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(12) **United States Design Patent**
Collins

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(54) **APPARATUS TO CONTROL FLUID FLOW THROUGH A TUBE**

3,831,600 A 8/1974 Buckles
4,038,982 A 8/1977 Burke
4,105,028 A 8/1978 Sadlier
4,155,362 A 5/1979 Jess
4,247,077 A 1/1981 Banick et al.
(Continued)

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(56) **References Cited**

U.S. PATENT DOCUMENTS

2,880,764 A 4/1959 Pelvavin
2,888,877 A 6/1959 Shellman
3,173,372 A 3/1965 Baldwin
3,384,336 A 5/1968 Pulman
3,609,379 A 9/1971 Hildebrandt
3,685,787 A 8/1972 Adelberg
3,733,149 A 5/1973 Jacobson
3,790,042 A 2/1974 McCormick

FOREIGN PATENT DOCUMENTS

AU 2247783 A 6/1985
CA 1213749 A1 11/1986
(Continued)

OTHER PUBLICATIONS

“The OpenCV Reference Manual Release 2.3”, May 10, 2011, pp.
1-263.

(Continued)

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(57) **CLAIM**

The ornamental design for an apparatus to control fluid flow
through a tube, as shown and described.

DESCRIPTION

FIG. 1 is a front, top, and right side perspective view of the
apparatus to control fluid flow through a tube, showing my
new design;

FIG. 2 is a front side elevational view thereof;

FIG. 3 is a back side elevational view thereof;

FIG. 4 is a left side elevational view thereof;

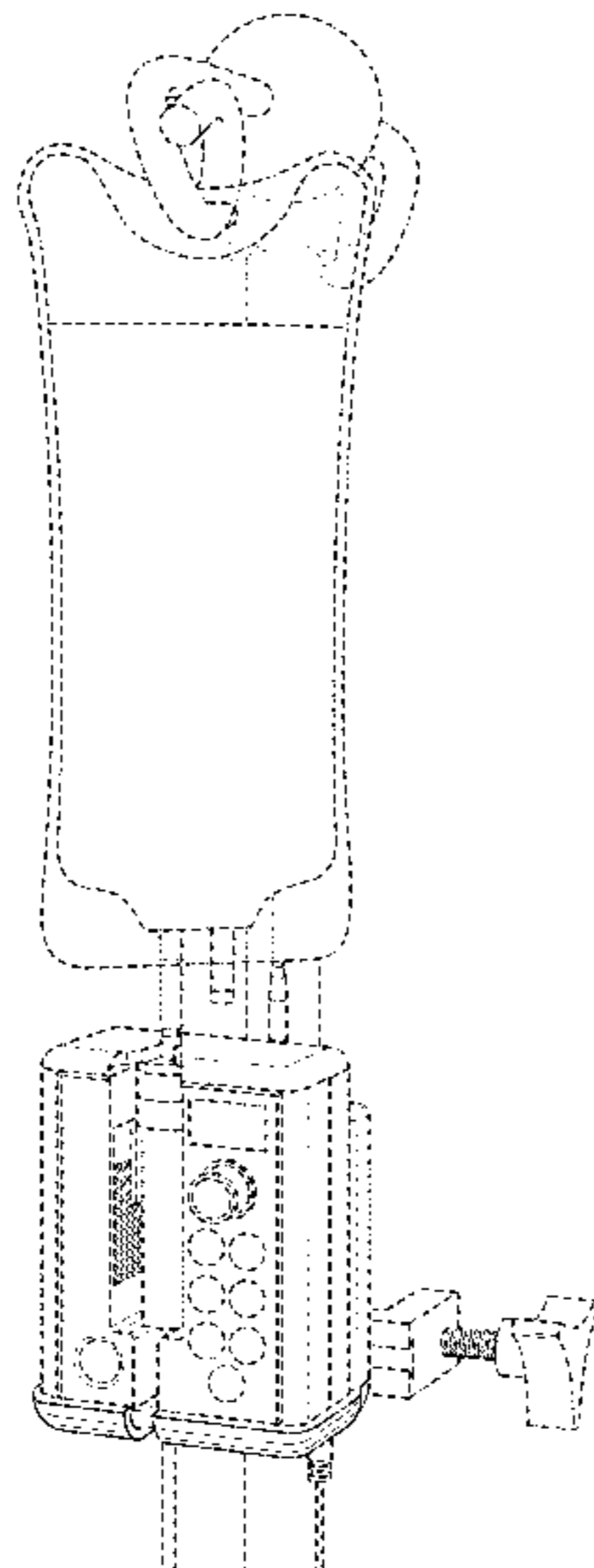
FIG. 5 is a right side elevational view thereof;

FIG. 6 is a top plan view thereof; and,

FIG. 7 is a bottom plan view thereof.

The broken lines in the drawings depict portions of the
apparatus to control fluid flow through a tube that form no
part of the claimed design.

