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(12) **United States Design Patent** (10) **Patent No.:** **US D890,024 S**  
**Schnapp et al.** (45) **Date of Patent:** **\*\* Jul. 14, 2020**

(54) **VEHICLE** 7,188,694 B1 \* 3/2007 Blair ..... B60B 19/06  
180/218  
(71) Applicant: **Piaggio Fast Forward, Inc.**, Boston, MA (US) D619,929 S \* 7/2010 Tyler ..... D12/1  
D784,852 S \* 4/2017 Gong ..... D12/1  
D805,464 S \* 12/2017 Ma ..... D12/598  
D840,277 S \* 2/2019 Li ..... D12/107  
(72) Inventors: **Jeffrey T. Schnapp**, Cambridge, MA 2011/0191013 A1 \* 8/2011 Leaser ..... B62D 11/04  
(US); **Gregory Stewart Lynn**, Venice, CA (US); **Rossitza Dimitrova Kotelova**, Cambridge, MA (US); **Sasha Priya Hoffman**, Boston, MA (US); **Jamar A. Bromley**, Jamaica Plain, MA (US); **Nazareth V. Ekmekjian**, Cambridge, MA (US) 2011/0209929 A1 \* 9/2011 Heinzmann ..... B62K 11/007  
180/6.2  
2014/0277841 A1 \* 9/2014 Klicpera ..... A45C 5/14  
701/2  
2018/0099720 A1 \* 4/2018 Chen ..... B62K 11/007  
2018/0105033 A1 \* 4/2018 Schnapp ..... B60K 7/0007  
2018/0105215 A1 \* 4/2018 Schnapp ..... B62D 37/04  
2018/0154971 A1 \* 6/2018 Zuo ..... B62H 1/02  
2018/0257512 A1 \* 9/2018 Chen ..... B60L 15/2036  
(73) Assignee: **PIAGGIO FAST FORWARD, INC.**, Boston, MA (US)

**FOREIGN PATENT DOCUMENTS**

(\*\*) Term: **15 Years** GB 2516619 A 2/2015  
JP 3993883 B2 10/2007  
(21) Appl. No.: **29/586,719** WO 0115962 A1 3/2001

(22) Filed: **Dec. 6, 2016**

**OTHER PUBLICATIONS**

(51) **LOC (12) Cl.** ..... **12-14**

(52) **U.S. Cl.** ..... **D12/1**  
USPC ..... **D12/1**

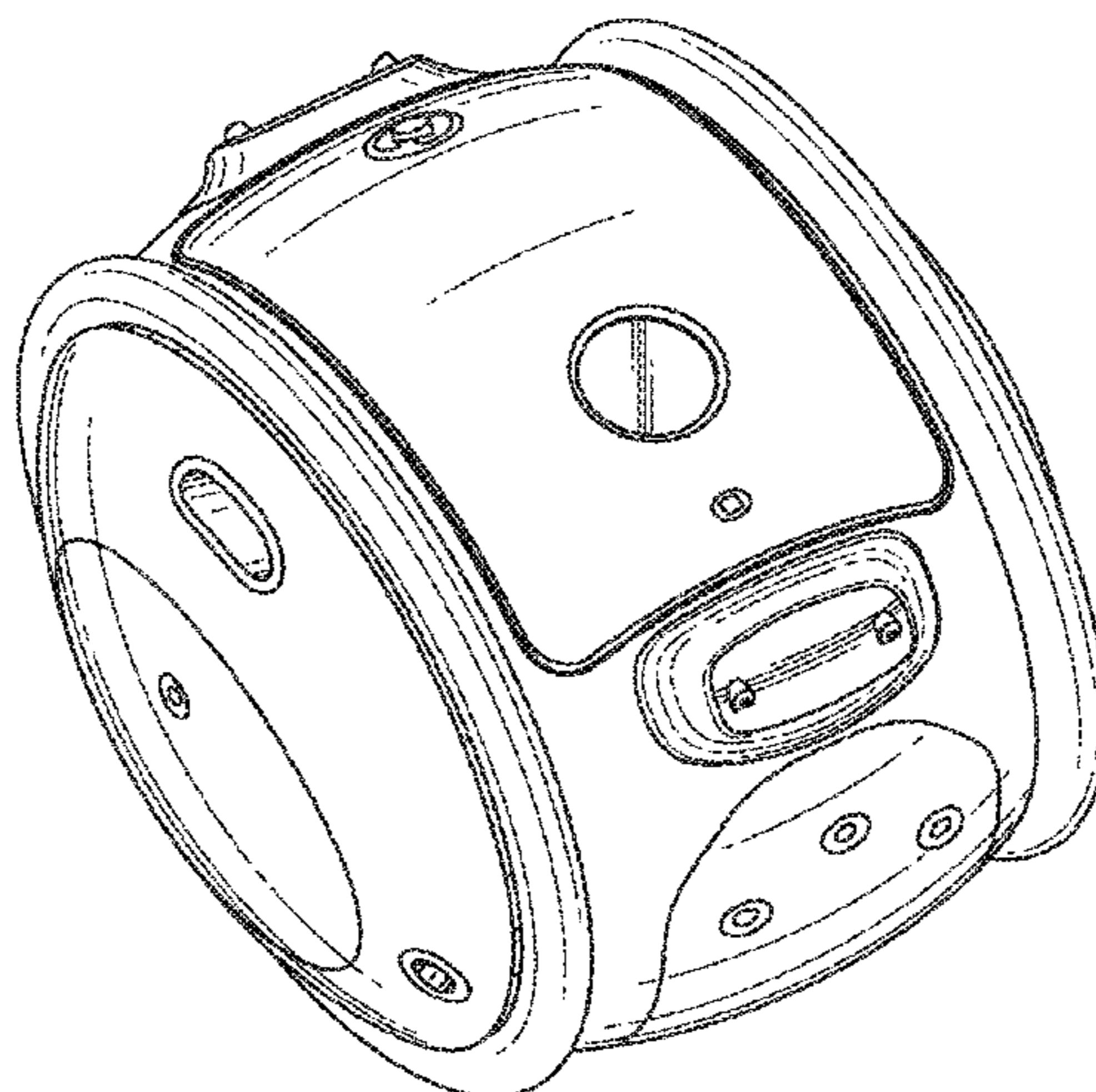
(58) **Field of Classification Search**  
USPC ..... D10/102, 103, 46, 98; D12/1, 107, 109, D12/110, 111, 112, 113, 16, 174, 178, D12/179, 180, 181, 190, 415, 43, 598, D12/86; D15/17, 28; D21/419, 423, D21/425, 433, 563, 760, 763, 764, 771, D21/779  
CPC ..... A45C 5/14; B60B 19/06; B60B 3/048; B60F 3/00; B60K 11/007; B60K 7/0007; B60L 15/2036; B62D 11/04; B62D 25/14; B62D 37/04; B62H 1/02  
See application file for complete search history.

Wu, K., et al. "Dynamic control of two-wheeled mobile robot" Journal of Astronautics, vol. 2, p. 024, 2006. (Translation of Abstract Only).  
Zhao, Yudong, et al. "Balancing control of Mobile Manipulator with Sliding mode Controller" In 2015 15th International Conference on Control, Automation and Systems (ICCAS), pp. 802-805, IEEE, Oct. 2015.  
Product 1, Photo A1—Front View.  
Product 1, Photo A2—Iso Left 1.  
Product 1, Photo A3—Iso Right 1.  
Product 1, Photo A4—Iso Right 2.  
Product 1, Photo A5—Iso Right 3.  
Product 1, Photo A6—Side View 1.  
Product 1, Photo A7—Side View 2.  
Product 1, Photo A8—Side View 3.  
Product 1, Photo A9—Side View 4.  
Product 1, Photo A10—Side View 5.  
Product 1, Photo A11—Top View.  
YouTube video uploaded on Feb. 26, 2015, titled "Still Human 2015 Présentation du Cyborg Végétal" downloaded from: <https://www.youtube.com/watch?v=Ev02Ym2ZVRE> on Feb. 7, 2017.  
Product 2, Photo B1—Back View.  
Product 2, Photo B2—Front View.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

2,267,254 A \* 12/1941 Reilly ..... B60F 3/00  
180/21  
D517,633 S \* 3/2006 Chen ..... D21/563



- Product 2, Photo B3—Iso Left View.  
 Product 2, Photo B4—Iso Right View.  
 Product 2, Photo B5—Side View 1.  
 Product 2, Photo B6—Side View 2.  
 YouTube video uploaded on Sep. 15, 2016, titled “TwinswHeel Lyon 2016 09 13 EN” downloaded from: <https://www.youtube.com/watch?v=ysYtN3Wm5Dw&feature=youtu.be> on Jan. 19, 2017.  
 YouTube video uploaded on Nov. 21, 2016, titled “TwinswHeel M6 1945 2016 11 18” downloaded from: <https://www.youtube.com/watch?v=e3laoGU56nY&feature=youtu.be> on Jan. 19, 2017.  
 Blog Jerome Libeskind—Twinswheel A quoi ressemblera le dernier kilometre dans 10 ans? With Machine Translation, 13 pages, Sep. 26, 2016. Retrieved from URL: <http://www.logicites.fr/2016/09/26/a-quoi-ressemblera-dernier-kilometre-10-ans/>.  
 Beroud, Annick. “L’intralogistique au service de la performance” à la matinale de l’Aslog (with English machine translation) L’antenne, Sep. 27, 2016. Retrieved from URL: [http://www.lantenne.com/L-intralogistique-au-service-de-la-performance-a-la-matinale-de-l-Aslog\\_a33383.html](http://www.lantenne.com/L-intralogistique-au-service-de-la-performance-a-la-matinale-de-l-Aslog_a33383.html).  
 Hay, Benjamin. TwinswHeel, le livreur de colis de demain? (with English machine translation) Tumblr French IoT, Oct. 6, 2016. Retrieved from URL: <http://french-iot.tumblr.com/post/151417346436/twinswheel-le-livreur-de-colis-de-demain-la>.  
 Product 3, Photo C1—Colors.  
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 Product 3, Photo C6—Iso Right View.  
 Product 3, Photo C7—Side View.  
 Product 3, Photo C8—Top View 1.  
 Product 3, Photo C9—Top View 2.  
 Product 3, Photo C10—Top View 3.  
 Product 4, Photo D1—Back View.  
 Product 4, Photo D2—Front View.  
 Product 4, Photo D3—Iso Left View.  
 Product 4, Photo D4—Iso Right View 1.  
 Product 4, Photo D5—Iso Right View 2.  
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 Product 4, Photo D8—Side View 3.  
 Goher, K. M., et al. “Dynamic Modeling and Control of a Two Wheeled Robotic Vehicle with a Virtual Payload”, ARPN Journal of Engineering and Applied Sciences, vol. 6, No. 3, pp. 7-41, Mar. 2011.  
 Product 1, Photo A1—Back View.  
 Product 1, Photo A2—Front View.  
 Product 1, Photo A3—Front View 2.  
 Product 1, Photo A4—Side View.  
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 Product 2, Photo B2—Iso.  
 Product 2, Photo B3—Iso 2.  
 Product 2, Photo B4—Side View.  
 Product 3, Photo C1—Back View.  
 Product 3, Photo C2—Front View.  
 Product 3, Photo C3—Side View.  
 Product 3, Photo C4—Top View.  
 Product 4, Photo D2—Detail view.  
 Product 4, Photo D3—Front View.  
 Product 4, Photo D4—Side View.  
 Product 5, Photo E1—Back View.  
 Product 5, Photo E2—Bottom view.  
 Product 5, Photo E3—Front View.  
 Product 5, Photo E4—Iso Left.  
 Product 5, Photo E5—Iso Right.  
 Product 5, Photo E6—Left.  
 Product 5, Photo E7—Right.  
 Product 5, Photo E8—Top.  
 Product 6, Photo F1—Iso.  
 Product 6, Photo F2—Side View.  
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 Product 6, Photo F4—Tumbleweed Side View.  
 YouTube video uploaded on Sep. 15, 2016, titled “TwinswHeel Lyon 2016 09 13 EN” downloaded from: <https://www.youtube.com/iwatch?v=ysYtN3Wm5Dw&feature=youtu.be> on Jan. 19, 2017.  
 Product 1, Photo A1: Cyborg Vegetal, Front View.  
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 Product 1, Photo A4: Cyborg Vegetal, Iso Right View 2.  
 Product 1, Photo A5: Cyborg Vegetal, Iso Right View 3.  
 Product 1, Photo A6: Cyborg Vegetal, Side View 1.  
 Product 1, Photo A7: Cyborg Vegetal, Side View 2.  
 Product 1, Photo A8: Cyborg Vegetal, Side View 3.  
 Product 1, Photo A9: Cyborg Vegetal, Side View 4.  
 Product 1, Photo A10: Cyborg Vegetal, Side View 5.  
 Product 1, Photo A11: Cyborg Vegetal, Top View.  
 Product 2, Photo B1: Twinswheel, Back View.  
 Product 2, Photo B2: Twinswheel, Front View.  
 Product 2, Photo B3: Twinswheel, Iso Left View.  
 Product 2, Photo B4: Twinswheel, Iso Right View.  
 Product 2, Photo B5: Twinswheel, Side View 1.  
 Product 2, Photo B6: Twinswheel, Side View 2.  
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 Product 4, Photo D5: Kugelpanzer, Iso Right View 2.  
 Product 4, Photo D6: Kugelpanzer, Side View 1.  
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 Product 4, Photo D8: Kugelpanzer, Side View 3.  
 Hu, Jian, et al. “Analysis of two-wheeled self-balancing mobile robots based on ADRC.” *Journal of Mechanical & Electrical Engineering*, vol. 31, No. 2, pp. 159-164, 2014. (Translation of Abstract Only).  
 Ji, Pengfei, et al. “Design of Self-balancing Two-wheeled Vehicle Control System Based on STM32” *Electronic Science and Technology*, vol. 11, p. 29, 2014. (Translation of Abstract Only).  
 Larimi, S. Reza, et al. “A New Stabilization Algorithm for a Two-Wheeled Mobile Robot Aided by Reaction Wheel” *Journal of Dynamic Systems, Measurement, and Control*, vol. 137, No. 1, paper 011009, Jan. 2015.  
 Libeskind, Jerome. Blog Jerome Libeskind, “A quoi ressemblera le dernier kilometre dans 10 ans?” (“What will the last mile look like in 10 years?”) *TwinswHeel*, Sep. 26, 2016. retrieved from URL: <http://www.logicites.fr/2016/09/26/a-quoi-ressemblera-dernier-kilometre-10-ans/> (with English machine translation).  
 Rahman, M.T. Abdul, et al. “Centre of Gravity (C.O.G.)-Based Analysis on the Dynamics of the Extendable Double-Link Two-Wheeled Mobile Robot” In *IOP Conference Series: Materials Science and Engineering*, vol. 53, No. 1, paper 012079, 2013.  
 Ruan, X., et al. “Research on stable control for two-wheeled self-balancing robot in complex environment” *Beijing Gongye Daxue Xuebao (Journal of Beijing University of Technology)*, vol. 37, No. 9, pp. 1310-1316, Sep. 2011. (Translation of Abstract Only).  
 Sales, Jorge, et al. “CompaRob: The Shopping Cart Assistant Robot” *International Journal of Distributed Sensor Networks*, vol. 2016, Article ID 4781280, 15 pages, 2016.  
 Van Der Wijk, Volkert, et al. “Force Balancing of Variable Payload by Active Force-Balanced Reconfiguration of the Mechanism” in *ASME/IFTOMM International Conference on Reconfigurable Mechanisms and Robots*, pp. 323-330, IEEE, Jun. 2009.

Wang, Kun, et al. “Enhanced active dynamic balancing of the planar robots using a three-rotating-bar balancer” *Advances in Mechanical Engineering*, vol. 8, No. 4, 1687814016643885, Apr. 2016.

\* cited by examiner

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*Assistant Examiner* — Jerry Shiuan-Hua Hsu

(74) *Attorney, Agent, or Firm* — Onello & Mello, LLP

(57) **CLAIM**

The ornamental design for a vehicle, as shown and described.

**DESCRIPTION**

FIG. 1 is a top-front perspective view of the vehicle, showing our new design;

FIG. 2 is a top view thereof;

FIG. 3 is a bottom view thereof;

FIG. 4 is a front side view thereof;

FIG. 5 is a rear side view thereof;

FIG. 6 is a left side view thereof, the right side view being a mirror image;

FIG. 7 is a top-rear perspective view thereof;

FIG. 8 is a top-front perspective view of a second embodiment of the vehicle;

FIG. 9 is a top view thereof;

FIG. 10 is a bottom view thereof;

FIG. 11 is a front side view thereof;

FIG. 12 is a rear side view thereof;

FIG. 13 is a left side view thereof, the right side view being a mirror image;

FIG. 14 is a top-rear perspective view thereof;

FIG. 15 is a top-front perspective view of a third embodiment of the vehicle;

FIG. 16 is a top view thereof;

FIG. 17 is a bottom view thereof;

FIG. 18 is a front side view thereof;

FIG. 19 is a rear side view thereof;

FIG. 20 is a left side view thereof, the right side view being a mirror image;

FIG. 21 is a top-rear perspective view thereof;

FIG. 22 is a top-front perspective view of a fourth embodiment of the vehicle;

FIG. 23 is a top view thereof;

FIG. 24 is a bottom view thereof;

FIG. 25 is a front side view thereof;

FIG. 26 is a rear side view thereof;

FIG. 27 is a left side view thereof, the right side view being a mirror image;

FIG. 28 is a top-rear perspective view thereof;

FIG. 29 is a top-front perspective view of a fifth embodiment of the vehicle;

FIG. 30 is a top view thereof;

FIG. 31 is a bottom view thereof;

FIG. 32 is a front side view thereof;

FIG. 33 is a rear side view thereof;

FIG. 34 is a left side view thereof, the right side view being a mirror image;

FIG. 35 is a top-rear perspective view thereof;

FIG. 36 is a top-front perspective view of a sixth embodiment of the vehicle;

FIG. 37 is a top view thereof;

FIG. 38 is a bottom view thereof;

FIG. 39 is a front side view thereof;

FIG. 40 is a rear side view thereof;

FIG. 41 is a left side view thereof, the right side view being a mirror image; and,

FIG. 42 is a top-rear perspective view thereof.

