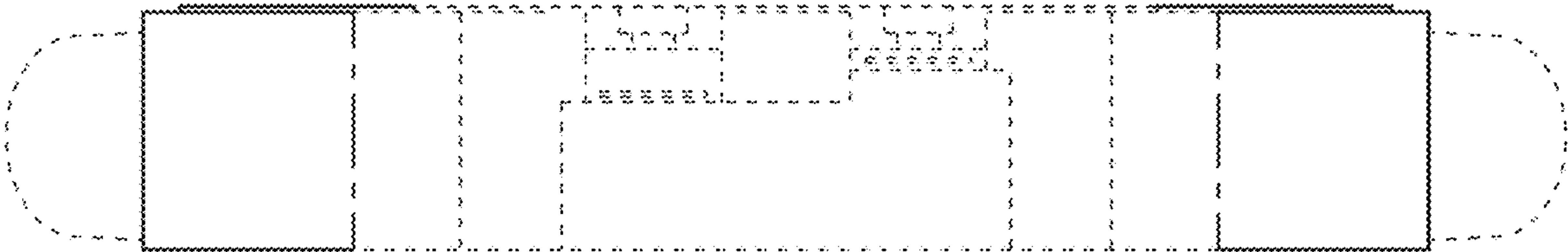
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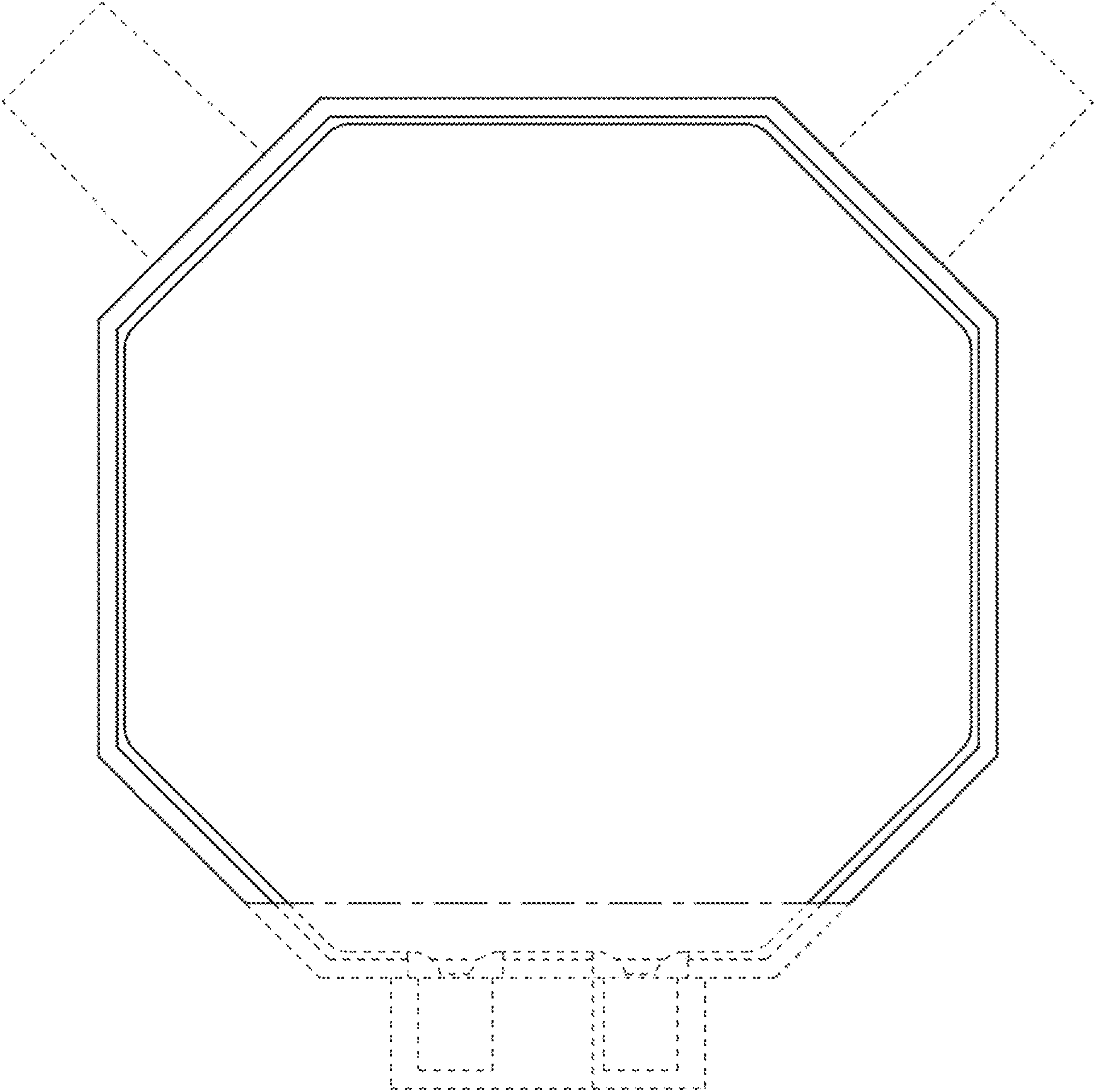
