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(12) **United States Design Patent** (10) **Patent No.:** **US D874,655 S**
Calef et al. (45) **Date of Patent:** **** Feb. 4, 2020**

(54) **POSITIONING ARM FOR ARTICULATING ROBOTIC SURGICAL SYSTEM** 3,951,271 A * 4/1976 Mette B25J 9/041 414/591

(71) Applicant: **Medrobotics Corporation**, Raynham, MA (US) 4,078,670 A 3/1978 Francois et al.
4,108,211 A 8/1978 Tanaka
4,150,329 A 4/1979 Dahlstrom
4,221,997 A 9/1980 Flemming
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4,260,319 A 4/1981 Motoda et al.
4,283,764 A * 8/1981 Crum B05B 13/0431 318/568.14

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4,351,323 A 9/1982 Ouchi et al.
D268,033 S * 2/1983 Stackhouse D15/122
4,432,349 A 2/1984 Oshiro
4,445,184 A 4/1984 Noguchi
4,474,174 A 10/1984 Petruzzi
(**) Term: **15 Years** 4,475,375 A 10/1984 Hill
(21) Appl. No.: **29/632,148** 4,494,417 A 1/1985 Larson et al.
4,496,278 A 1/1985 Kaise
4,502,830 A 3/1985 Inaba et al.
(22) Filed: **Jan. 5, 2018** 4,517,963 A 5/1985 Michel
4,531,885 A 7/1985 Molaug
(51) **LOC (12) Cl.** **24-02** 4,535,207 A 8/1985 Lindqvist
(52) **U.S. Cl.** 4,564,179 A 1/1986 Hollingsworth
USPC **D24/185** 4,586,868 A * 5/1986 Nakashima B25J 17/0283 414/735

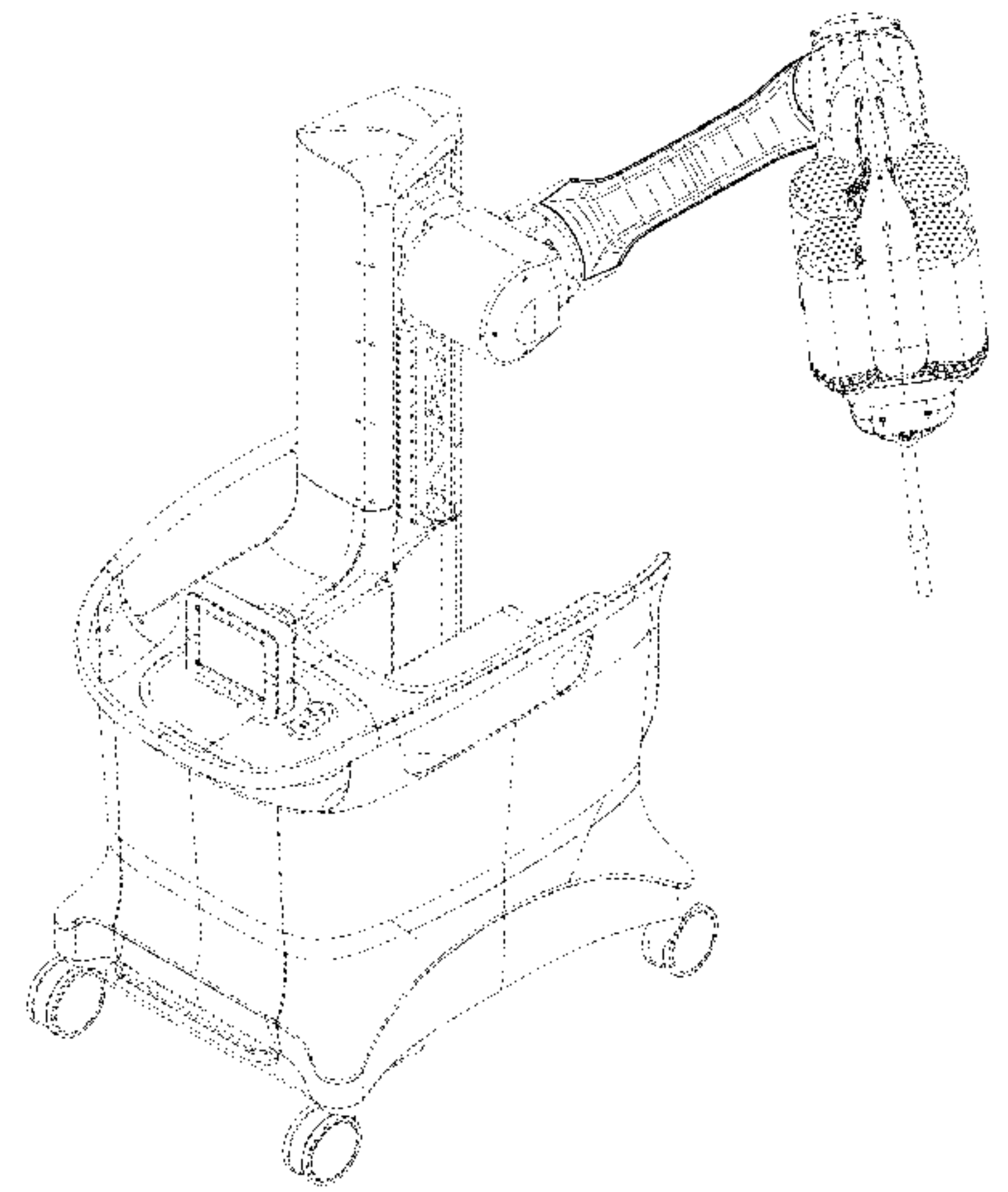
(58) **Field of Classification Search** 4,600,355 A 7/1986 Johnson
USPC D24/185, 199, 172, 232, 186, 170, 160, D287,368 S * 12/1986 Shibayama D15/122
D24/158; D21/578; D15/199, 122; D13/168; D14/452 4,655,257 A 4/1987 Iwashita
4,661,032 A 4/1987 Arai
CPC .. A61B 34/71; A61B 18/22; B25J 9/08; B25J 9/041; B25J 9/1689; B25J 9/047; B25J 17/0283; B25J 18/06; A61H 1/0274; B05B 13/0431 4,666,366 A 5/1987 Davis
4,693,663 A * 9/1987 Brenholt B25J 9/047 414/735

4,700,693 A 10/1987 Lia et al.
4,706,001 A 11/1987 Nakashima et al.
4,726,355 A 2/1988 Okada
4,766,775 A * 8/1988 Hodge B25J 9/08 74/490.01

See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS

2,513,027 A	6/1950	Kruczek	4,780,045 A	10/1988	Akeel et al.
3,060,972 A	10/1962	Sheldon	4,787,369 A	11/1988	Allred, III et al.
3,557,780 A	1/1971	Sato	4,790,294 A	12/1988	Allred, III et al.
3,572,325 A	3/1971	Bazell et al.	4,796,607 A	1/1989	Allred, III et al.
3,583,393 A	6/1971	Takahashi	4,804,897 A	2/1989	Gordon et al.
3,625,200 A	12/1971	Muller	4,805,477 A	2/1989	Akeel
3,638,973 A	2/1972	Poletti	4,806,066 A	2/1989	Rhodes et al.
3,703,968 A	11/1972	Uhrich et al.	4,830,569 A	5/1989	Jannborg
3,739,770 A	6/1973	Mori	4,831,547 A	5/1989	Ishiguro et al.
3,790,002 A	2/1974	Germond et al.	4,838,859 A	6/1989	Strassmann
3,892,228 A	7/1975	Mitsui	4,863,133 A	9/1989	Bonnell
3,920,972 A	11/1975	Corwin, Jr. et al.	4,864,888 A	9/1989	Iwata
			4,873,965 A	10/1989	Danieli
			4,888,708 A	12/1989	Brantmark et al.
			4,900,218 A	2/1990	Sutherland



