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Miller et al.

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(54) **OSTEOTOMY WEDGE**

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(*) Notice: This patent is subject to a terminal disclaimer.

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

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Related U.S. Application Data

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(51) **LOC (14) Cl.** **24-03**

(52) **U.S. Cl.**
USPC **D24/155**

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CPC E03C 1/00; A61L 2/00; A61L 9/00; A61L 9/22
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,440,835	A	4/1984	Vignaud	
4,588,574	A	5/1986	Felder et al.	
5,248,456	A	9/1993	Evans, Jr. et al.	
7,001,672	B2	2/2006	Justin et al.	
D595,853	S *	7/2009	Hanson	A61F 2/447 D24/155
7,632,575	B2	12/2009	Justin et al.	
7,666,522	B2	2/2010	Justin et al.	
D623,749	S *	9/2010	Horton	D24/155
D653,756	S	2/2012	Courtney et al.	
8,142,886	B2	3/2012	Noble et al.	
D675,320	S	1/2013	Oi	
8,430,930	B2	4/2013	Hunt	
8,457,930	B2	6/2013	Schroeder	
8,485,820	B1	7/2013	Ali	
D692,136	S *	10/2013	Tyber	D24/155
8,551,173	B2	10/2013	Lechmann et al.	

(Continued)

FOREIGN PATENT DOCUMENTS

KR 301007894.0000 * 5/2019

OTHER PUBLICATIONS

Instagram, "restor3d", first available Jul. 21, 2020. (https://www.instagram.com/p/CC6dzt0AKcM/?utm_source=ig_web_copy_link) (Year: 2020).*

(Continued)

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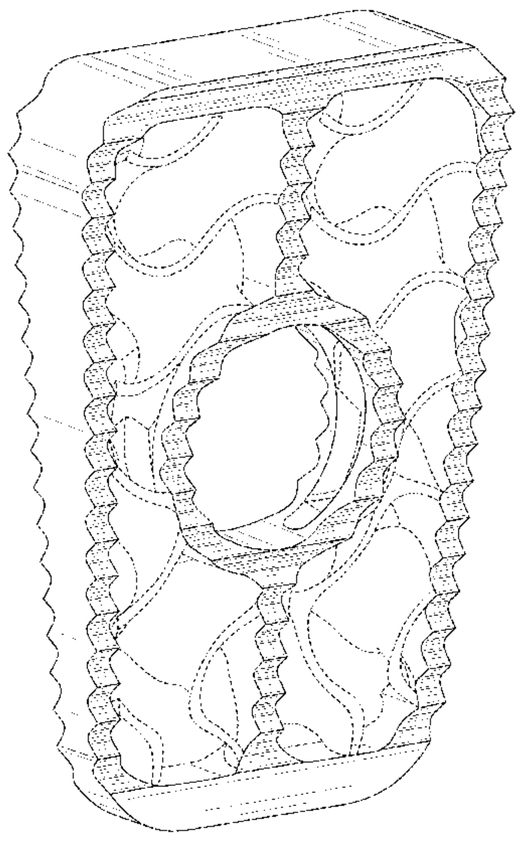
(57) **CLAIM**

The ornamental design for an osteotomy wedge, as shown and described.

DESCRIPTION

FIG. **1** is a perspective view of an osteotomy wedge showing my new design;
FIG. **2** is a top plan view thereof;
FIG. **3** is a bottom plan view thereof;
FIG. **4** is a left-side elevation view thereof;
FIG. **5** is a right-side elevation view thereof;
FIG. **6** is a front elevation view thereof; and,
FIG. **7** is a rear elevation view thereof.
The broken lines illustrate portions of the osteotomy wedge and form no part of the claimed design.