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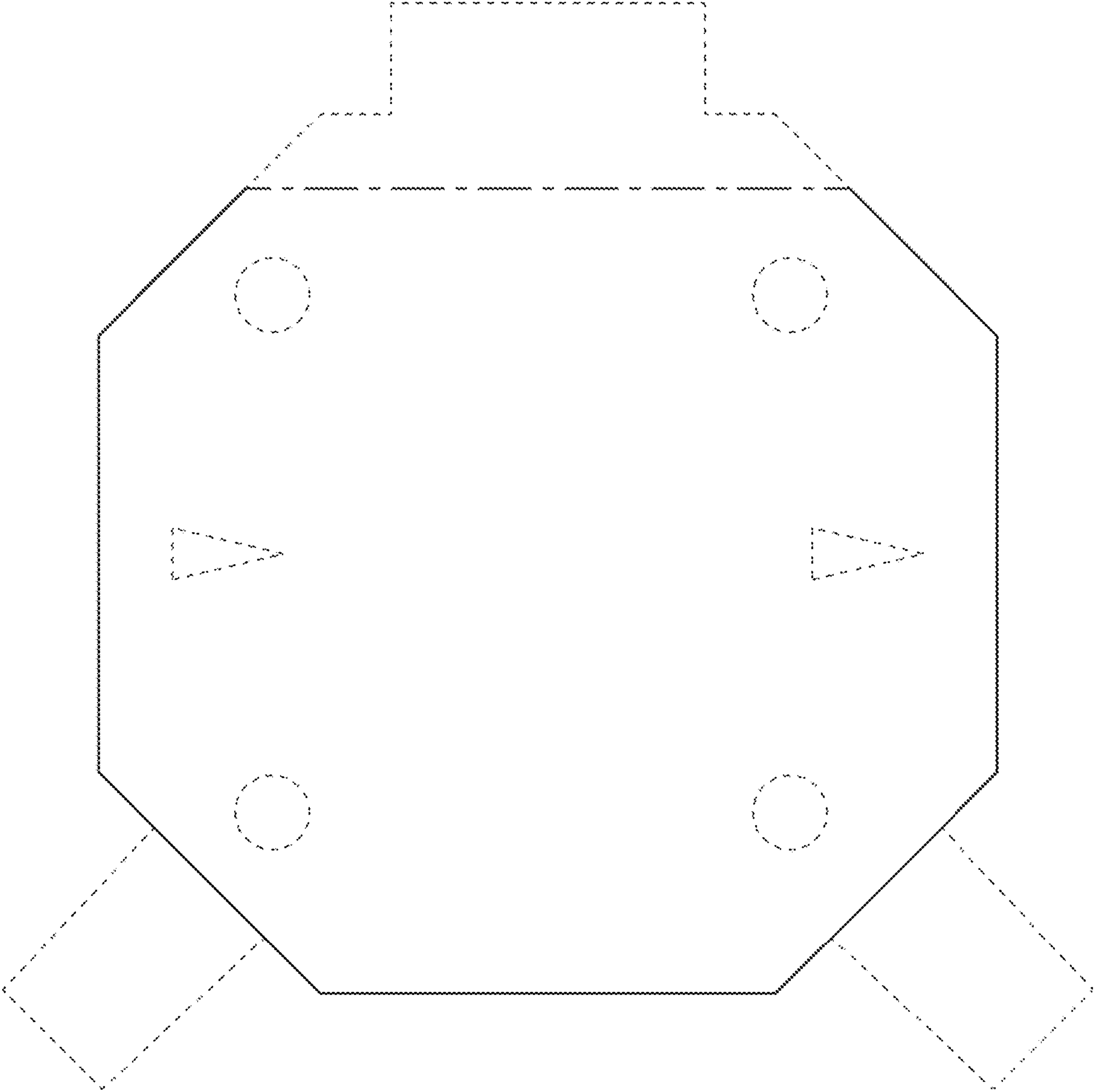
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