US D874,655 S

4,941,457 A	7/1990	Hasegawa	7,364,582 B2	4/2008	Lee	
4,943,296 A	7/1990	Funakubo et al.	7,381,018 B2	6/2008	Zepic et al.	
4,947,827 A	8/1990	Opie et al.	D572,739 S *	7/2008	Jennings	D15/199
4,949,927 A	8/1990	Madocks et al.	7,410,483 B2	8/2008	Danitz et al.	
4,950,116 A	8/1990	Nishida	D583,051 S	12/2008	Lee et al.	
4,956,790 A	9/1990	Tsuchihashi et al.	7,615,067 B2	11/2009	Lee et al.	
4,979,949 A	12/1990	Matsen, III et al.	7,648,519 B2	1/2010	Lee et al.	
4,998,916 A	3/1991	Hammerslag et al.	7,686,826 B2	3/2010	Lee et al.	
5,005,558 A	4/1991	Aomori	7,708,758 B2	5/2010	Lee et al.	
5,006,035 A	4/1991	Nakashima et al.	7,789,875 B2	9/2010	Brock et al.	
5,012,169 A	4/1991	Ono et al.	7,819,885 B2	10/2010	Cooper	
5,037,391 A	8/1991	Hammerslag et al.	D627,474 S *	11/2010	Nordgren	D14/452
5,044,063 A	9/1991	Voellmer	7,828,808 B2	11/2010	Hinman et al.	
5,046,375 A	9/1991	Salisbury, Jr. et al.	7,842,028 B2	11/2010	Lee	
5,064,340 A	11/1991	Genov et al.	7,850,642 B2	12/2010	Moll et al.	
5,078,140 A	1/1992	Kwoh	7,854,109 B2	12/2010	Zubiate et al.	
5,086,401 A	2/1992	Glassman et al.	7,854,738 B2	12/2010	Lee et al.	
5,105,819 A	4/1992	Wollschlager et al.	D631,155 S	1/2011	Peine et al.	
5,108,368 A	4/1992	Hammerslag et al.	7,867,241 B2	1/2011	Brock et al.	
5,143,475 A	9/1992	Chikama	7,946,546 B2	5/2011	Zubiate et al.	
5,167,221 A	12/1992	Chikama	D640,789 S	6/2011	Peine et al.	
5,174,277 A	12/1992	Matsumaru	D646,703 S *	10/2011	Wong	D15/199
5,176,126 A	1/1993	Chikama	8,029,531 B2	10/2011	Lee et al.	
5,178,129 A	1/1993	Chikama et al.	8,083,765 B2	12/2011	Lee et al.	
5,179,935 A	1/1993	Miyagi	8,100,031 B2	1/2012	Zubiate et al.	
5,193,963 A	3/1993	McAffee et al.	8,105,350 B2	1/2012	Lee et al.	
5,195,968 A	4/1993	Lundquist et al.	D654,503 S *	2/2012	Sapper	D14/452
5,200,679 A	4/1993	Graham	8,114,118 B2	2/2012	Knodel et al.	
5,201,325 A	4/1993	McEwen et al.	D655,324 S *	3/2012	Wong	D15/199
5,203,380 A	4/1993	Chikama	D660,845 S *	5/2012	Schmauch	D14/452
5,203,772 A	4/1993	Hammerslag et al.	8,192,422 B2	6/2012	Zubiate et al.	
5,217,003 A	6/1993	Wilk	8,221,450 B2	7/2012	Lee et al.	
5,217,453 A	6/1993	Wilk	8,257,386 B2	9/2012	Lee et al.	
5,236,432 A	8/1993	Matsen, III et al.	D679,016 S *	3/2013	Jarva	D24/158
5,251,611 A	10/1993	Zehel et al.	8,409,175 B2	4/2013	Lee et al.	
5,254,088 A	10/1993	Lundquist et al.	8,409,245 B2	4/2013	Lee	
5,254,130 A	10/1993	Poncet et al.	8,459,138 B2	6/2013	Zubiate et al.	
5,257,669 A	11/1993	Kerley et al.	D690,421 S *	9/2013	Charles	D24/158
5,266,875 A	11/1993	Slotine et al.	D692,139 S *	10/2013	Charles	D24/158
5,271,381 A	12/1993	Ailinger et al.	D703,817 S *	4/2014	Sung	D24/158
5,273,026 A	12/1993	Wilk	8,709,037 B2	4/2014	Lee et al.	
5,297,443 A	3/1994	Wentz	8,834,169 B2 *	9/2014	Reinkensmeyer ...	A61H 1/0274
5,318,526 A	6/1994	Cohen				434/247
5,327,905 A	7/1994	Avitall	D715,440 S *	10/2014	Kim	D24/158
5,337,732 A	8/1994	Grundfest et al.	D716,357 S *	10/2014	Gombert	D15/199
5,386,741 A	2/1995	Rennex	8,926,597 B2	1/2015	Lee	
5,405,344 A	4/1995	Williamson et al.	8,992,421 B2	3/2015	Stand et al.	
5,448,989 A	10/1995	Heckele	9,168,050 B1	10/2015	Peine et al.	
5,454,827 A	10/1995	Aust et al.	D743,036 S *	11/2015	Boukhny	D24/172
5,520,678 A	5/1996	Heckele et al.	D749,223 S *	2/2016	Vargas	D24/185
5,524,180 A	6/1996	Wang et al.	9,364,955 B2 *	6/2016	Oyola	B25J 18/06
D378,315 S *	3/1997	Schwaegerle	D763,336 S *	8/2016	Ries	D15/199
5,624,381 A	4/1997	Kieturakis	9,427,256 B2	8/2016	Lee	
5,643,294 A	7/1997	Tovey et al.	D768,219 S *	10/2016	Kraus	D15/199
5,665,105 A	9/1997	Furnish et al.	9,517,059 B2	12/2016	Castro	
5,702,408 A	12/1997	Wales et al.	9,572,628 B2	2/2017	Zubiate et al.	
5,759,151 A	6/1998	Sturges	9,649,163 B2	5/2017	Darisse et al.	
5,815,640 A	9/1998	Wang et al.	D790,618 S *	6/2017	Ke	D15/199
5,841,950 A	11/1998	Wang et al.	9,675,380 B2	6/2017	Castro et al.	
D409,636 S *	5/1999	Genov	9,757,856 B2	9/2017	Oyola et al.	
5,907,664 A	5/1999	Wang et al.	D802,041 S *	11/2017	He	D15/199
5,987,757 A	11/1999	Schmidt et al.	9,821,477 B2	11/2017	Anderson et al.	
6,080,181 A	6/2000	Jensen et al.	D809,142 S *	1/2018	Lim	D24/160
6,132,368 A	10/2000	Cooper	9,901,410 B2	2/2018	Oyola et al.	
D435,107 S *	12/2000	Blair	9,913,695 B2	3/2018	Johnston et al.	
6,210,416 B1	4/2001	Chu et al.	9,949,802 B2	4/2018	Cooper	
D449,057 S *	10/2001	Selic	D818,019 S *	5/2018	Huang	D15/199
6,346,072 B1	2/2002	Cooper	9,962,179 B2	5/2018	Castro et al.	
6,666,854 B1	12/2003	Lange	10,004,568 B2	6/2018	Castro et al.	
6,837,846 B2	1/2005	Jaffe et al.	10,016,187 B2	7/2018	Castro	
6,837,847 B2	1/2005	Ewers et al.	D824,977 S *	8/2018	Everman	D15/199
7,090,637 B2	8/2006	Danitz	D825,066 S *	8/2018	Liu	D24/199
D528,216 S *	9/2006	Korner	D825,632 S *	8/2018	Clemmer	D15/199
7,147,650 B2	12/2006	Lee	D827,005 S *	8/2018	Huang	D15/199
7,250,028 B2	7/2007	Julian et al.	D827,006 S *	8/2018	Lin	D15/199
D548,759 S *	8/2007	Kraft	D832,371 S *	10/2018	Miao	D21/578
D553,655 S *	10/2007	Jennings	D836,779 S *	12/2018	Alder	D24/158
7,338,513 B2	3/2008	Lee et al.	D837,380 S *	1/2019	Hulford	D24/170
7,357,774 B2	4/2008	Cooper	D840,360 S *	2/2019	Scott	D13/168

D840,451	S *	2/2019	Yoo	D15/199
D841,710	S *	2/2019	Klassen	D15/199
10,206,752	B2 *	2/2019	Hares	B25J 9/1689
D843,427	S *	3/2019	Medal	D15/199
D844,485	S *	4/2019	Siegel	D11/164
D846,127	S *	4/2019	Yang	D24/185
10,299,873	B2 *	5/2019	Hares	A61B 34/71
D852,285	S *	6/2019	Qi	D21/578
10,398,516	B2 *	9/2019	Jackson	
2002/0091374	A1	7/2002	Cooper	
2003/0158463	A1	8/2003	Julian et al.	
2004/0236316	A1	11/2004	Danitz	
2005/0021050	A1	1/2005	Cooper	
2005/0107667	A1	5/2005	Danitz et al.	
2005/0125027	A1	6/2005	Knodel et al.	
2005/0165429	A1	7/2005	Douglas et al.	
2005/0273084	A1	12/2005	Hinman et al.	
2007/0003385	A1	1/2007	Zepic et al.	
2007/0250110	A1	10/2007	Lu et al.	
2008/0147091	A1	6/2008	Cooper	
2008/0245173	A1	10/2008	Schwerin et al.	
2009/0171151	A1	7/2009	Choset et al.	
2011/0028990	A1	2/2011	Cooper	
2011/0066161	A1	3/2011	Cooper	
2011/0152613	A1	6/2011	Zubiate et al.	
2011/0184241	A1	7/2011	Zubiate et al.	
2011/0313243	A1	12/2011	Zubiate et al.	
2014/0005683	A1	1/2014	Stand et al.	
2014/0012287	A1	1/2014	Oyola et al.	
2014/0012288	A1	1/2014	Darisse et al.	
2014/0046305	A1	2/2014	Castro et al.	
2014/0318299	A1	10/2014	Oyola et al.	
2014/0371764	A1	12/2014	Oyola et al.	
2015/0157410	A1	6/2015	Kilroy et al.	
2015/0282835	A1	10/2015	Castro et al.	
2015/0342690	A1 *	12/2015	Zubiate	A61B 18/22 606/130
2016/0067000	A1	3/2016	Johnston et al.	
2016/0074028	A1	3/2016	Castro	
2016/0256226	A1	9/2016	Castro et al.	
2016/0262840	A1	9/2016	Zubiate et al.	
2016/0354114	A1	12/2016	Lee	
2017/0015007	A1	1/2017	Anderson et al.	
2017/0100197	A1	4/2017	Zubiate et al.	
2017/0119364	A1	5/2017	Castro	
2017/0196546	A1	7/2017	Lee	

FOREIGN PATENT DOCUMENTS

EP	0653922	11/2005
EP	1015068	9/2011
WO	2012015659	2/2012
WO	2012054829	4/2012
WO	2012078309	6/2012
WO	2012138834	10/2012
WO	2012167043	12/2012
WO	2013039999	3/2013
WO	2013096610	6/2013
WO	2013184560	12/2013
WO	2014026104	2/2014
WO	2014110218	7/2014
WO	2014179683	11/2014
WO	2014189876	11/2014
WO	2015081008	6/2015
WO	2015102939	7/2015
WO	2015188071	12/2015
WO	2016172162	10/2016
WO	2018064475	4/2018
WO	2018187425	10/2018

OTHER PUBLICATIONS

International Search Report & Written Opinion report dated Mar. 7, 2019, issued in corresponding International Application No. PCT/US2019/012158.

* cited by examiner

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

(57) CLAIM

The ornamental design for a positioning arm for articulating robotic surgical system, as shown and described.

DESCRIPTION

FIG. 1 is a front perspective view of a positioning arm for articulating robotic surgical system, illustrated in an extended position, in accordance with the present invention; FIG. 2 is a rear perspective view of a positioning arm for articulating robotic surgical system, illustrated in an extended position, in accordance with the present invention; FIG. 3 is a front view of a positioning arm for articulating robotic surgical system, illustrated in an extended position, in accordance with the present invention; FIG. 4 is a rear view of a positioning arm for articulating robotic surgical system, illustrated in an extended position, in accordance with the present invention; FIG. 5 is a top view of a positioning arm for articulating robotic surgical system, illustrated in an extended position, in accordance with the present invention; FIG. 6 is a bottom view of a positioning arm for articulating robotic surgical system, illustrated in an extended position, in accordance with the present invention; FIG. 7 is a left side view of a positioning arm for articulating robotic surgical system, illustrated in an extended position, in accordance with the present invention; FIG. 8 is a right side view of a positioning arm for articulating robotic surgical system, illustrated in an extended position, in accordance with the present invention; FIG. 9 is a front perspective view of a positioning arm for articulating robotic surgical system, illustrated in a retracted position, in accordance with the present invention; FIG. 10 is a rear perspective view of a positioning arm for articulating robotic surgical system, illustrated in a retracted position, in accordance with the present invention; FIG. 11 is a front view of a positioning arm for articulating robotic surgical system, illustrated in a retracted position, in accordance with the present invention; FIG. 12 is a rear view of a positioning arm for articulating robotic surgical system, illustrated in a retracted position, in accordance with the present invention; FIG. 13 is a top view of a positioning arm for articulating robotic surgical system, illustrated in a retracted position, in accordance with the present invention; FIG. 14 is a bottom view of a positioning arm for articulating robotic surgical system, illustrated in a retracted position, in accordance with the present invention; FIG. 15 is a left side view of a positioning arm for articulating robotic surgical system, illustrated in a retracted position, in accordance with the present invention; and, FIG. 16 is a right side view of a positioning arm for articulating robotic surgical system, illustrated in a retracted position, in accordance with the present invention.