**1 Claim, 42 Drawing Sheets**

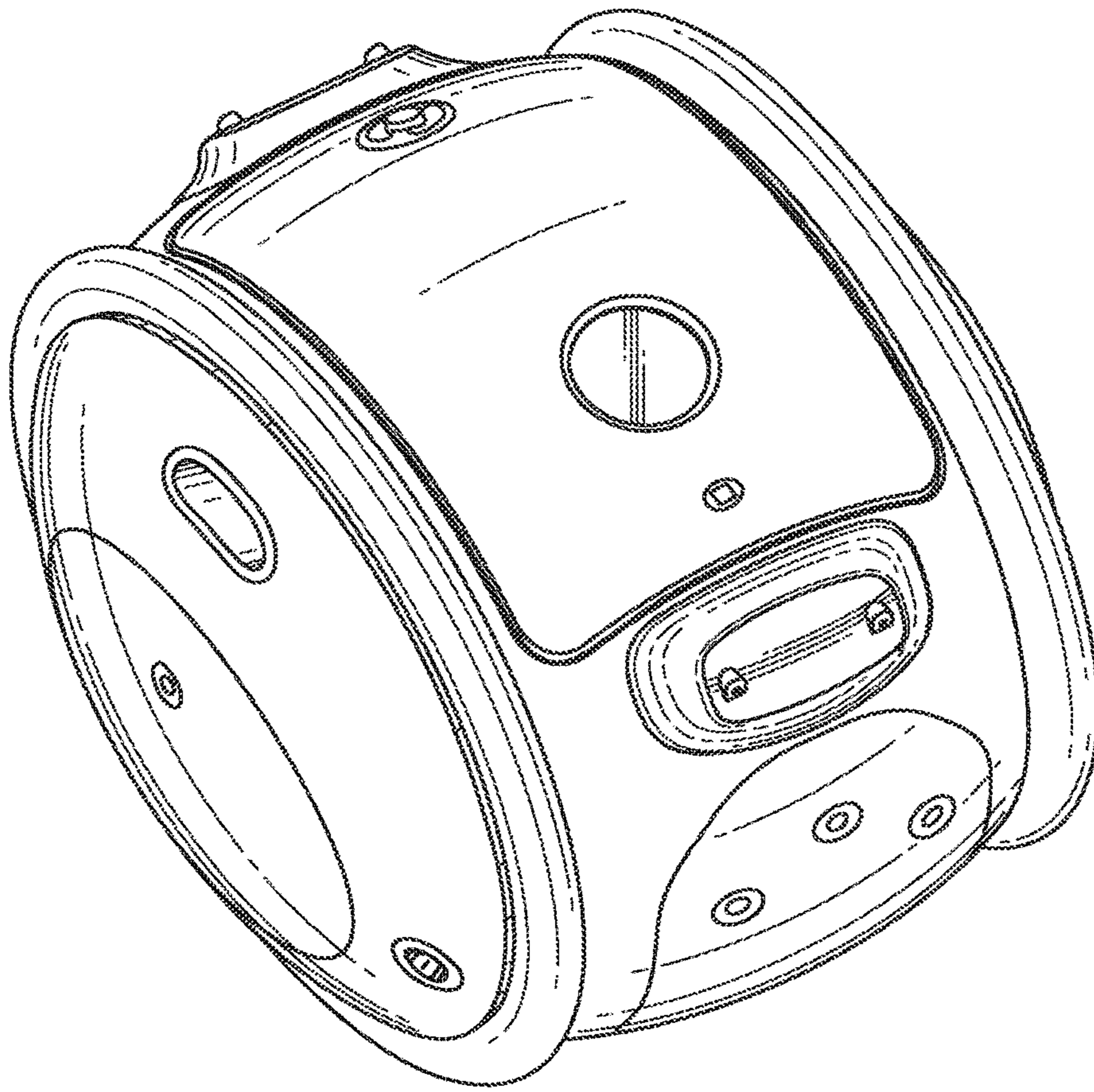


FIG. 1

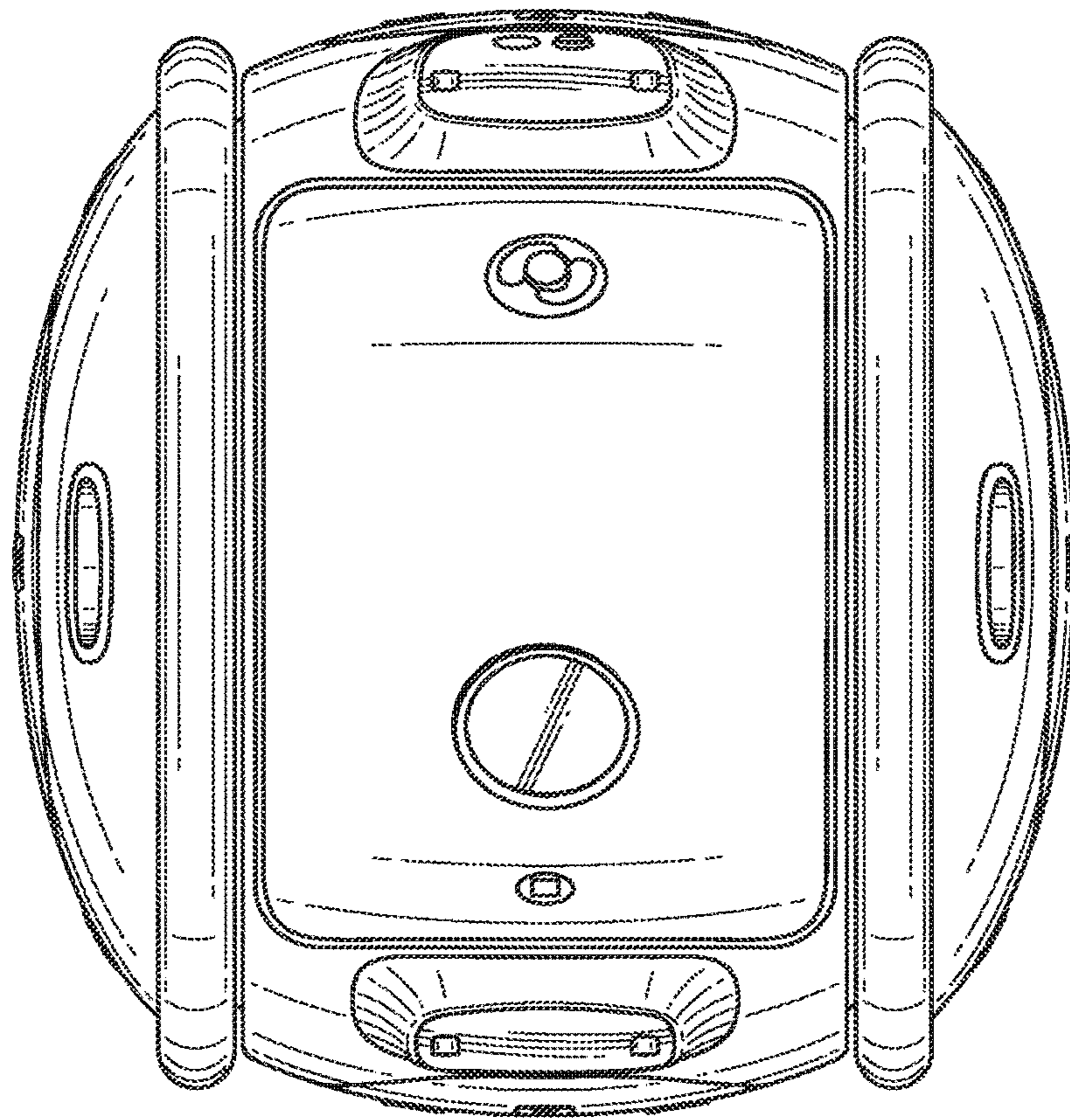


FIG. 2

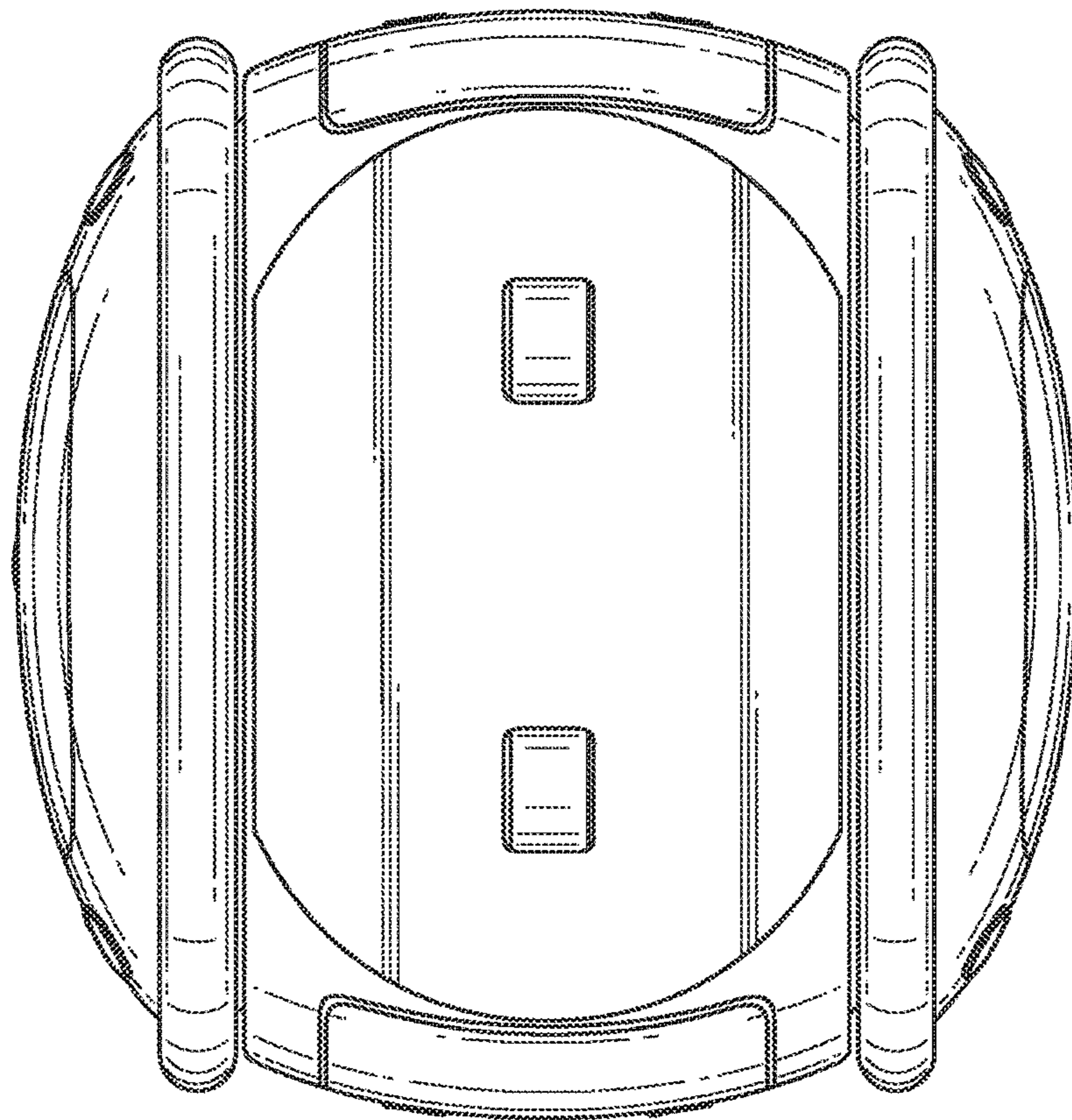


FIG. 3

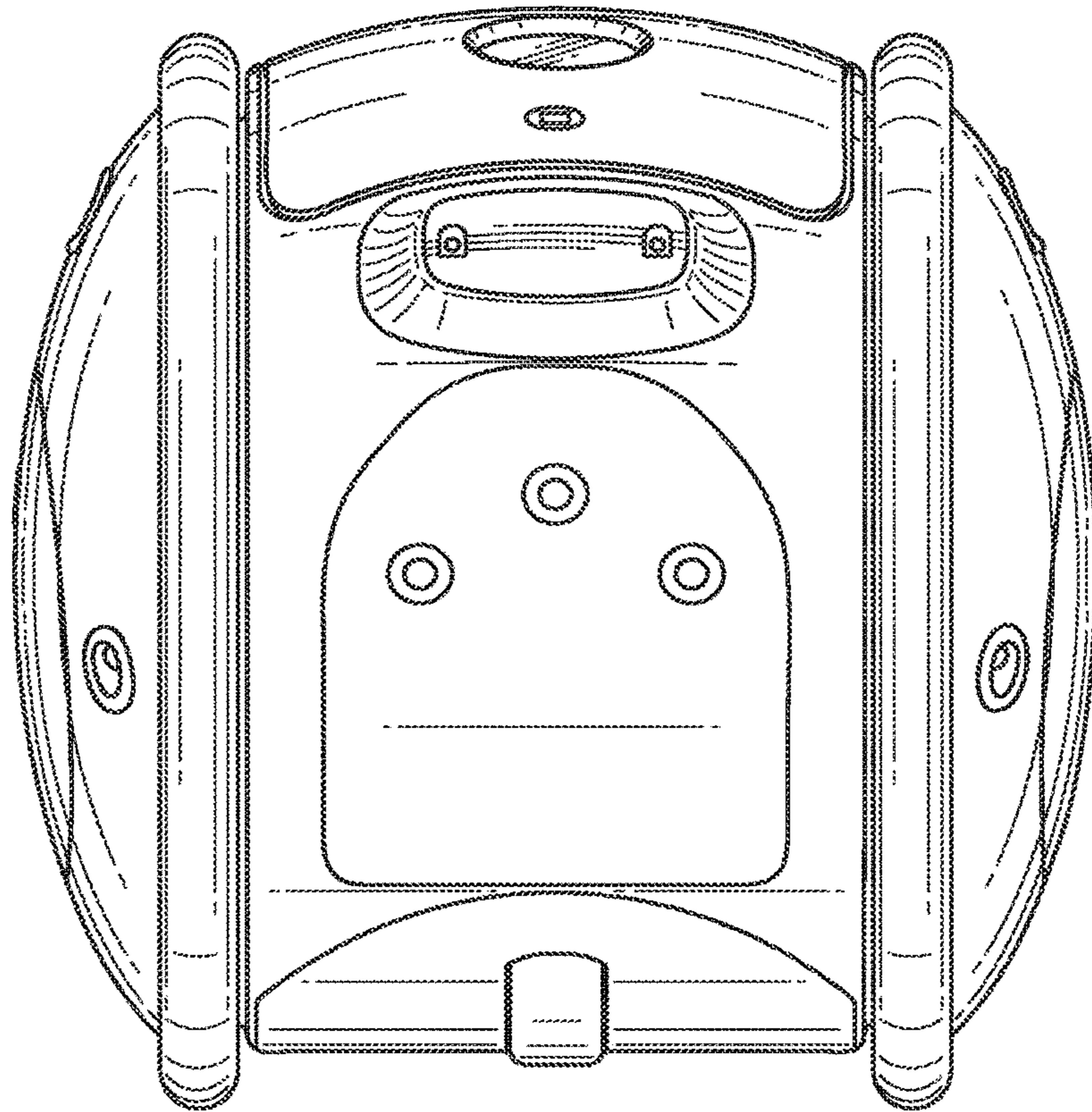


FIG. 4

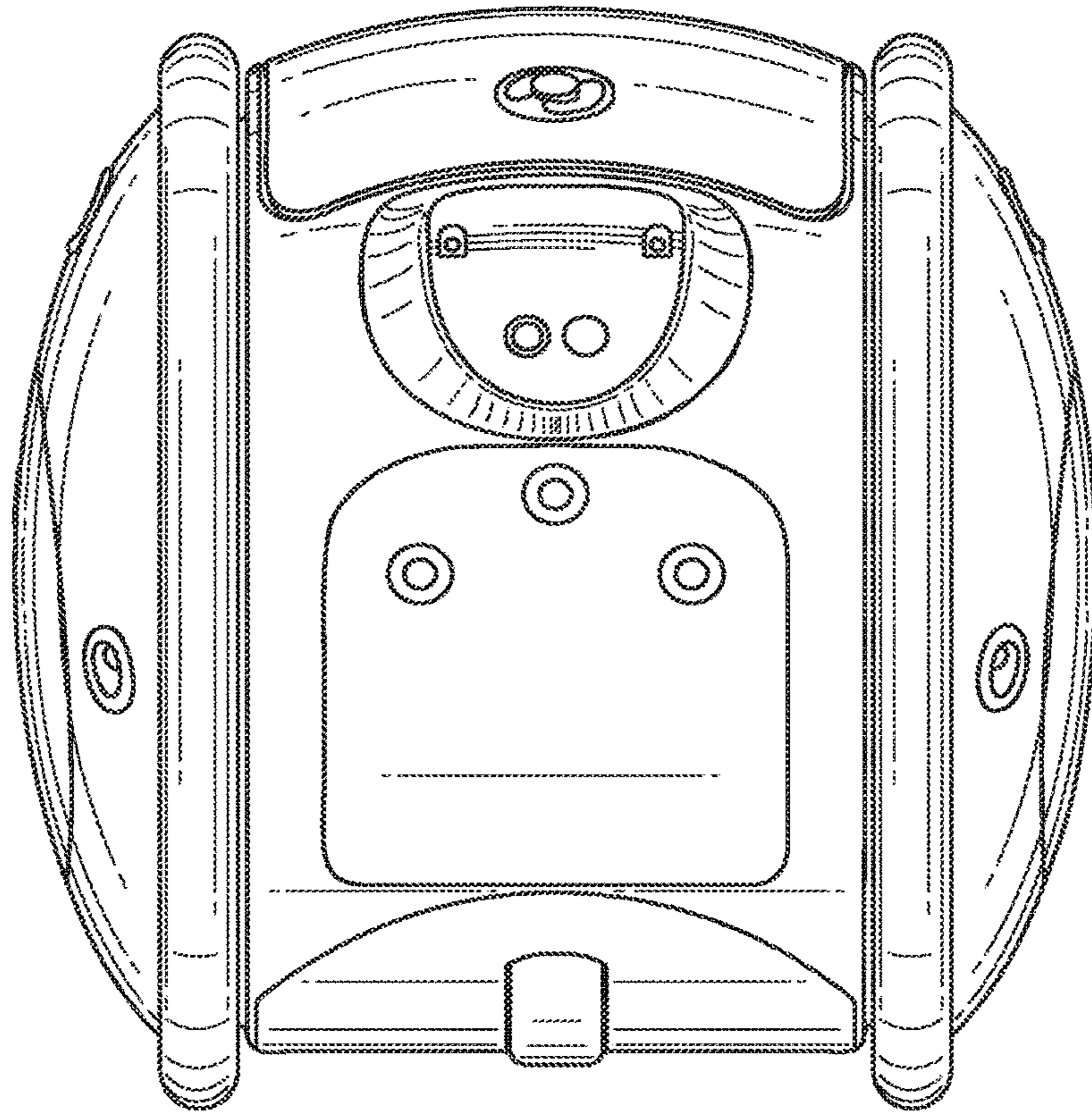


FIG. 5



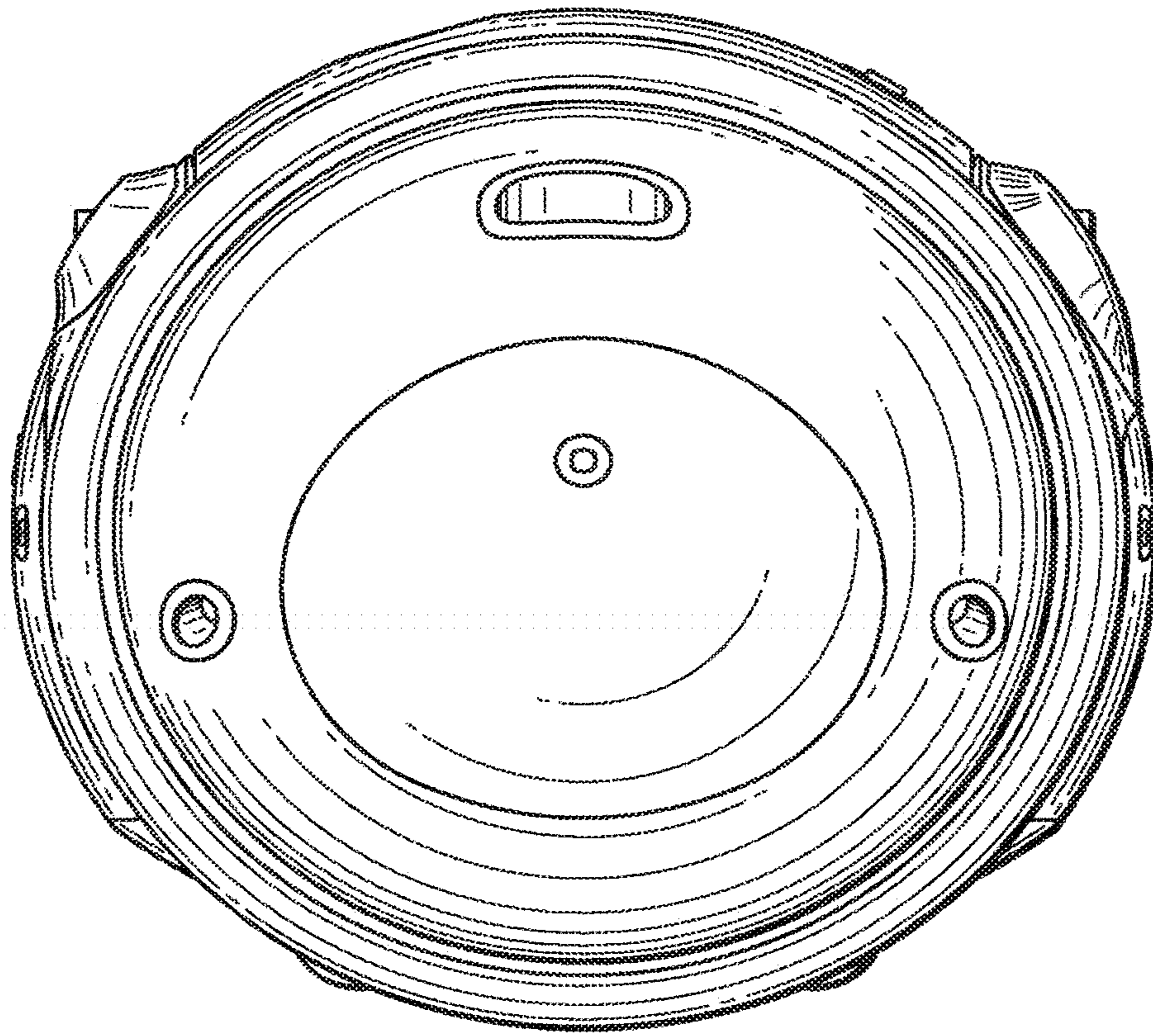


