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(12) United States Design Patent

Pendergraft

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(54) **MULTI-ORIENTATION SONAR TRANSDUCER ARRAY SYSTEM**

(71) Applicant: **NAVICO, INC.**, Tulsa, OK (US)

(72) Inventor: **Dustyn P. Pendergraft**, Claremore, OK (US)

(73) Assignee: **Navico, Inc.**, Tulsa, OK (US)

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

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(51) **LOC (14) Cl.** **10-04**

(52) **U.S. Cl.**
USPC **D10/65**; D10/70

(58) **Field of Classification Search**
USPC D10/65, 70
CPC . G01S 7/52; G01S 7/521; G01S 7/526; G01S 7/62; G01S 15/42; G01S 15/89; G01S 15/93; G01S 15/96; G01S 1/042; G01S
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,311,095 A 5/1994 Smith et al.
5,329,496 A 7/1994 Smith
(Continued)

FOREIGN PATENT DOCUMENTS

AU 2004258175 B2 9/2009
AU 2009283312 B8 6/2015
(Continued)

OTHER PUBLICATIONS

Thompson et al; "Two Dimensional and Three Dimensional Imaging Results Using Blazed Arrays;" MTS/IEEE Oceans 2001. An Ocean Odyssey. Conference Proceedings (IEEE Cat. No. 01CH37295); Nov. 5-8, 2001; pp. 985-988.
(Continued)

Primary Examiner — Antoine Duval Davis
(74) *Attorney, Agent, or Firm* — Nelson Mullins Riley & Scarborough LLP

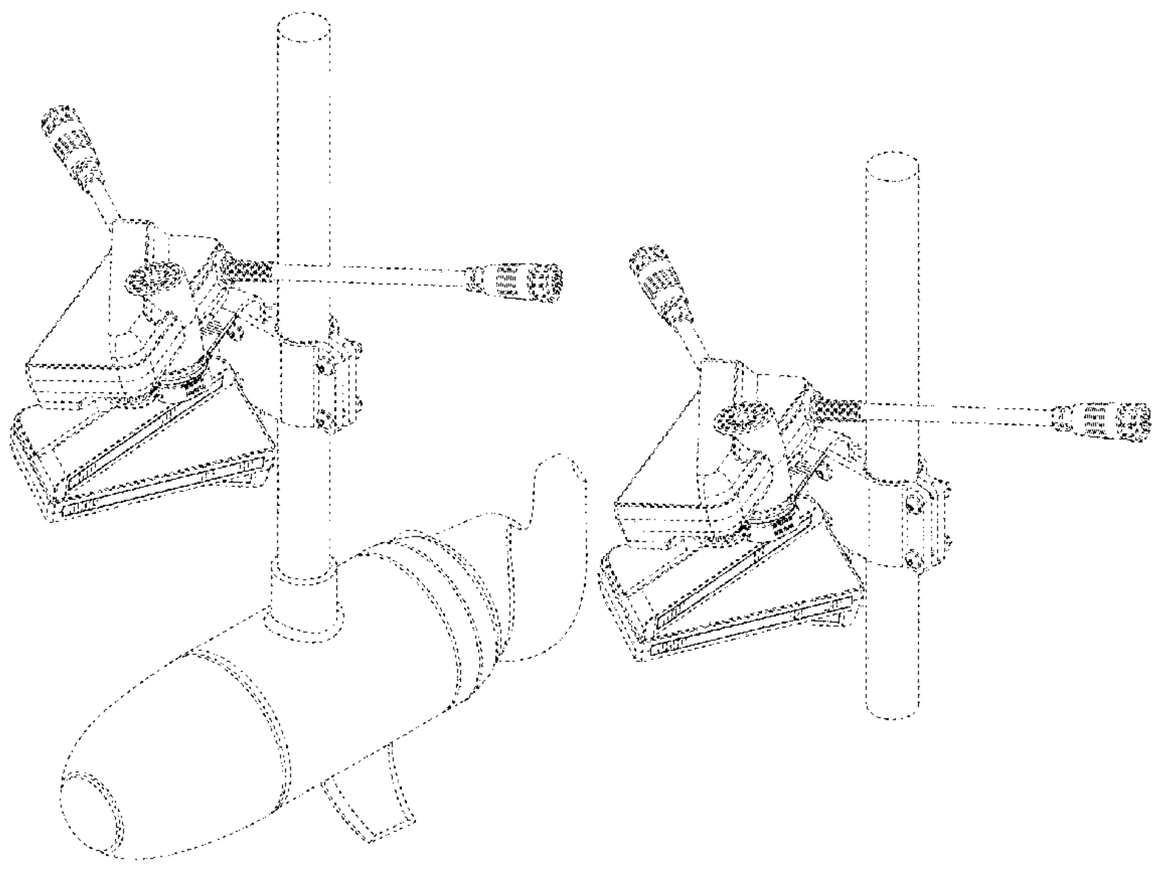
(57) **CLAIM**

The ornamental design for a multi-orientation sonar transducer array system, as shown and described.

DESCRIPTION

FIG. **1** is a right top perspective view of a multi-orientation sonar transducer array system in accordance with an embodiment of the present invention;
FIG. **2** is a front view of the multi-orientation sonar transducer array system of FIG. **1**;
FIG. **3** is a rear view of the multi-orientation sonar transducer array system of FIG. **1**;
FIG. **4** is a right view of the multi-orientation sonar transducer array system of FIG. **1**;
FIG. **5** is a left view of the multi-orientation sonar transducer array system of FIG. **1**;
FIG. **6** is a top view of the multi-orientation sonar transducer array system of FIG. **1**;
FIG. **7** is a bottom view of the multi-orientation sonar transducer array system of FIG. **1**;
FIG. **8** is a right top perspective view of the multi-orientation sonar transducer array system of FIG. **1**, where the multi-orientation sonar transducer array system is attached to a shaft of a trolling motor; and,
FIG. **9** is a right top perspective view of the multi-orientation sonar transducer array system of FIG. **1**, where the multi-orientation sonar transducer array system is attached to a pole, such as for mounting to a watercraft.
The dash-dash broken lines illustrate environmental structure and form no part of the claimed design. The dash-dot-dash broken lines define the bounds of the claimed design and form no part thereof.