In the drawings, the broken lines are for the purpose of illustrating environment only and form no part of the claimed design.

1 Claim, 16 Drawing Sheets

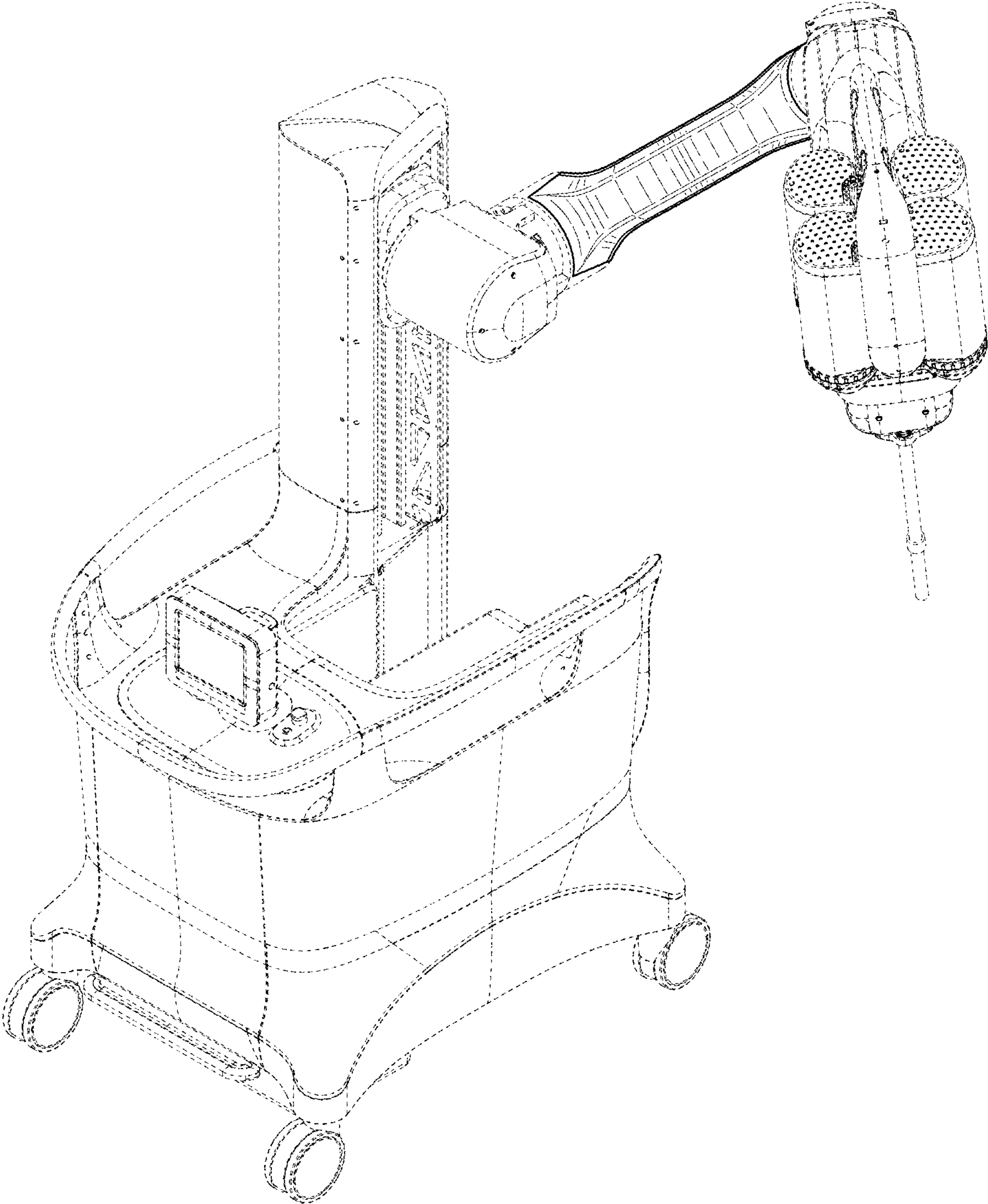


FIG. 1

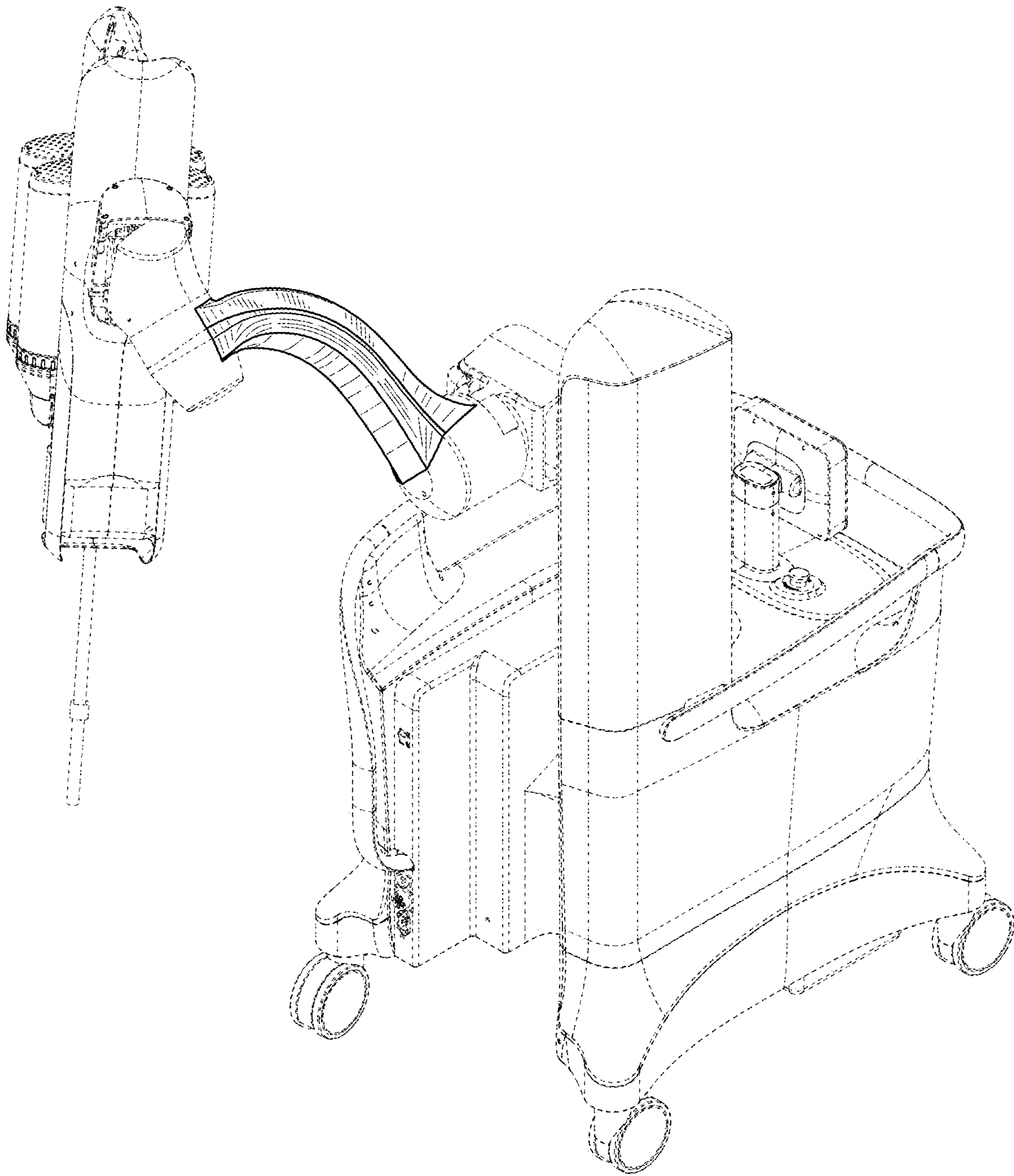


FIG. 2

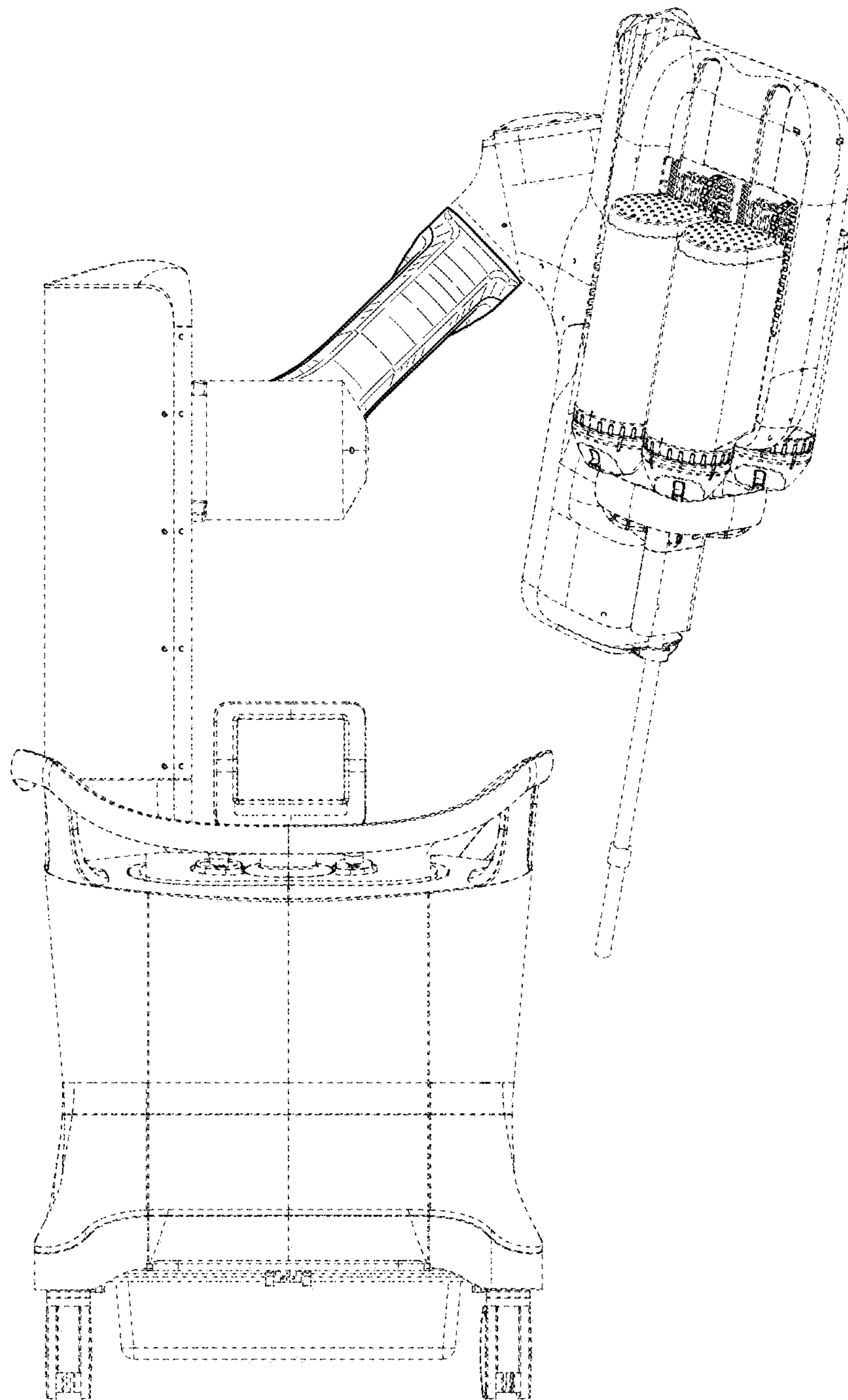


FIG. 3