FIG. 6

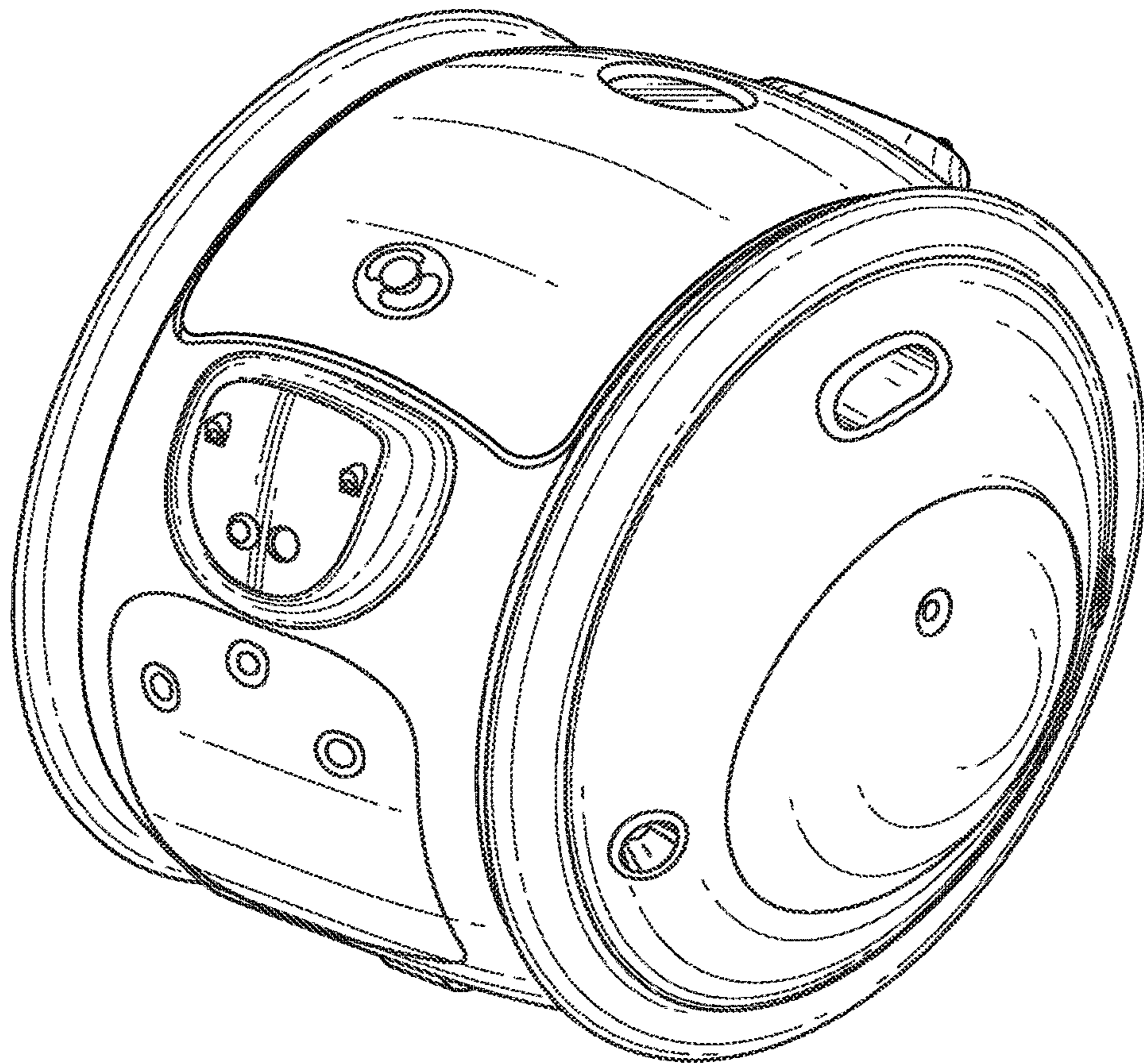


FIG. 7

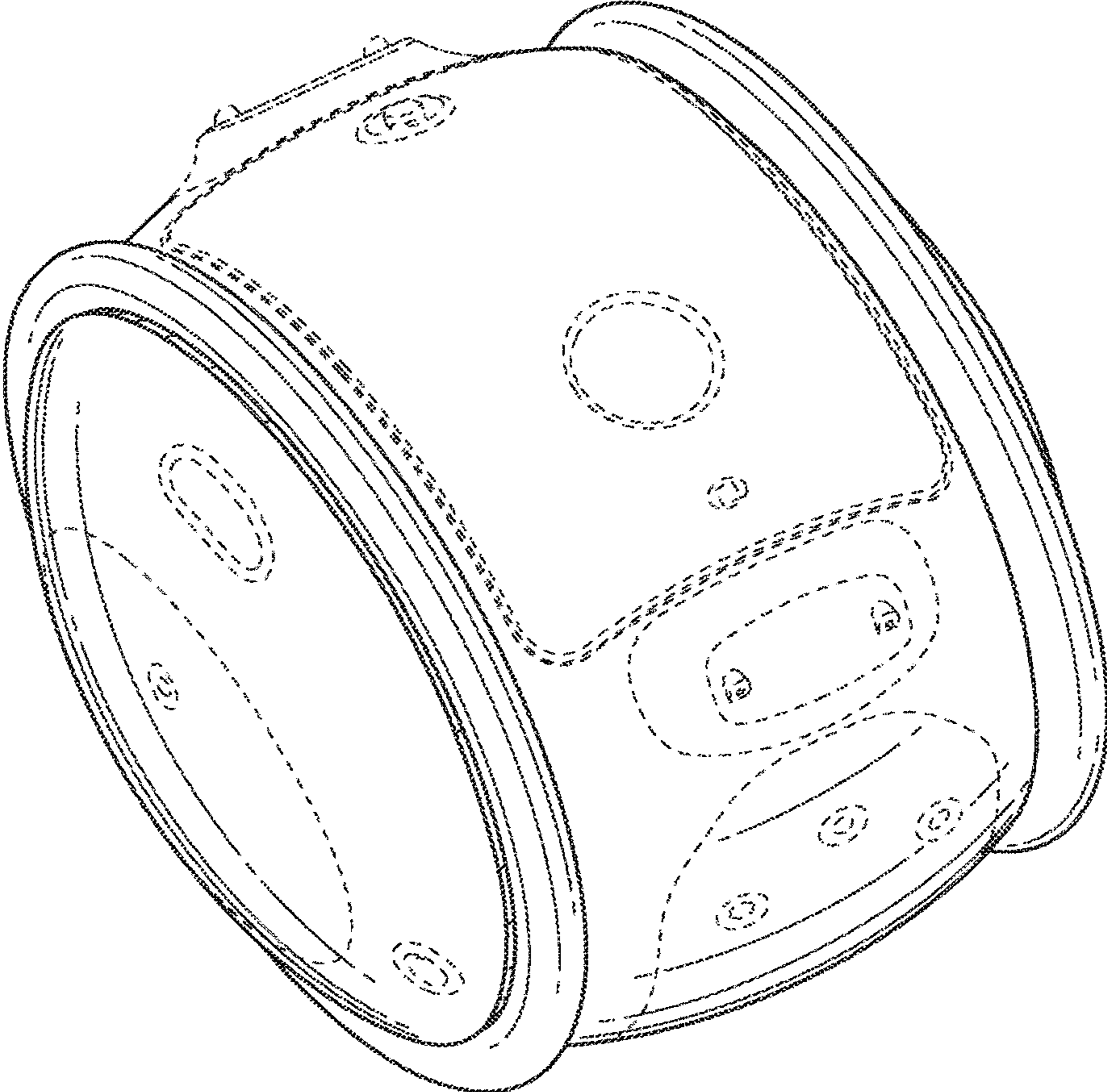


FIG. 8

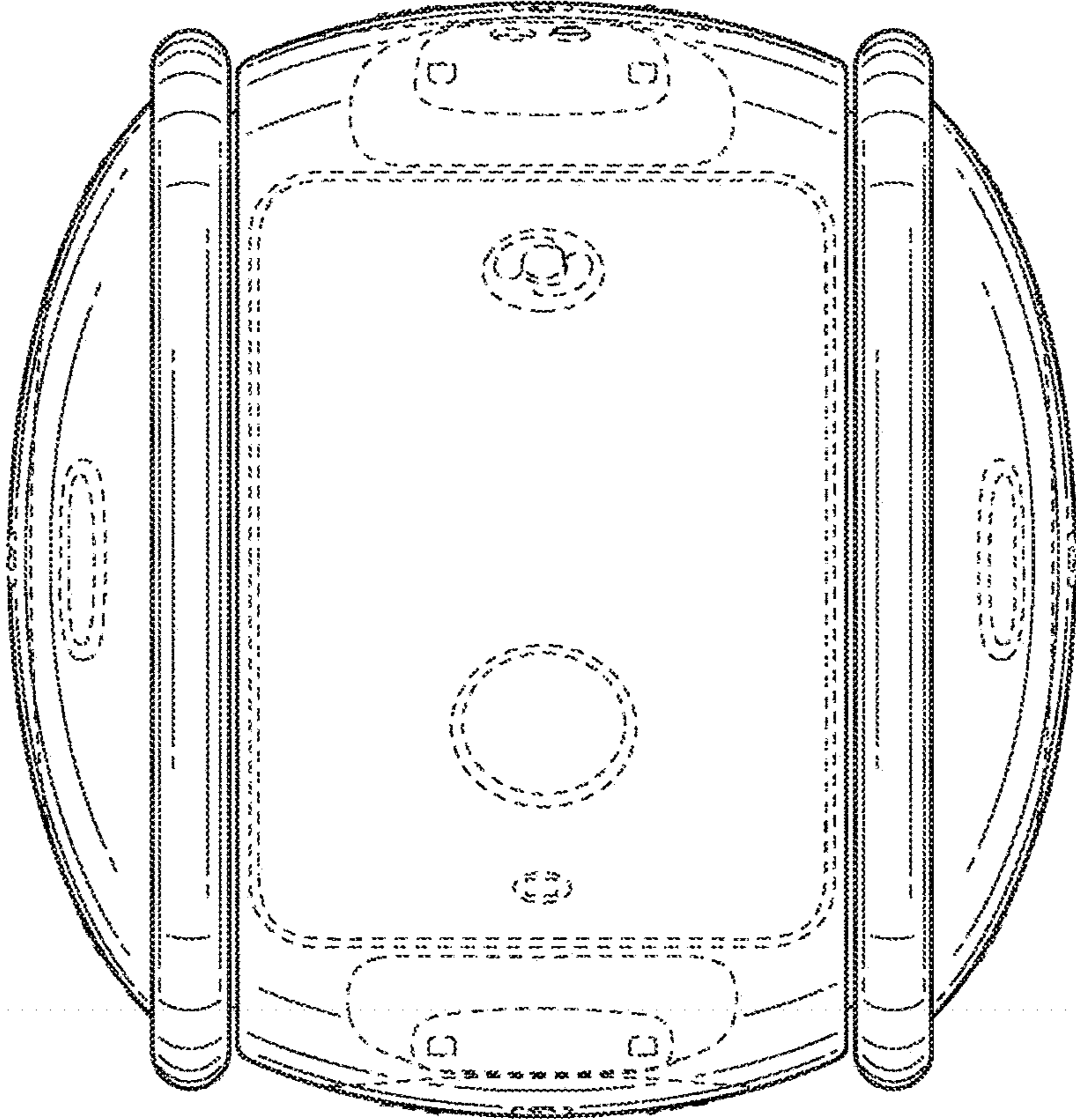


FIG. 9

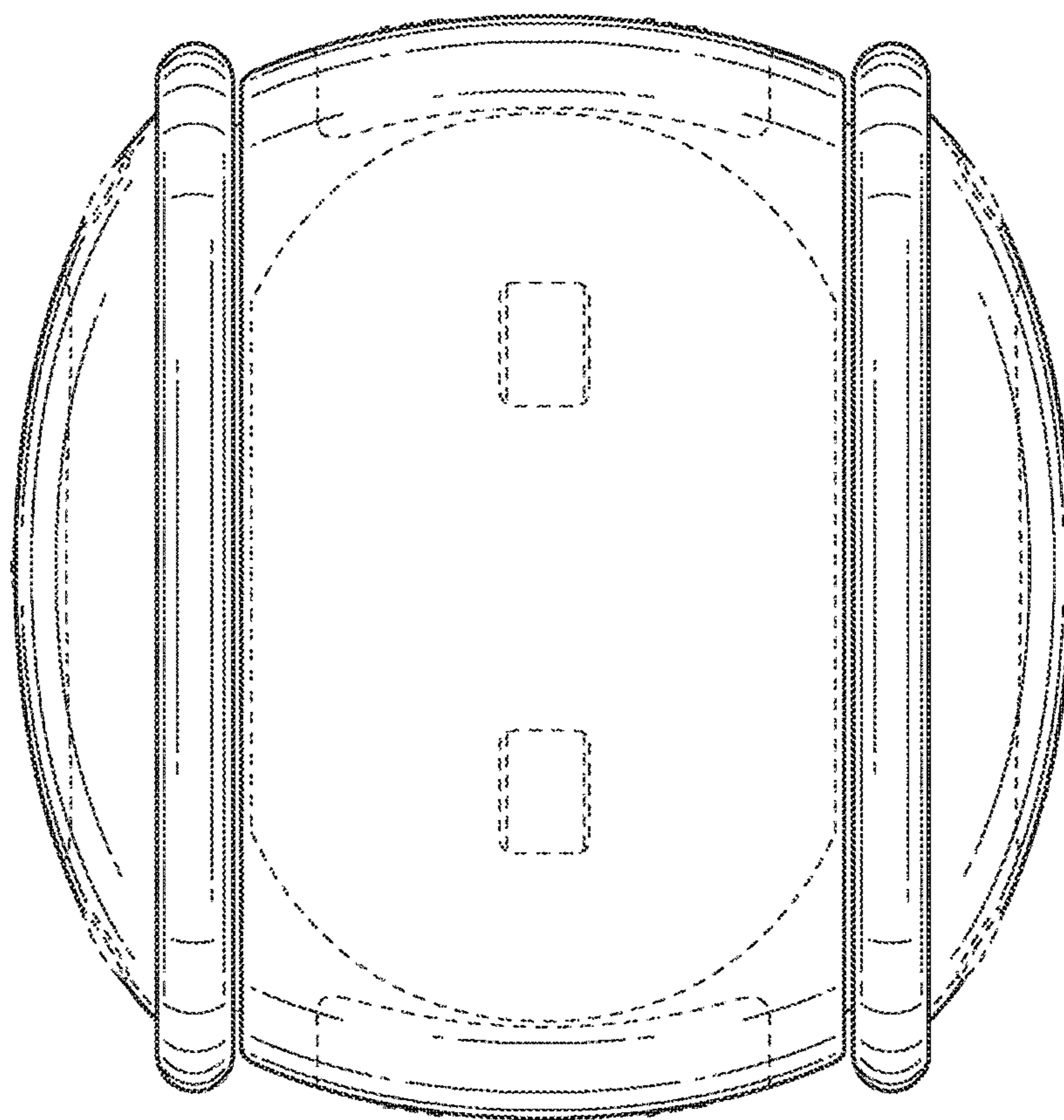


FIG. 10

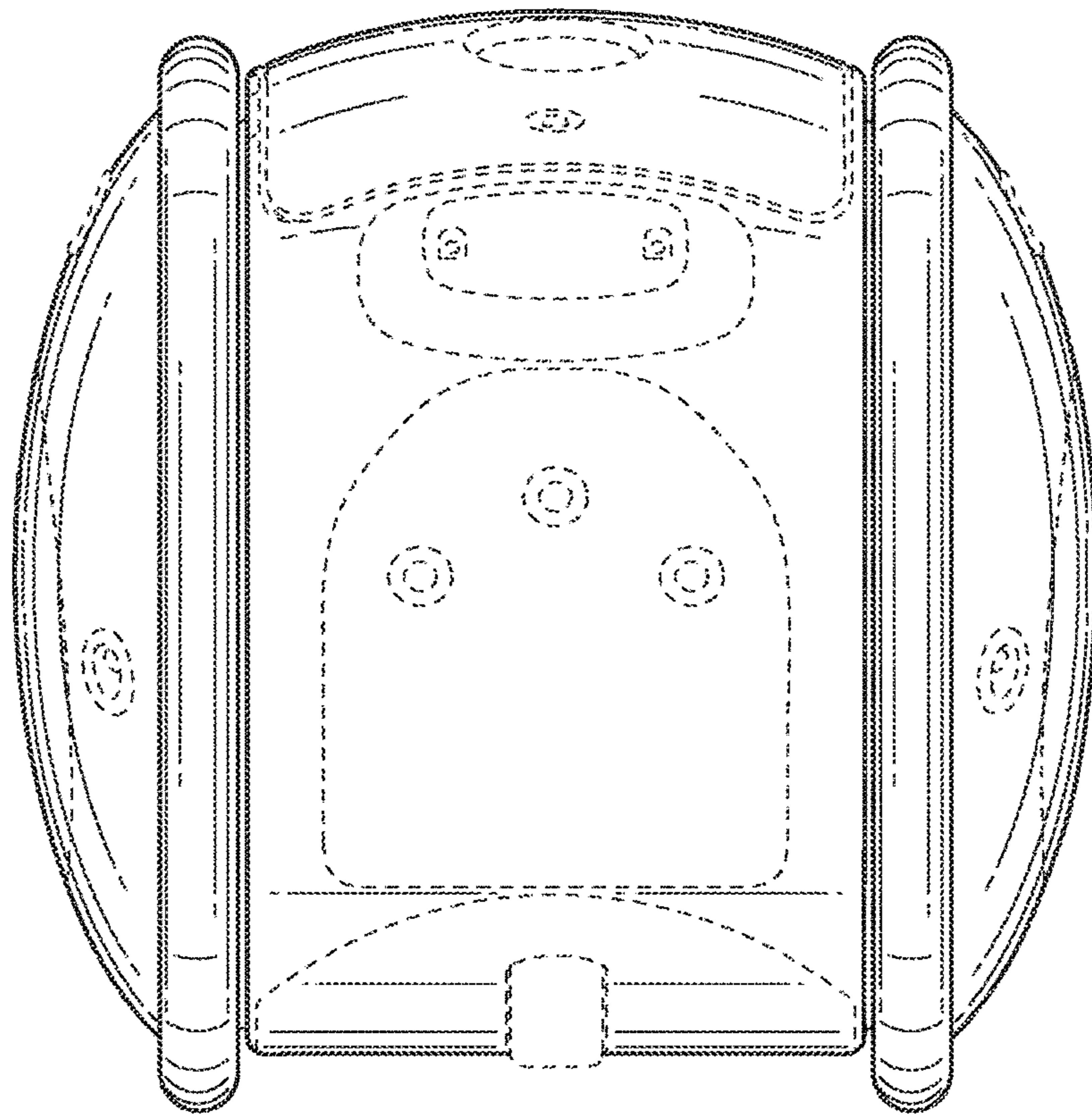


FIG. 11

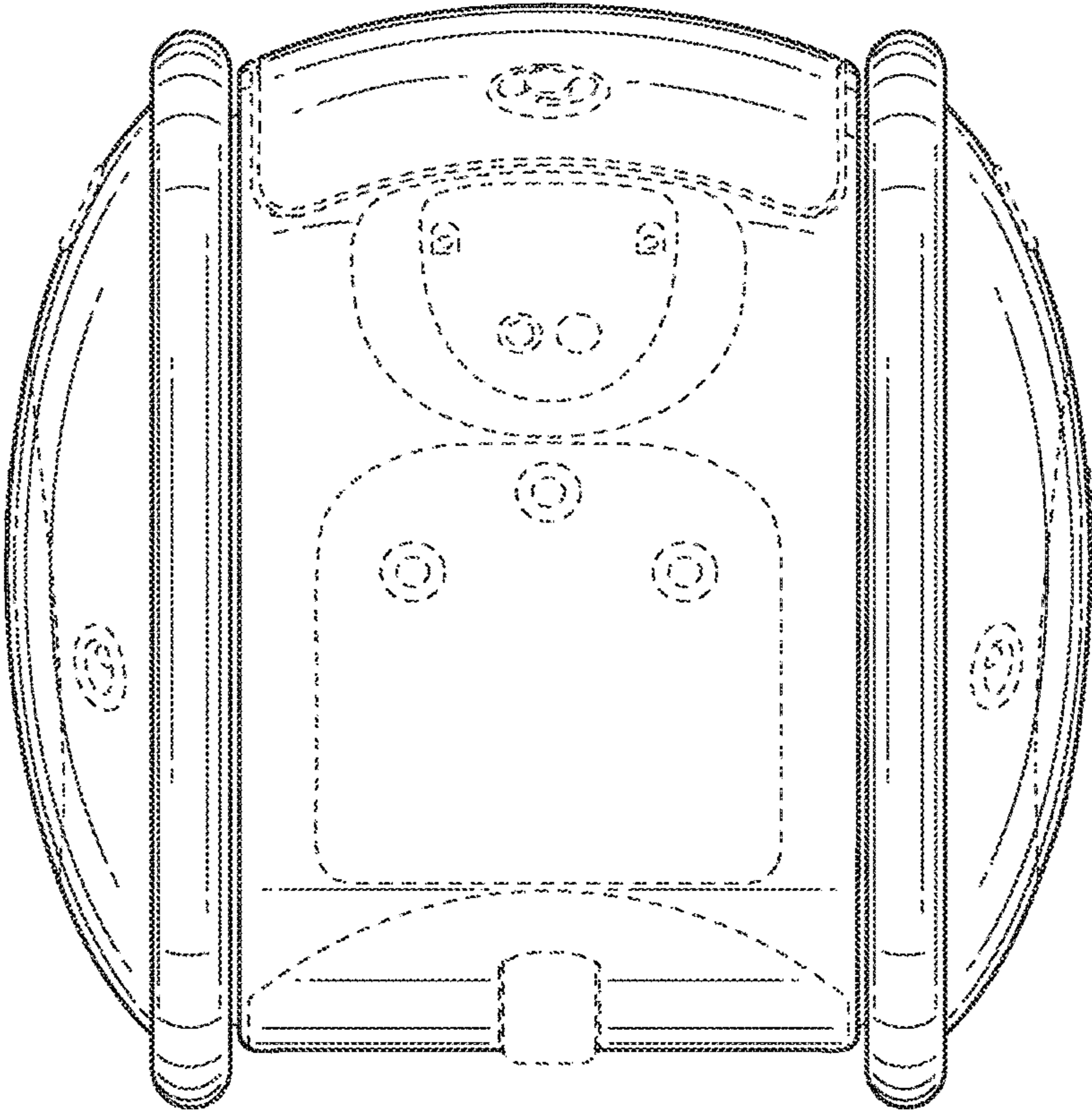