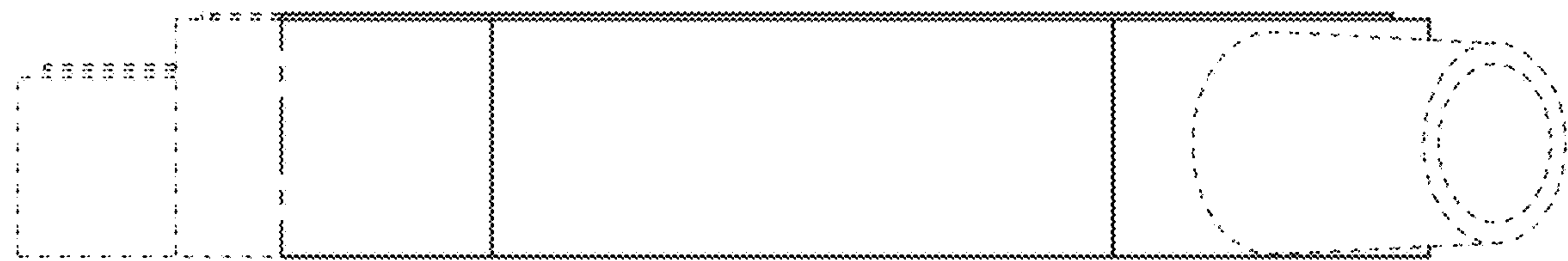
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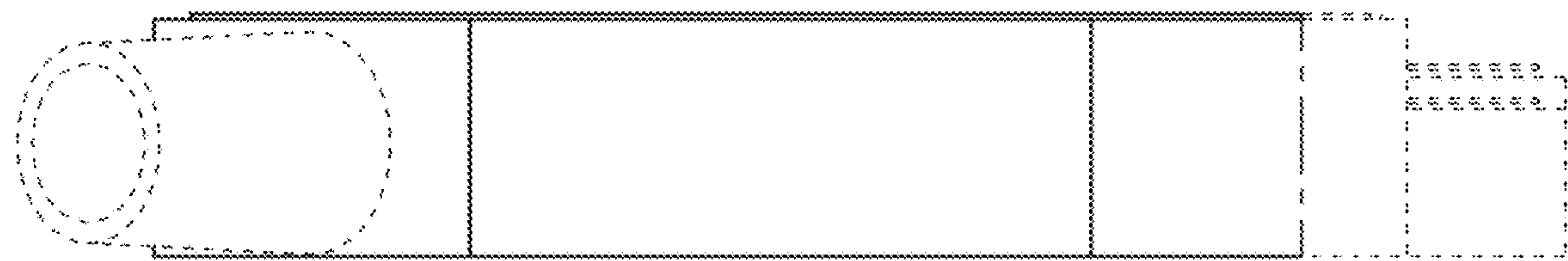