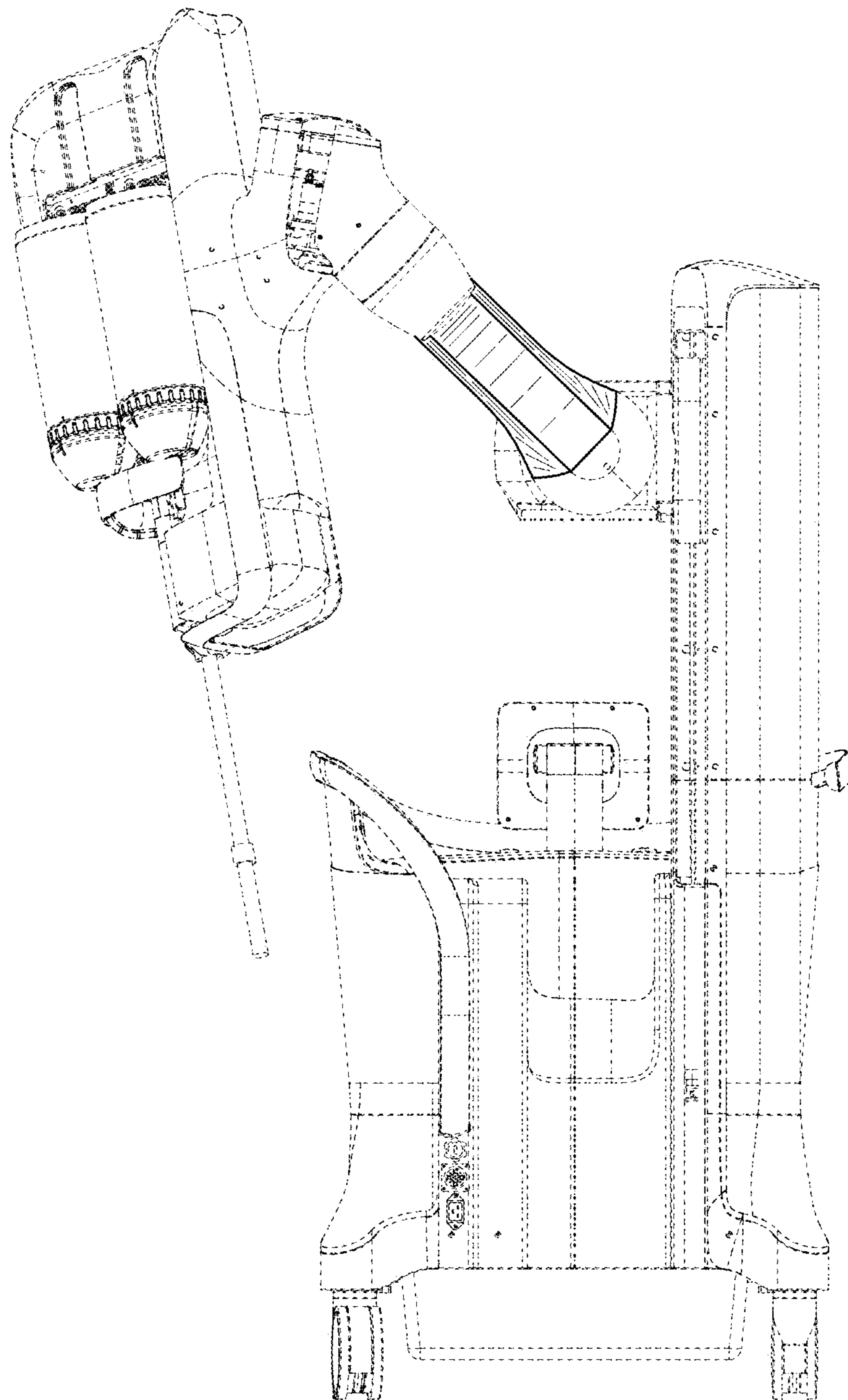


FIG. 4

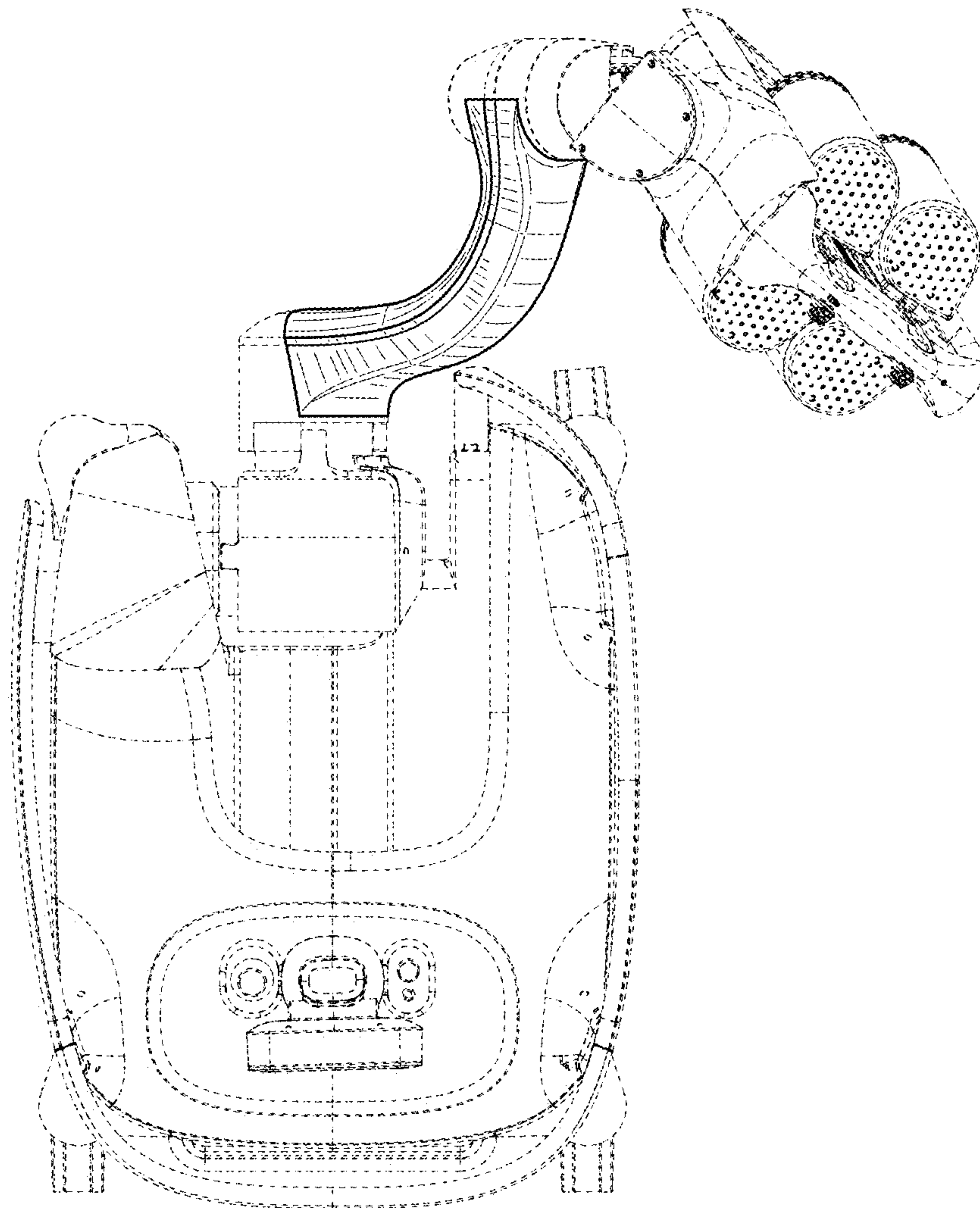


FIG. 5

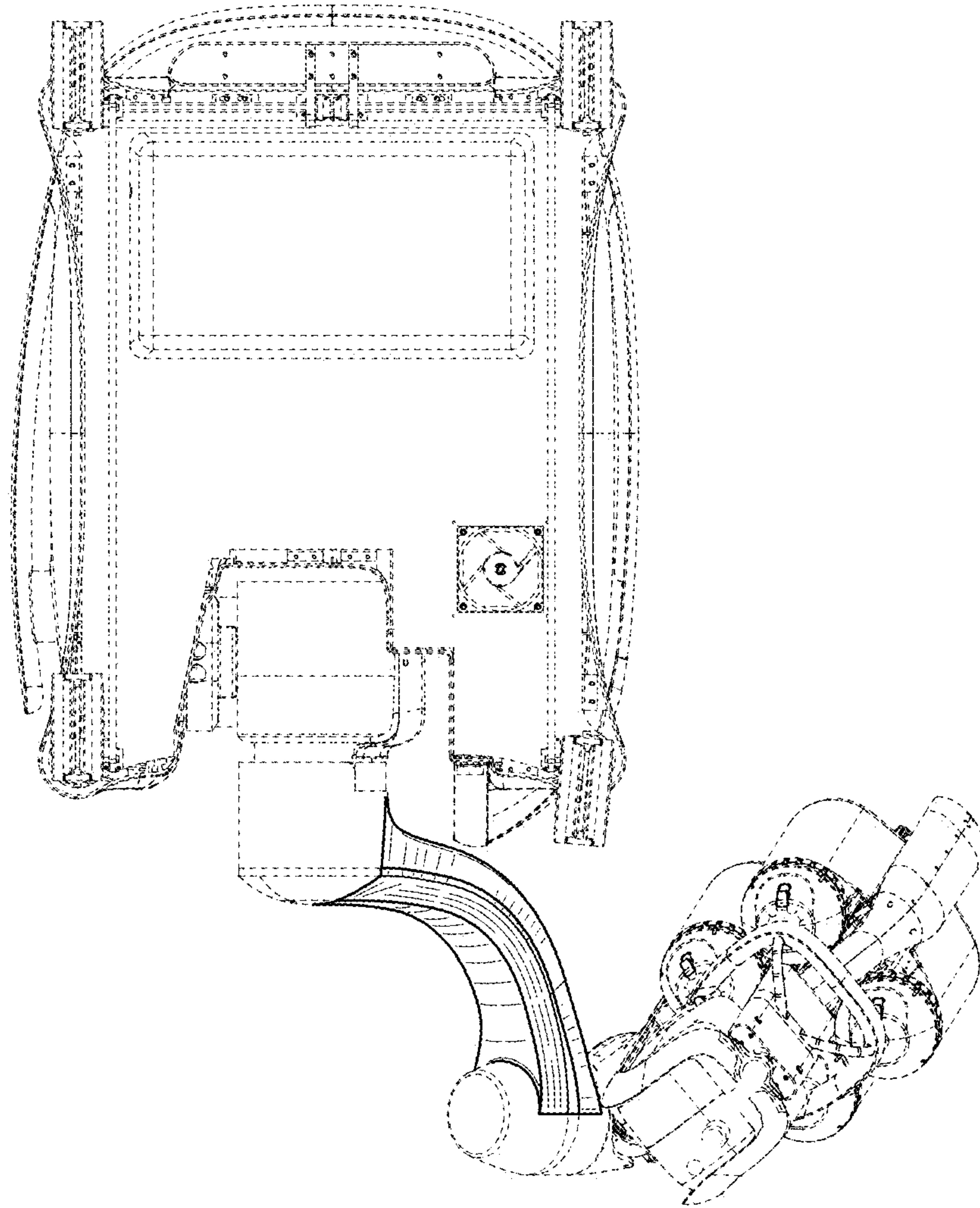


FIG. 6

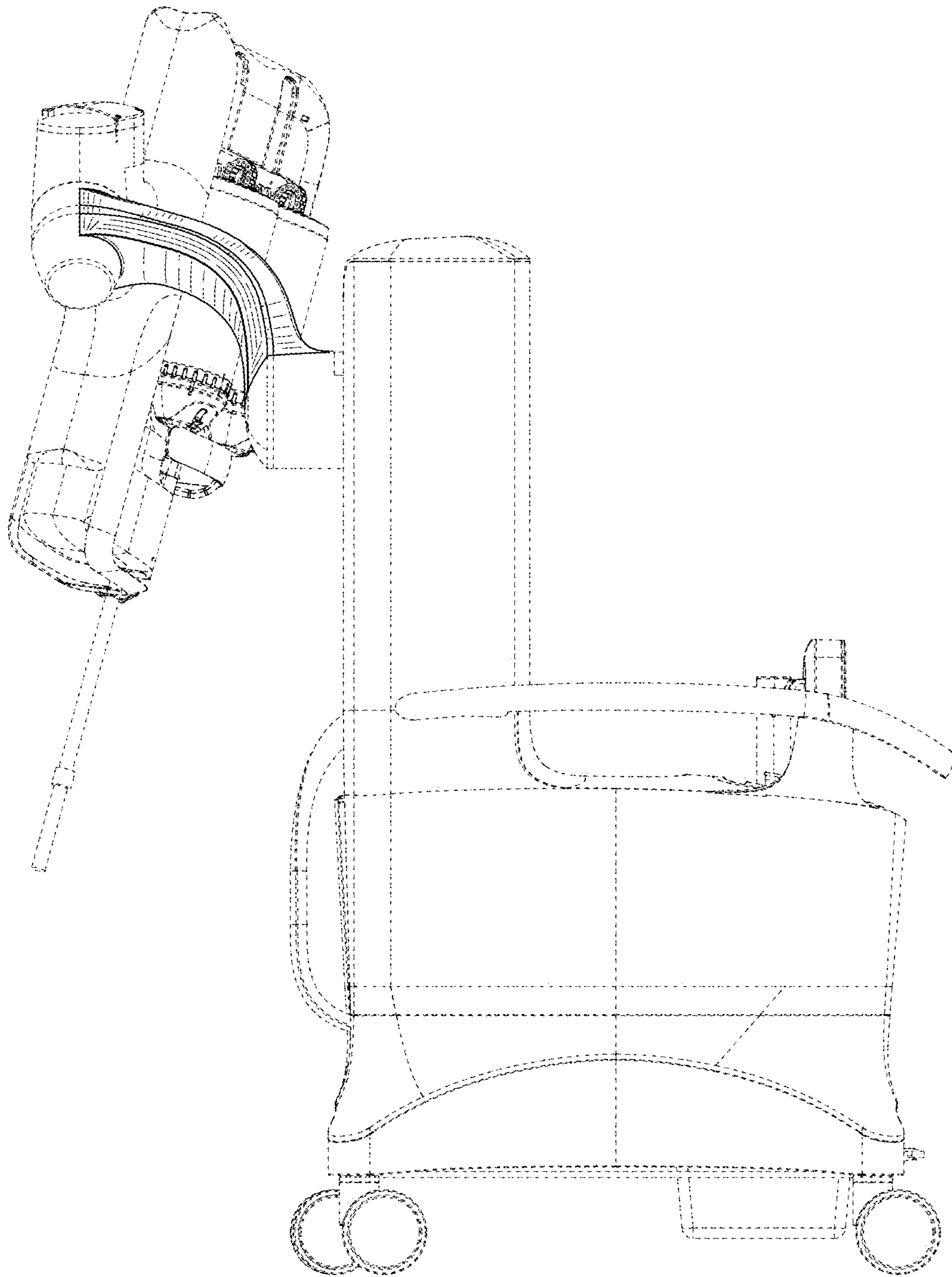