FIG. 12

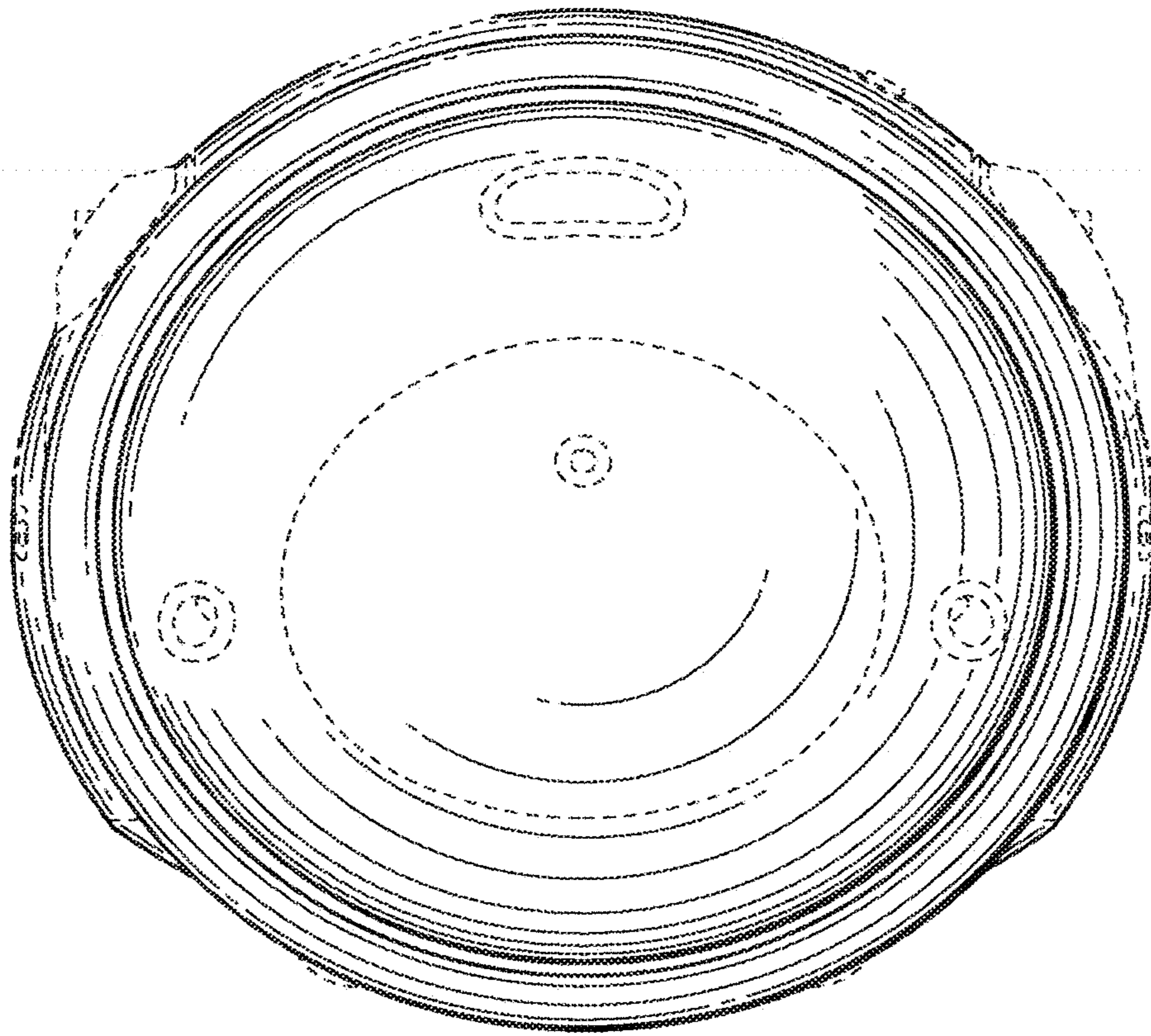


FIG. 13



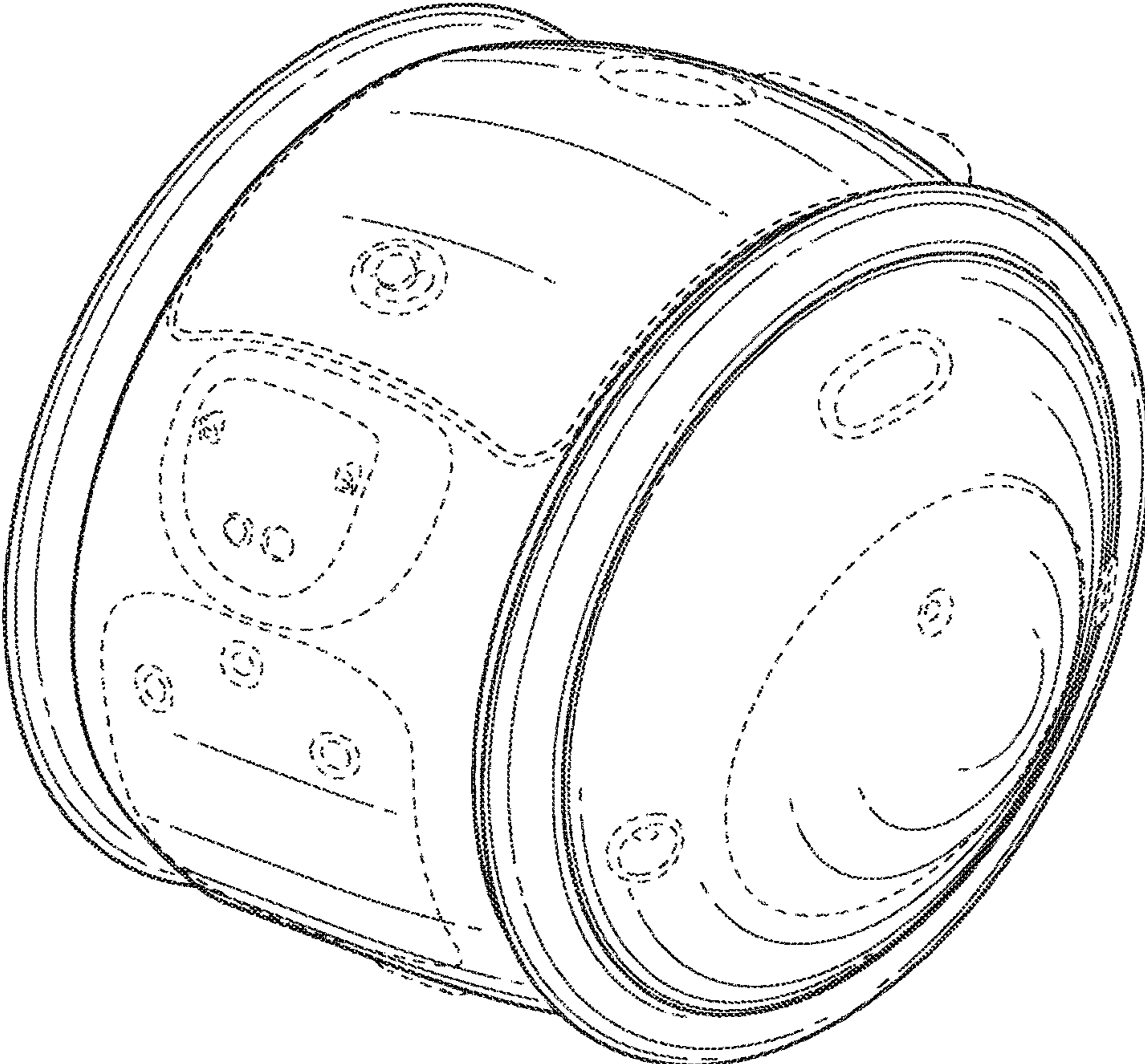


FIG. 14

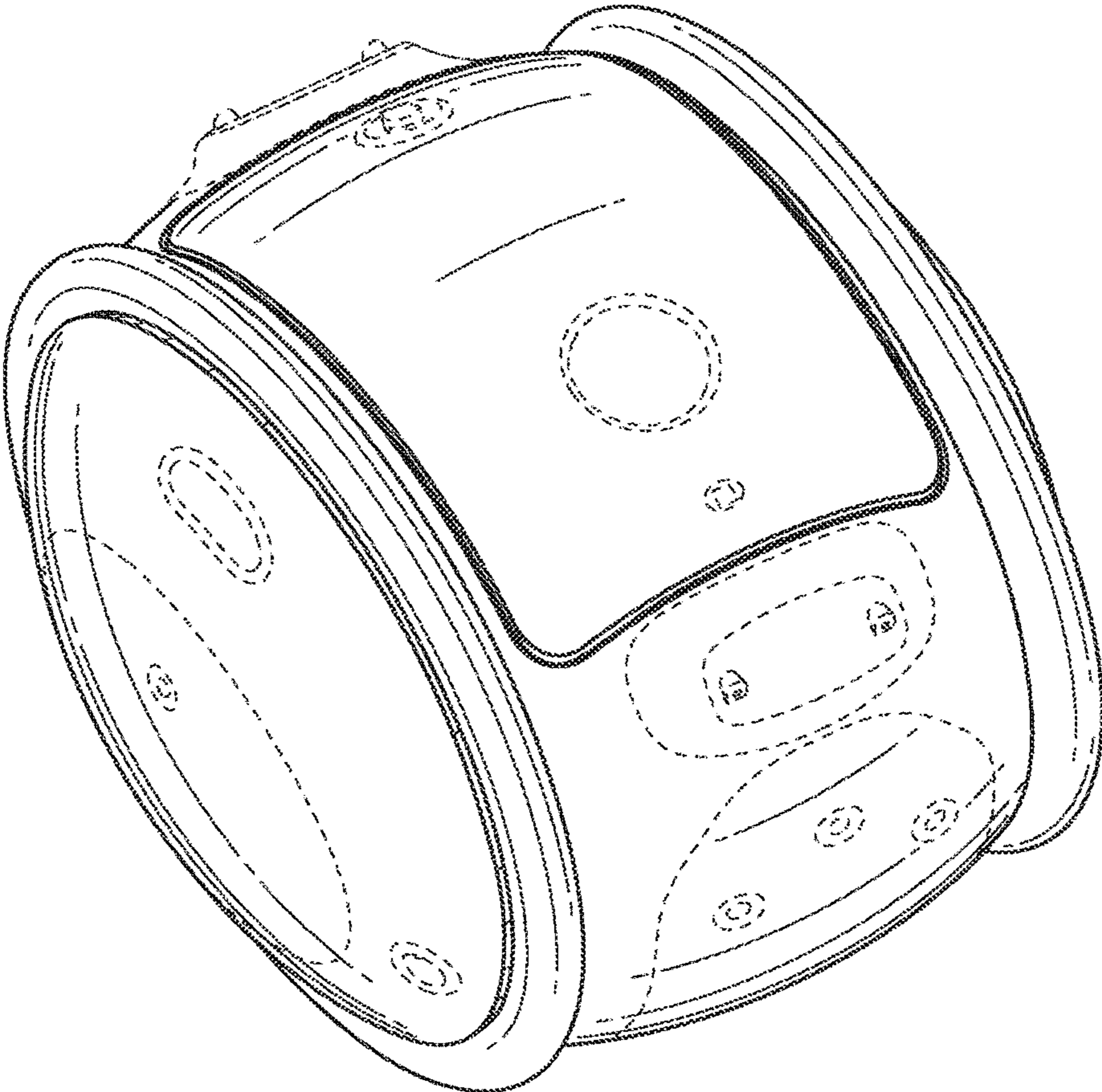


FIG. 15

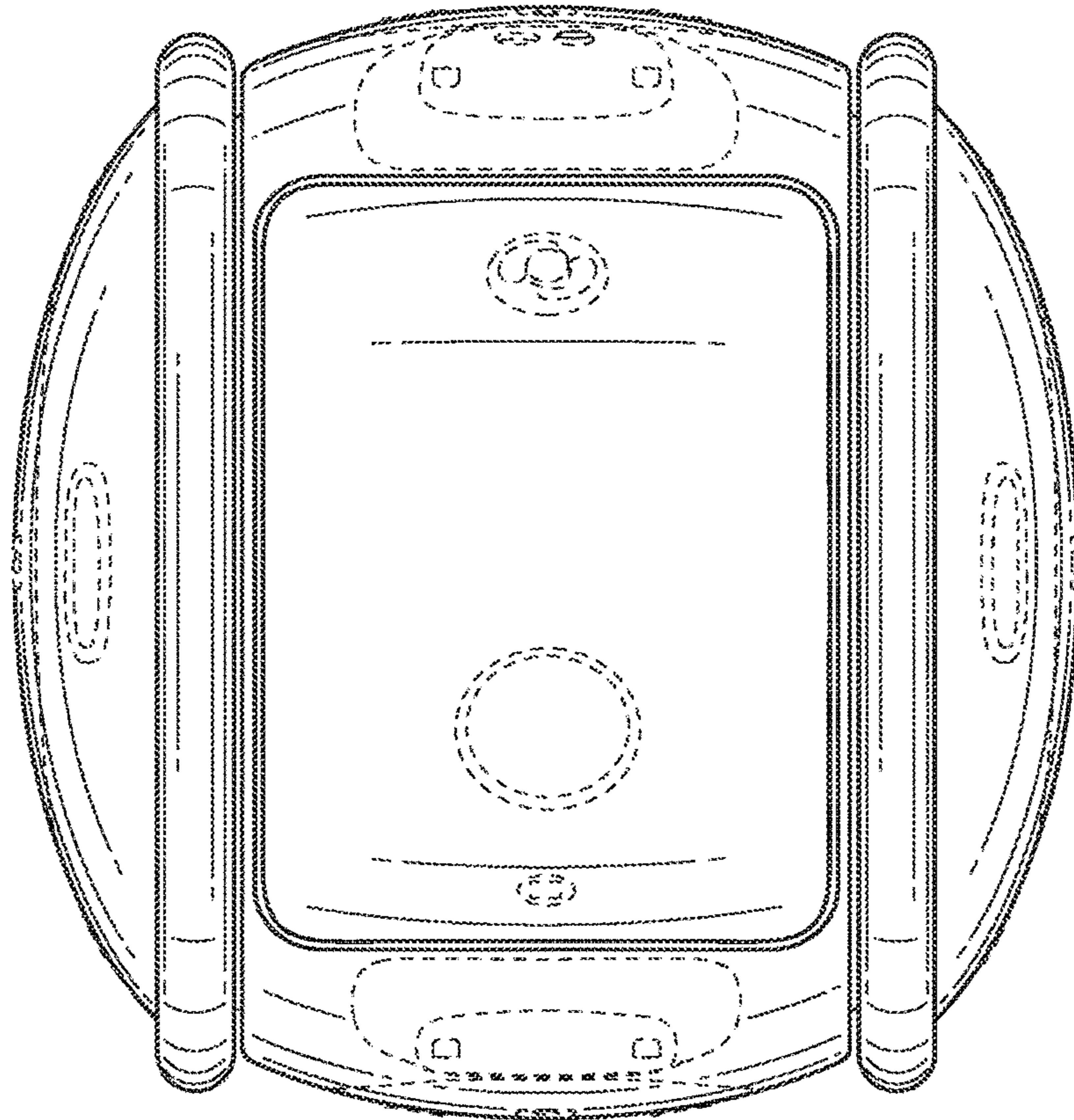


FIG. 16

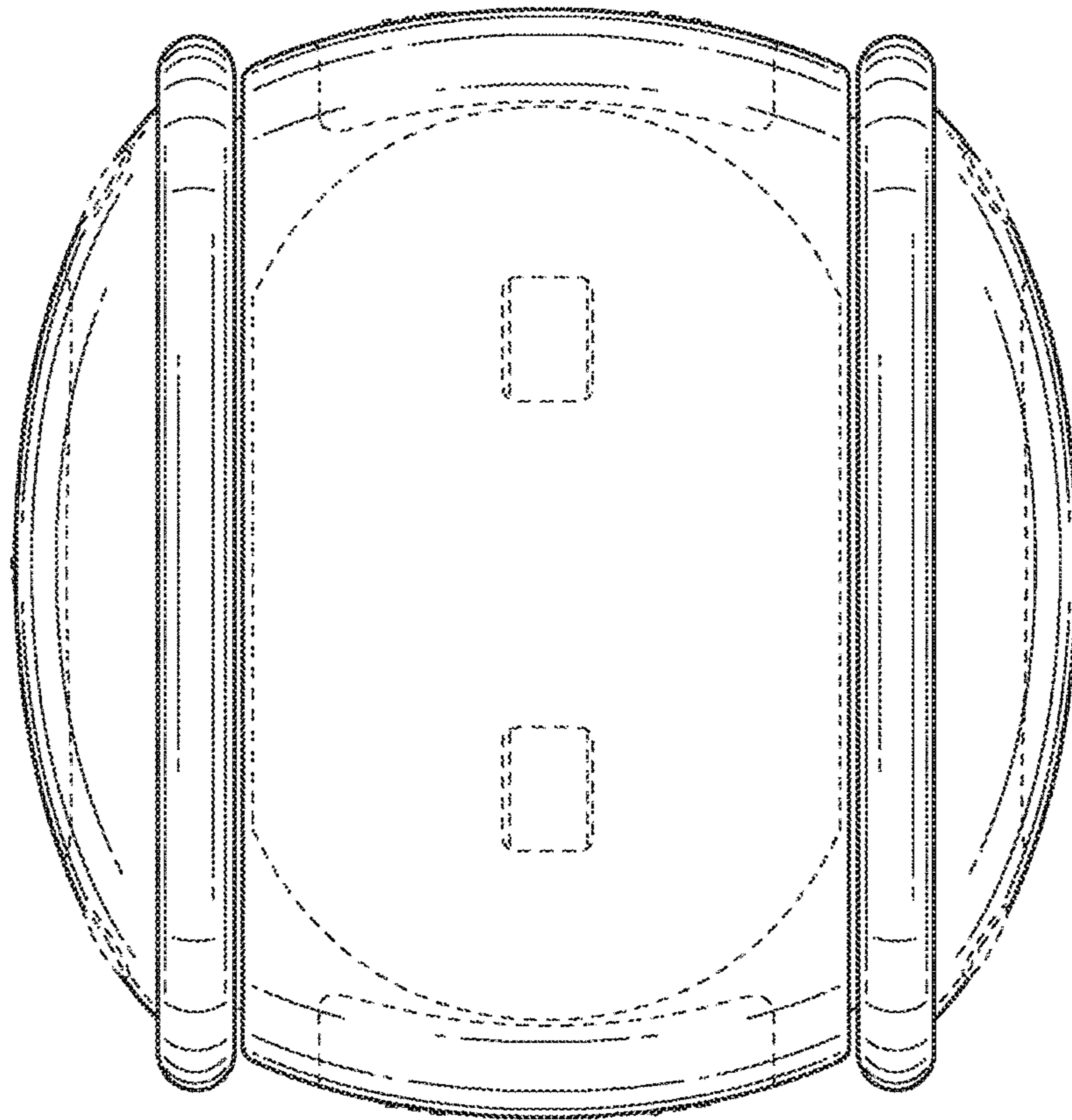


FIG. 17

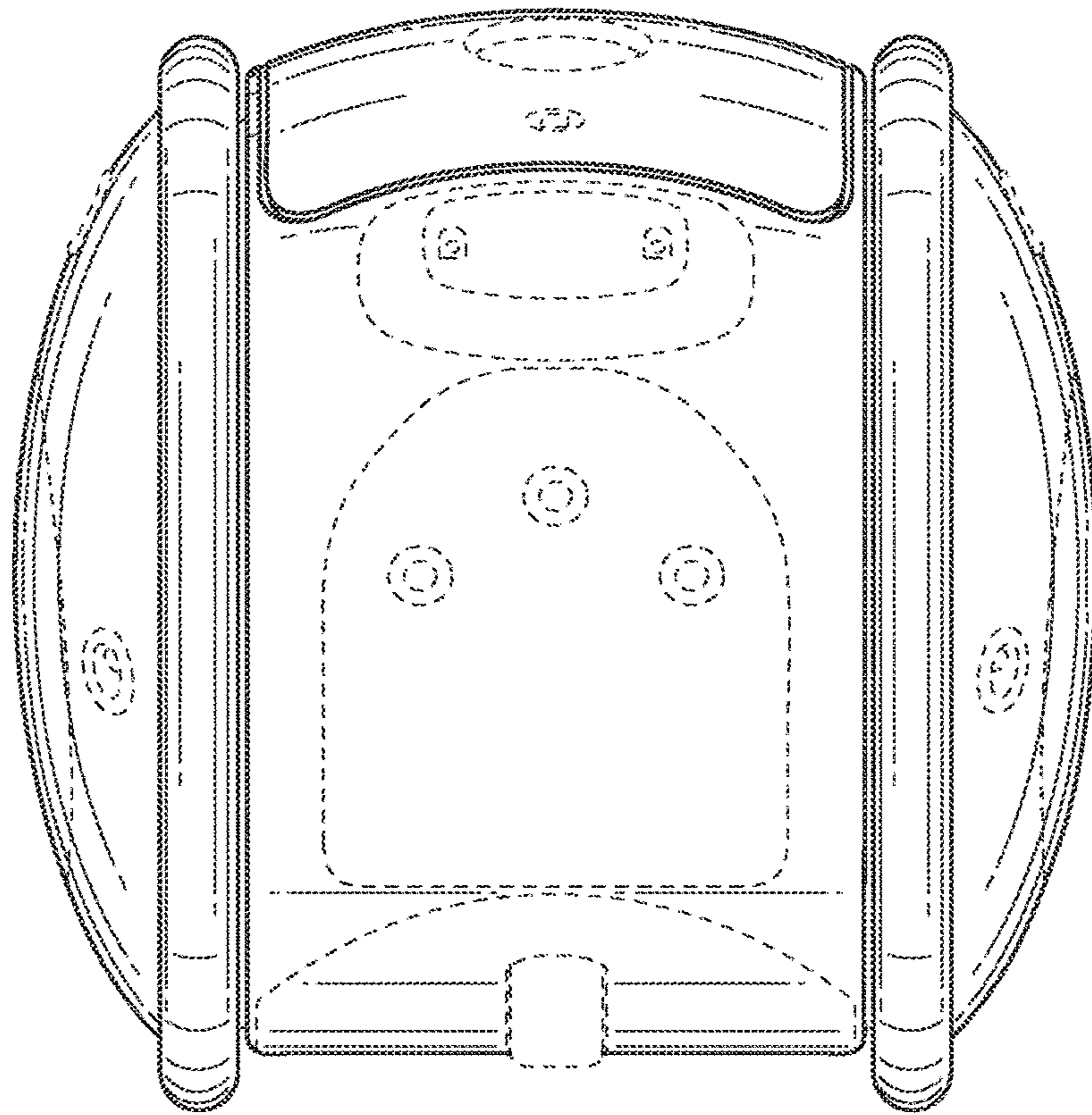