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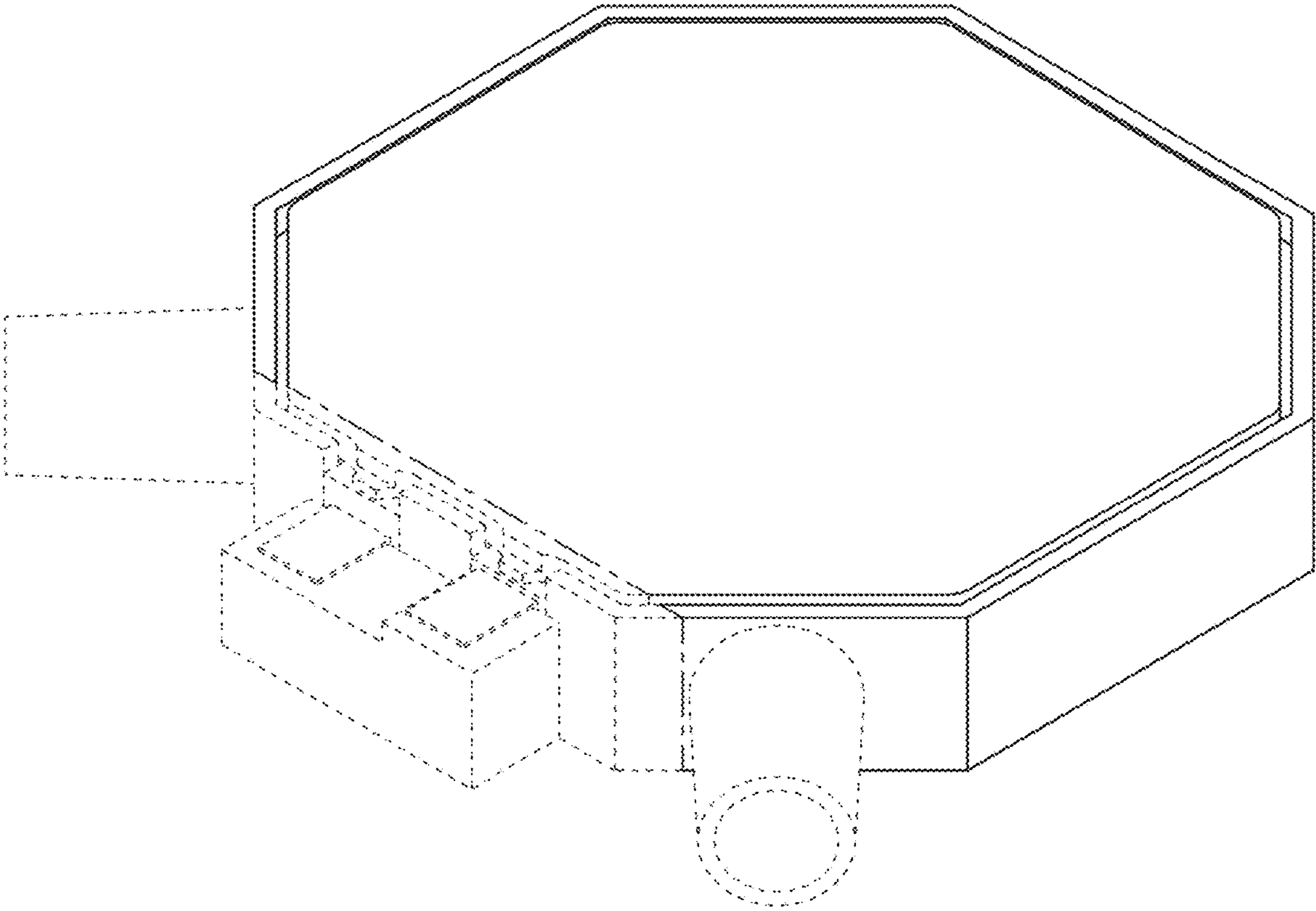
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