



US00D749713S

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

(10) **Patent No.:** **US D749,713 S**
(45) **Date of Patent:** **** Feb. 16, 2016**

(54) **HEAT EXCHANGER**

FOREIGN PATENT DOCUMENTS

(71) Applicant: **Innovative Medical Equipment, LLC**,
Lyndhurst, OH (US)

EP 1175135 A1 1/2002

(72) Inventors: **Bahman Guyuron**, Lyndhurst, OH (US); **Fred Bahr**, Seven Hills, OH (US); **Brad A. Pulver**, Shaker Heights, OH (US); **Jamie Horvath**, Twinsburg, OH (US); **Glen M. Guyuron**, Lyndhurst, OH (US)

OTHER PUBLICATIONS

Kandlikar and Hayner II, Liquid Cooled Cold Plates for Industrial High-Power Electronic Devices—Thermal Design and Manufacturing Considerations, 2009, p. 921, vol. 30 No. 12, Taylor and Francis Group, LLC.

(Continued)

(73) Assignee: **Innovative Medical Equipment, LLC**,
Lyndhurst, OH (US)

Primary Examiner — T. Chase Nelson

Assistant Examiner — Ania Aman

(**) Term: **14 Years**

(74) *Attorney, Agent, or Firm* — Renner, Otto, Boisselle and Sklar, LLP

(21) Appl. No.: **29/498,081**

(57) **CLAIM**

The ornamental design for a heat exchanger, as shown and described.

(22) Filed: **Jul. 31, 2014**

DESCRIPTION

(51) **LOC (10) Cl.** **23-03**

(52) **U.S. Cl.**
USPC **D23/314**

(58) **Field of Classification Search**
USPC D23/314, 323, 324, 329, 341; 62/3.2, 62/3.3, 3.1
CPC Y10S 257/93; Y10S 977/833; G01N 2030/303; G01N 2030/3092; A61B 2018/00047; H01S 5/02415
See application file for complete search history.

FIG. 1 is a perspective view of a heat exchanger showing our new design.

FIG. 2 is a top view thereof.

FIG. 3 is a bottom view thereof.

FIG. 4 is a rear view thereof.

FIG. 5 is a front view thereof.

FIG. 6 is a left side view thereof.

FIG. 7 is a right side view thereof.

FIG. 8 is a perspective view of another embodiment of the heat exchanger.

FIG. 9 is a top view thereof.

FIG. 10 is a bottom view thereof.

FIG. 11 is a rear view thereof.

FIG. 12 is a front view thereof.

FIG. 13 is a left side view thereof; and,

FIG. 14 is a right side view thereof.

The broken line shown in the drawings are for the purpose of illustrating portions of the article that form no part of the claimed design.