FIG. 18

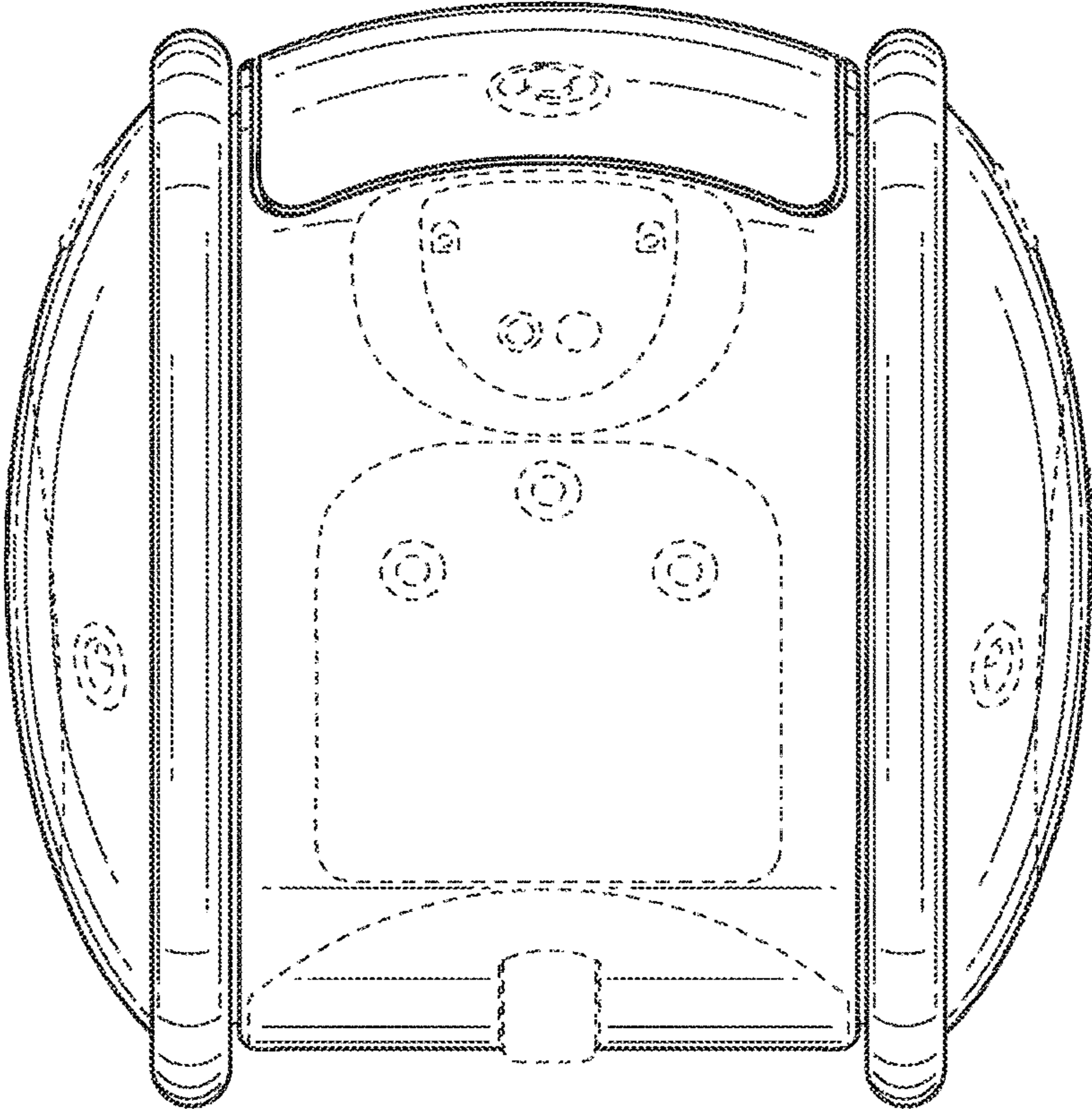


FIG. 19

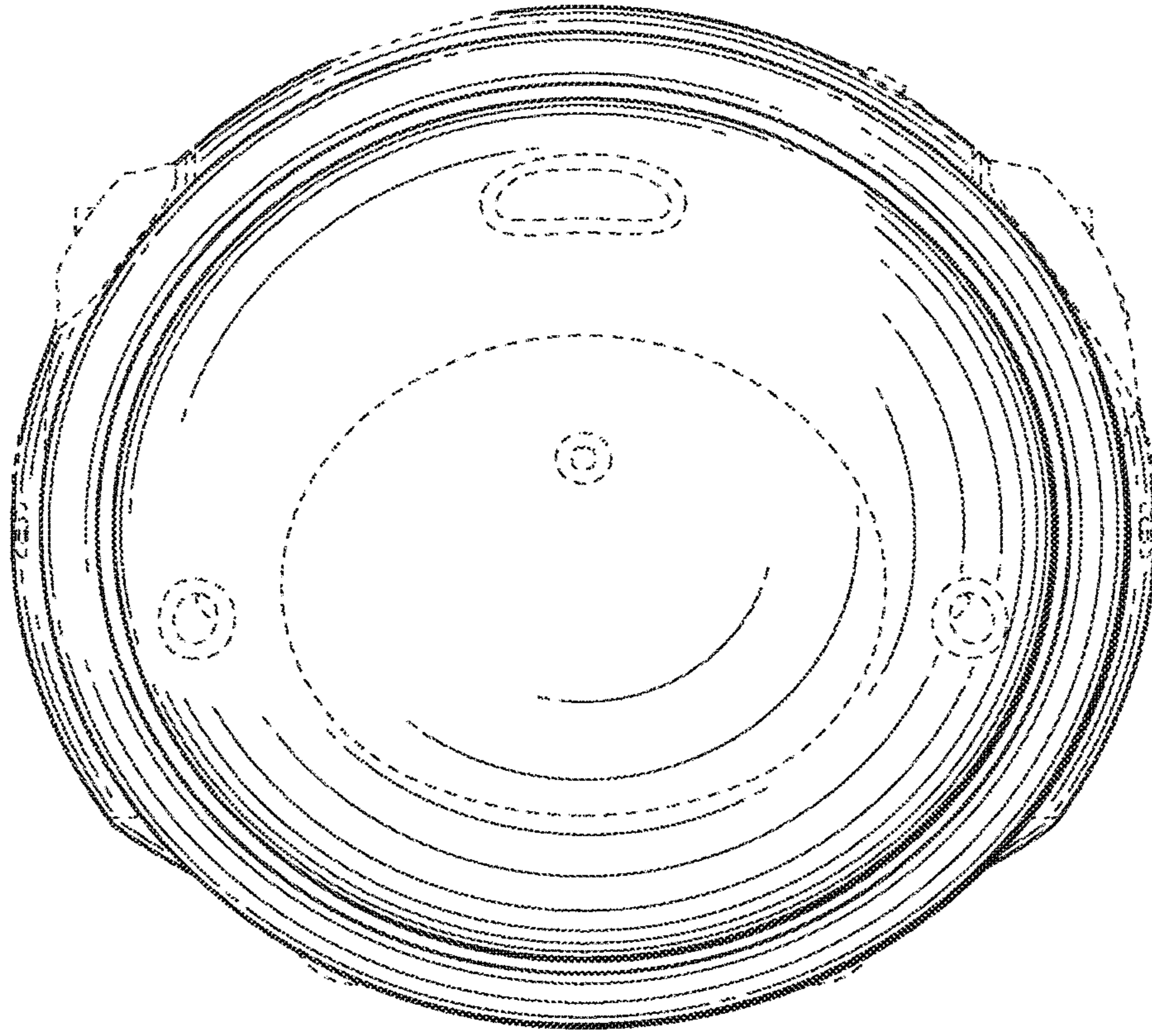


FIG. 20

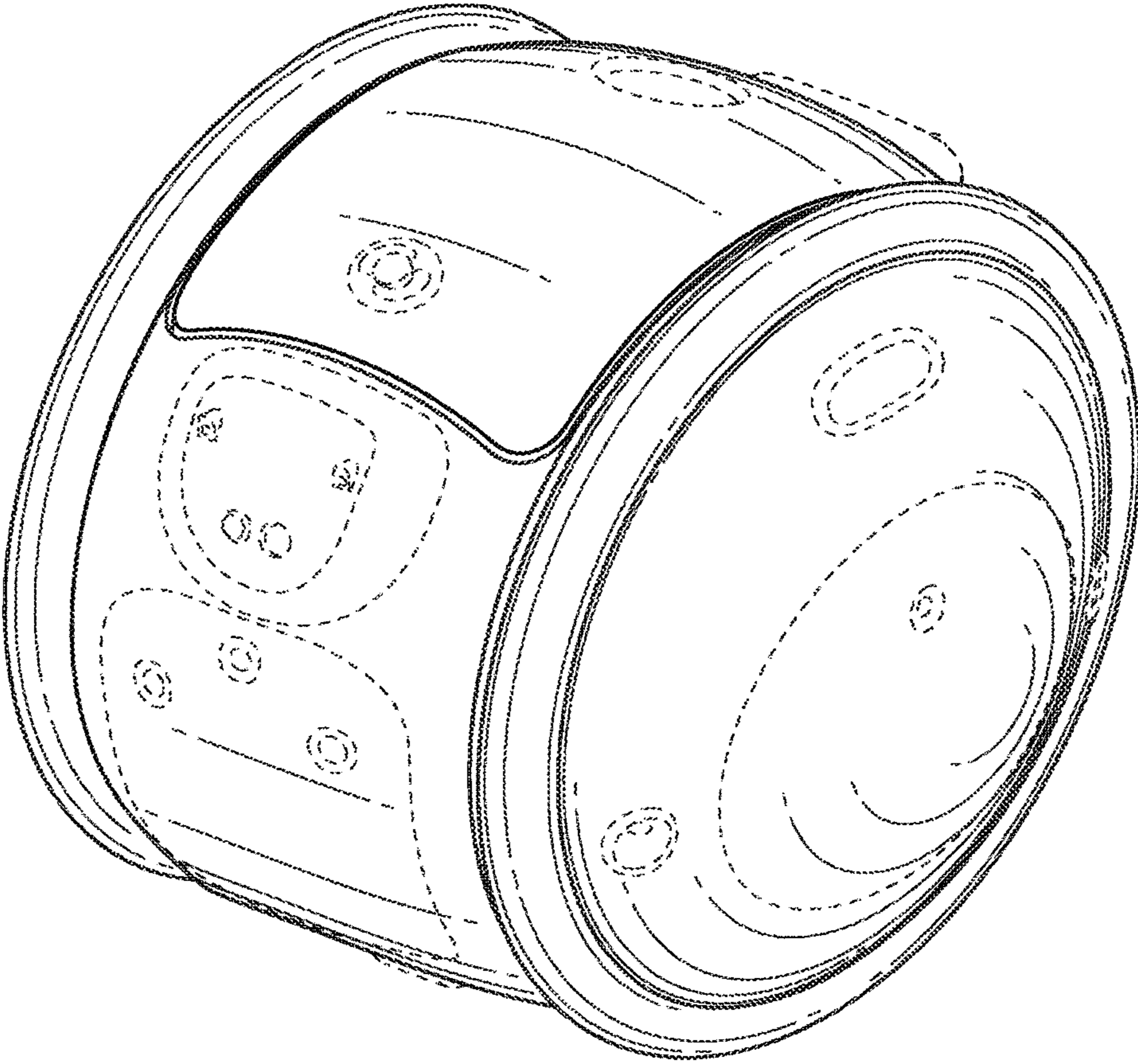


FIG. 21



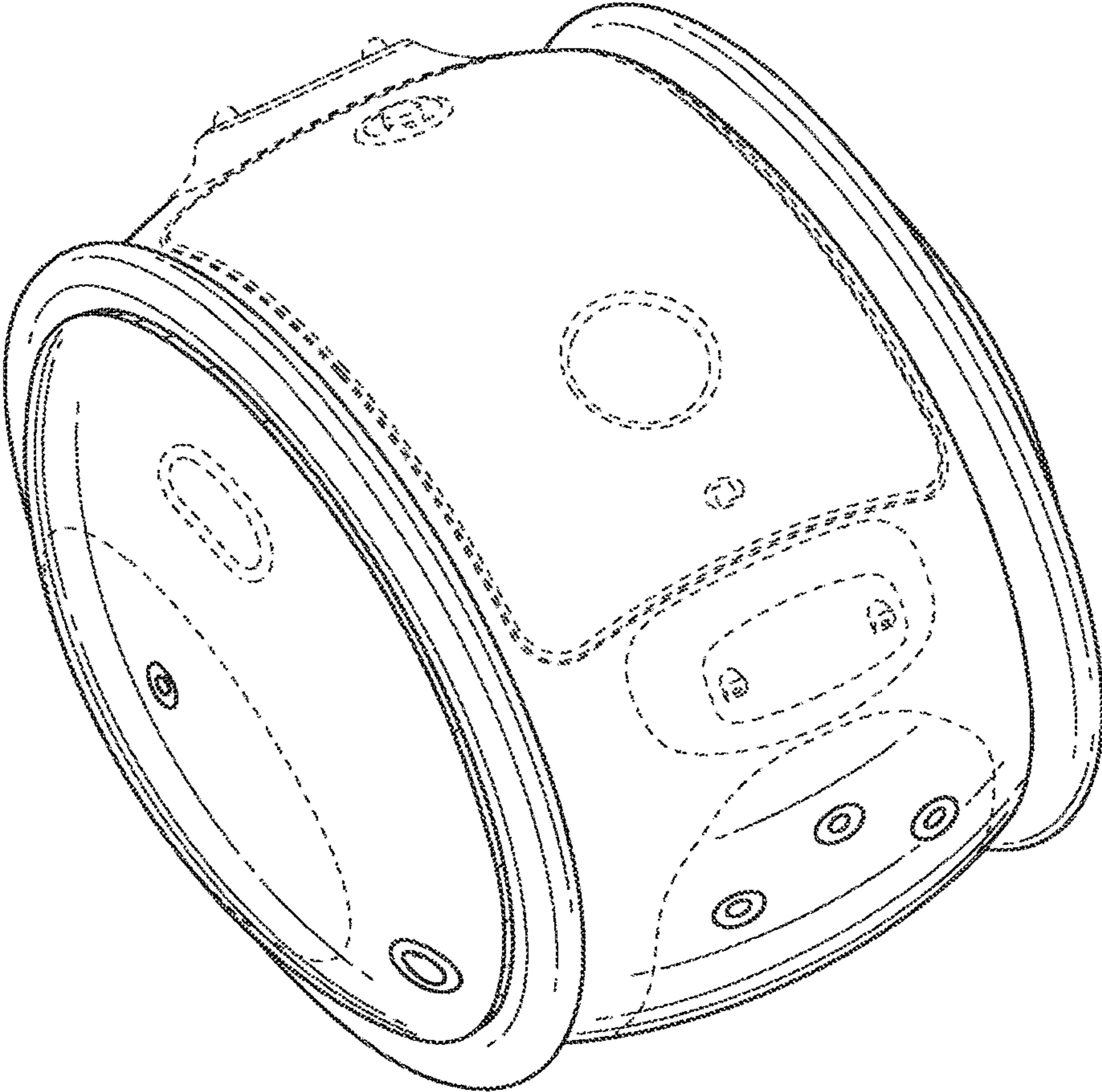


FIG. 22

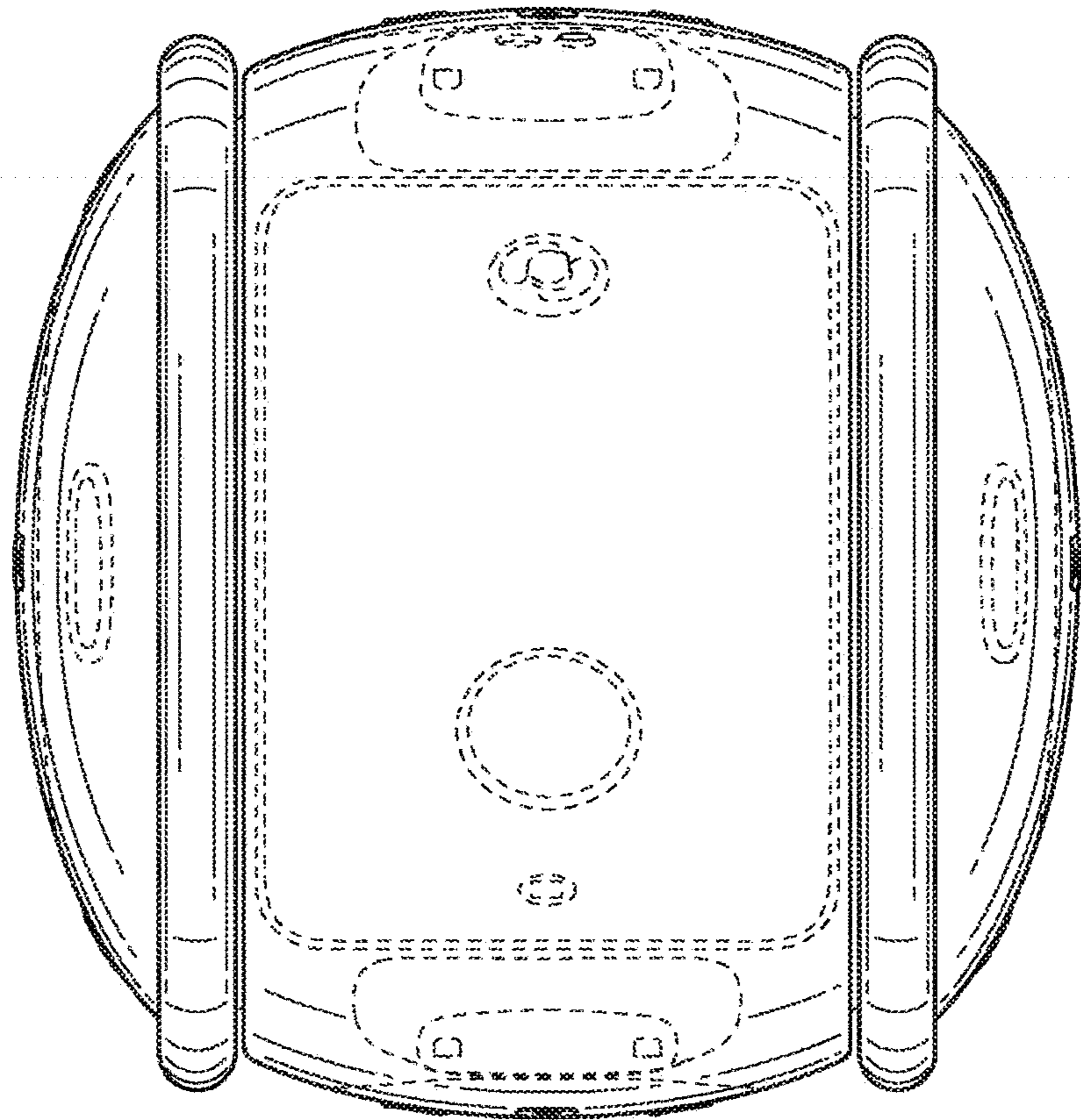


FIG. 23

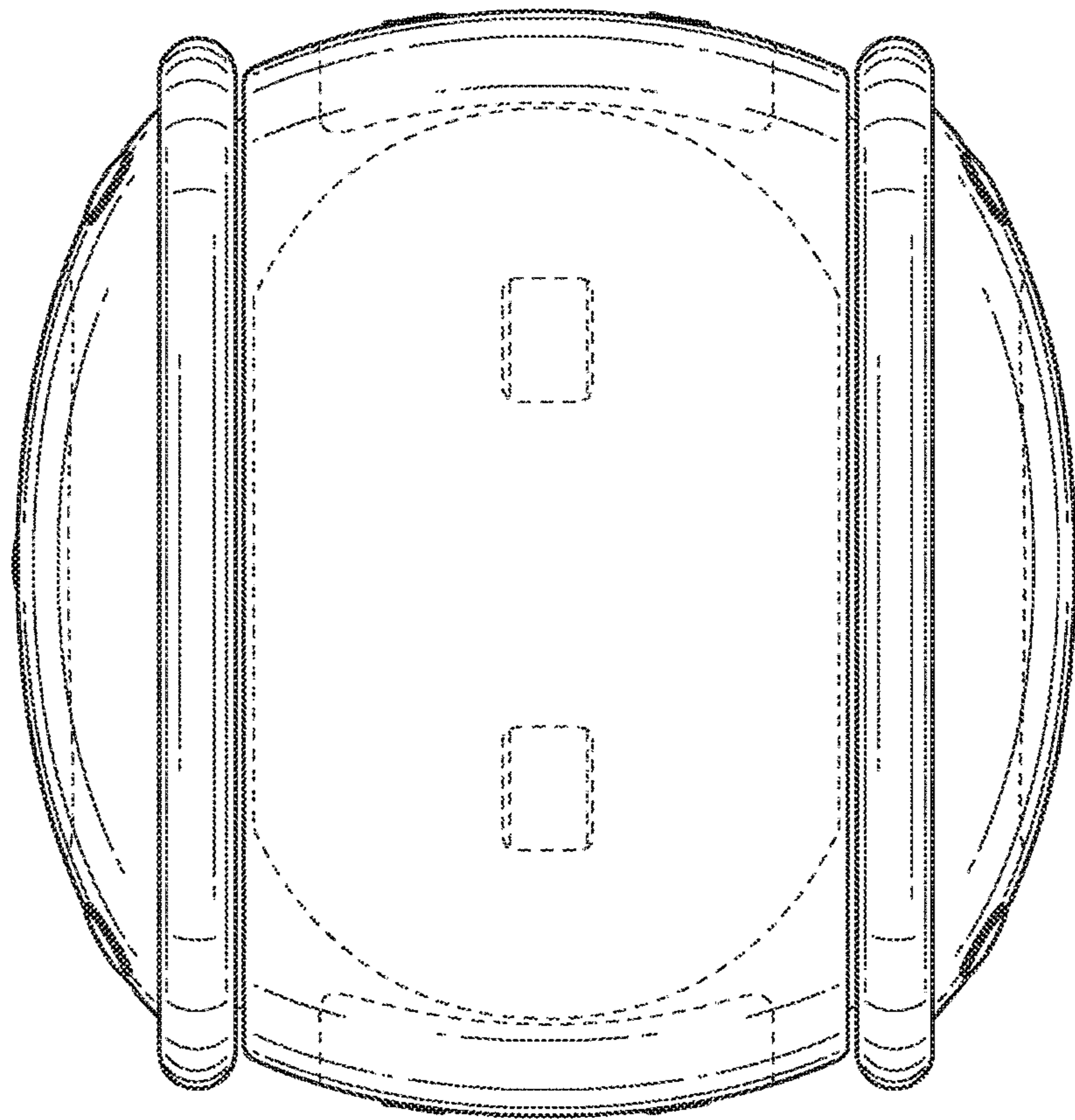