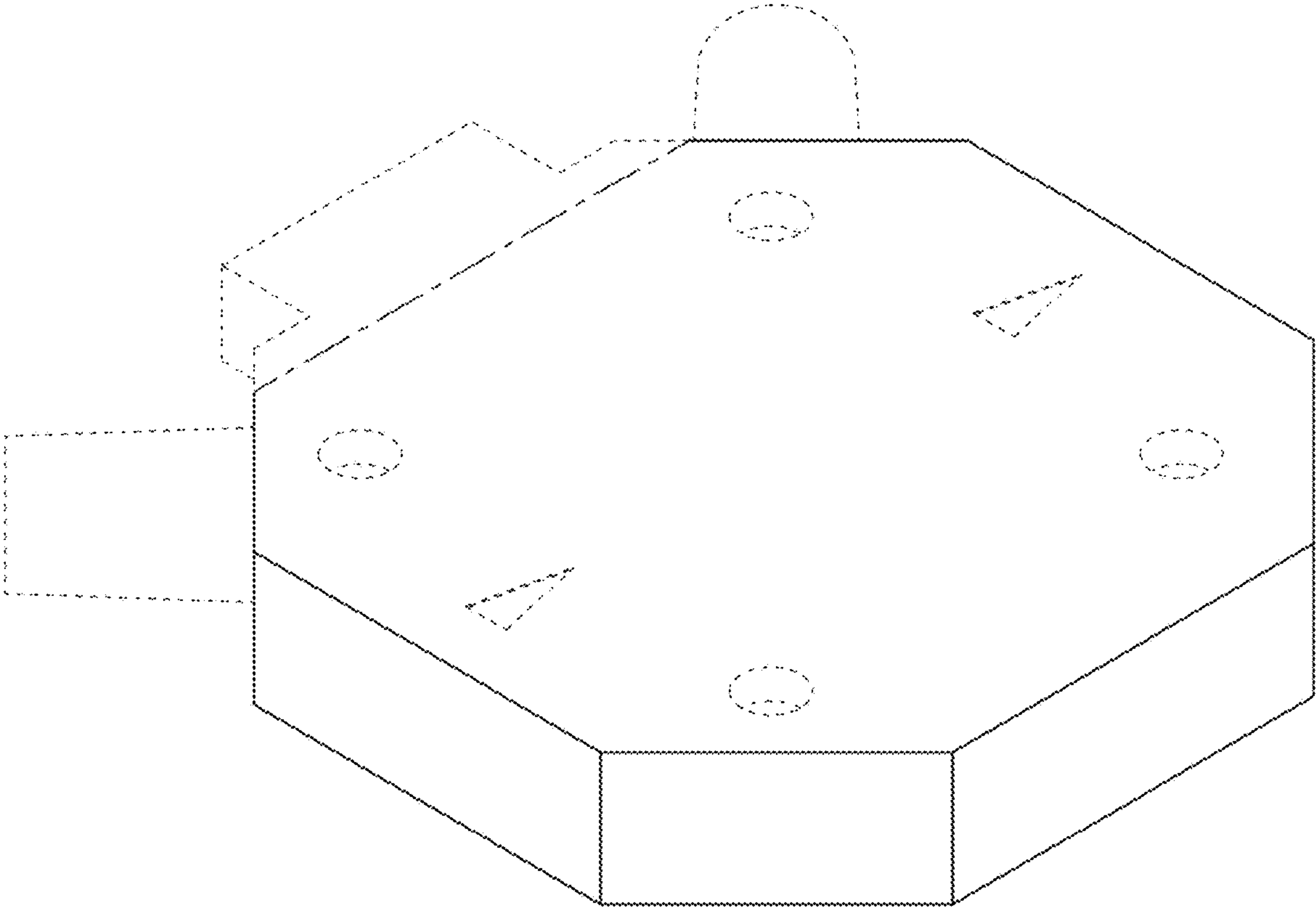
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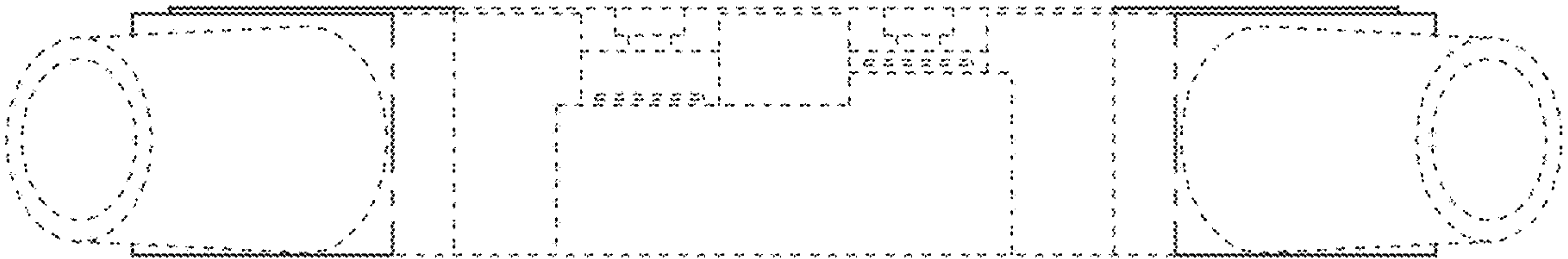