1 Claim, 7 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

D708,747	S	7/2014	Curran et al.	
8,775,133	B2	7/2014	Schroeder	
8,828,311	B2	9/2014	Medina et al.	
8,843,229	B2	9/2014	Vanasse et al.	
8,888,485	B2	11/2014	Ali	
D722,693	S	2/2015	Kaufmann et al.	
9,034,237	B2	5/2015	Sperry et al.	
D735,860	S *	8/2015	Palinchik	D24/155
D736,384	S *	8/2015	Palinchik	D24/155
9,180,029	B2	11/2015	Hollister et al.	
9,186,257	B2	11/2015	Geisler et al.	
D745,159	S	12/2015	Lin	
D747,485	S	1/2016	Oi	
9,271,845	B2	3/2016	Hunt et al.	
9,295,562	B2	3/2016	Lechmann et al.	
9,308,060	B2	4/2016	Ali	
9,339,279	B2	5/2016	Dubois et al.	
9,364,896	B2	6/2016	Christensen et al.	
9,370,426	B2	6/2016	Gabbrielli et al.	
9,415,137	B2	8/2016	Meridew	
9,421,108	B2	8/2016	Hunt	
D767,137	S	9/2016	Lin	
9,433,510	B2	9/2016	Lechmann et al.	
9,433,707	B2	9/2016	Swords et al.	
9,545,317	B2	1/2017	Hunt	
9,549,823	B2	1/2017	Hunt et al.	
9,561,115	B2	2/2017	Elahinia et al.	
9,572,669	B2	2/2017	Hunt et al.	
9,597,197	B2	3/2017	Lechmann et al.	
9,636,226	B2	5/2017	Hunt	
9,649,178	B2	5/2017	Ali	
9,662,157	B2	5/2017	Schneider et al.	
9,662,226	B2	5/2017	Wickham	
9,668,863	B2	6/2017	Sharp et al.	
9,675,465	B2	6/2017	Padovani et al.	
9,688,026	B2	6/2017	Ho et al.	
9,694,541	B2	7/2017	Pruett et al.	
9,715,563	B1	7/2017	Schroeder	
9,757,235	B2	9/2017	Hunt et al.	
9,757,245	B2	9/2017	O'Neil et al.	
9,782,270	B2	10/2017	Wickham	
9,788,972	B2	10/2017	Flickinger et al.	
D809,661	S	2/2018	Mueller et al.	
9,907,670	B2	3/2018	Deridder et al.	
9,910,935	B2	3/2018	Golway et al.	
9,918,849	B2	3/2018	Morris et al.	
9,943,627	B2	4/2018	Zhou et al.	
D829,909	S	10/2018	Horton	
D835,278	S	12/2018	Gottlieb	
10,183,442	B1	1/2019	Miller	
10,245,152	B2	4/2019	Kloss	
D849,944	S	5/2019	DaCosta	
10,278,823	B1	5/2019	Xue	
D850,620	S	6/2019	Tyber	
D855,184	S *	7/2019	Predick	A61B 17/8061 D24/155
10,357,377	B2	7/2019	Nyahay	
D858,769	S	9/2019	Barela et al.	
10,449,051	B2	10/2019	Hamzey	
D877,907	S	3/2020	Linder et al.	
D878,589	S	3/2020	Linder	
D878,590	S	3/2020	Linder et al.	
D879,295	S	3/2020	Abbasi	
D879,961	S	3/2020	Linder et al.	
D881,665	S	4/2020	Zemel et al.	
10,624,746	B2	4/2020	Jones et al.	
10,667,924	B2	6/2020	Nyahay	
10,744,001	B2	8/2020	Sack	
10,772,732	B1	9/2020	Miller et al.	
D899,900	S	10/2020	Blanco	
10,940,015	B2	3/2021	Sack	
D920,515	S *	5/2021	Miller	D24/155
D920,516	S *	5/2021	Miller	D24/155
D920,517	S *	5/2021	Miller	D24/155
11,026,798	B1	6/2021	Miller et al.	
11,033,394	B2	6/2021	Hamzey	
11,135,771	B1	10/2021	Reith	
D938,033	S *	12/2021	Dang	D24/155
11,353,277	B2	6/2022	Muceus	
11,439,726	B2	9/2022	Spence	
11,471,203	B2	10/2022	Sutika	
2004/0148032	A1	7/2004	Rutter et al.	
2006/0249875	A1	11/2006	Robb et al.	
2007/0118243	A1	5/2007	Schroeder et al.	
2008/0206297	A1	8/2008	Roeder et al.	
2009/0093668	A1	4/2009	Marten et al.	
2009/0182430	A1	7/2009	Tyber et al.	
2010/0137990	A1	6/2010	Apatsidis et al.	
2010/0168798	A1	7/2010	Clineff et al.	
2010/0286791	A1	11/2010	Goldsmith	
2011/0144752	A1	6/2011	Defelice et al.	
2011/0190898	A1	8/2011	Lenz	
2011/0224796	A1	9/2011	Weiland et al.	
2011/0230974	A1	9/2011	Musani	
2012/0064288	A1	3/2012	Nakano et al.	
2012/0215310	A1	8/2012	Sharp et al.	
2013/0068968	A1	3/2013	Daniel	
2013/0123935	A1	5/2013	Hunt et al.	
2013/0158651	A1	6/2013	Hollister et al.	
2013/0197657	A1	8/2013	Anca et al.	
2013/0218282	A1	8/2013	Hunt	
2013/0274890	A1	10/2013	McKay	
2014/0107785	A1	4/2014	Geisler et al.	
2014/0107786	A1	4/2014	Geisler et al.	
2014/0236299	A1	8/2014	Roeder et al.	
2014/0277443	A1	9/2014	Fleury et al.	
2014/0277452	A1	9/2014	Skaer	
2014/0288650	A1	9/2014	Hunt	
2014/0336680	A1	11/2014	Medina et al.	
2014/0371863	A1	12/2014	Vanasse et al.	
2015/0105858	A1	4/2015	Papay et al.	
2015/0282945	A1	10/2015	Hunt	
2015/0282946	A1	10/2015	Hunt	
2015/0320461	A1	11/2015	Ehmke	
2015/0335434	A1	11/2015	Patterson et al.	
2015/0343709	A1	12/2015	Gerstle et al.	
2015/0351915	A1	12/2015	Defelice et al.	
2016/0008139	A1	1/2016	Siegler et al.	
2016/0051371	A1	2/2016	Defelice et al.	
2016/0089138	A1	3/2016	Early et al.	
2016/0151833	A1	6/2016	Tsao	
2016/0193055	A1	7/2016	Ries	
2016/0199193	A1	7/2016	Willis et al.	
2016/0213485	A1	7/2016	Schaufler et al.	
2016/0213486	A1	7/2016	Nunley et al.	
2016/0213487	A1	7/2016	Wilson et al.	
2016/0213488	A1	7/2016	Moore et al.	
2016/0220288	A1	8/2016	Dubois et al.	
2016/0256279	A1	9/2016	Sanders et al.	
2016/0256610	A1	9/2016	Zhou et al.	
2016/0270931	A1	9/2016	Trieu	
2016/0287388	A1	10/2016	Hunt et al.	
2016/0303793	A1	10/2016	Ermoshkin et al.	
2016/0333152	A1	11/2016	Cook et al.	
2016/0374829	A1	12/2016	Vogt et al.	
2017/0014169	A1	1/2017	Dean et al.	
2017/0020685	A1	1/2017	Geisler et al.	
2017/0036403	A1	2/2017	Ruff et al.	
2017/0042697	A1	2/2017	McShane, III et al.	
2017/0056178	A1	3/2017	Sharp et al.	
2017/0056179	A1	3/2017	Lorio	
2017/0066873	A1	3/2017	Gardet	
2017/0105844	A1	4/2017	Kuyler et al.	
2017/0156880	A1	6/2017	Halverson et al.	
2017/0165085	A1	6/2017	Lechmann et al.	
2017/0165790	A1	6/2017	McCarthy et al.	
2017/0172758	A1	6/2017	Field et al.	
2017/0182222	A1	6/2017	Paddock et al.	
2017/0209274	A1	7/2017	Beerens et al.	
2017/0216035	A1	8/2017	Hunt	
2017/0216036	A1	8/2017	Cordaro	
2017/0239054	A1	8/2017	Engstrand et al.	
2017/0239064	A1	8/2017	Cordaro	
2017/0245998	A1	8/2017	Padovani et al.	