FIG. 24

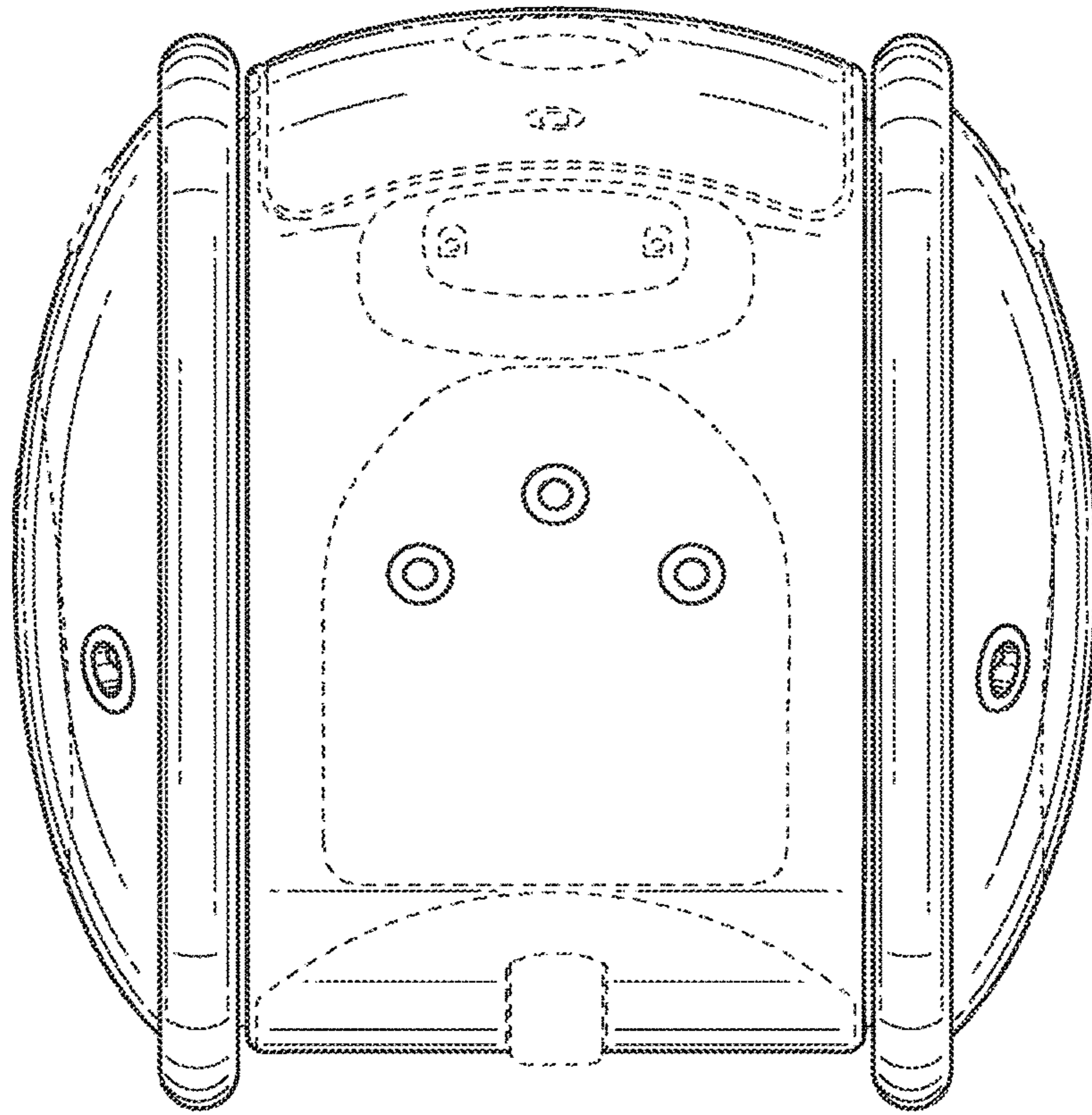


FIG. 25

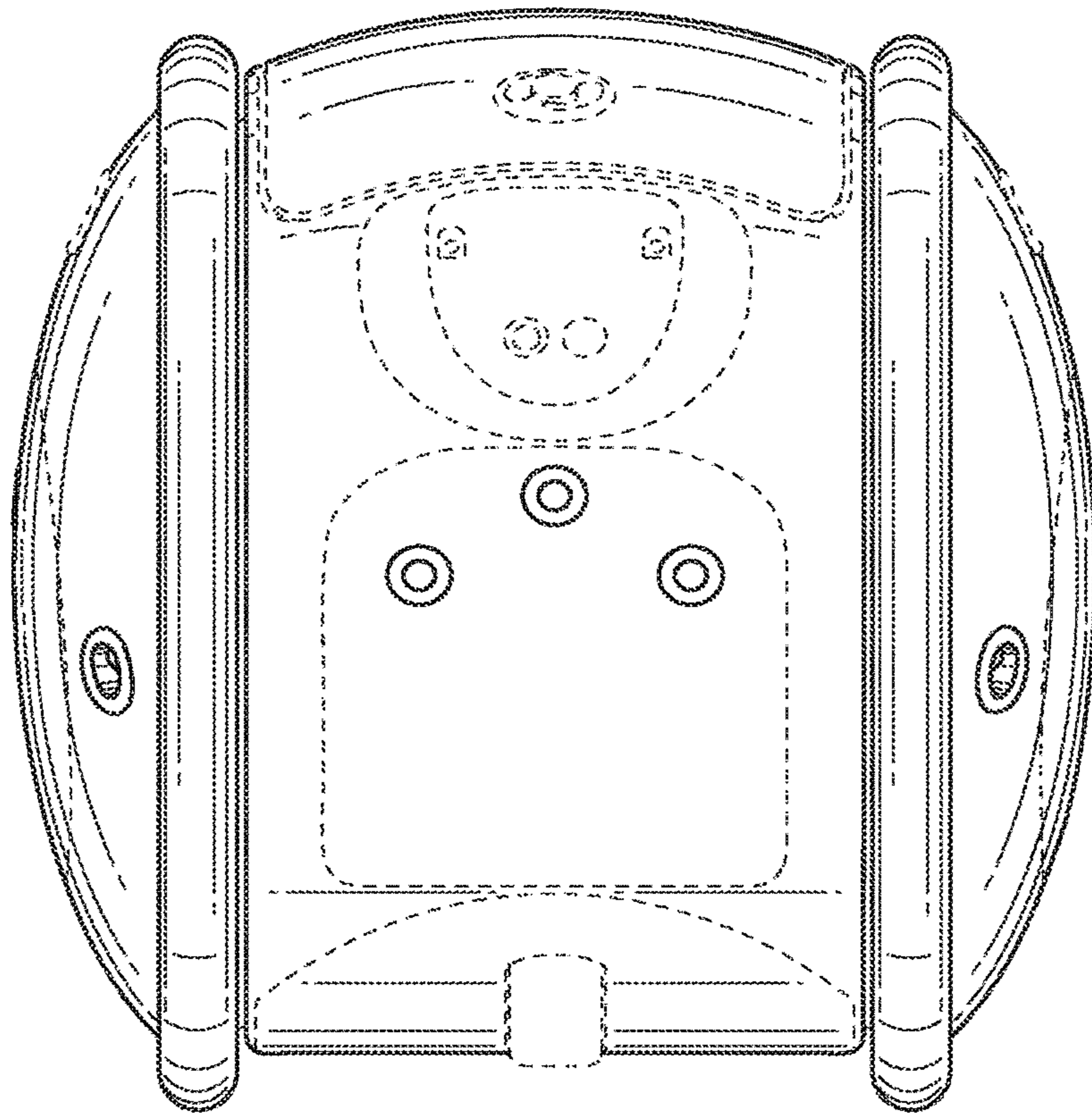


FIG. 26

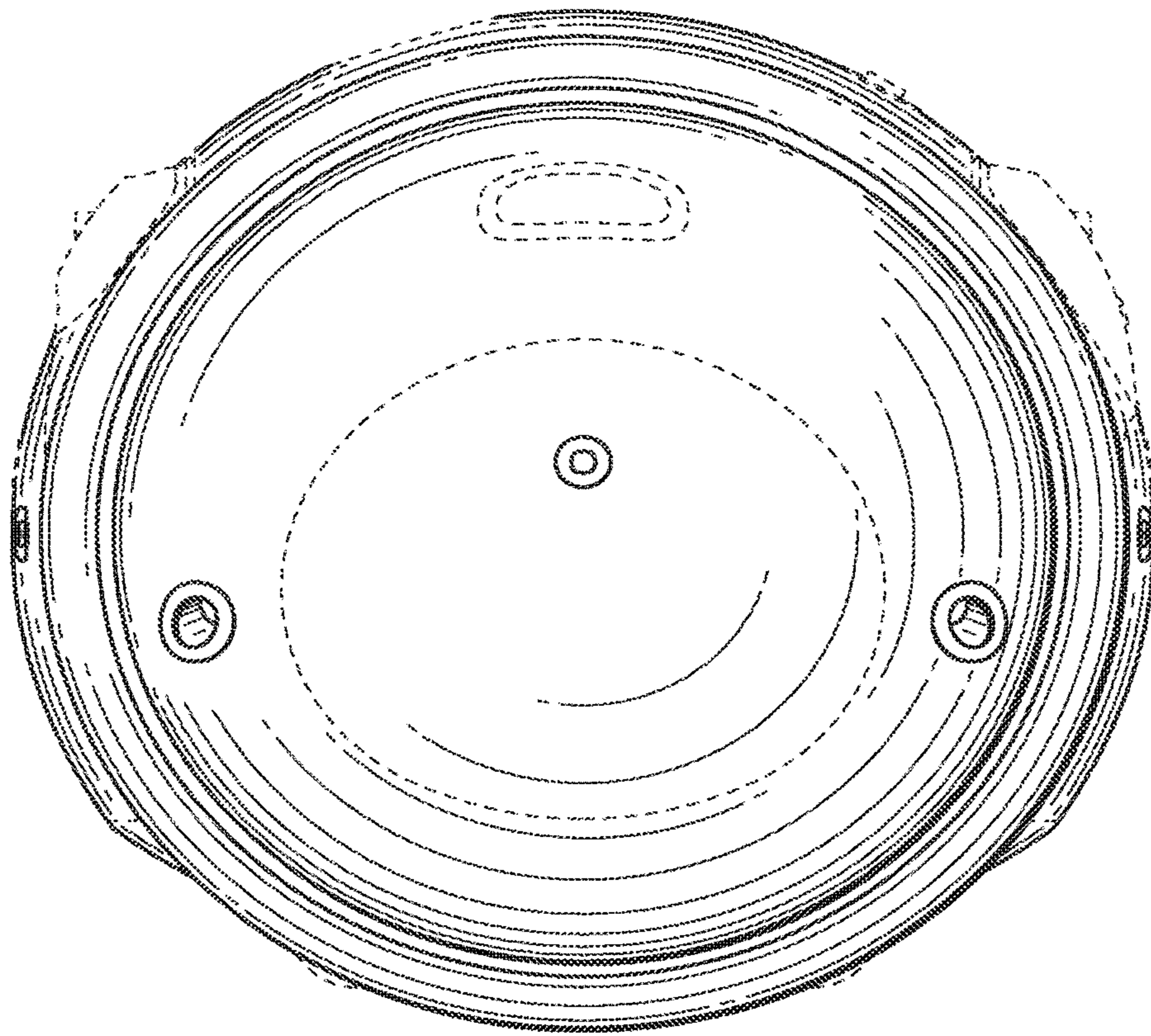


FIG. 27

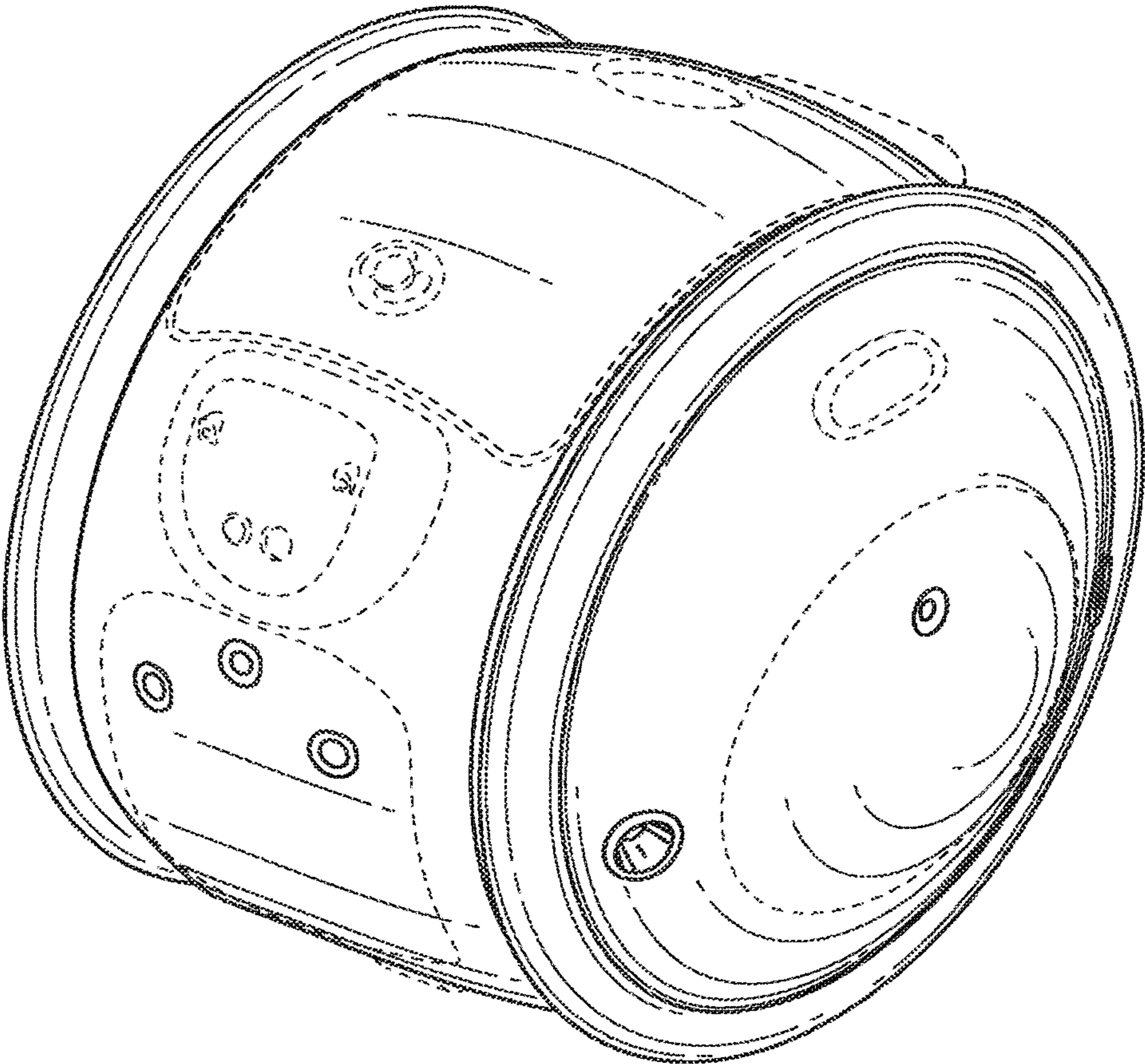


FIG. 28

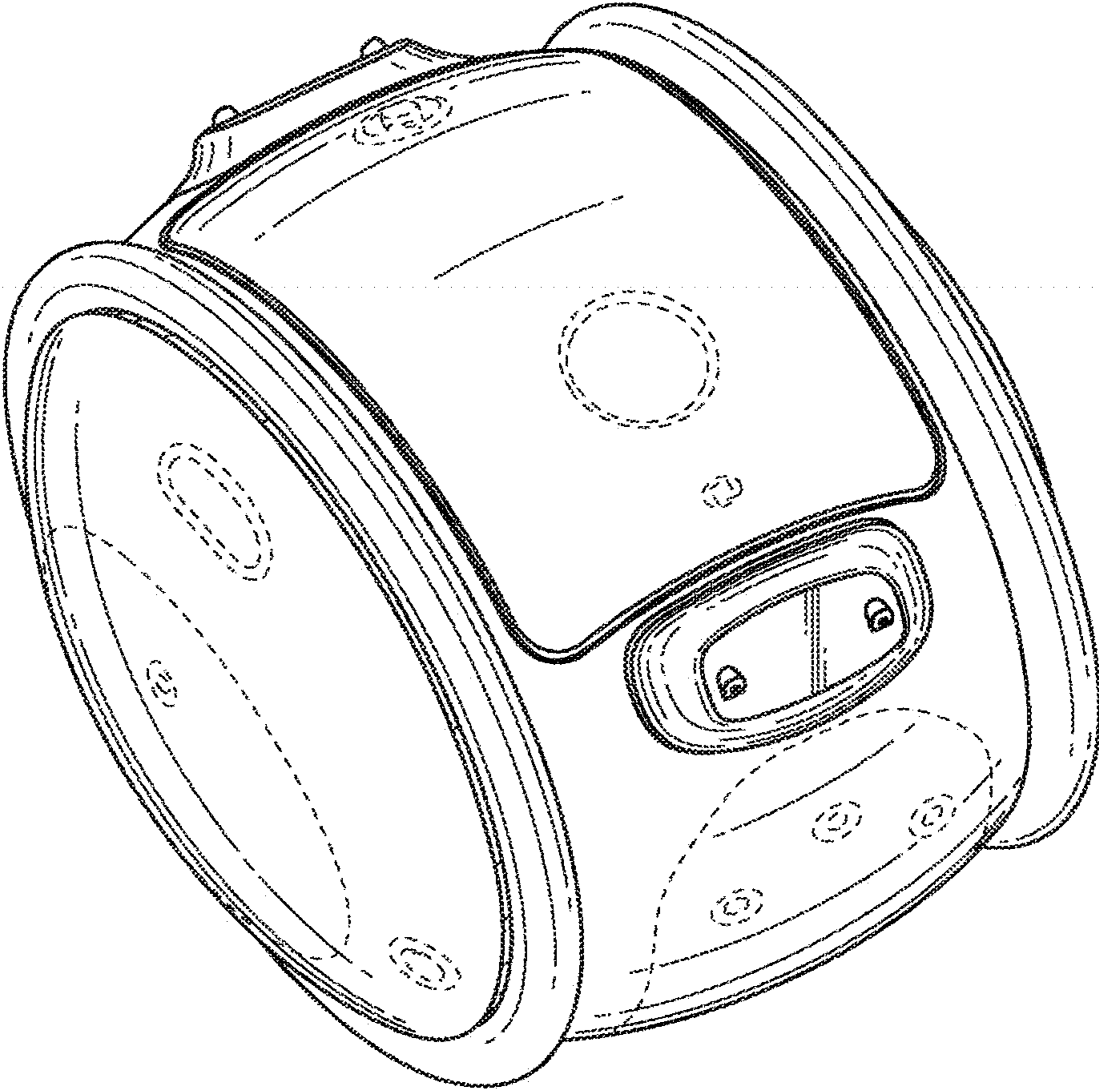


FIG. 29



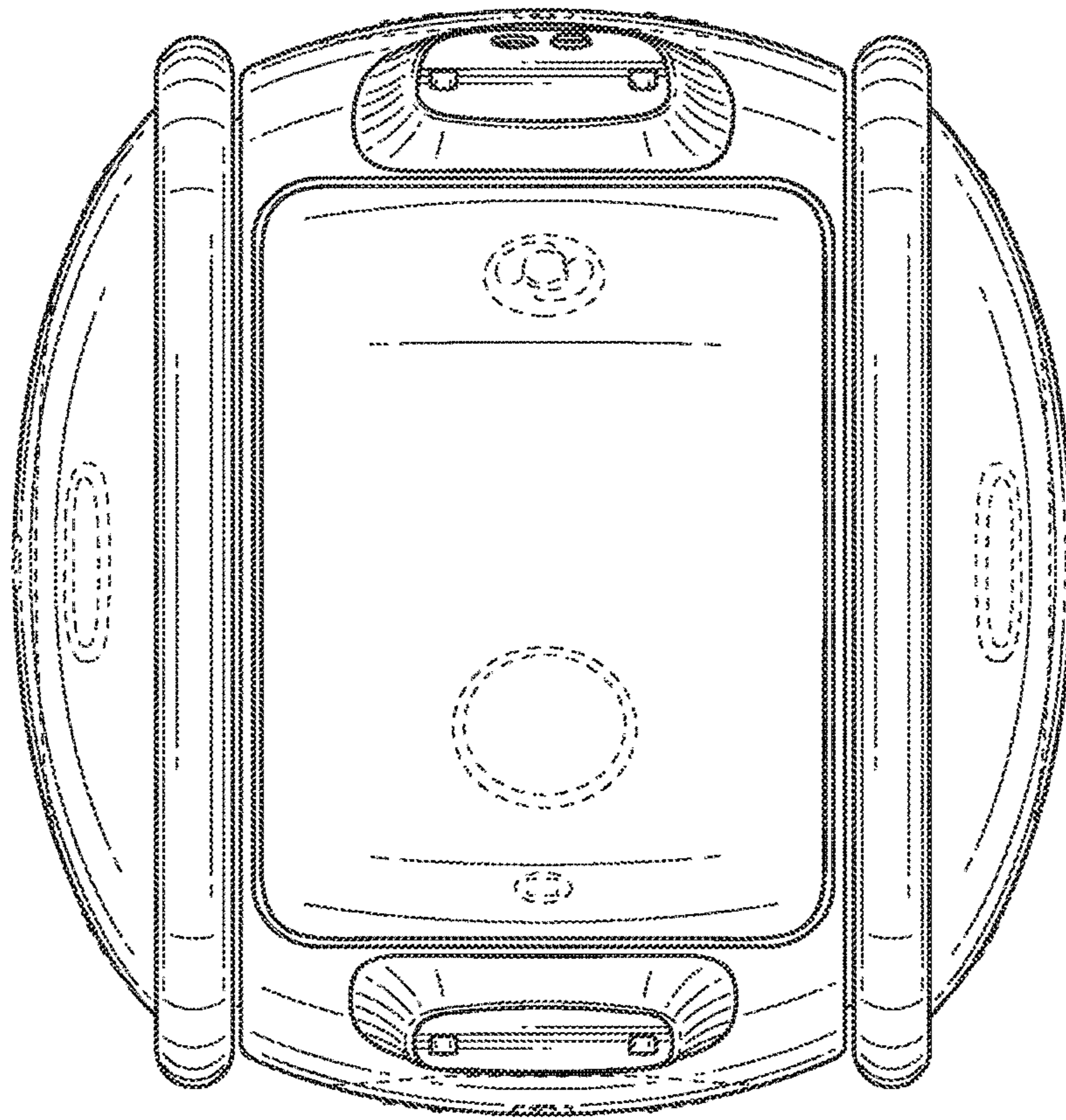