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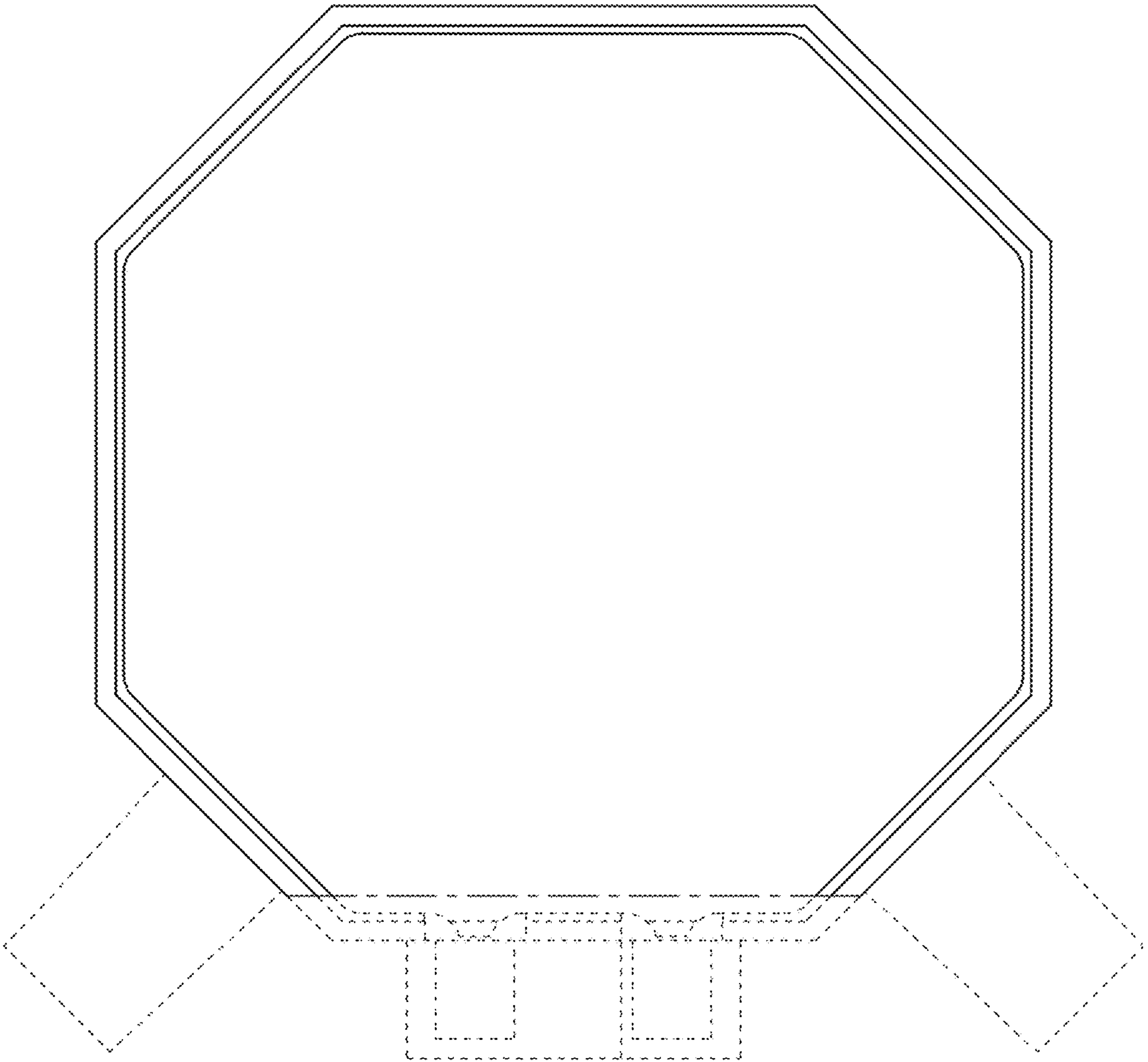
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