(56) **References Cited**

U.S. PATENT DOCUMENTS

2017/0252165	A1	9/2017	Sharp et al.
2017/0258606	A1	9/2017	Afzal
2017/0282455	A1	10/2017	Defelice et al.
2017/0296244	A1	10/2017	Schneider et al.
2017/0319344	A1	11/2017	Hunt
2017/0323037	A1	11/2017	Schroeder
2017/0333205	A1	11/2017	Joly et al.
2017/0354510	A1	12/2017	O'Neil et al.
2017/0354513	A1	12/2017	Maglaras et al.
2017/0355815	A1	12/2017	Becker et al.
2017/0360488	A1	12/2017	Kowalczyk et al.
2017/0360563	A1	12/2017	Hunt et al.
2017/0360578	A1	12/2017	Shin et al.
2017/0367843	A1	12/2017	Eisen et al.
2017/0367844	A1	12/2017	Eisen et al.
2017/0367845	A1	12/2017	Eisen et al.
2018/0008419	A1	1/2018	Tyber et al.
2018/0022017	A1	1/2018	Fukumoto et al.
2018/0064540	A1	3/2018	Hunt
2018/0085230	A1	3/2018	Hunt
2018/0104063	A1	4/2018	Asaad
2018/0110593	A1	4/2018	Khalil
2018/0110626	A1	4/2018	McShane, III et al.
2018/0110627	A1	4/2018	Sack
2018/0117219	A1	5/2018	Yang et al.
2018/0147319	A1	5/2018	Colucci-Mizenko et al.
2018/0280140	A1	10/2018	Jones
2018/0289515	A1	10/2018	Nemes et al.
2019/0167433	A1	6/2019	Allen
2019/0262101	A1	8/2019	Shanjani et al.
2019/0343652	A1	11/2019	Petersheim et al.
2020/0000595	A1	1/2020	Jones
2020/0030102	A1	1/2020	Mullens et al.
2020/0046512	A1	2/2020	Newman et al.
2020/0085452	A1	3/2020	Siegler
2020/0085585	A1	3/2020	Siegler
2020/0155321	A1	5/2020	Dikovsky
2020/0171752	A1	6/2020	Rogren
2020/0171753	A1	6/2020	Satko
2021/0216683	A1	7/2021	Rai
2021/0298908	A1	9/2021	Holmes
2021/0340334	A1	11/2021	Portela
2022/0023048	A1	1/2022	Nolens
2022/0087670	A1	3/2022	Selmoune
2022/0134639	A1	5/2022	Allen
2022/0142783	A1	5/2022	Ahmadi
2022/0168109	A1	6/2022	Giordano
2022/0296386	A1	9/2022	Fang