FIG. 7

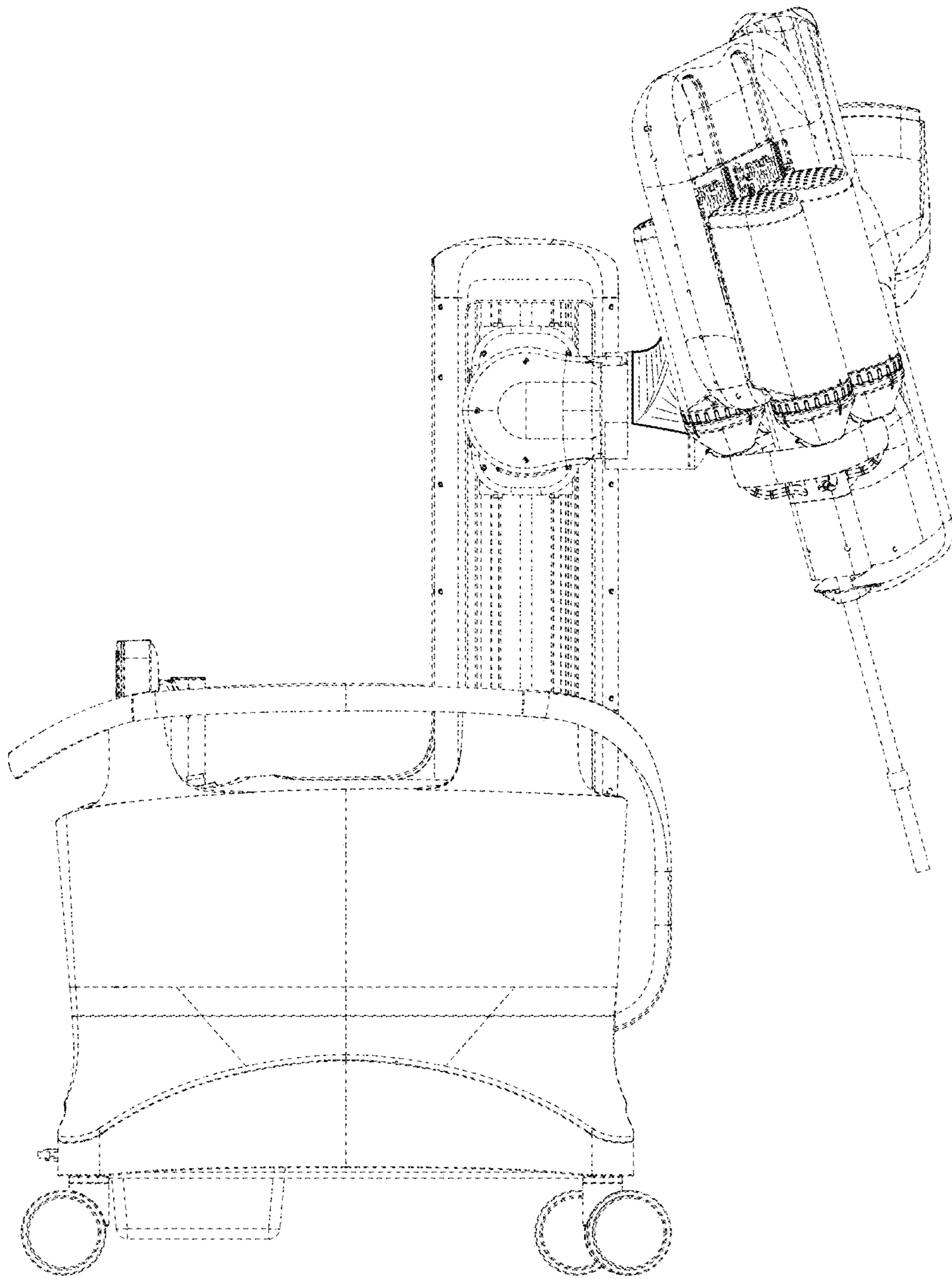


FIG. 8

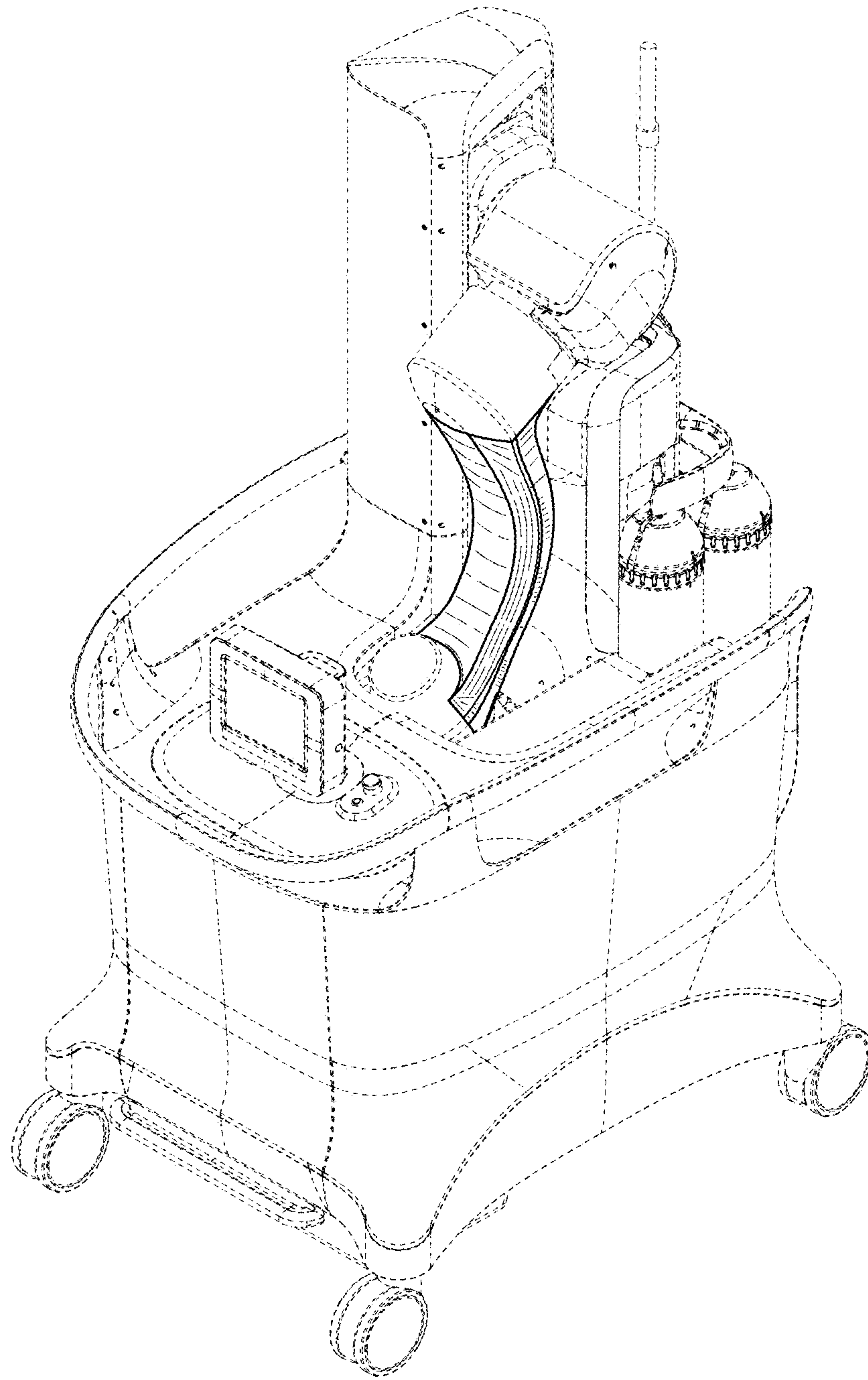


FIG. 9

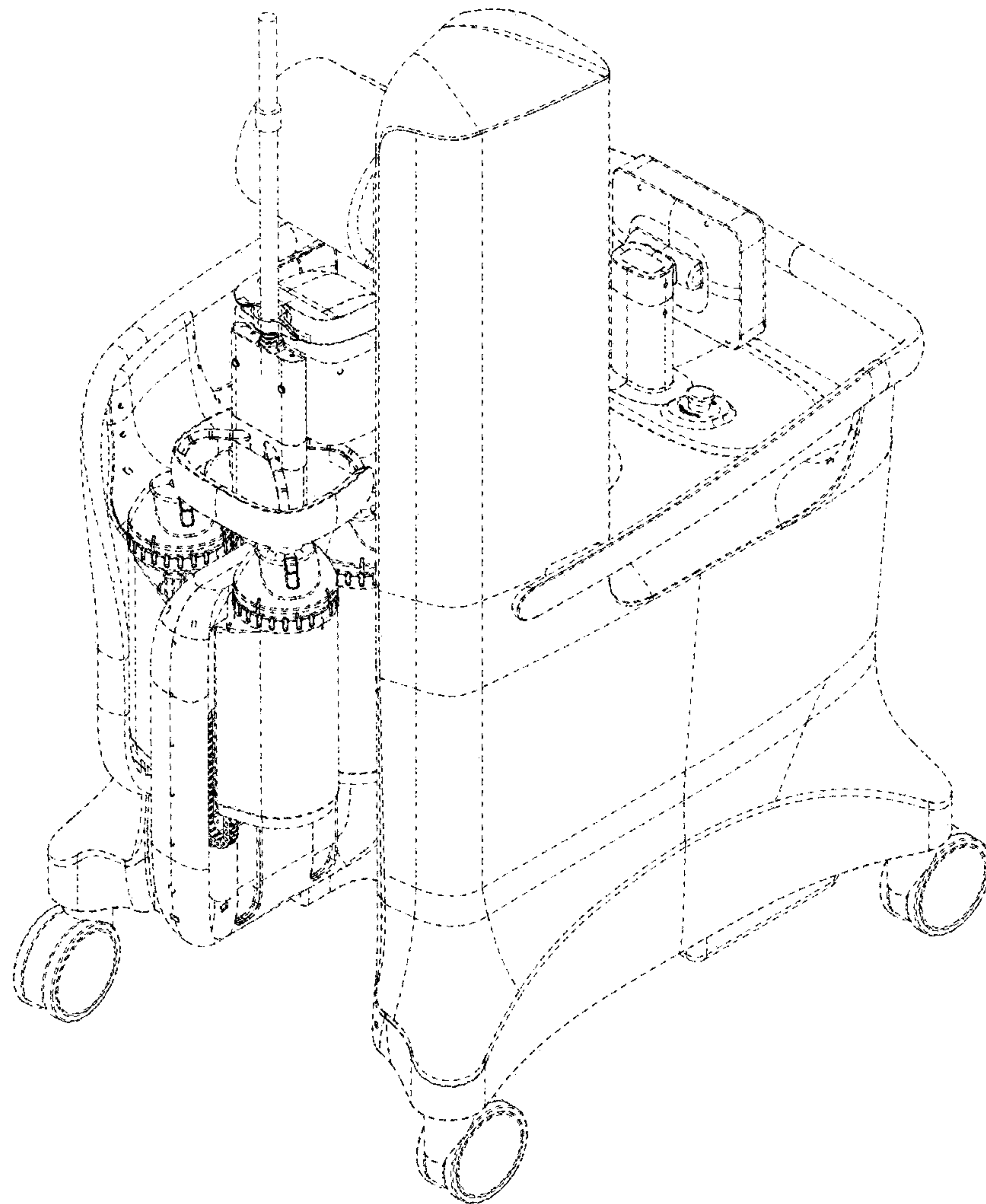