1 Claim, 8 Drawing Sheets



(58) **Field of Classification Search**
CPC .. 1/04; G01S 1/045; G01S 3/04; G01S 3/043; G01S 5/0221; G01S 2007/027; G01S 2007/028; G01S 7/282; G01S 7/285; G01S 7/288; G01S 7/292; G01S 7/2921; G01S 7/2922; G01S 7/2923; G01S 7/2925; G01S 7/2926; G01S 7/2927; G01S 7/2928; G01S 7/352; G01S 7/354; G01S 7/481; G01S 7/4811; G01S 7/4812; G01S 7/4813; G01S 7/4814; G01S 7/4816; G01S 7/484; G01S 7/486; G01S 7/491; G01S 7/4911; G01S 7/4912; G01S 7/524; G01S 2007/2883; G01S 2007/2886; G01S 2007/356; G01S 2007/358
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,548,564	A	8/1996	Smith	
5,744,898	A	4/1998	Smith et al.	
5,923,617	A	7/1999	Thompson et al.	
6,678,210	B2	1/2004	Rowe	
7,035,166	B2	4/2006	Zimmerman et al.	
7,106,656	B2	9/2006	Lerro et al.	
7,123,546	B2	10/2006	Zimmerman et al.	
7,173,879	B2	2/2007	Zimmerman et al.	
7,330,399	B2	2/2008	Lerro et al.	
7,355,924	B2	4/2008	Zimmerman et al.	
D570,715	S *	6/2008	Di Federico	D10/70
7,453,769	B2	11/2008	Kirschner et al.	
7,542,376	B1	6/2009	Thompson et al.	
7,542,377	B2	6/2009	Kirschner et al.	
7,606,114	B2	10/2009	Bachelor et al.	
7,847,925	B2	12/2010	Vogt	
7,852,709	B1	12/2010	Lerro et al.	
7,889,600	B2	2/2011	Thompson et al.	
7,957,609	B2	6/2011	Lu et al.	
8,254,208	B2	8/2012	Vogt	
8,300,499	B2	10/2012	Coleman et al.	
8,345,511	B1	1/2013	Rikoski	
8,514,659	B2	8/2013	Vogt	
8,638,362	B1	1/2014	Thompson et al.	
8,717,847	B2	5/2014	Blake	
8,811,120	B2	8/2014	Bachelor et al.	
8,814,795	B2	8/2014	Derode et al.	
RE45,379	E	2/2015	Rowe	
8,964,507	B2	2/2015	Bachelor et al.	
9,182,486	B2	11/2015	Brown et al.	
RE45,823	E	12/2015	Vogt	
9,218,799	B2	12/2015	Stytsenko et al.	
9,322,915	B2	4/2016	Betts et al.	
9,386,964	B2	7/2016	Bagge	
9,664,783	B2	5/2017	Brown et al.	
9,739,884	B2	8/2017	Proctor et al.	
9,766,328	B2	9/2017	Black et al.	
9,784,825	B2	10/2017	Brown et al.	
9,784,826	B2	10/2017	Matson et al.	
9,812,118	B2	11/2017	Matson et al.	
9,846,232	B1	12/2017	Thompson et al.	
9,947,309	B2	4/2018	Stokes et al.	
10,019,002	B2	7/2018	Harnett et al.	
10,067,228	B1	9/2018	Steenstrup et al.	
10,107,908	B2	10/2018	Betts et al.	
10,114,119	B2	10/2018	Horner et al.	
10,197,674	B2	2/2019	Thompson et al.	
10,215,849	B2	2/2019	Kozuki	
10,241,200	B2	3/2019	Sayer et al.	
10,310,062	B2	6/2019	Coleman et al.	
D852,655	S *	7/2019	Gan	D10/70
10,365,356	B2	7/2019	Stokes et al.	
10,408,933	B1	9/2019	DeHart et al.	
10,502,820	B2	12/2019	Zimmerman et al.	
10,514,451	B2	12/2019	Brown et al.	
10,545,226	B2	1/2020	Wigh et al.	
10,605,913	B2	3/2020	Coleman et al.	
10,852,429	B2	12/2020	Gatland	
10,890,660	B2	1/2021	Wigh et al.	
10,914,810	B2	2/2021	Laster et al.	
11,059,556	B2	7/2021	Ahlgren	
11,125,866	B2	9/2021	Sumi et al.	
11,885,876	B2 *	1/2024	Jiang	G01S 7/521
2003/0235112	A1	12/2003	Zimmerman et al.	
2005/0007882	A1	1/2005	Bachelor et al.	
2007/0159922	A1	7/2007	Zimmerman et al.	
2010/0067330	A1	3/2010	Collier et al.	
2010/0074057	A1	3/2010	Bachelor et al.	
2010/0284248	A1	11/2010	Wang et al.	
2011/0013485	A1	1/2011	Maguire	
2014/0050051	A1	2/2014	Vogt	
2014/0092709	A1	4/2014	Miller et al.	
2017/0031022	A1	2/2017	Ivanov	
2017/0031023	A1	2/2017	Ivanov	
2017/0038344	A1	2/2017	Capus et al.	
2017/0212230	A1	7/2017	Wigh et al.	
2017/0371039	A1	12/2017	Clark et al.	
2018/0100922	A1	4/2018	Wigh et al.	
2018/0224544	A1	8/2018	Ivanov	
2018/0275649	A1	9/2018	Harnett et al.	
2019/0079185	A1	3/2019	Steenstrup et al.	
2019/0113619	A1	4/2019	Laster	
2019/0235075	A1	8/2019	Thompson et al.	
2019/0242994	A1	8/2019	Wanis et al.	
2019/0265354	A1	8/2019	Antao et al.	
2020/0011965	A1	1/2020	Stokes et al.	
2020/0011981	A1	1/2020	Stokes et al.	
2020/0072953	A1	3/2020	Wigh et al.	
2020/0088840	A1	3/2020	Stokes et al.	
2020/0103512	A1	4/2020	Brown et al.	
2020/0116843	A1	4/2020	Zimmerman et al.	
2020/0158842	A1	5/2020	Wigh et al.	
2020/0256967	A1	8/2020	Wigh et al.	
2020/0300994	A1	9/2020	Matson et al.	
2021/0096244	A1	4/2021	Wigh et al.	
2021/0141048	A1	5/2021	Laster et al.	
2021/0165068	A1	6/2021	Clark	
2021/0173061	A1	6/2021	Fyler et al.	
2021/0263150	A1	8/2021	Stokes	
2021/0364636	A1	11/2021	Simonton	
2021/0389439	A1	12/2021	Sumi et al.	
2022/0035026	A1	2/2022	Proctor	
2022/0035027	A1	2/2022	Proctor	
2022/0113393	A1	4/2022	Nishimori et al.	
2022/0120882	A1	4/2022	Coleman et al.	