OTHER PUBLICATIONS

Sina, "Triple Periodic Minimum Surface", first available Oct. 24, 2020. (https://k.sina.com.cn/article_2422410454_90630cd600100tlbm.html?from=science#/) (Year: 2020).*

Restor3d, "Products", first available Sep. 28, 2020. (https://web.archive.org/web/20200928123335/https:/restor3d.com/products) (Year: 2020).*

Indiamart, "Anterior Cervical Fusion Cage for Spine Surgery", first accessed Dec. 9, 2020. (https://www.indiamart.com/proddetail/anterior-cervical-fusion-cage-12402896897.html) (Year: 2020).*

Larraona et al., "Radiopaque material for 3D printing scaffolds", XXXV Confreso Anual de la Sociedad Espanola de Ingenieria Biomedica. Bilbao, Nov. 29-Dec. 1, 2017, p. 451-454 (Year: 2017).

Rozema et al., The effects of different steam-sterilization programs on material properties of poly(l-lactide). Journal of Applied Biomaterials, vol. 2, 23-28 (1991) (Year: 1991).

Alt, Sami. "Design for Sterilization Part 1: Steam Sterillization." Material, Material Technology Blog, Jun. 3, 2016, www.material-technology.com/single-post/2016/05/24/Design-for-Sterilization-part-1-Steam-Sterillization.

Ducheyne, Paul. "Comprehensive Biomaterials." Comprehensive Biomaterials, vol. 1, Elsevier, 2011, pp. 135-135.

Anat Ratnovsky et al., Mechanical Properties of Different Airway Stents, Med. Eng'g. Physics, Mar. 2011, at 408., http://www.medengphys.com/article/S1350-4533(15)00042-9/fulltext.

Andrew T. Miller et al., Fatigue of Injection Molded and 30 Printed Polycarbonate Urethane in Solution, 108 Polymer 121 (2017).

Andrew T. Miller et al., Deformation and Fatigue of Tough 30 Printed Elastomer Scaffolds Processed by Fused 3 Deposition Modeling and Continuous Liquid Interface Production, 75 J. Mechanical Behavior Biomedical Materials 1 (2017).

Ortho Spine News, "SeaSpine Announces 25,000th NanoMetalene Implantation", first available Dec. 18, 2019. (https://orthospinenews.com/2019/12/18/seaspine-announces-25000th-nanometalene-implantation/) (Year: 2019).

Ortho Spine News, "Nvision Biomedical Technologies: First FDA Clearance for Osteotomy Wedge System", first available Oct. 28, 2020. (https://orthospinenews.com/2020/10/28/nvision-biomedical-technologies-first-fda-clearance-for-osteotomy-wedge-system-made-of-peek-optima-ha-enhanced/) (Year: 2020).

Sina, "Application logic of triple periodic minimum surface", first available Oct. 24, 2020. (https://k.sina.com.cn/article_2422410454_90630cd6001 OOtlbm.html?from=science) (Year: 2020).

3D Adept Media, "Johnson & Johnson Medical", first available Sep. 17, 2018. (https://3dadept.com/johnson-johnson-medical-has-acquired-3d-printed-spmplants-special ist-emerging-implant-technologies/) (Year: 2018).

Additive Orthopaedics, "Additive Orthopaedics 3d Printed Cotton Bone Segment", first available Sep. 19, 2020. (https://web.archive.org/web/20200919145251/https:/www.additiveorthopaedics.com/our-products/cotton/) (Year: 2020).

Instagram, "restor3d", first available Jul. 21, 2020. (https://www.instagram.com/p/CC6dztOAKcM/7utm_source=ig_web_link) (Year: 2020).