FIG. 10

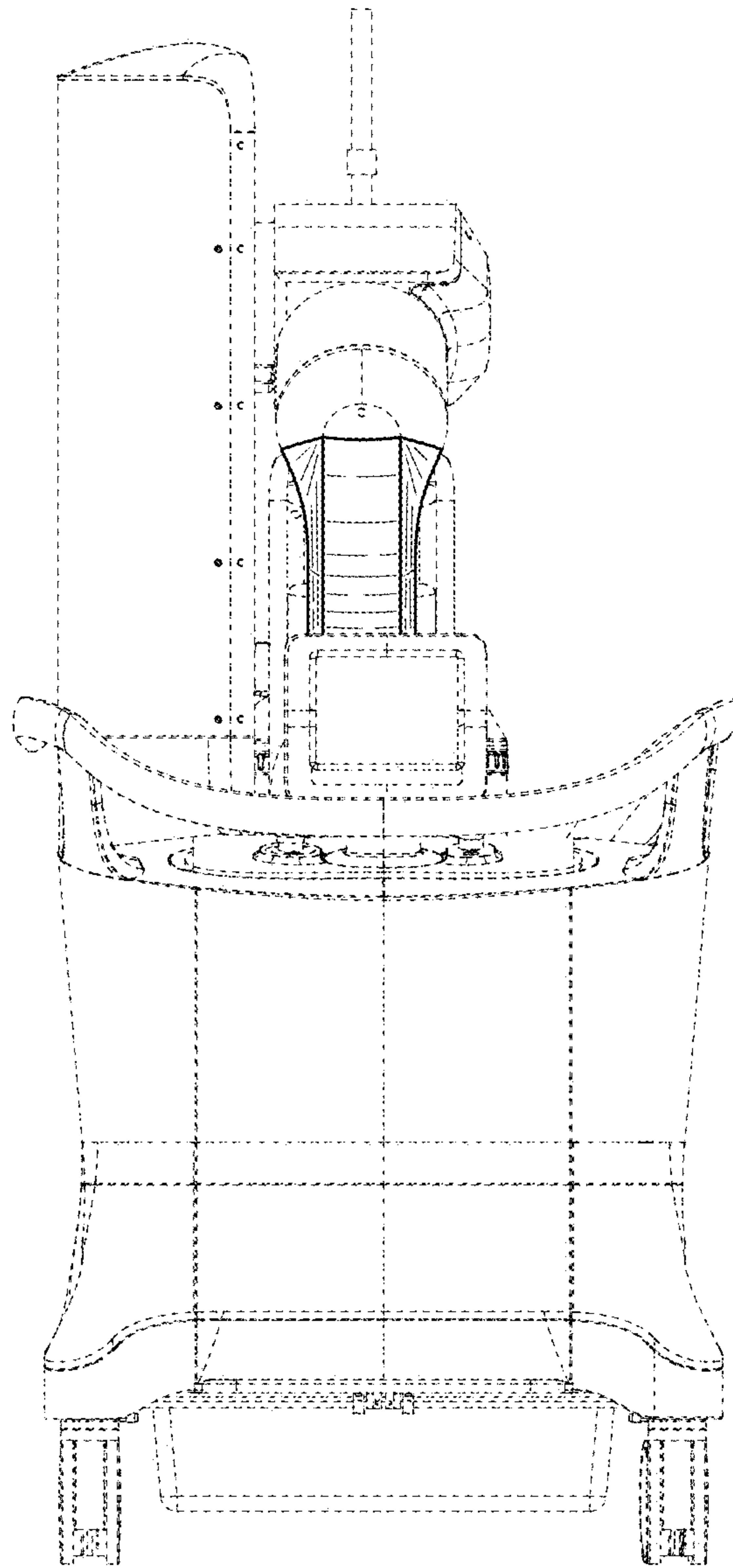


FIG. 11

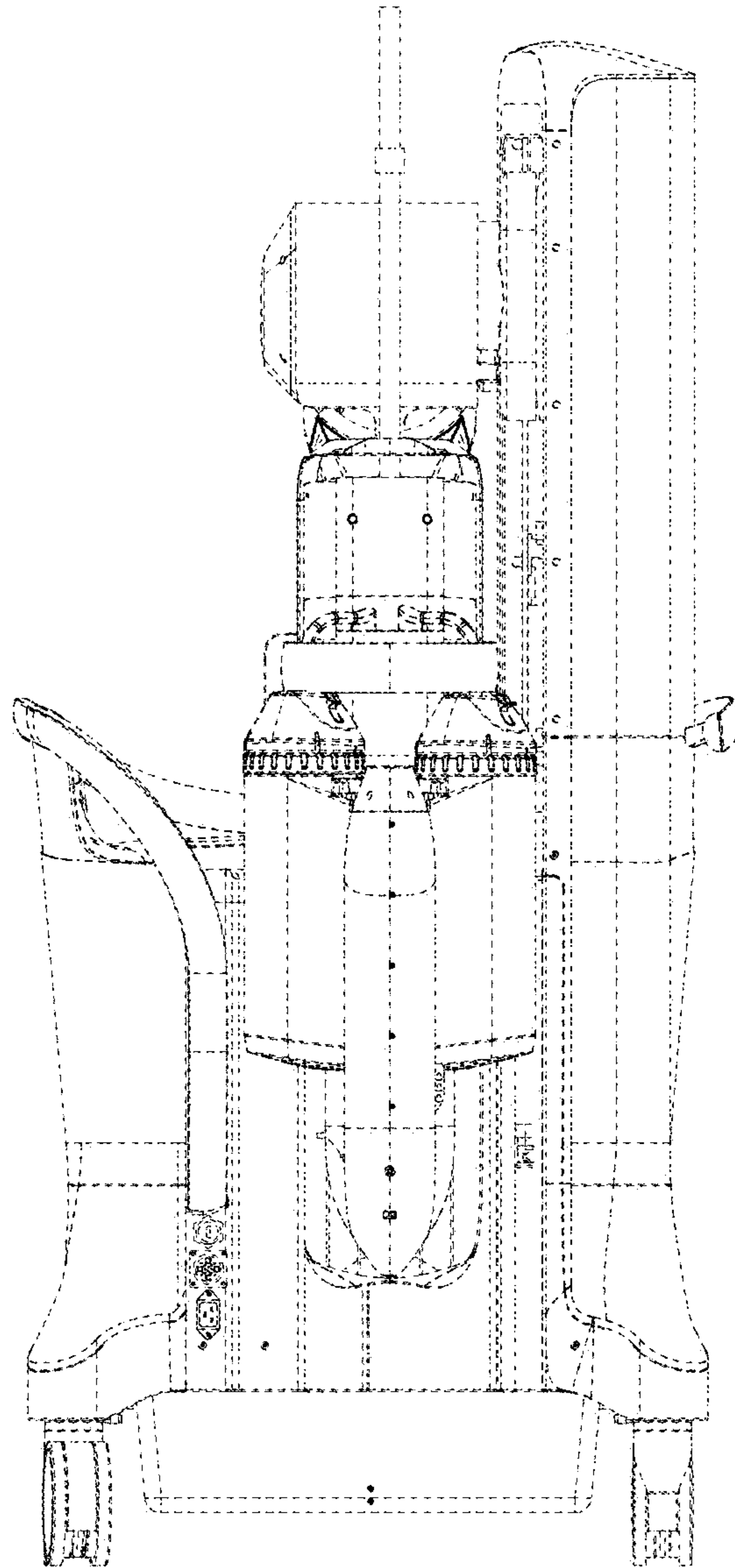


FIG. 12

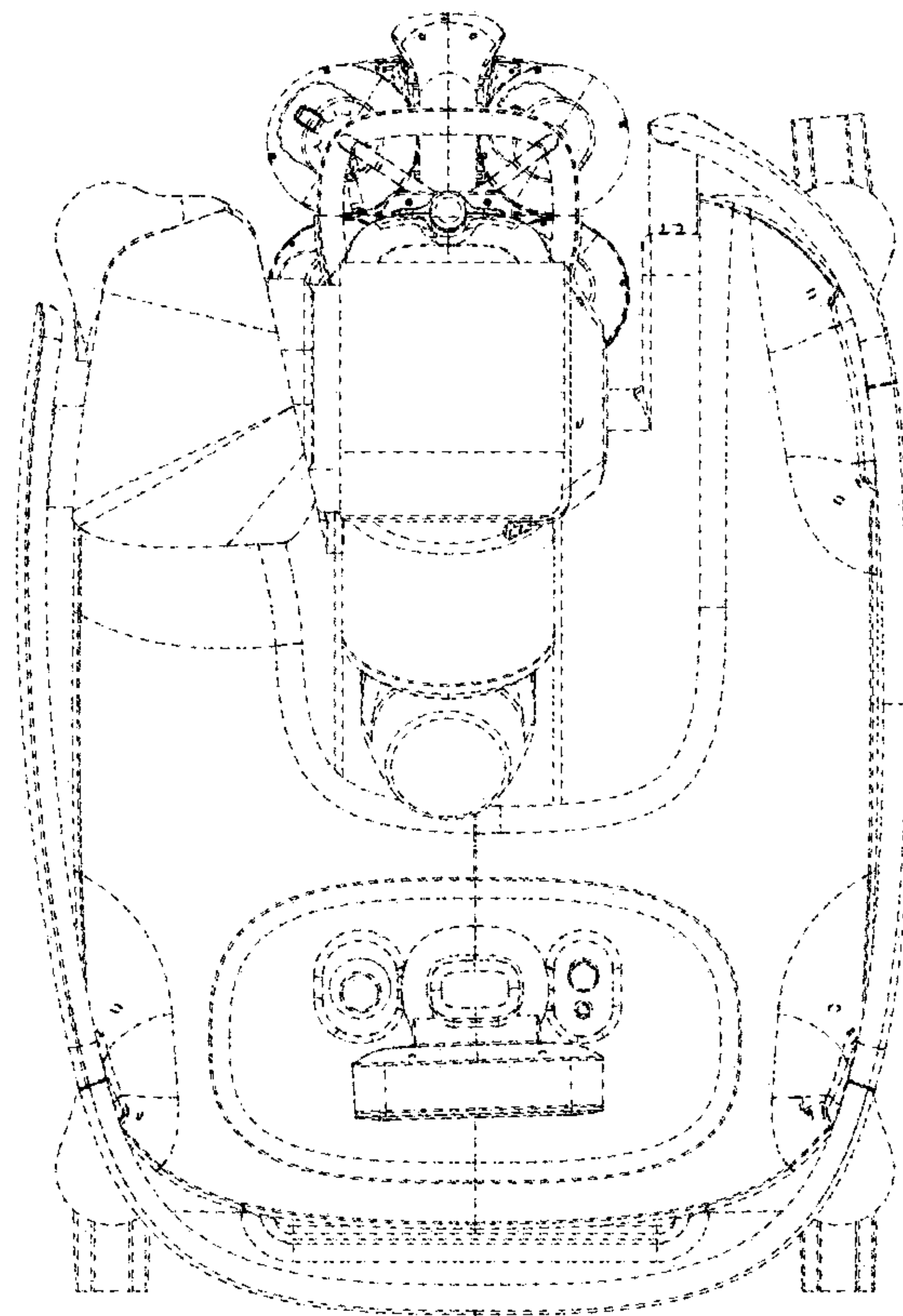