FOREIGN PATENT DOCUMENTS

AU	2019213353	A1	8/2019
AU	2019203322	B2	12/2020
CA	2530290	C	11/2015
CA	2899119	A1	1/2017
CA	2928461	A1	1/2017
CA	2993361	A1	2/2017
CA	3032163	A1	8/2019
CA	3042656	A1	11/2019
CN	105759257	A	7/2016
CN	110493698	A	11/2019
EP	1925949	A1	5/2008
EP	2294452	B1	12/2011
EP	2612165	A1	7/2013
EP	3084467	A2	10/2016
EP	3144700	A1	3/2017
EP	1656568	B1	12/2017
EP	3325997	A1	5/2018
EP	3479138	A1	5/2019
EP	3572837	A1	11/2019
EP	2326970	B1	10/2020
EP	2956796	B1	4/2022
EP	4009069	A1	6/2022
JP	2004-080577	A	3/2004
JP	2007-535195	A	11/2007
JP	2008-508539	A	3/2008

(56) **References Cited**

FOREIGN PATENT DOCUMENTS

JP	2010-261883	A	11/2010
JP	5600678	B2	10/2014
JP	5688197	B2	3/2015
JP	2016-510106	A	4/2016
JP	2017-227489	A	12/2017
JP	6444319	B2	12/2018
JP	2019-030623	A	2/2019
JP	2020-039841	A	3/2020
JP	6732274	B1	7/2020
JP	6737464	B2	8/2020
JP	2020-141250	A	9/2020
JP	2020-155900	A	9/2020
KR	200184719	Y1	6/2000
WO	94/09605	A1	4/1994
WO	2005/008272	A2	1/2005
WO	2006/017511	A2	2/2006
WO	2012/028896	A1	3/2012
WO	2013/126761	A1	8/2013
WO	2014/126847	A2	8/2014
WO	2017/015741	A1	2/2017
WO	2018/222556	A1	12/2018
WO	2019/050552	A1	3/2019
WO	2020/174640	A1	9/2020
WO	2021/019858	A1	2/2021
WO	2021/127592	A2	6/2021
WO	2021/176726	A1	9/2021
WO	2021/220377	A1	11/2021

OTHER PUBLICATIONS

SeaBotix—Underwater Remotely Operated Vehicles (ROVs); ADS, Inc. YouTube. 2014 Video (mentioning SmartFlight): retreived Jul. 29, 2020 from https://www.youtube.com/watch?v=hkqJh5j6eQA.

SmartFlight 2.0 video; retrieved Jul. 29, 2020 from: http://www.teledynemarine.com/smartflight2-0?ProductLineID=112.

"Garmin Marine Webinars: Panoptix LiveScope Installation and Setup;" YouTube; Apr. 6, 2020; retreived Jan. 12, 2021 from https://www.youtube.com/watch?v=Z2AiSOmX5PA.

Nov. 26, 2021 Extended European Search Report issued in European Patent Application No. 21177698.4; 8 pp.

RyTek Marine (Apr. 6, 2022). Seeing double isn't always a bad thing . . . ; retreived Sep. 30, 2022 from https://www.facebook.com/RyTekMarine.

"Open Access Review: a Review of Acoustic Impedance Matching Techniques for Piezoelectric Sensors and Transducers;" Sensors; vol. 20; No. 14; Jul. 21, 2020; DOI: https://doi.org/10.3390/s20144051.

"Active Target 'Scout Only' Transducer Mount Combo;" RyTek Marine; retreived Aug. 10, 2022 from https://rytekmarine.com/collections/lowrance-activetarget/products/active-target-scout-only-transducer-mount-combo.