* cited by examiner

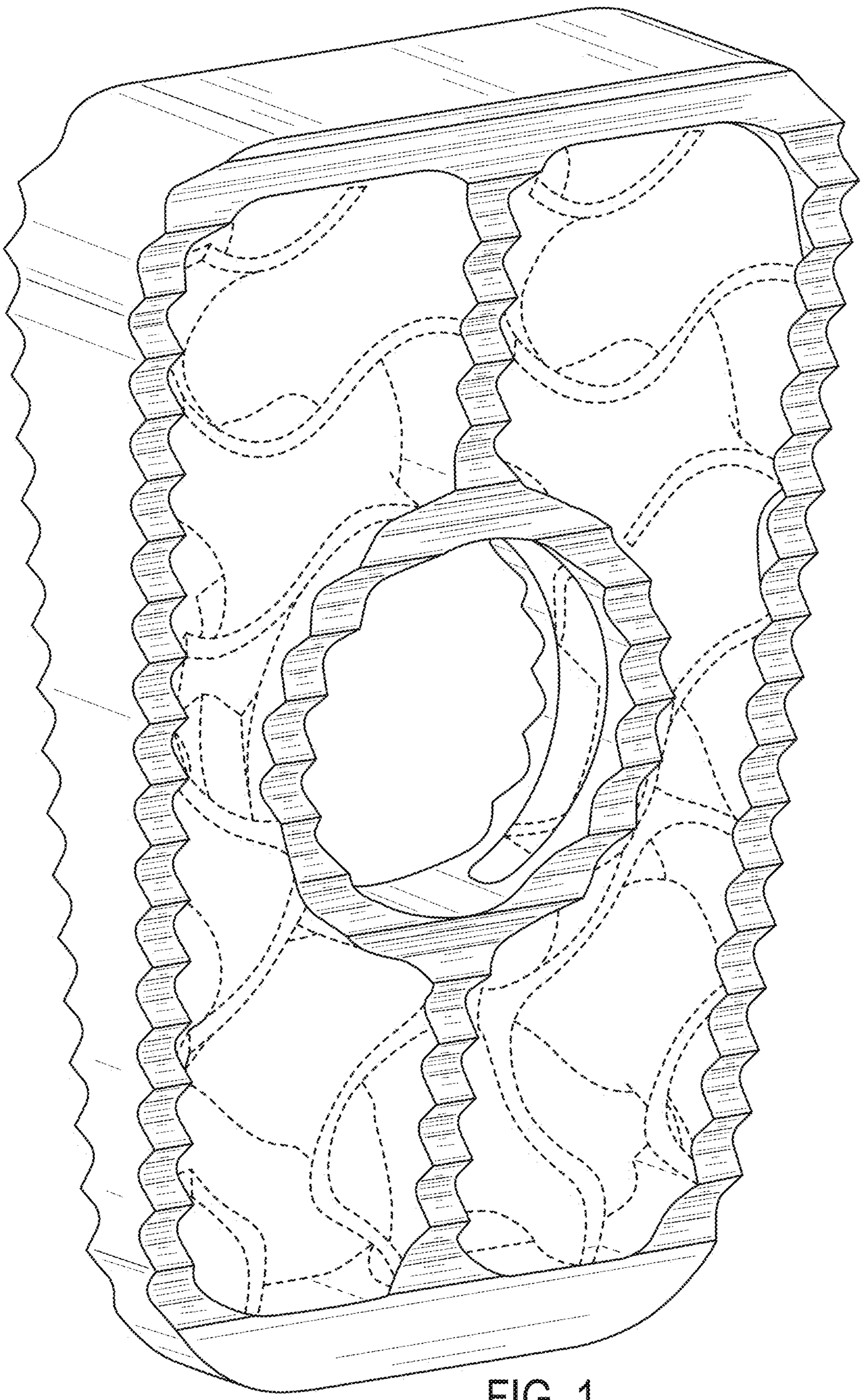


FIG. 1

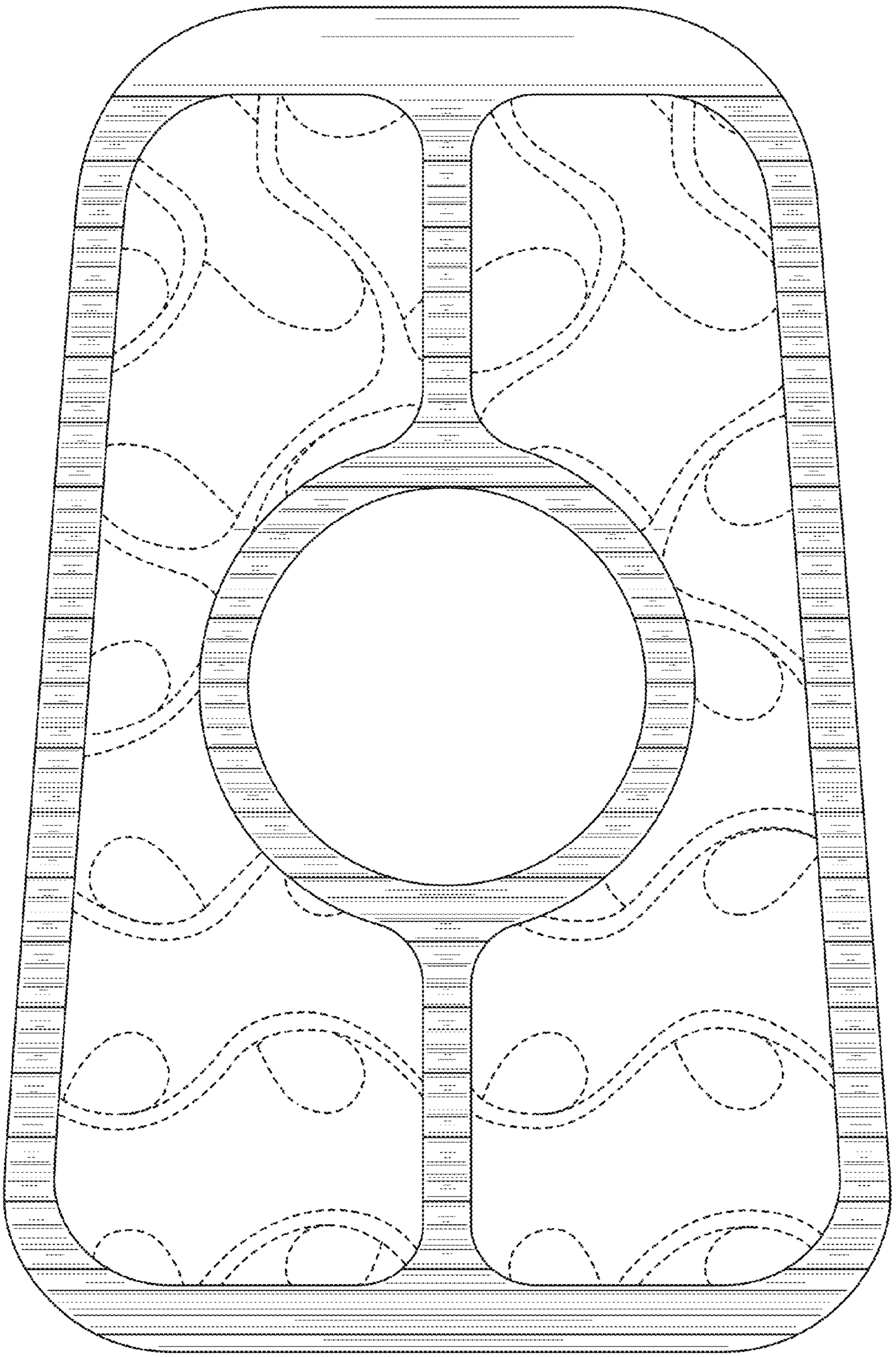