FIG. 30

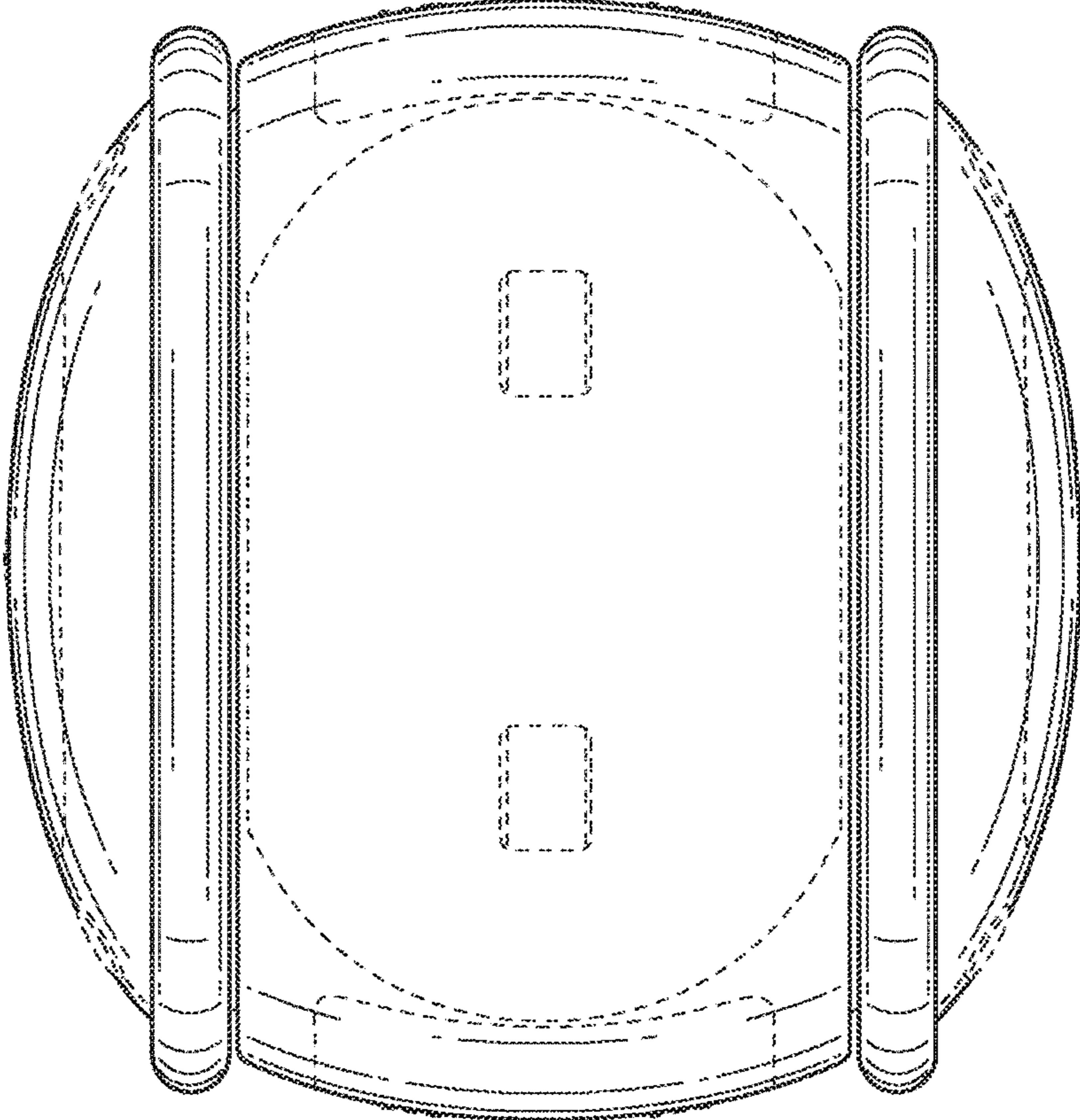


FIG. 31

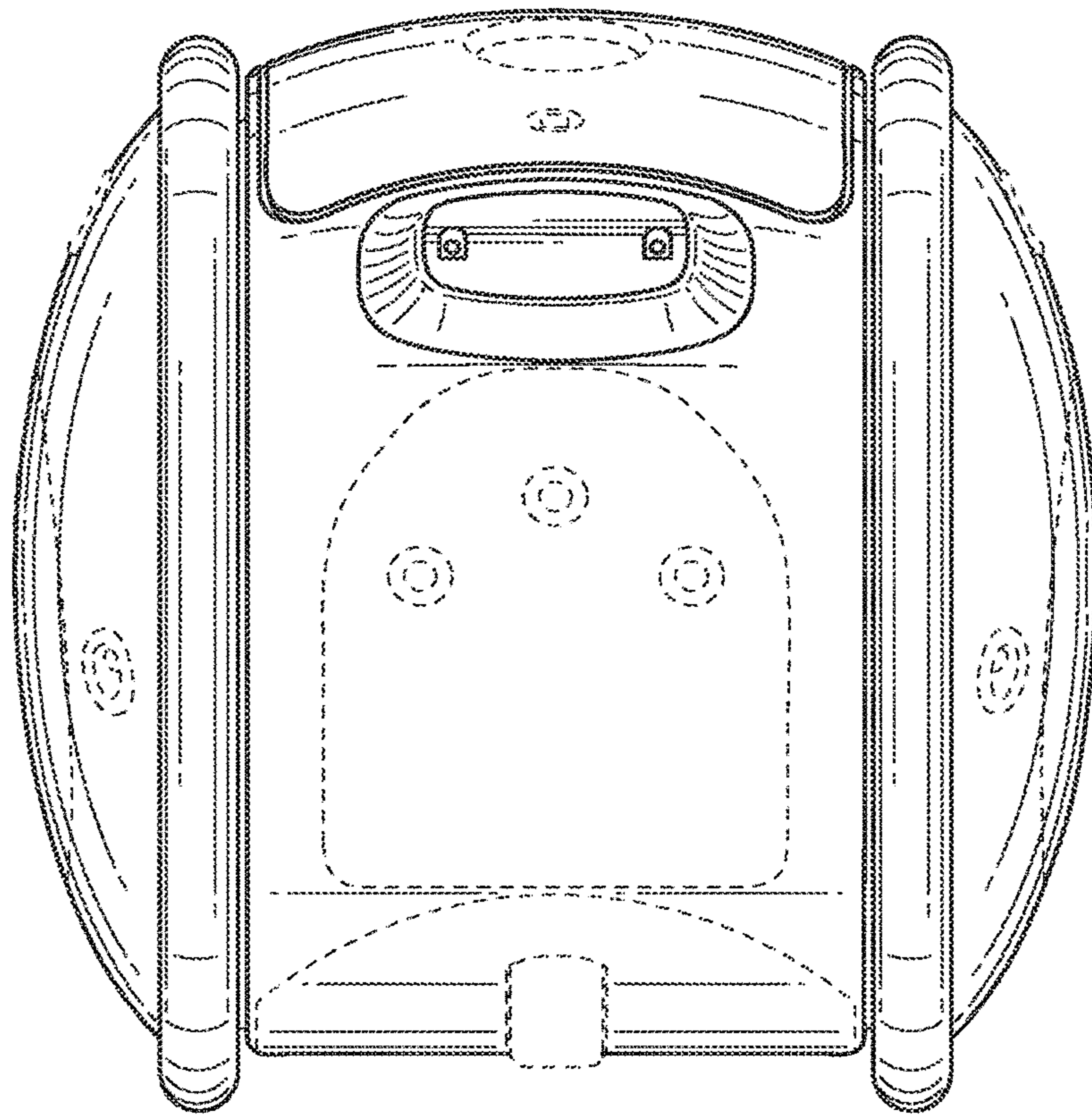


FIG. 32

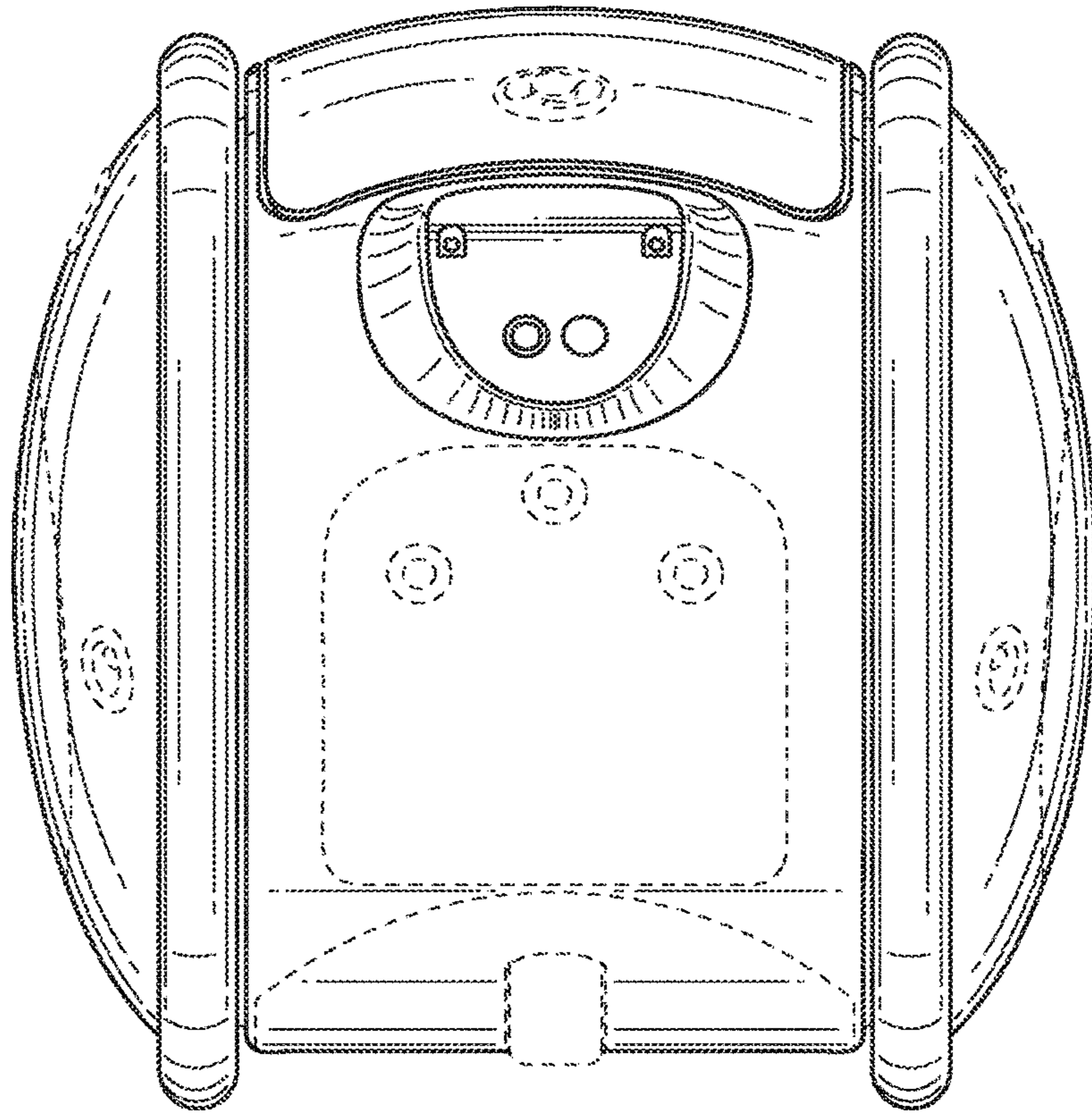


FIG. 33

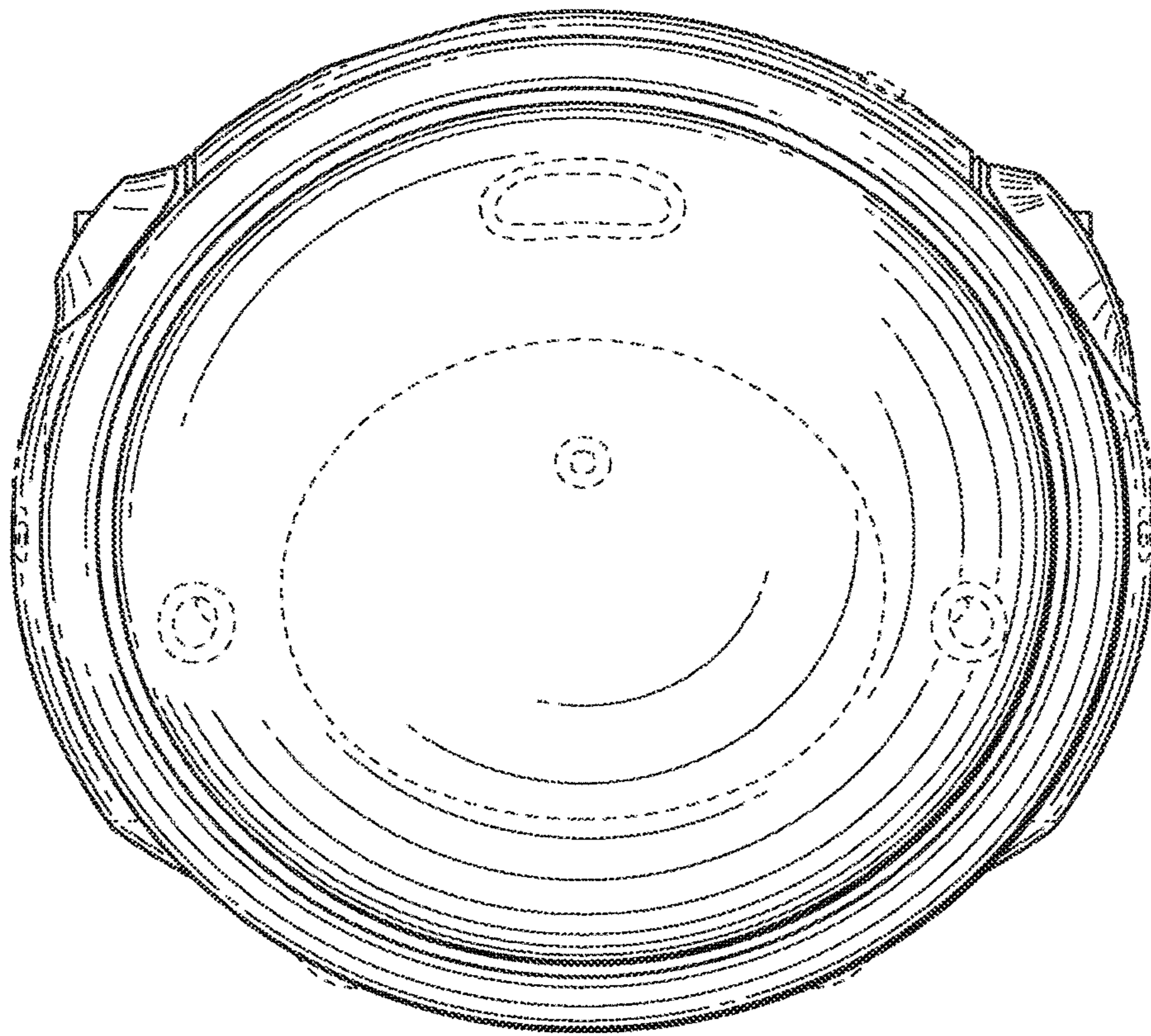


FIG. 34

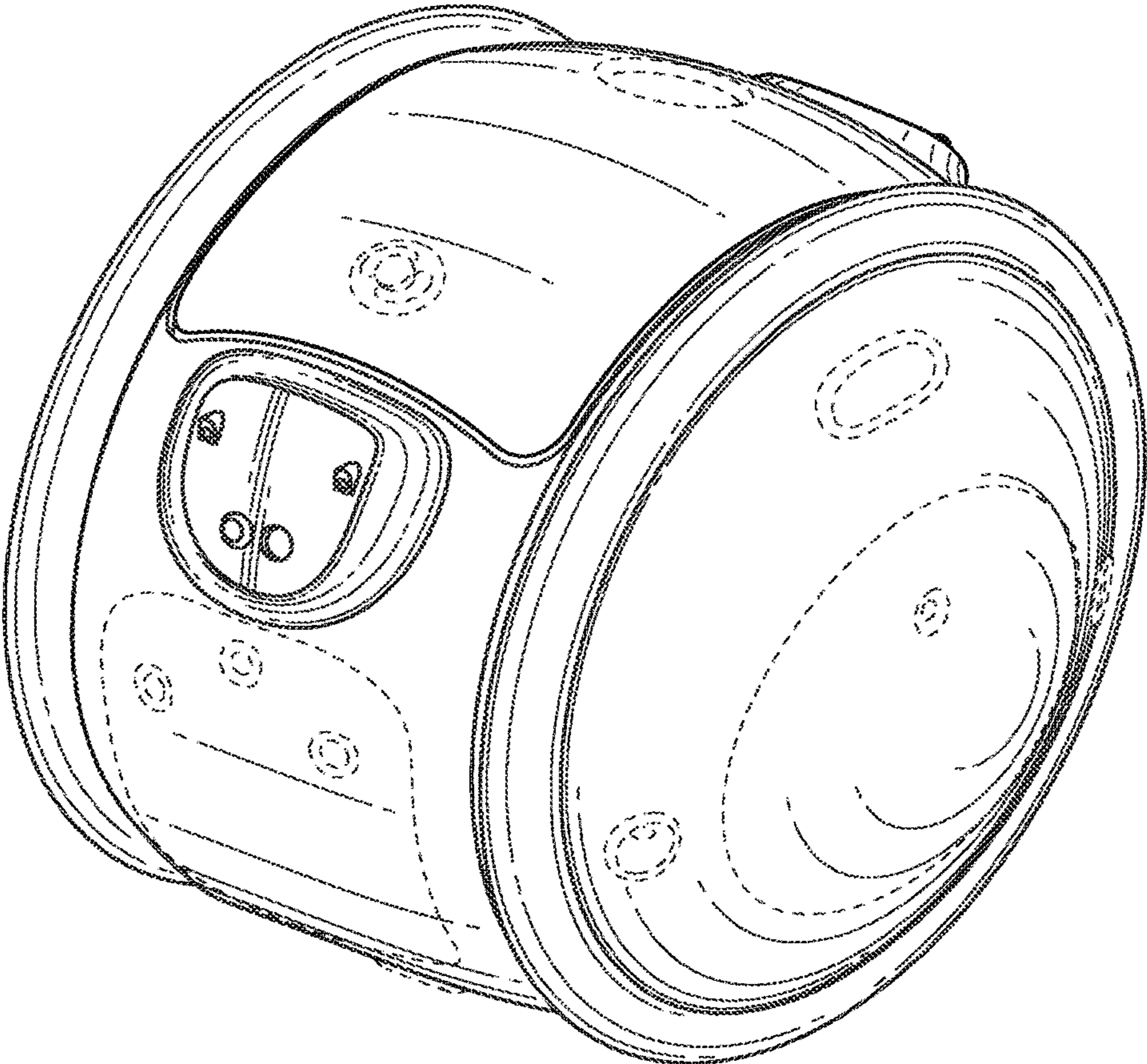


FIG. 35

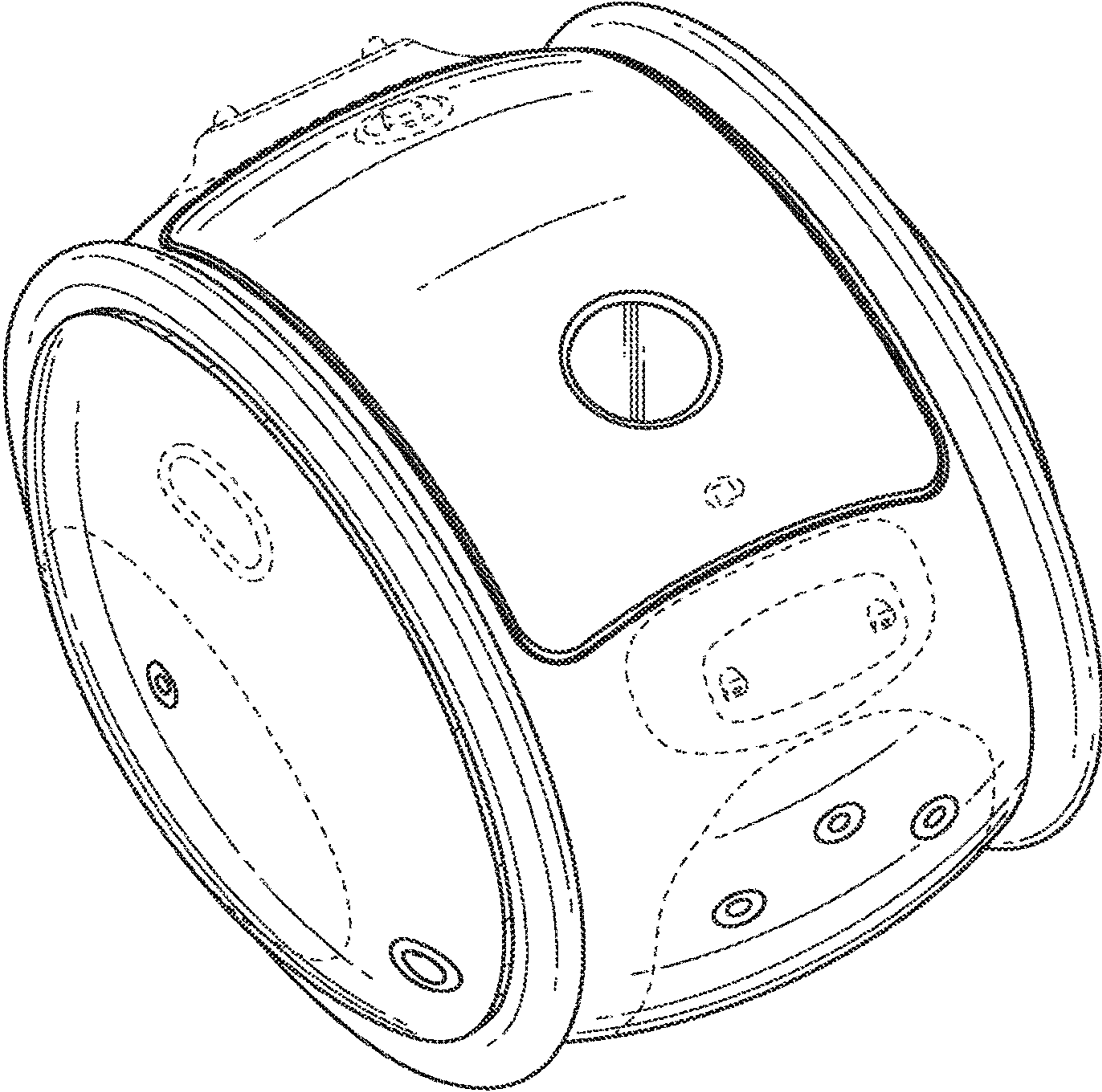


FIG. 36