* cited by examiner

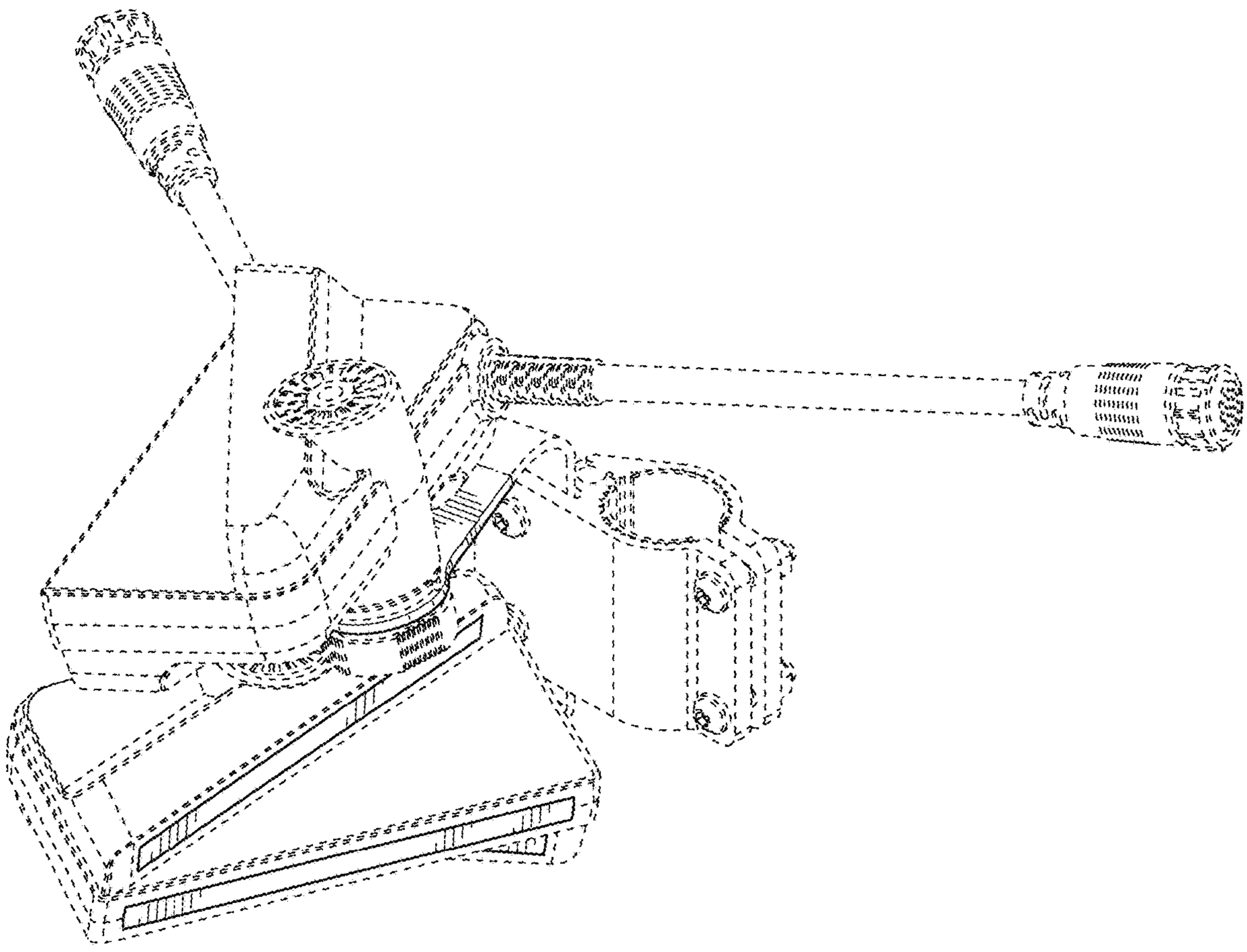


FIG. 1