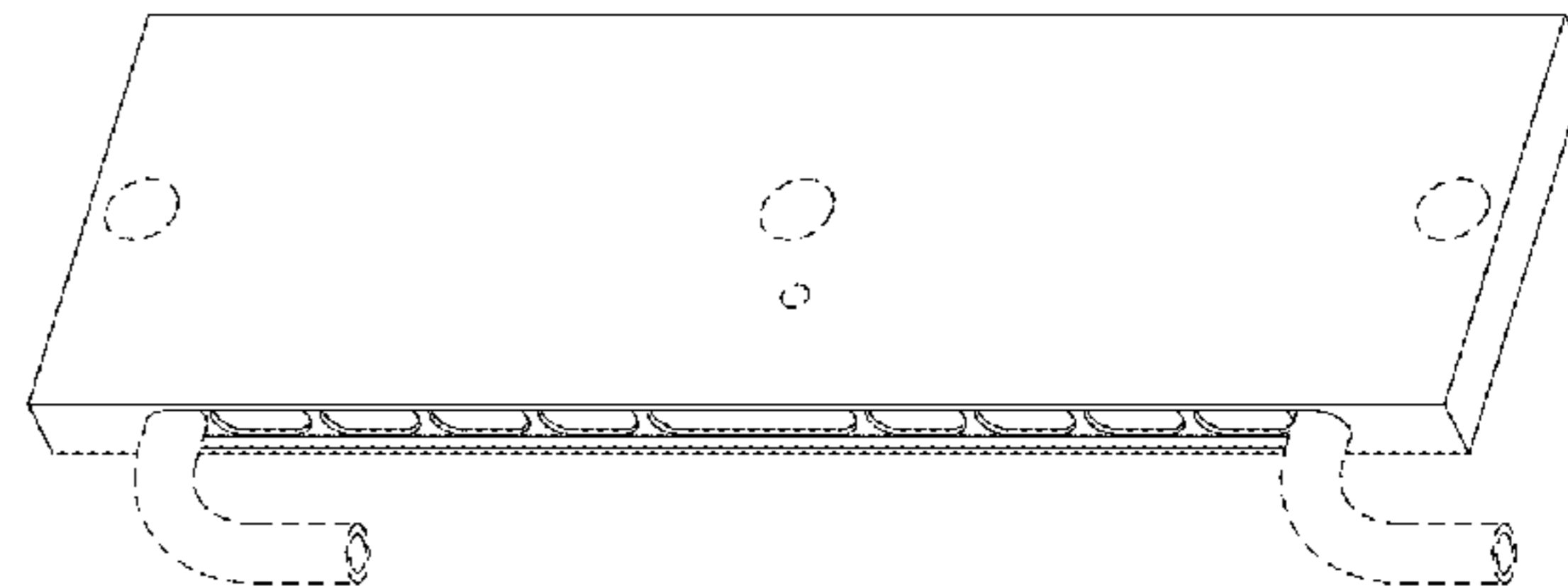
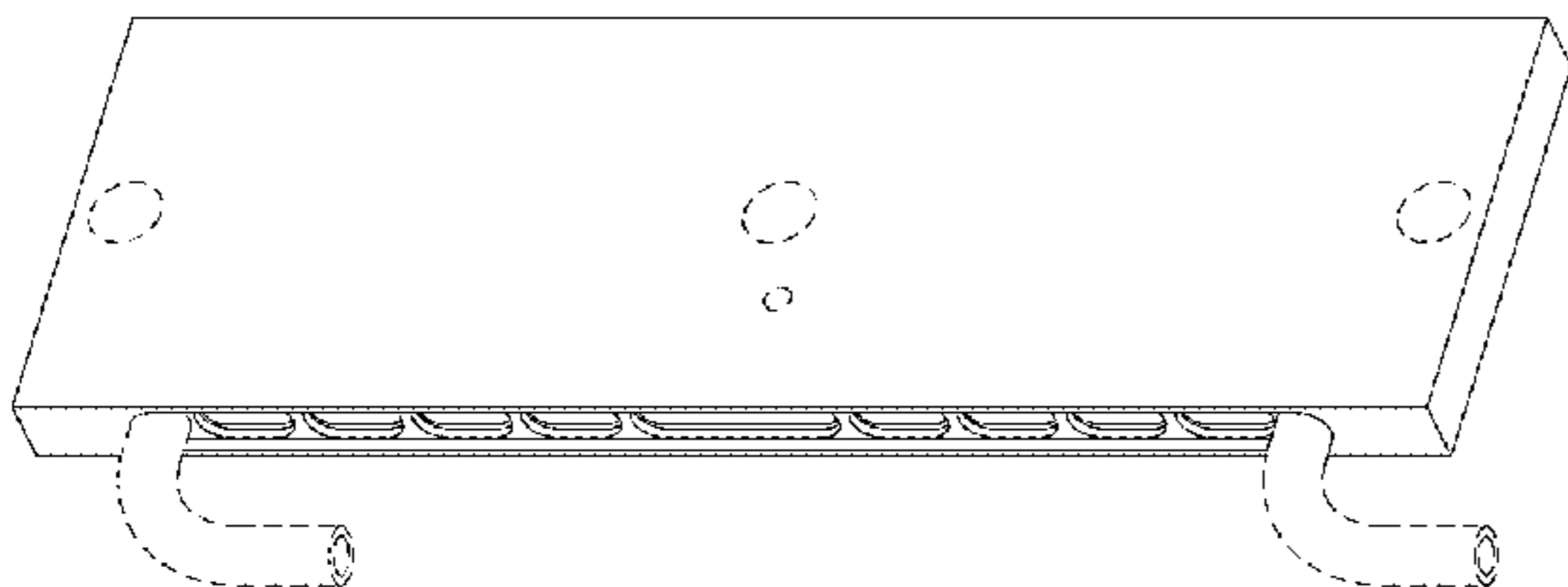
(56) **References Cited**

U.S. PATENT DOCUMENTS

2,039,593	A	5/1936	Hubbuch et al.	
4,227,068	A *	10/1980	Carter	392/370
4,712,158	A	12/1987	Kikuchi et al.	
5,057,968	A	10/1991	Morrison	
5,070,606	A	12/1991	Hoopman et al.	
5,285,347	A	2/1994	Fox et al.	
5,329,993	A	7/1994	Ettehadih	

(Continued)