FIG. 2

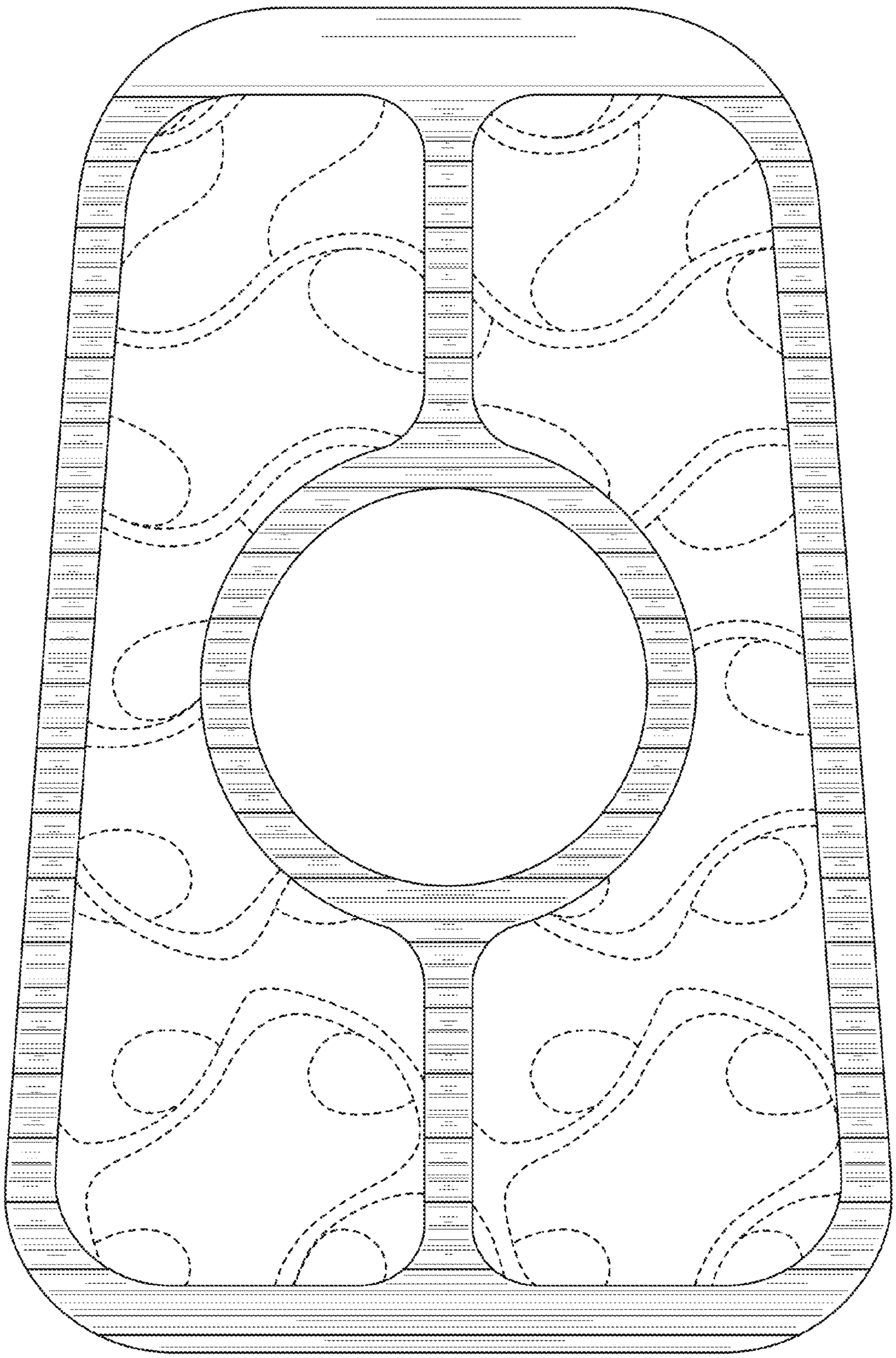
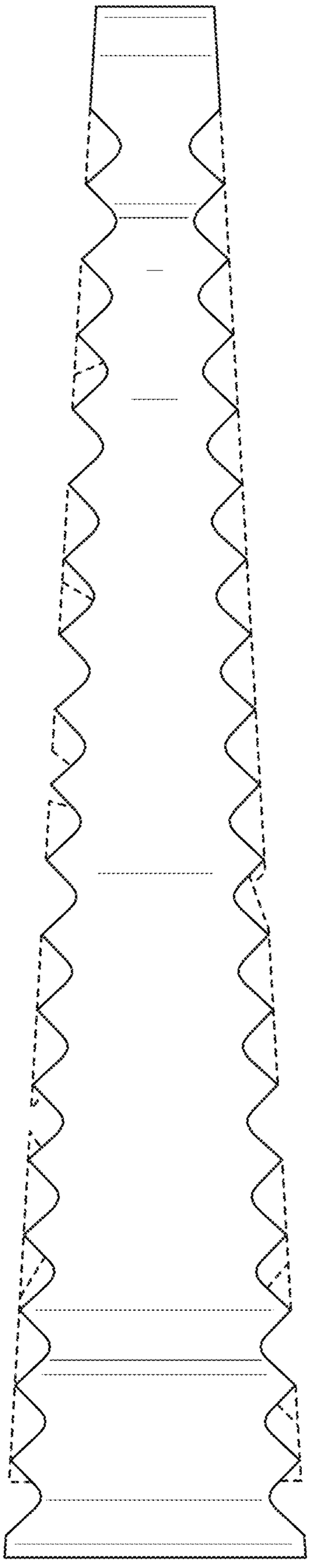