FIG. 13

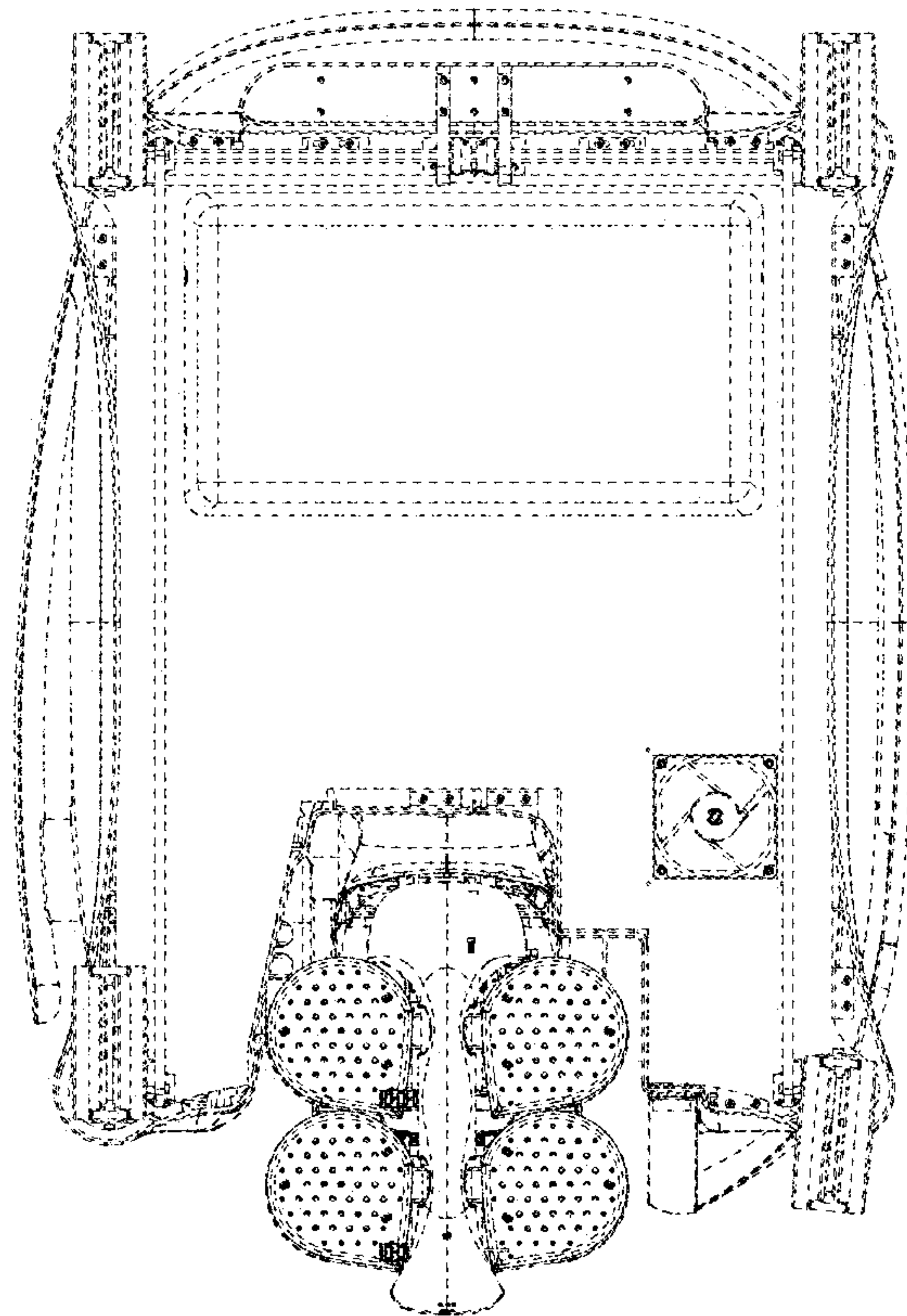


FIG. 14

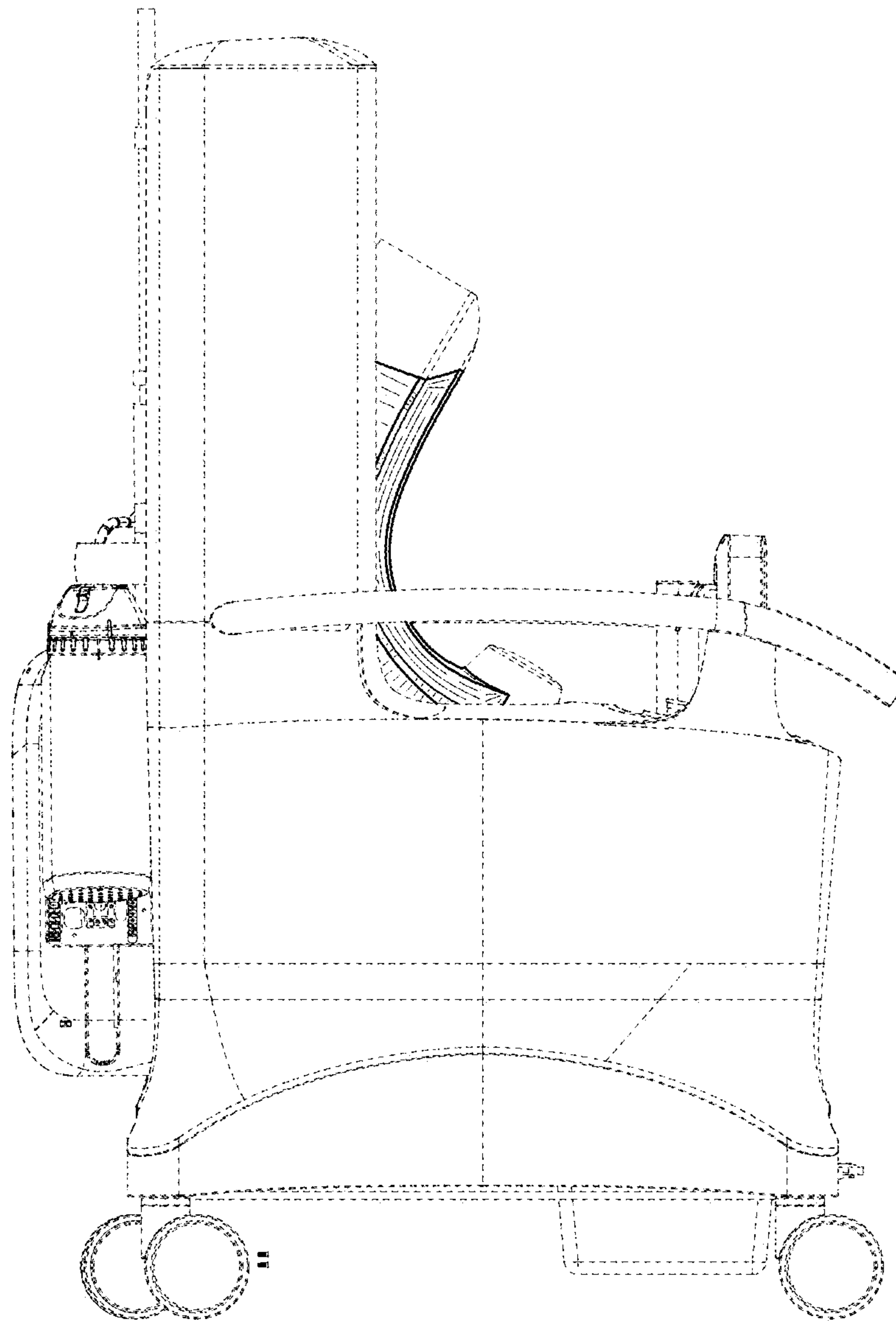


FIG. 15

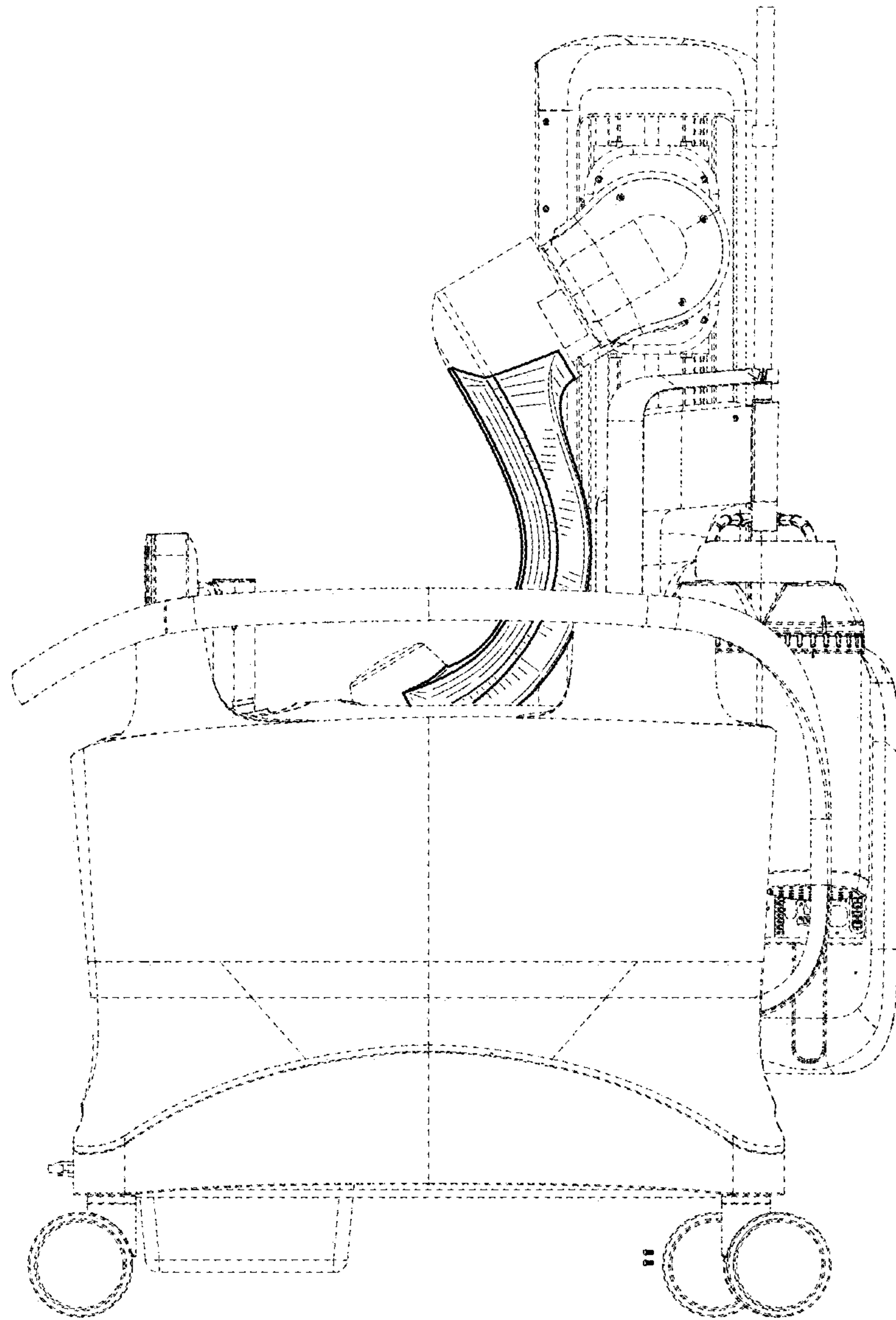


FIG. 16