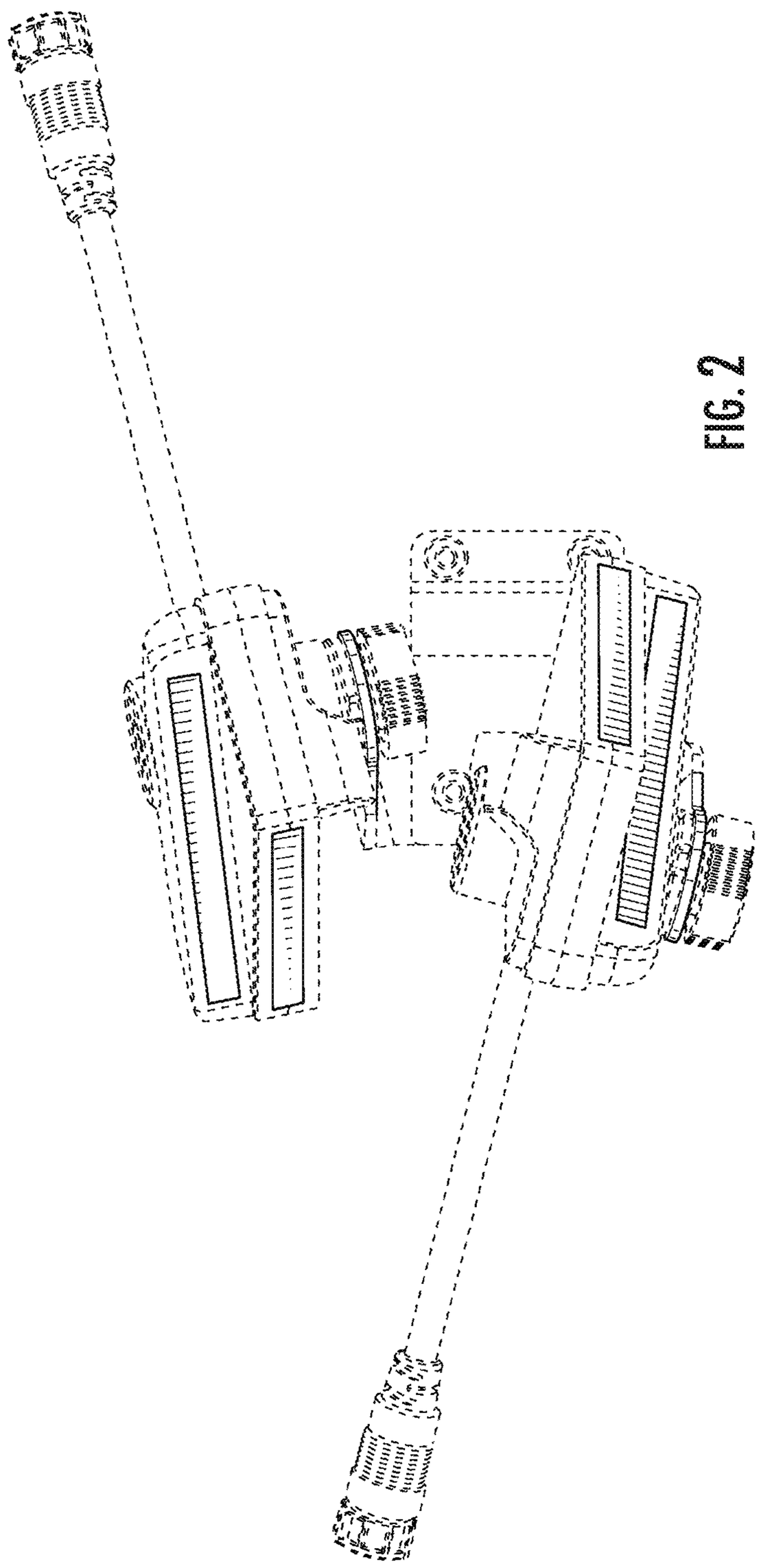


FIG. 2

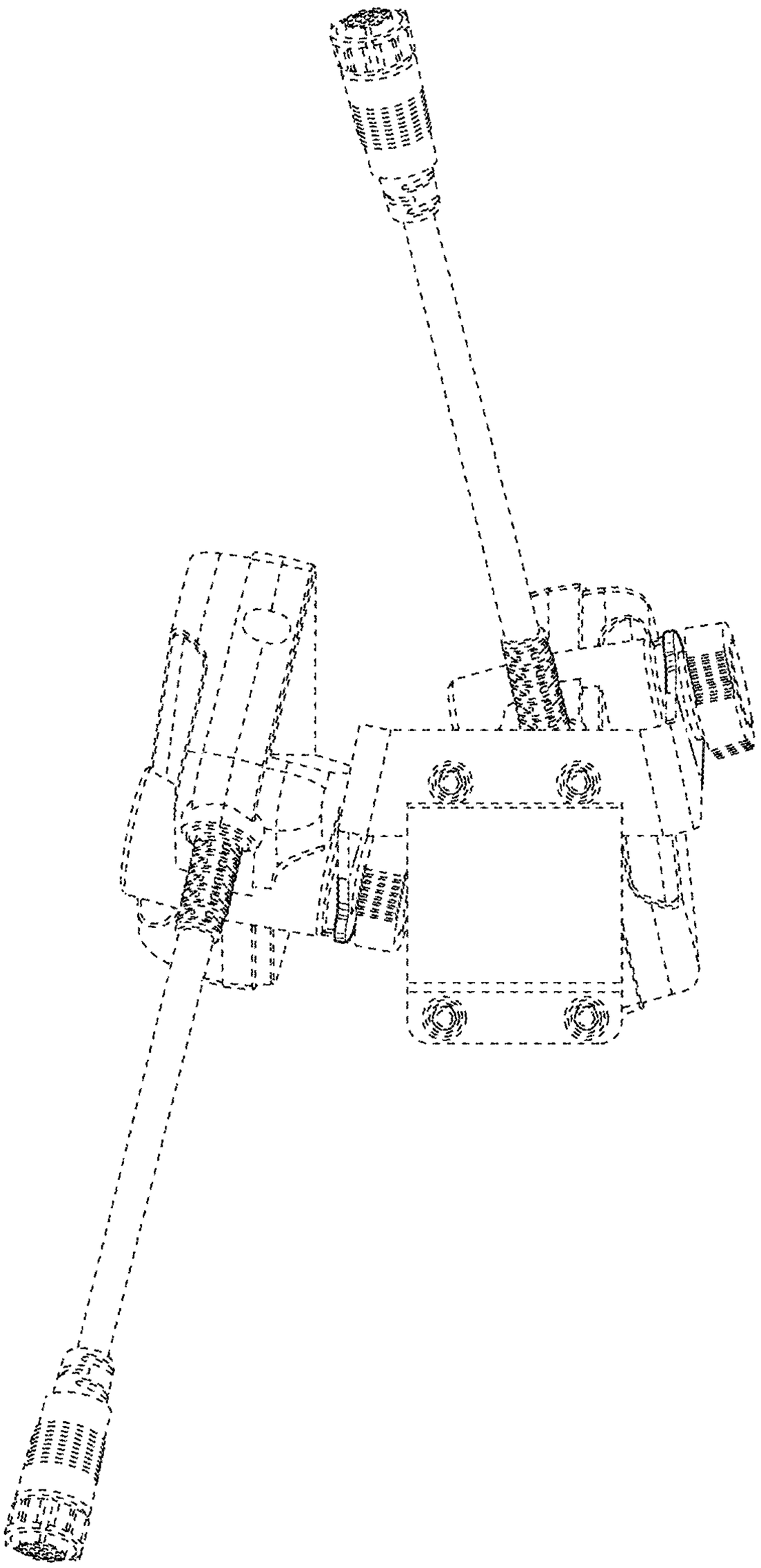


FIG. 3