1 Claim, 4 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

5,457,342 A * 10/1995 Herbst, II H01L 23/38
257/712
5,502,967 A * 4/1996 Nakagawa B43K 8/22
219/216
5,590,532 A * 1/1997 Bachman B67D 1/0869
62/3.3
5,628,769 A * 5/1997 Saringer A61F 7/007
607/98
5,737,923 A * 4/1998 Gilley et al. 62/3.7
5,829,516 A 11/1998 Lavochkin
5,859,763 A 1/1999 Nam et al.
5,983,995 A 11/1999 Shutou et al.
6,072,815 A * 6/2000 Peterson H01S 3/025
372/34
6,154,363 A * 11/2000 Chang H01L 23/4093
165/80.4
6,189,213 B1 2/2001 Kimura et al.
6,345,507 B1 * 2/2002 Gillen 62/3.7
6,438,964 B1 * 8/2002 Giblin A41D 13/005
62/259.3
6,725,682 B2 4/2004 Scott
6,808,013 B2 10/2004 Lai et al.
6,826,923 B2 12/2004 Nakano et al.
6,923,362 B2 8/2005 Mishra
6,988,534 B2 1/2006 Kenny et al.
D536,773 S * 2/2007 Yeung D23/330
7,178,586 B2 2/2007 Goldman et al.
7,298,617 B2 11/2007 Campbell et al.
7,746,641 B2 * 6/2010 Sun G06F 1/20
165/80.4
D621,016 S * 8/2010 Garcia D23/330
7,850,061 B2 12/2010 Rigal et al.
8,359,871 B2 * 1/2013 Woods et al. 62/3.2
8,441,794 B2 5/2013 Hou et al.
2003/0044130 A1 * 3/2003 Crane, Jr. G02B 6/3839
385/92

2003/0183839 A1 * 10/2003 Yamashita H01L 23/38
257/108
2004/0194942 A1 10/2004 Okamoto et al.
2005/0121065 A1 * 6/2005 Otey 136/205
2006/0137358 A1 * 6/2006 Feher B01N 2/5635
62/3.3
2008/0098750 A1 * 5/2008 Busier F24H 4/04
62/3.3
2010/0281884 A1 * 11/2010 Rawski et al. 62/3.6
2011/0032679 A1 * 2/2011 Baek H01L 23/38
361/715
2011/0271994 A1 * 11/2011 Gilley 136/205
2012/0312029 A1 * 12/2012 Brehm et al. 62/3.3
2013/0061605 A1 * 3/2013 de Rochemont 62/3.5
2013/0239589 A1 * 9/2013 Mahalingam H01L 23/467
62/3.2
2014/0051155 A1 * 2/2014 Evans B01L 7/52
435/287.2
2014/0075960 A1 * 3/2014 Kuo F25B 21/02
62/3.2
2014/0208772 A1 * 7/2014 Schon B01L 7/52
62/3.3
2014/0216060 A1 * 8/2014 Ilercil F25B 21/02
62/3.6
2014/0251579 A1 * 9/2014 Sloss 165/96
2015/0107270 A1 * 4/2015 Oh A47G 23/0208
62/3.3
2015/0221846 A1 * 8/2015 Terauchi H01S 5/02415
136/203

OTHER PUBLICATIONS

Nelson, The Evolution of the PC Cooling Water Block, 1 page, <<<http://www.overclockers.com/the-evolution-of-the-pc-cooling-waterblock/>>>, at least as early as 2012.
Andrew, Water Cooling Twin Peltiers, 1 page, Nov. 1, 2010.
Foster, It's Copper Cool'n. Time, 2 pages, <<<http://www.unofficial3d.com/stevefoster/copper.htm>>>, at least as early as 2007.