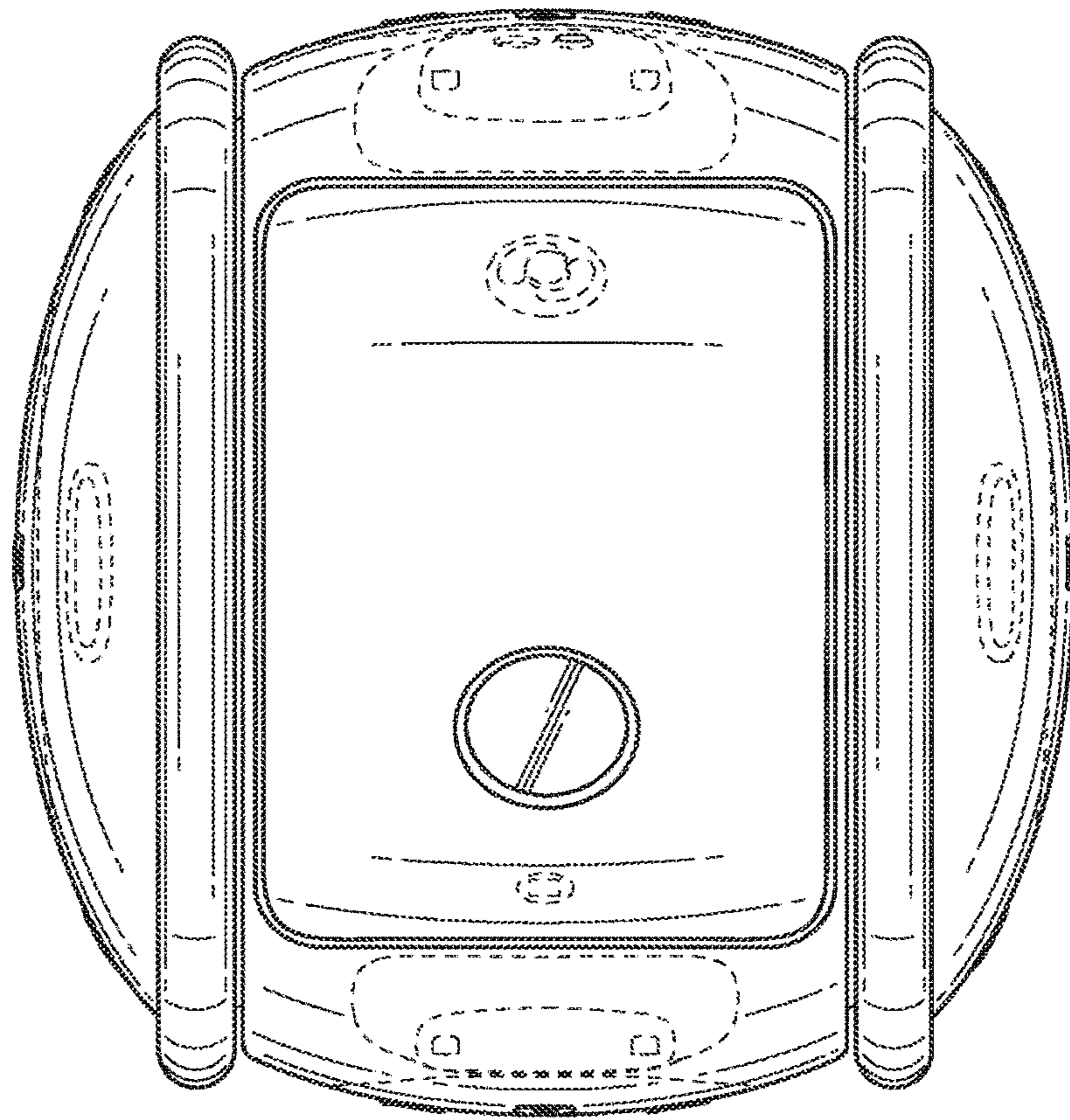


FIG. 37



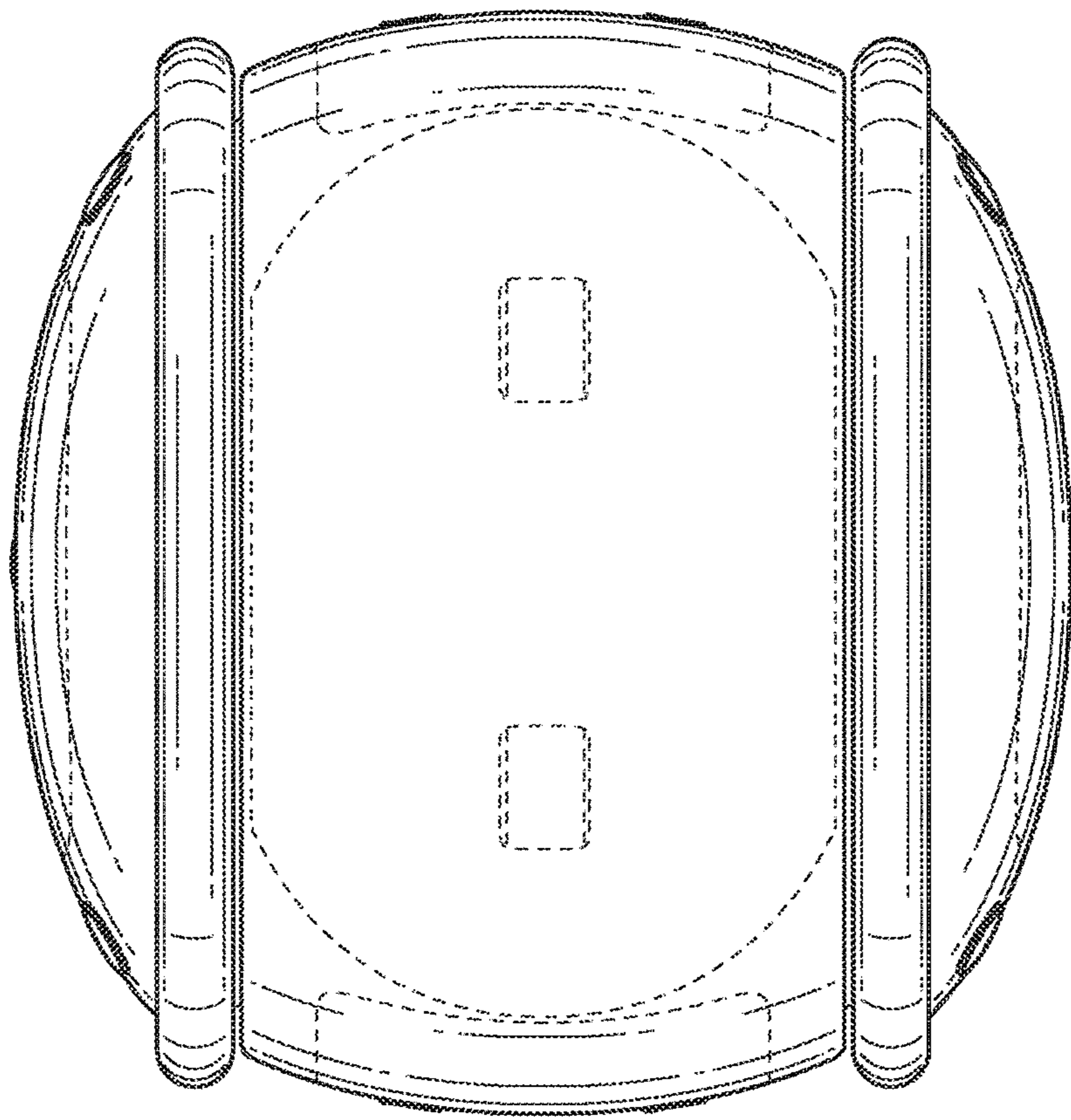


FIG. 38

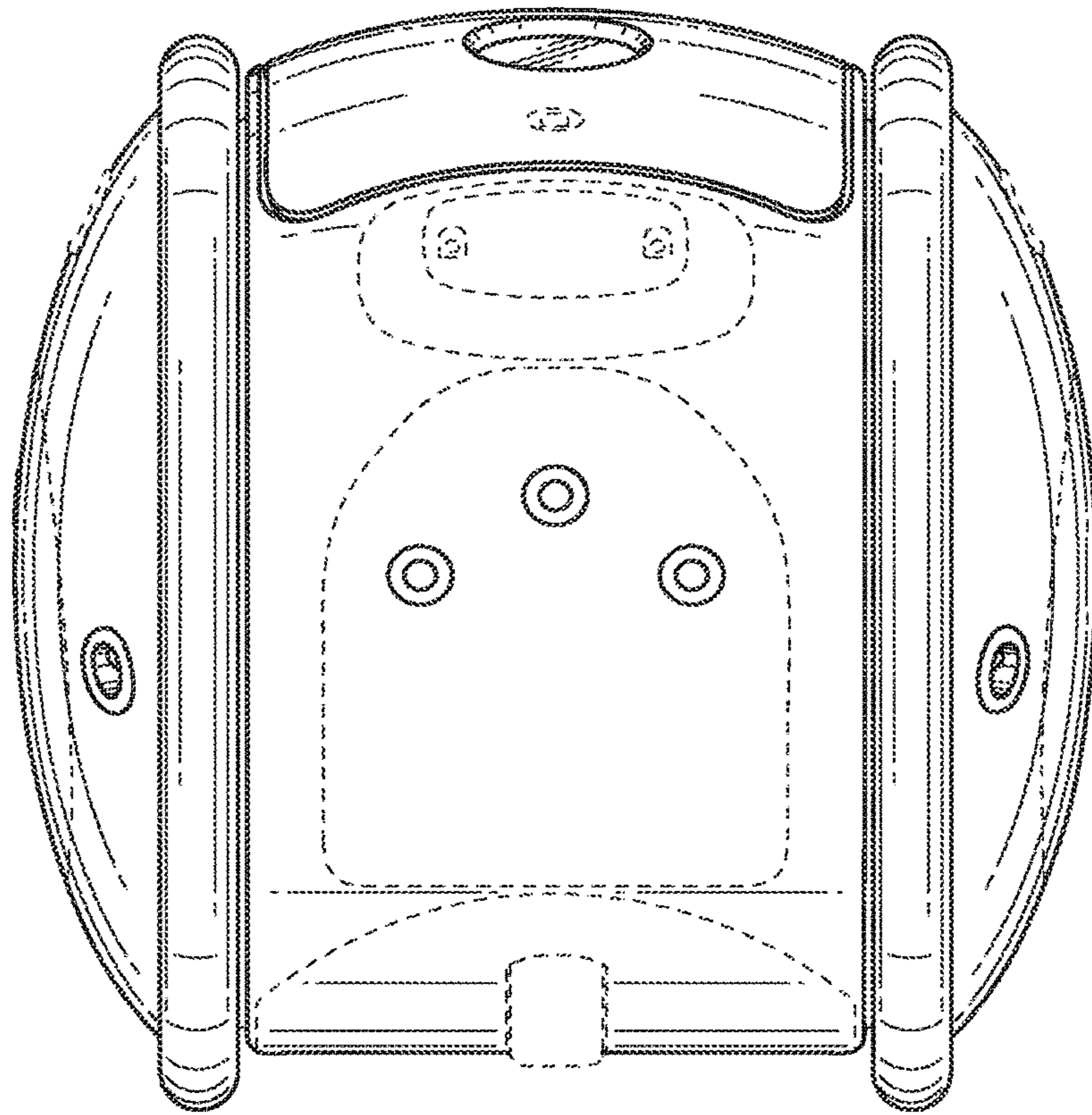


FIG. 39

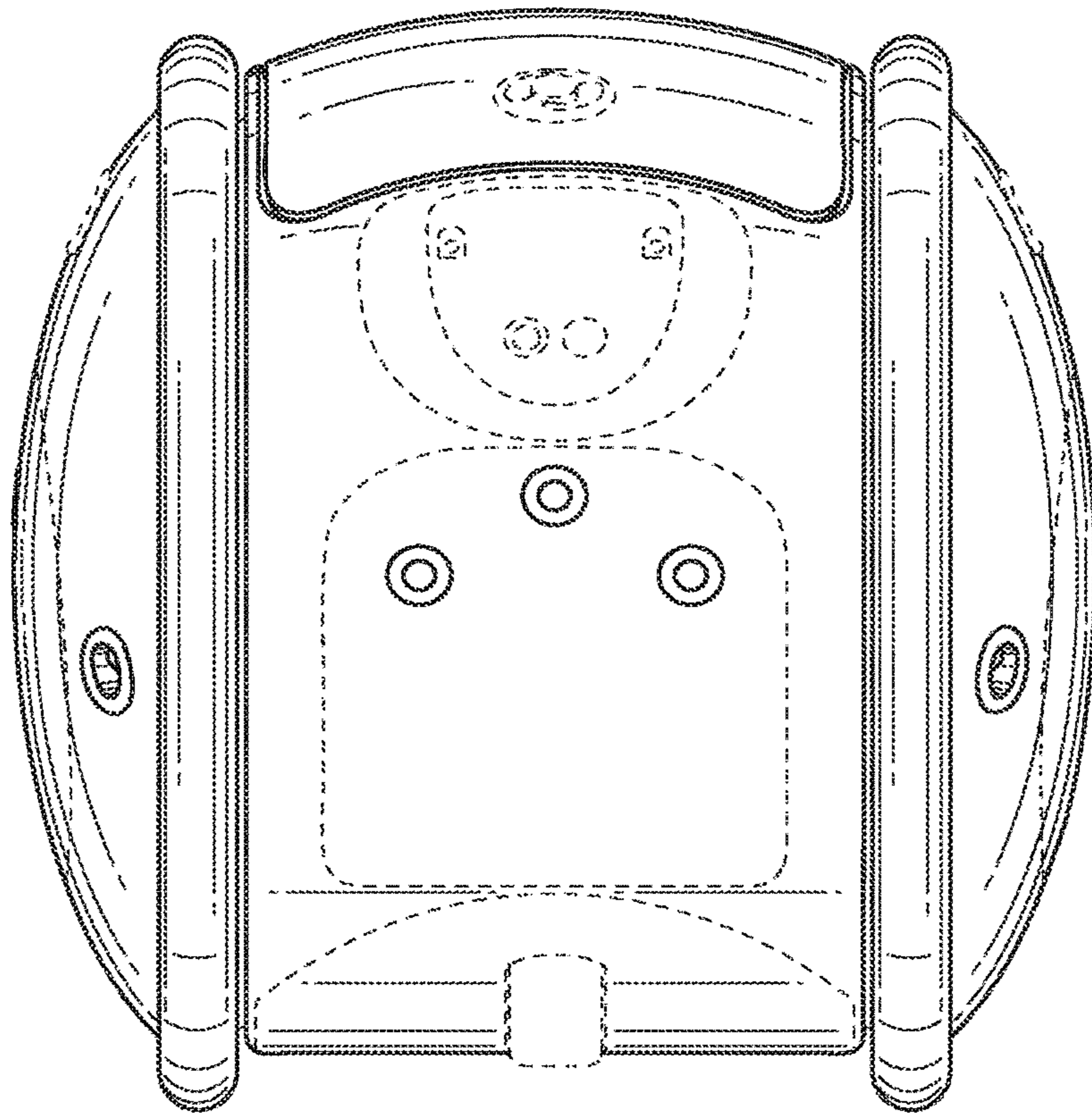


FIG. 40

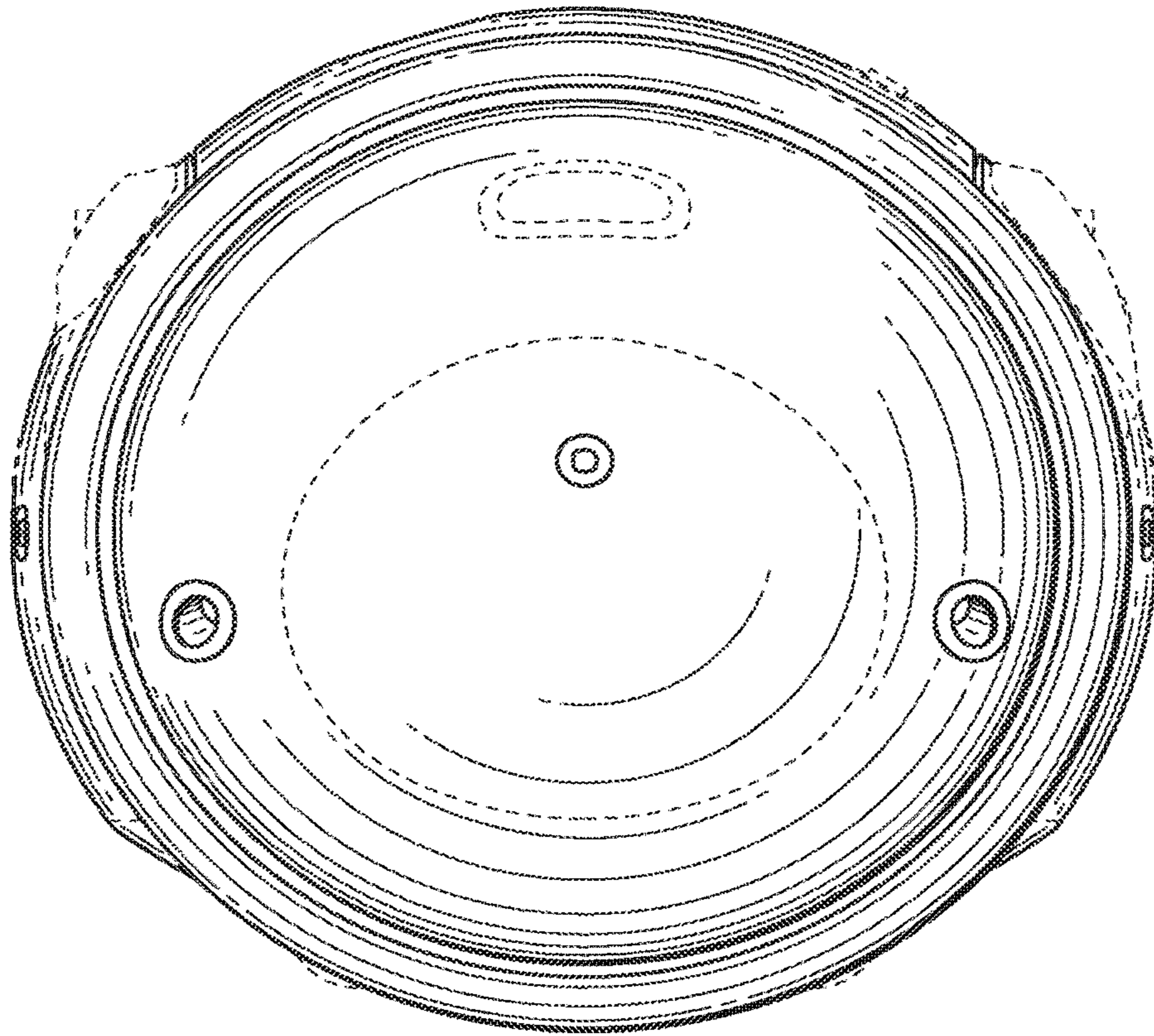


FIG. 41

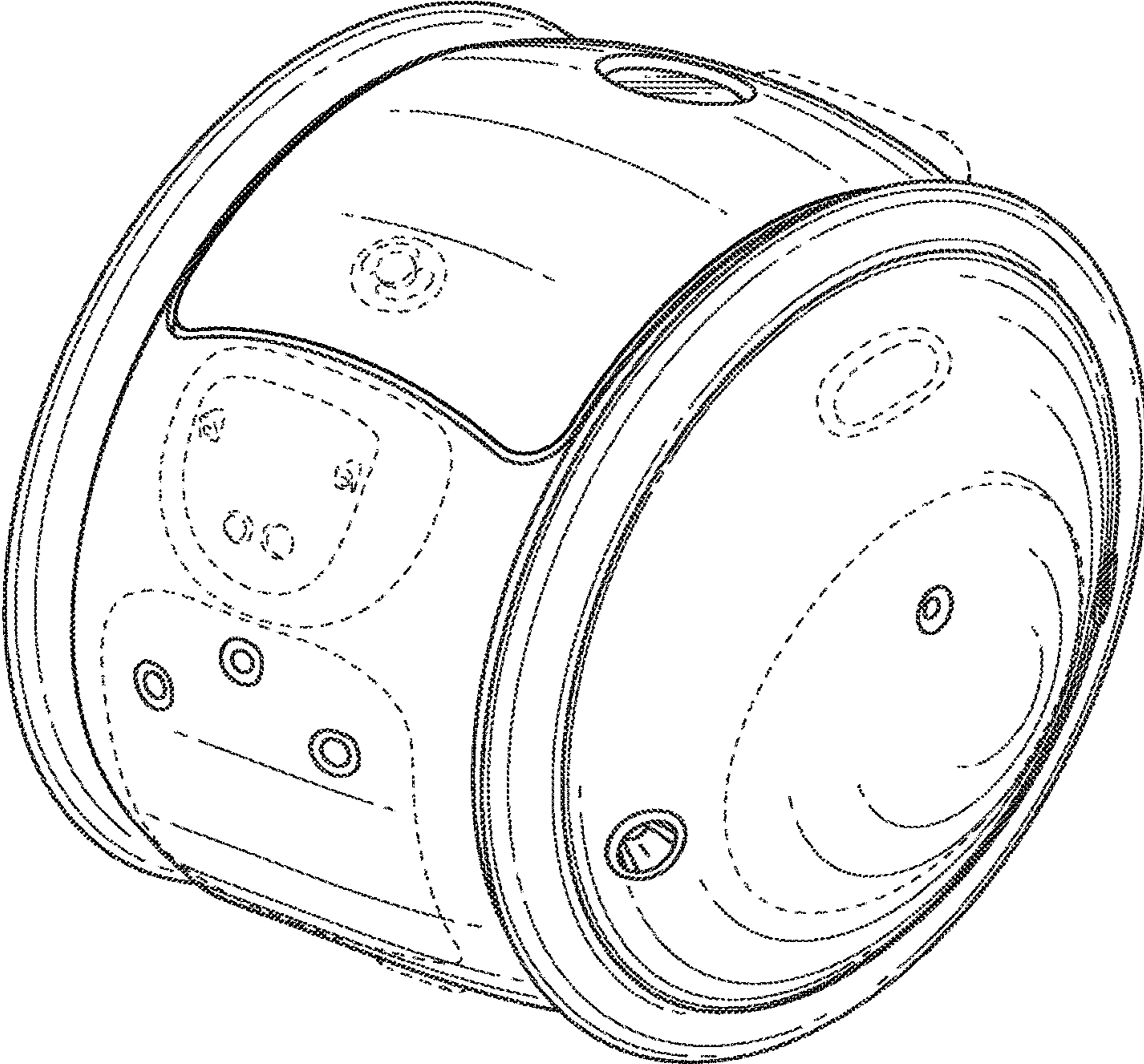


FIG. 42