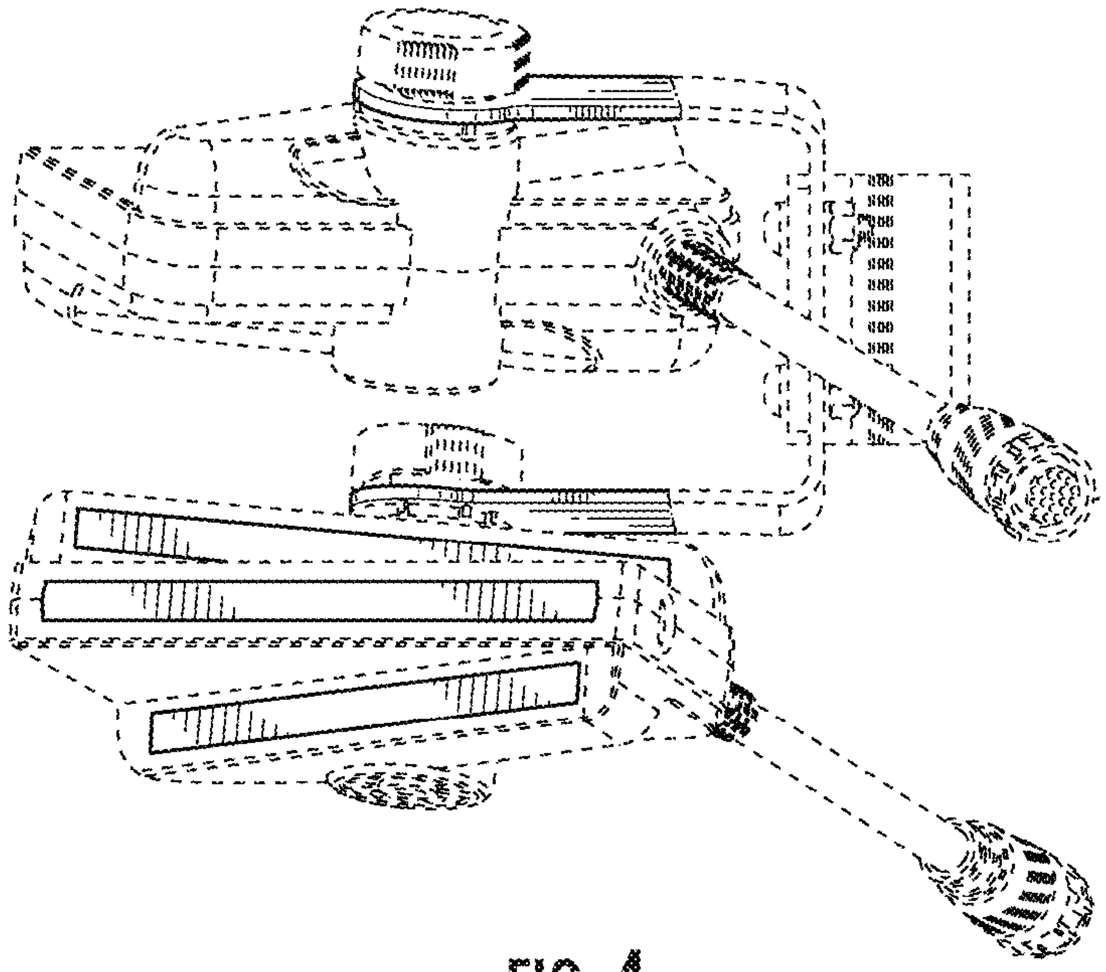


FIG. 4

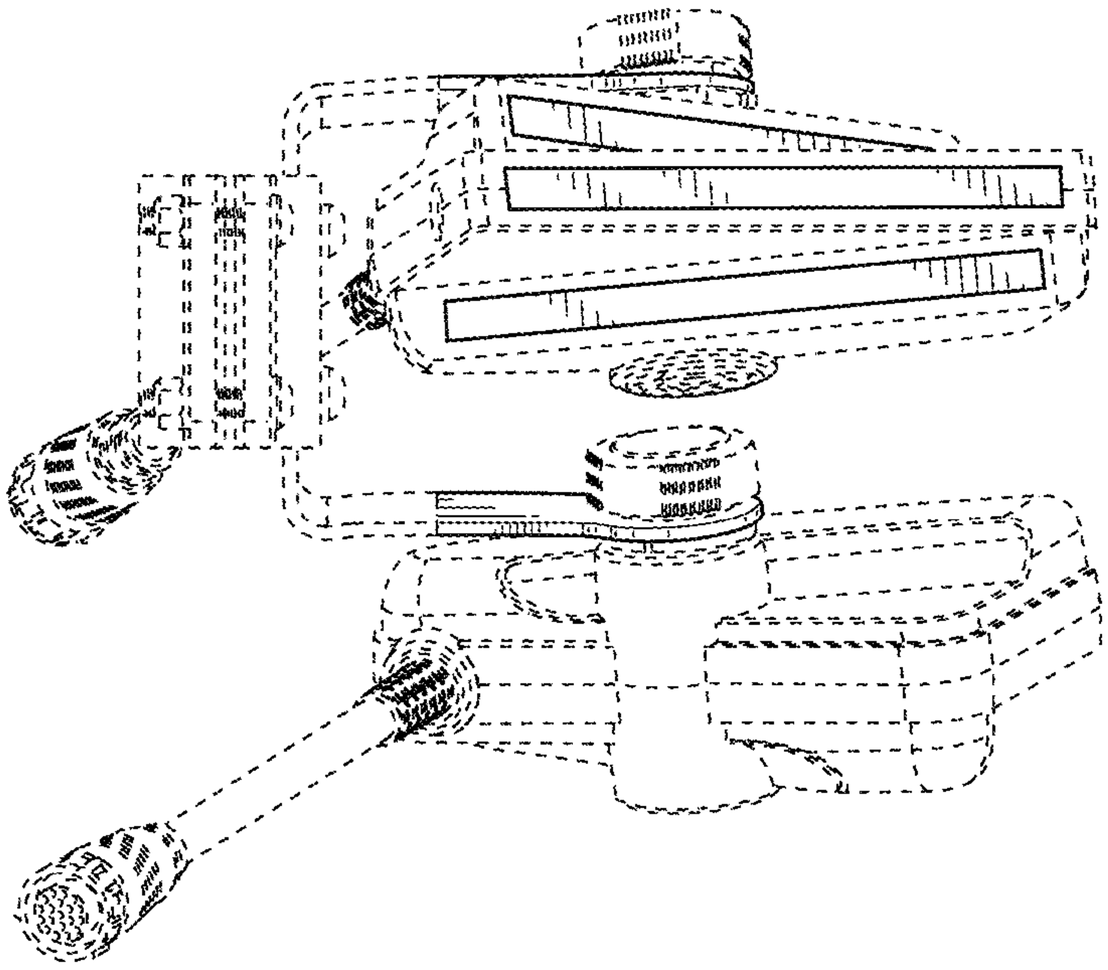