* cited by examiner

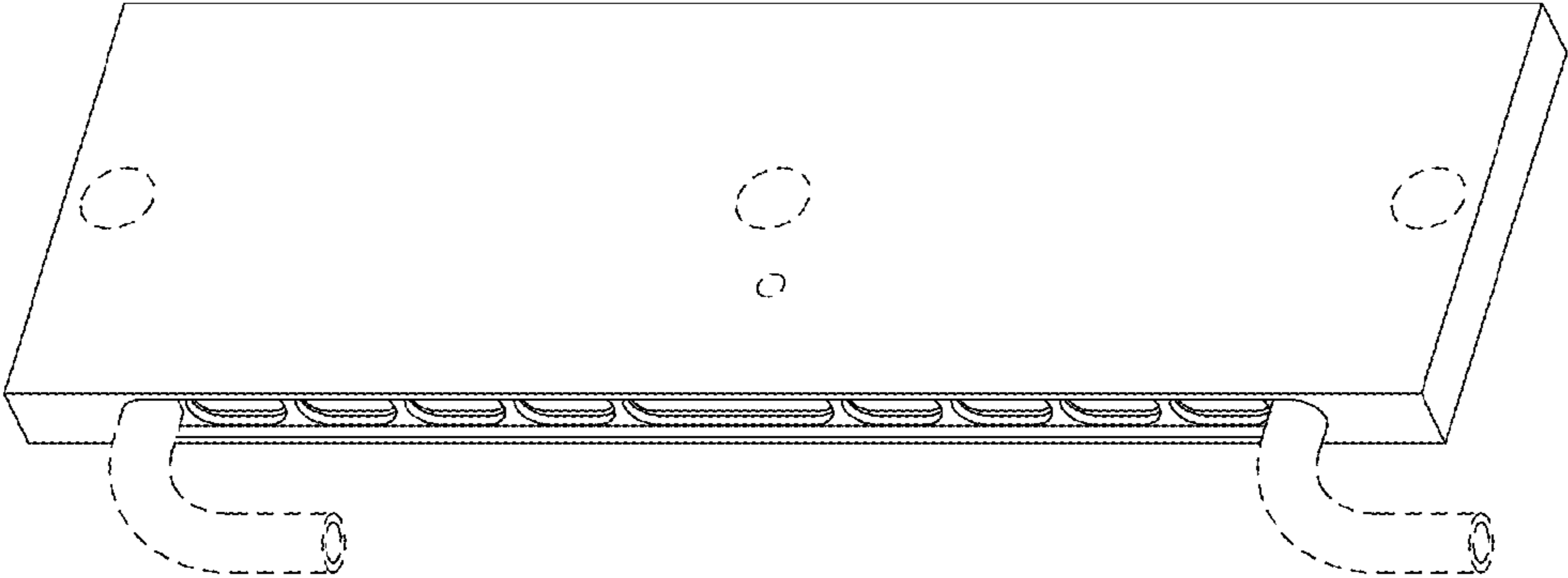


FIG. 1

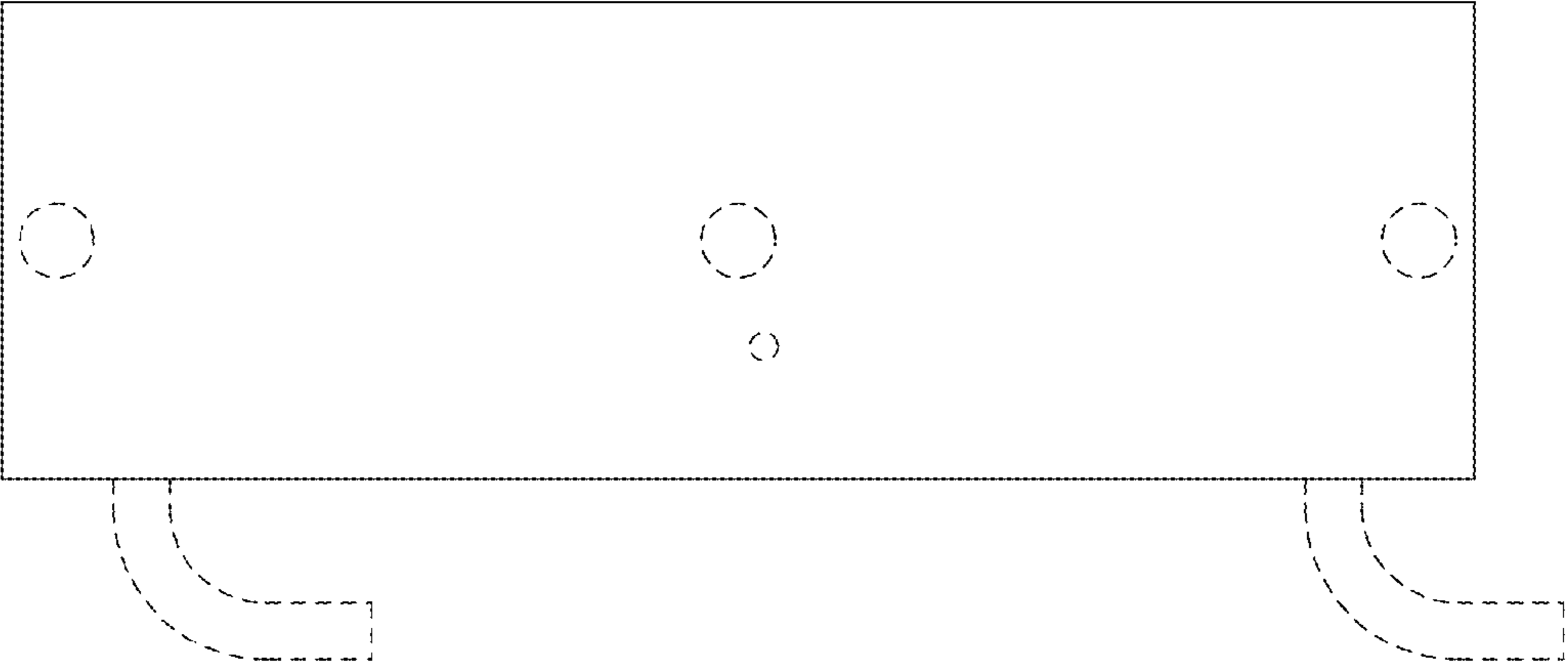


FIG. 2

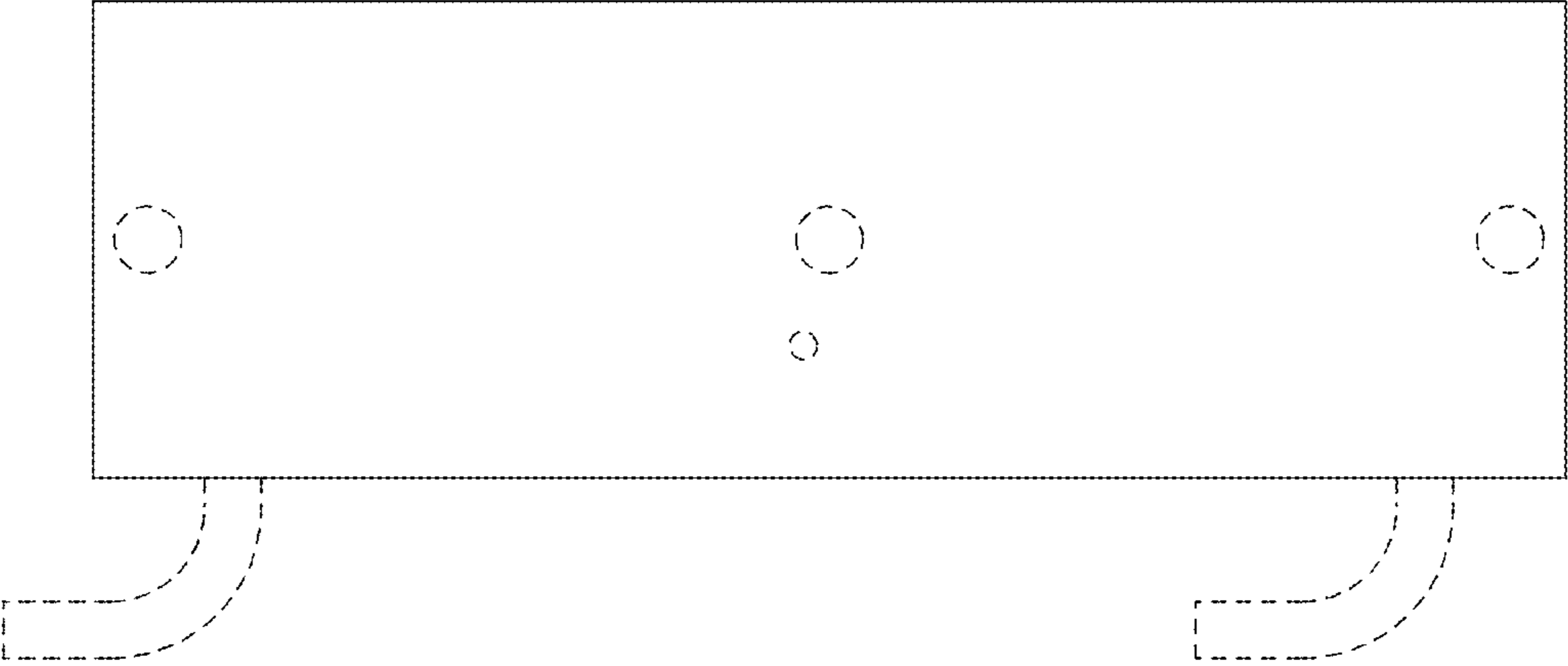


FIG. 3

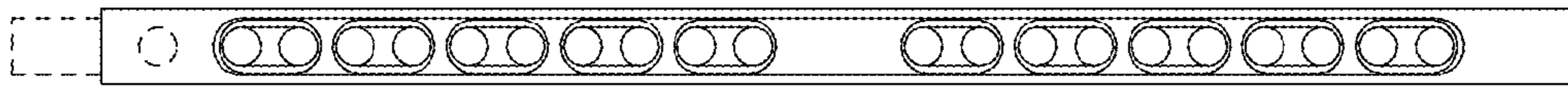


FIG. 4

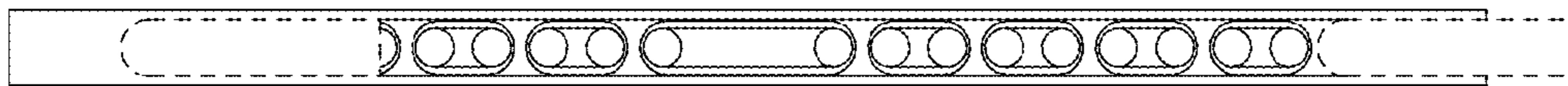


FIG. 5



FIG. 6



FIG. 7

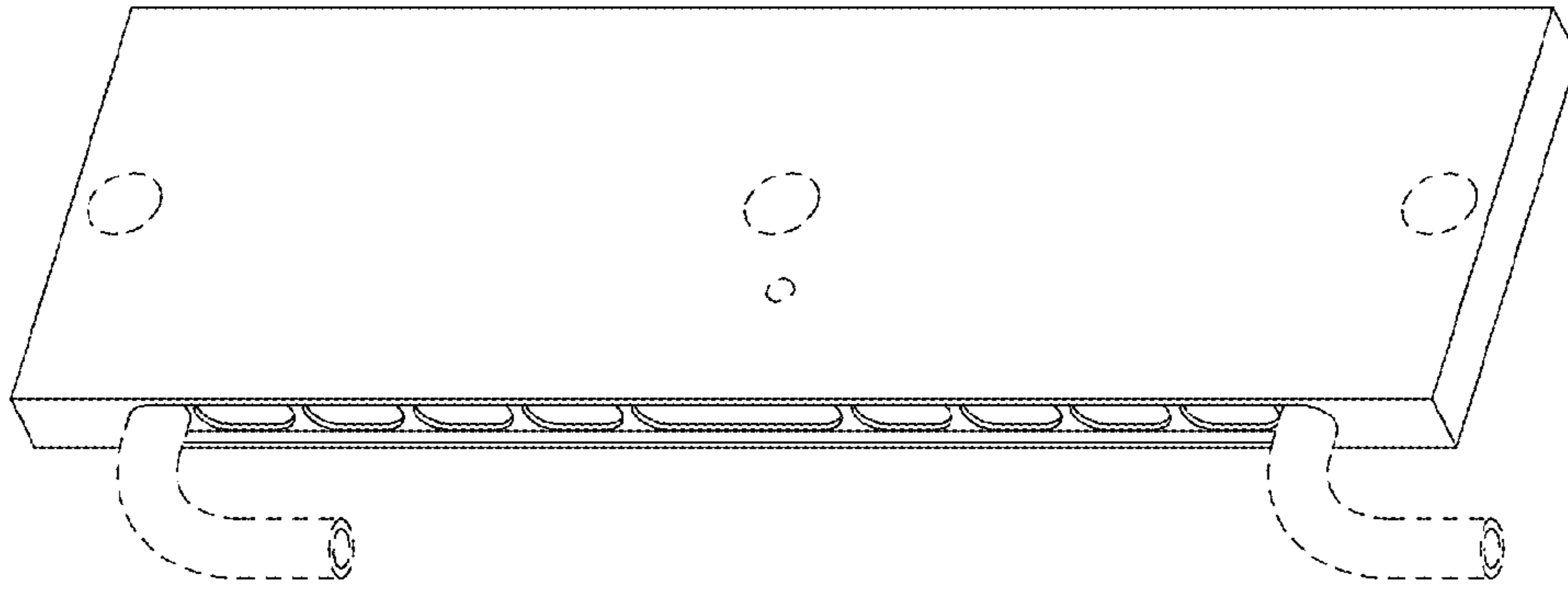


FIG. 8

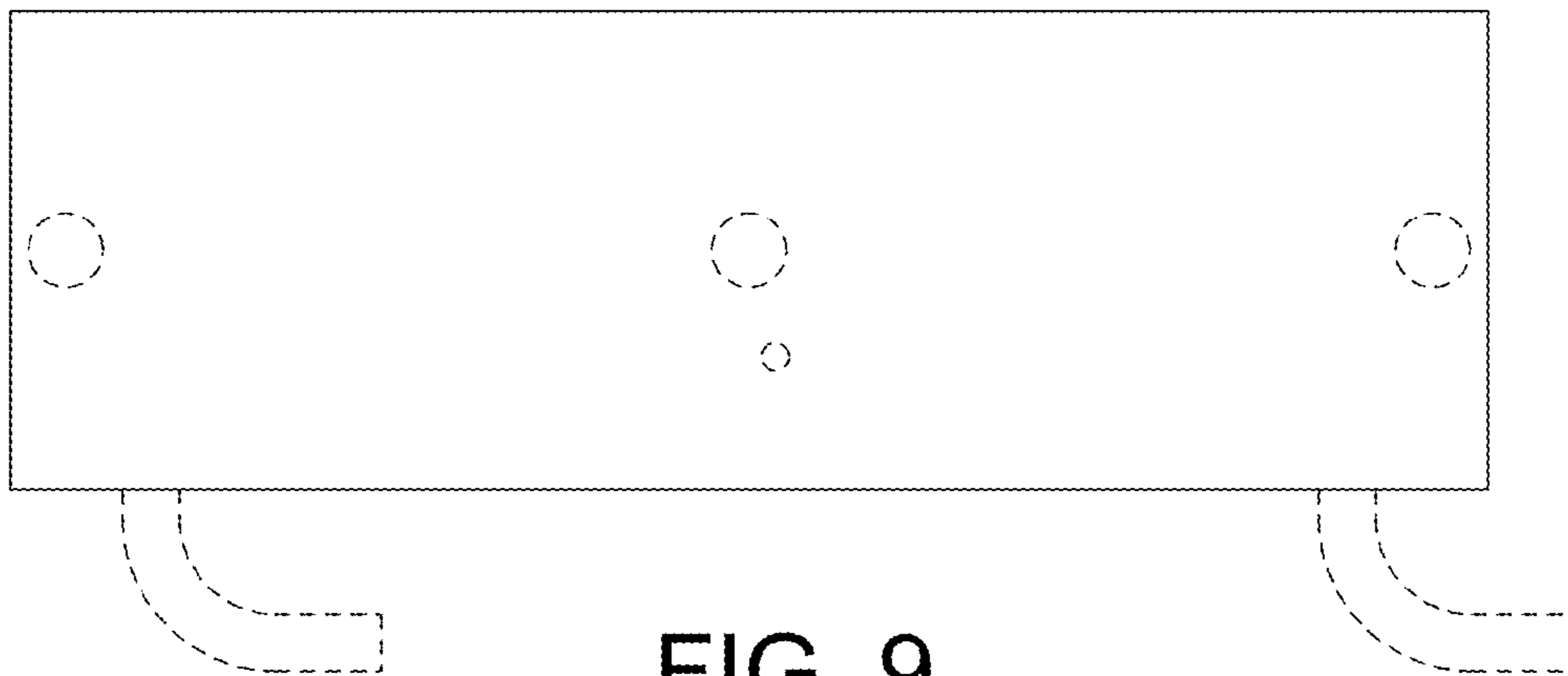