FIG. 3



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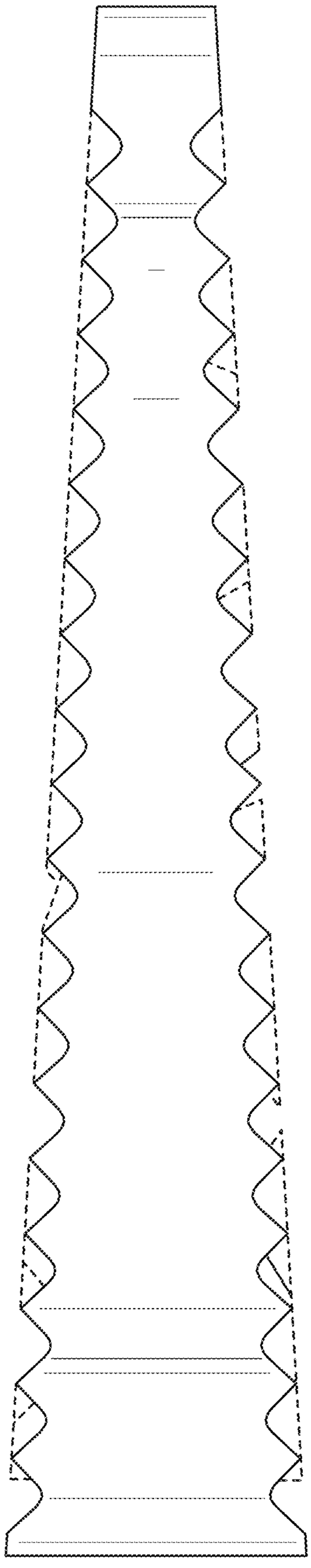