FIG. 5

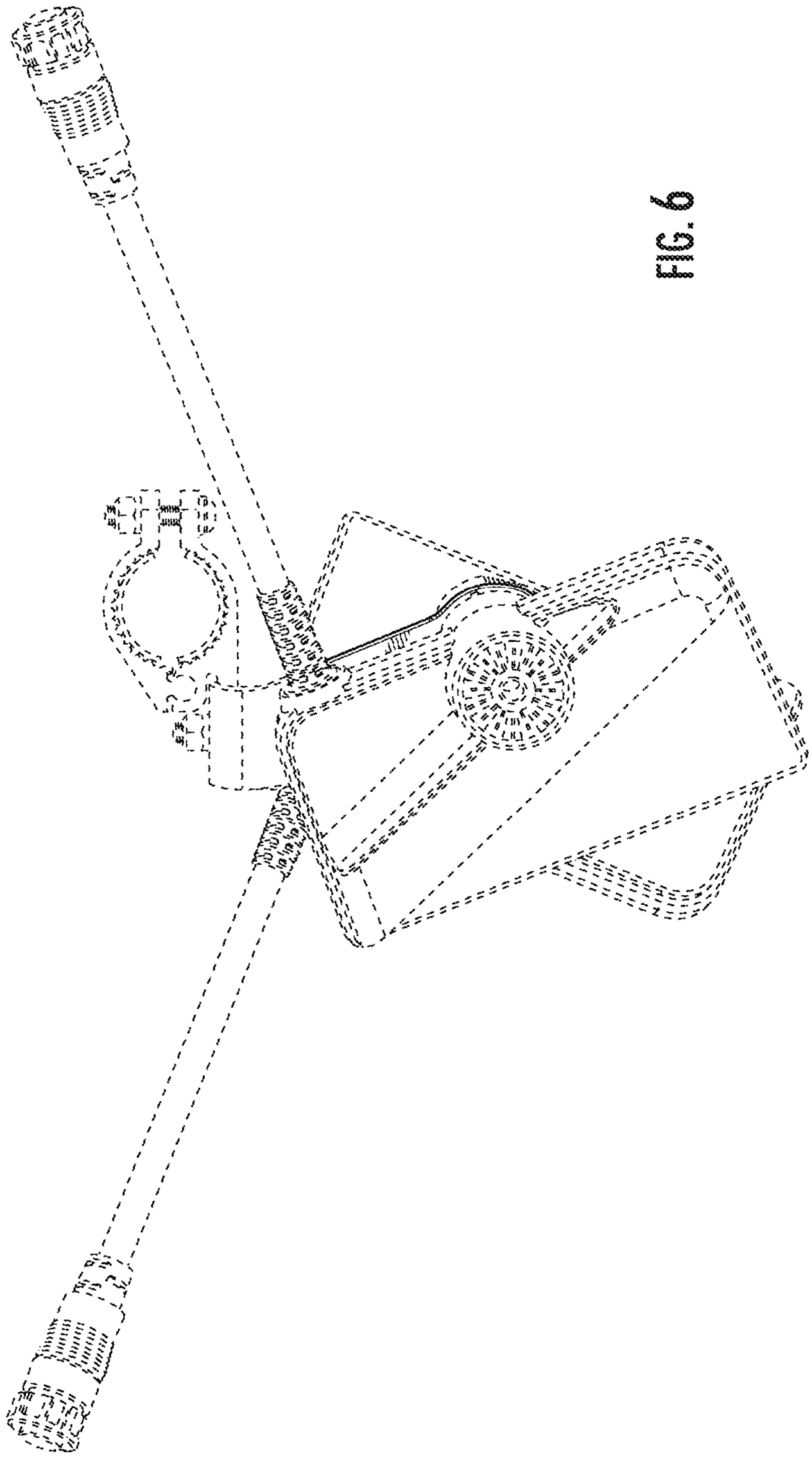
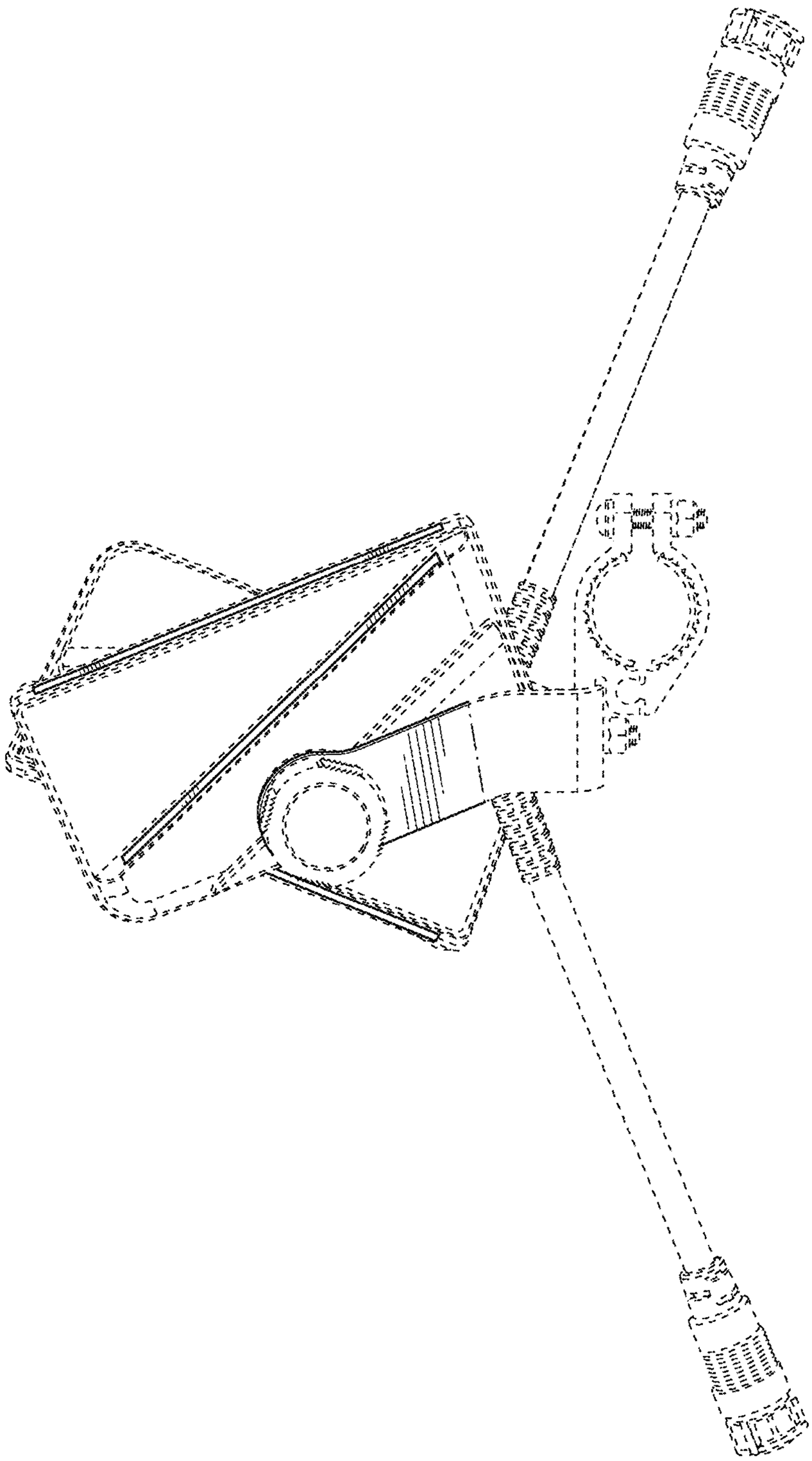