1 Claim, 7 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

4,303,376 A	12/1981	Siekmann	5,707,588 A	1/1998	Tsukishima	
4,321,461 A	3/1982	Walter	5,718,562 A	2/1998	Lawless	
4,328,800 A	5/1982	Marx	5,753,820 A	5/1998	Reed	
4,328,801 A	5/1982	Marx	5,782,805 A	7/1998	Meinzer	
4,383,252 A	5/1983	Purcell	5,800,140 A	9/1998	Forni	
4,397,642 A	8/1983	Lamadrid	5,800,386 A	9/1998	Bellifemine	
4,421,506 A	12/1983	Danby	5,814,015 A *	9/1998	Gargano	A61M 5/1456 604/67
4,449,534 A	5/1984	Leibinsohn Saul	5,843,045 A	12/1998	DuPont	
4,469,480 A	9/1984	Figler	5,896,195 A	4/1999	Juvinall	
4,490,140 A	12/1984	Carr	5,899,665 A	5/1999	Makino	
4,496,351 A	1/1985	Hillel et al.	5,920,361 A	7/1999	Gibeau	
4,504,263 A	3/1985	Steuer	D416,999 S	11/1999	Miyamoto	
4,525,163 A	6/1985	Slavik	6,015,083 A	1/2000	Hayes	
4,577,197 A	3/1986	Crean	6,049,381 A	4/2000	Reintjes	
4,583,975 A	4/1986	Pekkarinen	6,050,713 A	4/2000	O'Donnell	
RE32,294 E	11/1986	Knute	6,083,206 A	7/2000	Molko	
4,634,426 A	1/1987	Kamen	6,091,483 A	7/2000	Guirguis	
4,635,281 A	1/1987	Jones	6,091,492 A	7/2000	Strickland	
4,648,869 A	3/1987	Bobo, Jr.	6,110,153 A	8/2000	Davis	
4,662,829 A	5/1987	Nehring	6,144,453 A	11/2000	Hallerman	
4,668,216 A	5/1987	Martin	6,149,631 A	11/2000	Haydel, Jr.	
4,673,161 A	6/1987	Flynn et al.	6,159,186 A	12/2000	Wickham	
4,673,820 A	6/1987	Kamen	6,213,354 B1	4/2001	Kay	
4,680,977 A	7/1987	Conero	6,213,739 B1	4/2001	Phallen et al.	
4,703,314 A	10/1987	Spani	6,228,047 B1	5/2001	Dadson	
4,718,896 A	1/1988	Arndt	D446,860 S	8/2001	Mezière	
4,720,636 A	1/1988	Benner, Jr.	6,270,478 B1 *	8/2001	Mernøe	A61M 5/142 604/122
4,722,224 A	2/1988	Scheller et al.	6,305,908 B1	10/2001	Hermann	
4,775,368 A	10/1988	Iwatschenki	6,328,712 B1	12/2001	Cartledge	
4,778,451 A	10/1988	Kamen	6,362,887 B1	3/2002	Meisberger	
4,787,406 A	11/1988	Edwards et al.	6,491,659 B1	12/2002	Miyamoto	
4,812,904 A	3/1989	Maring	6,500,151 B1	12/2002	Cobb	
4,820,268 A	4/1989	Kawamura	6,503,221 B1	1/2003	Briggs	
4,820,281 A	4/1989	Lawler	6,523,414 B1	2/2003	Malmstrom	
4,834,744 A	5/1989	Ritson	D471,274 S	3/2003	Diaz et al.	
4,837,708 A	6/1989	Wright	6,554,791 B1	4/2003	Cartledge et al.	
4,846,792 A	7/1989	Bobo, Jr.	6,562,012 B1	5/2003	Brown	
4,909,786 A	3/1990	Gijsselhart	6,574,050 B1	6/2003	Lin et al.	
4,920,336 A	4/1990	Meijer	6,599,282 B2	7/2003	Burko	
4,936,828 A	6/1990	Chiang	6,641,556 B1	11/2003	Shigezawa	
4,959,050 A	9/1990	Bobo, Jr.	6,657,545 B1	12/2003	Lin	
4,979,940 A	12/1990	Bobo, Jr.	6,736,801 B1	5/2004	Gallagher	
4,981,467 A	1/1991	Bobo	6,810,290 B2	10/2004	Lebel et al.	
5,002,539 A	3/1991	Coble	6,814,547 B2	11/2004	Childers et al.	
5,045,069 A	9/1991	Imparato	6,975,898 B2	12/2005	Seibel	
5,047,014 A	9/1991	Mosebach et al.	6,984,052 B1	1/2006	Del Castillo	
5,057,090 A	10/1991	Bessman	7,001,365 B2	2/2006	Makkink	
5,083,741 A	1/1992	Sancoff	7,068,831 B2	6/2006	Florent	
5,154,693 A	10/1992	East et al.	7,070,121 B2	7/2006	Schramm	
5,154,704 A	10/1992	Archibald	7,092,796 B2 *	8/2006	Vanderveen	G05D 7/0629 604/131
5,181,910 A	1/1993	Scanlon	7,118,549 B2	10/2006	Chan	
5,186,057 A	2/1993	Everhart	7,163,740 B2	1/2007	Rosati	
RE34,413 E	10/1993	McCullough	7,190,275 B2	3/2007	Goldberg	
5,267,980 A	12/1993	Dirr, Jr.	D564,087 S	3/2008	Yodfat et al.	
5,278,626 A	1/1994	Poole	7,338,475 B2	3/2008	Brown	
5,279,558 A	1/1994	Kriesel	7,420,151 B2	9/2008	Fengler et al.	
D347,472 S *	5/1994	Sunderland	7,448,706 B2	11/2008	Yamanobe	
5,314,316 A	5/1994	Shibamoto	7,467,055 B2	12/2008	Seshimo et al.	
D348,730 S *	7/1994	Walker	7,498,563 B2	3/2009	Mandro	
5,328,341 A	7/1994	Forni	7,499,581 B2	3/2009	Tribble	
5,331,309 A	7/1994	Sakai	7,540,859 B2	6/2009	Claude	
D353,667 S *	12/1994	Tsubota	7,677,689 B2	3/2010	Kim	
D355,716 S *	2/1995	Nash	7,695,448 B2	4/2010	Cassidy	
5,411,052 A	5/1995	Murray	7,767,991 B2	8/2010	Sacchetti	
5,415,641 A	5/1995	Yerlikaya	7,776,927 B2	8/2010	Chu	
5,439,442 A	8/1995	Bellifemine	7,783,107 B2	8/2010	Zandifar	
D362,721 S	9/1995	Peeler et al.	D629,503 S	12/2010	Caffey et al.	
5,482,446 A	1/1996	Williamson	7,892,201 B1	2/2011	Laguna	
D367,527 S *	2/1996	Marston	7,892,204 B2	2/2011	Kraus	
5,489,265 A *	2/1996	Montalvo	7,905,859 B2	3/2011	Bynum	
			7,914,483 B2	3/2011	Simmons	
			7,918,834 B2	4/2011	Mernoe	
5,526,285 A	6/1996	Campo	7,924,424 B2	4/2011	Erickson et al.	
5,562,615 A	10/1996	Nassif	7,933,780 B2	4/2011	De La Huerga	
5,588,963 A	12/1996	Roelofs	7,952,698 B2	5/2011	Friedrich	
5,601,980 A	2/1997	Gordon	8,004,683 B2	8/2011	Tokhtuev et al.	