FIG. 9

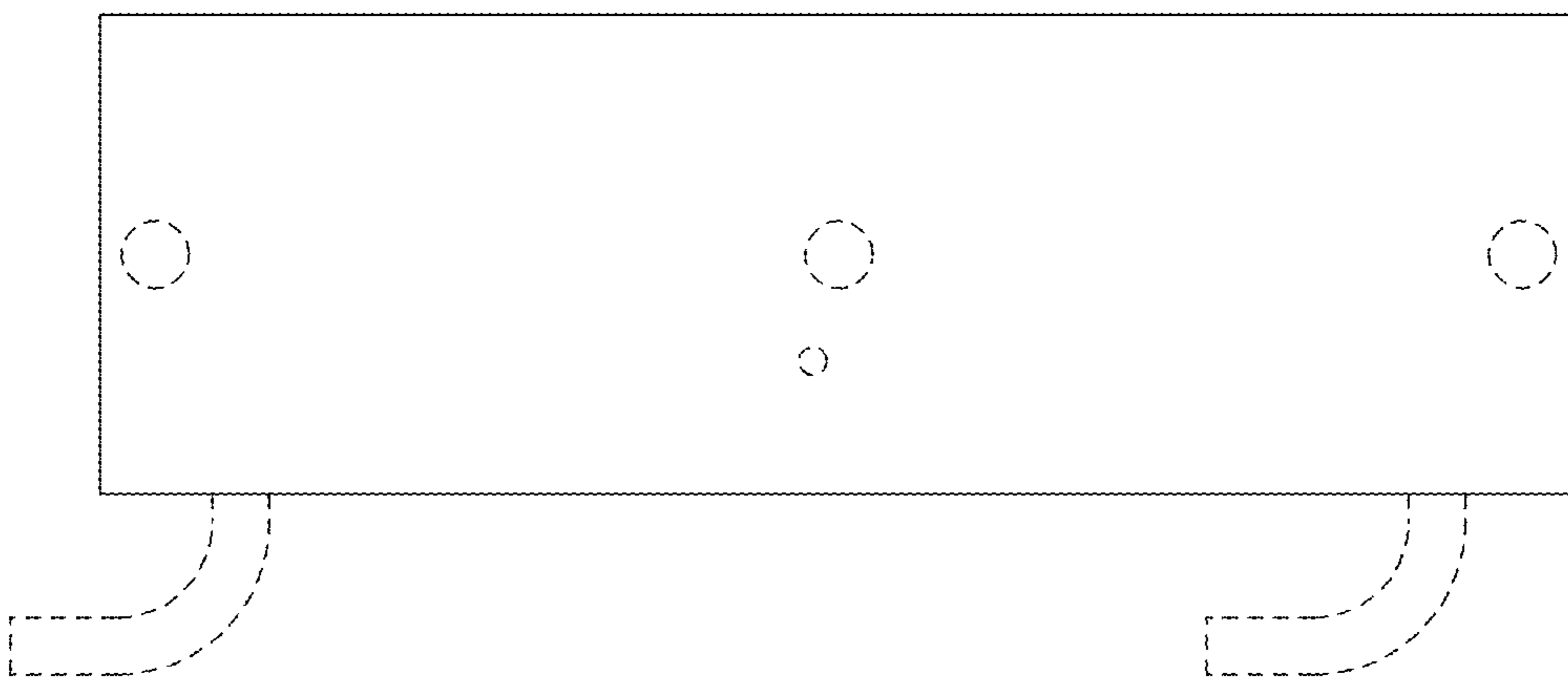


FIG. 10

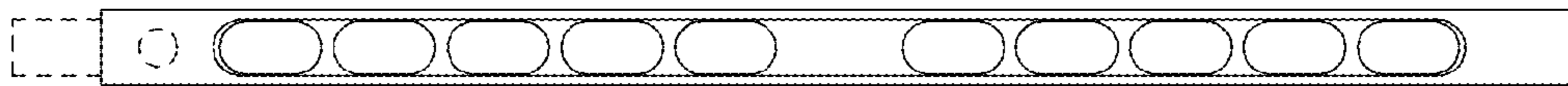


FIG. 11

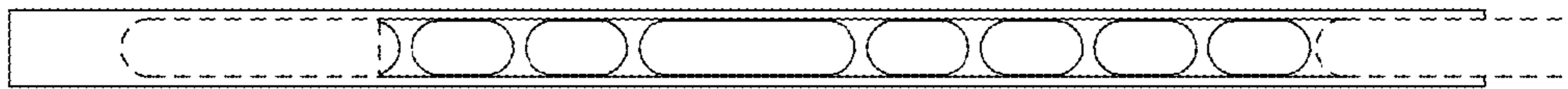


FIG. 12

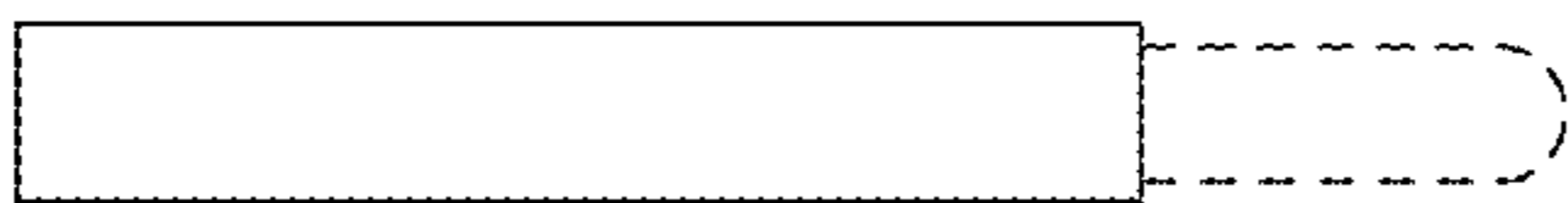


FIG. 13

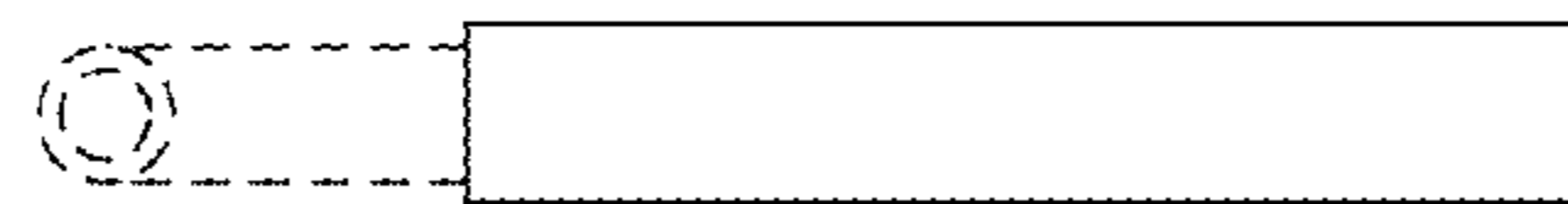


FIG. 14

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : D749,713 S
APPLICATION NO. : 29/498081
DATED : February 16, 2016
INVENTOR(S) : Fred Bahr

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title Page

Item (72) inventors, please change the listing of inventors to:

Inventor(s): Fred Bahr, Seven Hills, OH (US)

Signed and Sealed this
Twenty-first Day of June, 2016



Michelle K. Lee
Director of the United States Patent and Trademark Office

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : D749,713 S
APPLICATION NO. : 29/498081
DATED : February 16, 2016
INVENTOR(S) : Bahman Guyuron et al.

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title Page

“Item (72) inventors, please change the listing of inventors to:

Inventor(s): Fred Bahr, Seven Hills, OH (US)”

(as corrected to read in the Certificate of Correction issued March 29, 2016) is deleted and patent is returned to its original state with the Inventors name in patent to read

--(72) Inventors: **Bahman Guyuron**, Lyndhurst, OH
(US); **Fred Bahr**, Seven Hills, OH (US);
Brad A. Pulver, Shaker Heights, OH
(US); **Jamie Horvath**, Twinsburg, OH
(US); **Glen M. Guyuron**, Lundhurst, OH
(US)--

Signed and Sealed this
Second Day of August, 2016



Michelle K. Lee
Director of the United States Patent and Trademark Office