FIG. 6



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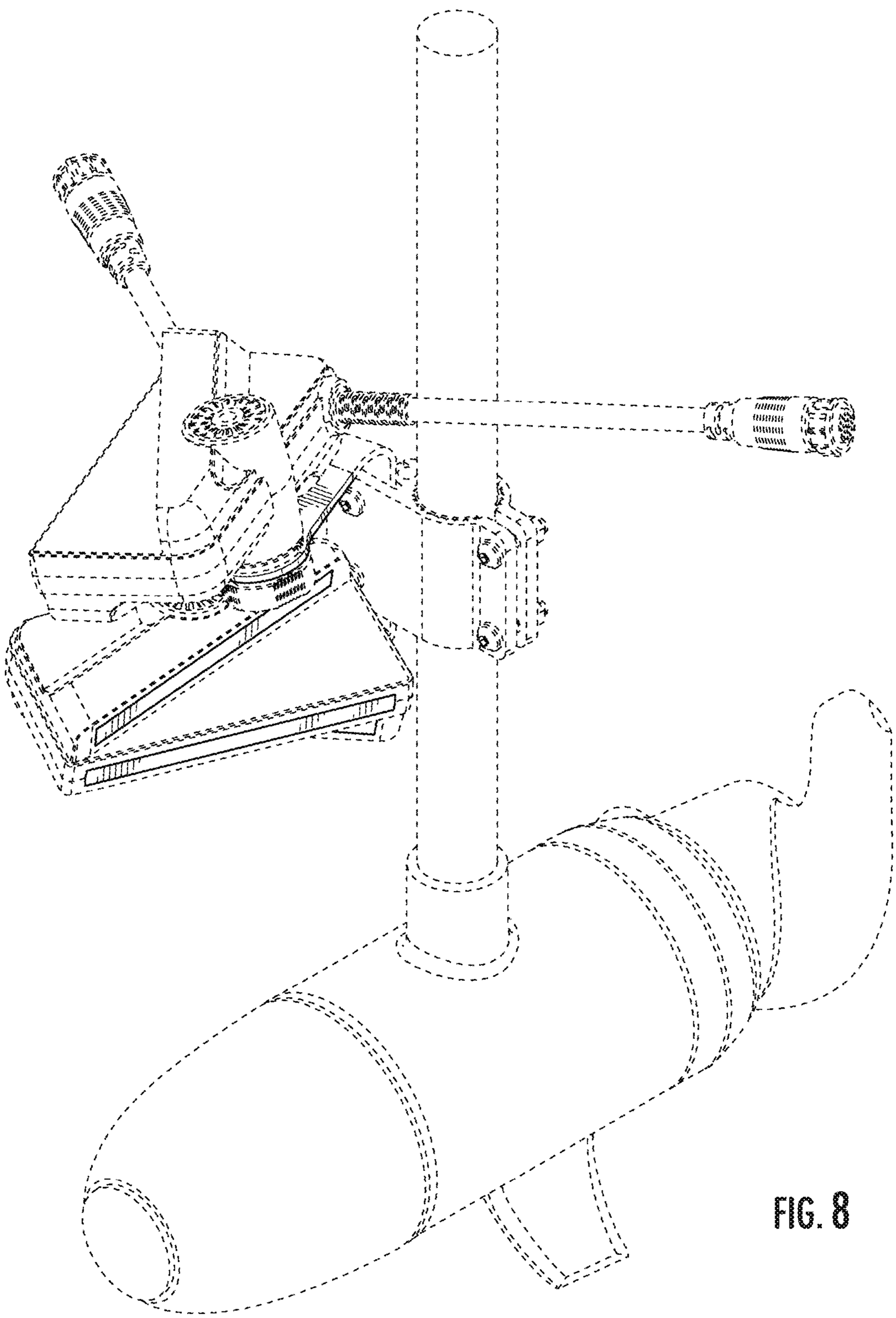

FIG. 8

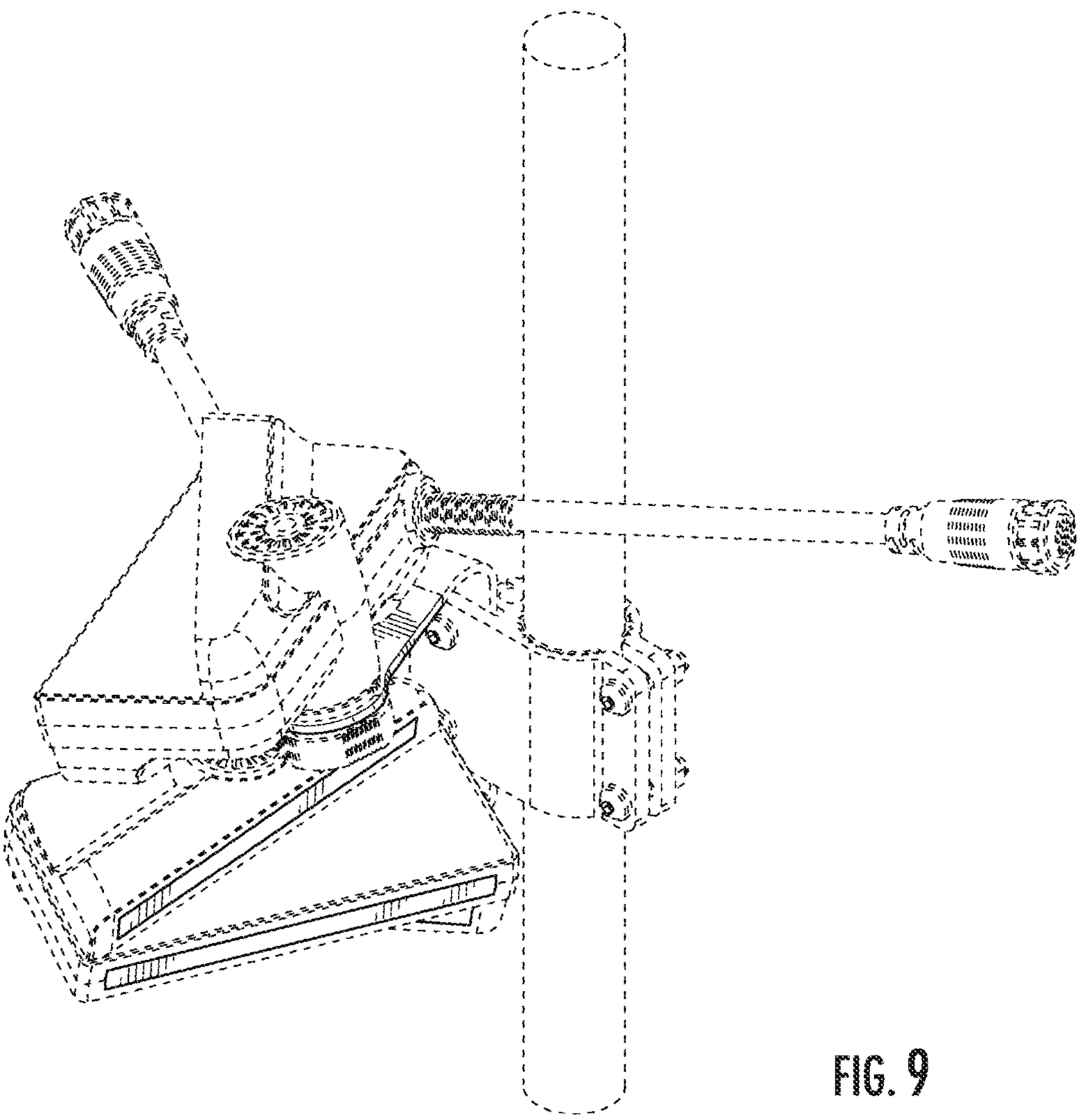

FIG. 9