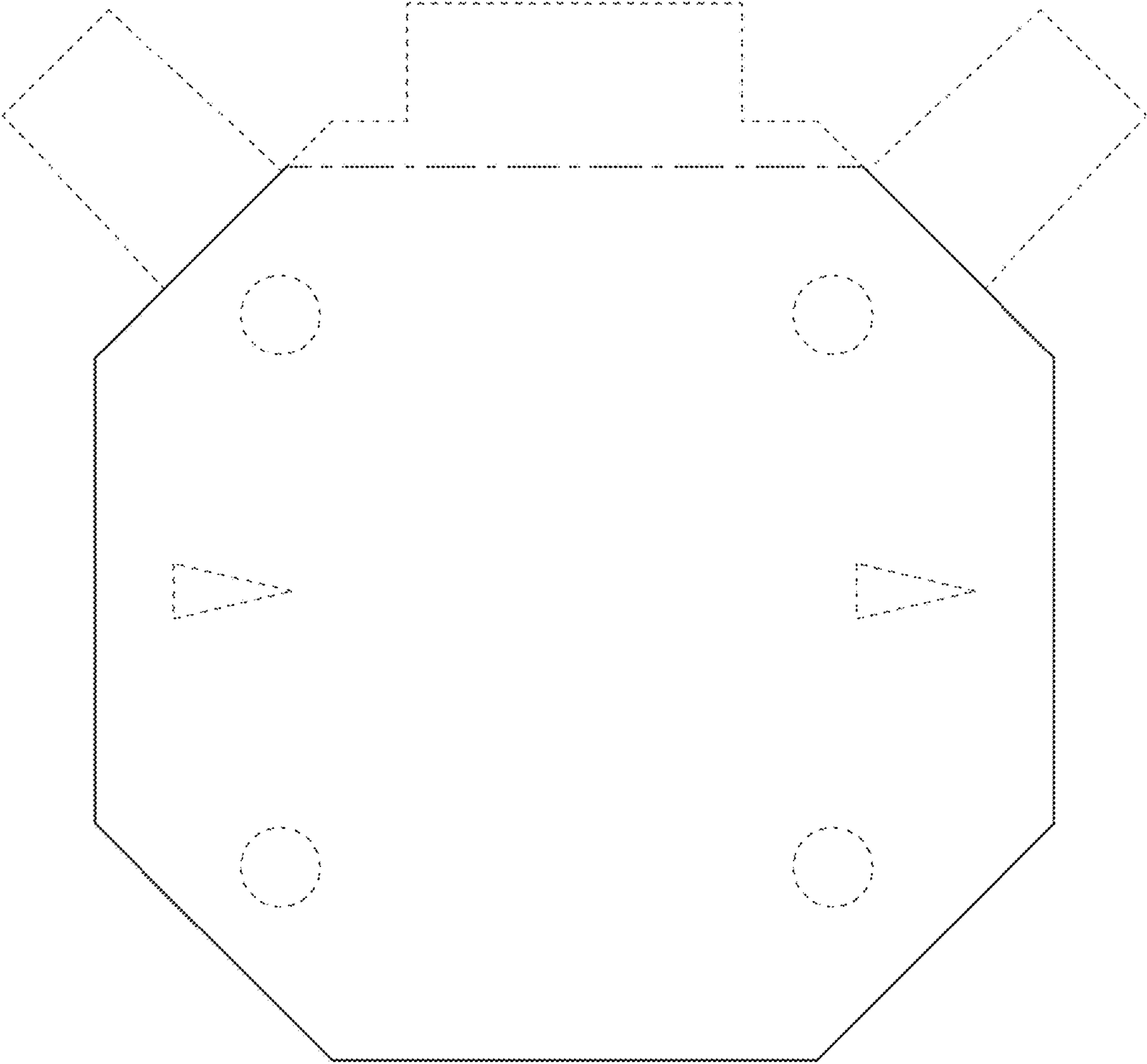
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9.5



9.6



9.7



9.8