FIG. 5

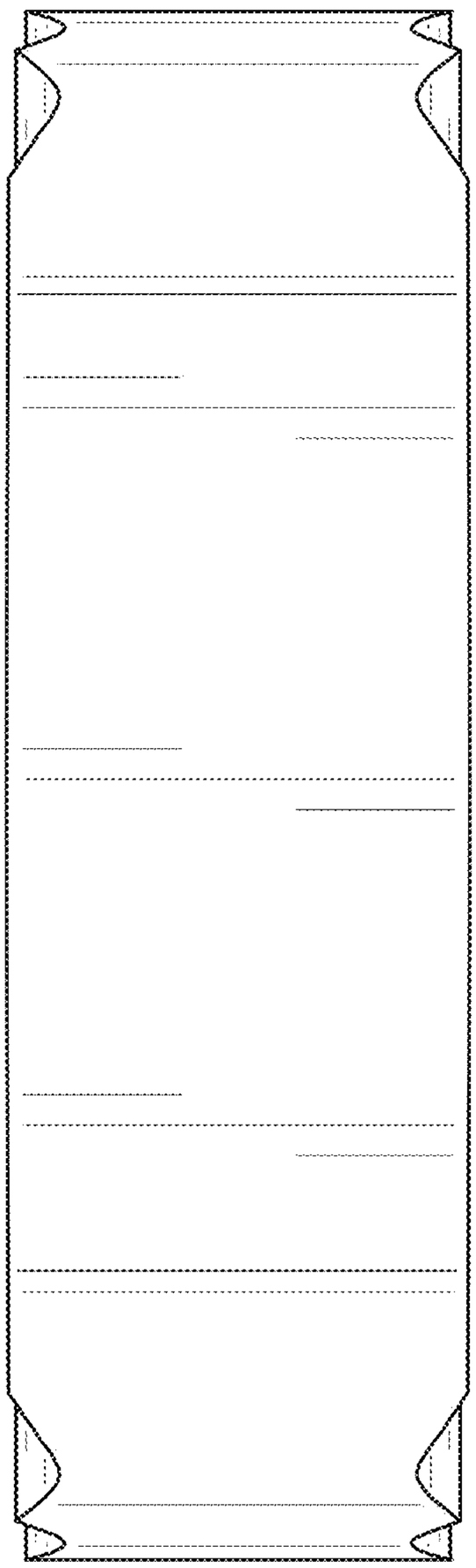

FIG. 6

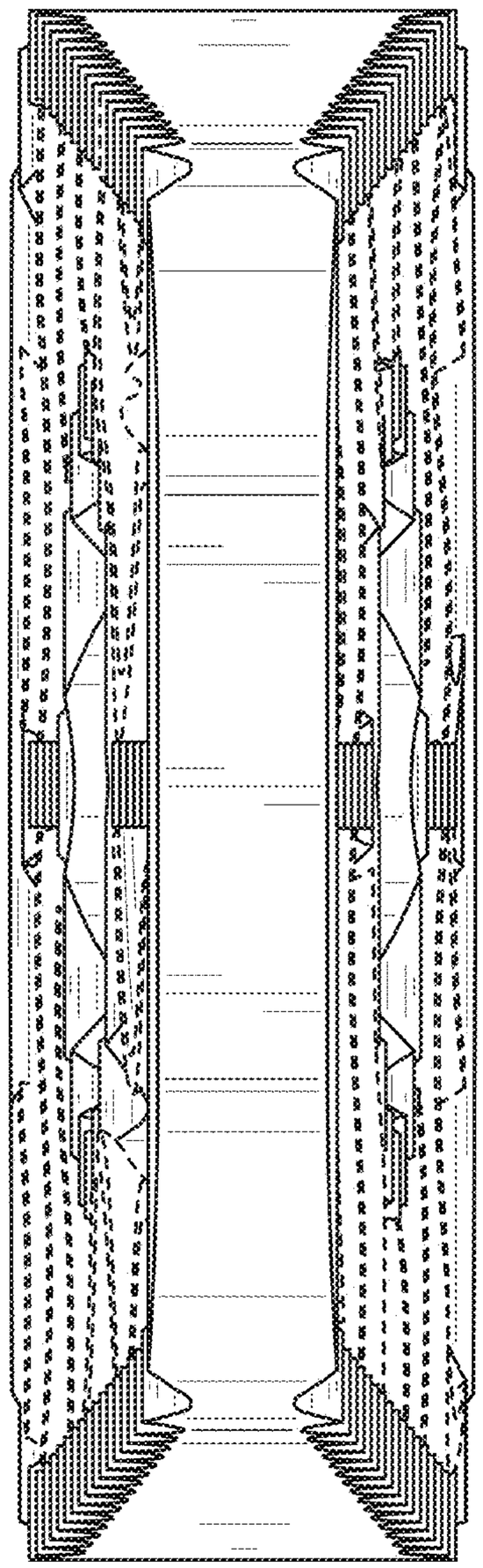

FIG. 7