(56)

References Cited

U.S. PATENT DOCUMENTS

8,025,634 B1	9/2011	Moubayed		
8,038,657 B2	10/2011	Davis		
8,038,663 B2	10/2011	Miner		
8,103,461 B2	1/2012	Glaser et al.		
8,112,814 B2	2/2012	Shimizu		
8,137,083 B2	3/2012	Zhou		
8,147,447 B2	4/2012	Sundar et al.		
8,147,448 B2	4/2012	Sundar		
8,147,464 B2	4/2012	Spohn		
8,184,848 B2	5/2012	Wu		
8,256,984 B2	9/2012	Fathallah		
8,257,779 B2	9/2012	Abernathy		
8,282,894 B2	10/2012	Lee		
D676,551 S	2/2013	Desai et al.		
D677,784 S	3/2013	Marguerie		
8,394,062 B2	3/2013	Powers		
8,439,880 B2	5/2013	Rondeau		
8,447,069 B2	5/2013	Huang et al.		
8,471,231 B2	6/2013	Paz		
8,523,797 B2	9/2013	Lowery et al.		
8,523,829 B2	9/2013	Miner et al.		
8,523,839 B2	9/2013	Siefert		
8,529,511 B2	9/2013	Boulanger		
8,531,517 B2	9/2013	Tao		
8,552,361 B2	10/2013	Mandro		
8,622,979 B2	1/2014	Hungerford		
8,638,358 B2	1/2014	Dabiri et al.		
8,647,074 B2	2/2014	Moberg et al.		
8,692,678 B2	4/2014	Warner et al.		
8,733,178 B2 *	5/2014	Bivans	A61M 5/14228	73/169
8,777,897 B2	7/2014	Butterfield		
D712,043 S	8/2014	Sliger		
8,834,429 B2	9/2014	Grant		
D720,449 S	12/2014	Galbraith et al.		
D728,779 S	5/2015	Sabin et al.		
D735,319 S	7/2015	Sabin et al.		
D736,370 S	8/2015	Sabin et al.		
9,095,652 B2	8/2015	Dewey		
9,128,051 B2	9/2015	Bui		
9,134,735 B2	9/2015	Lowery et al.		
9,134,736 B2	9/2015	Lowery et al.		
9,144,644 B2	9/2015	Hungerford		
9,151,646 B2	10/2015	Kamen et al.		
D745,661 S	12/2015	Collins et al.		
9,216,279 B2	12/2015	Travis et al.		
9,234,850 B2	1/2016	Hammond et al.		
D749,206 S	2/2016	Johnson et al.		
D751,689 S	3/2016	Peret et al.		
D751,690 S	3/2016	Peret et al.		
D752,209 S	3/2016	Peret et al.		
9,295,778 B2	3/2016	Kamen et al.		
D754,065 S	4/2016	Gray et al.		
D756,386 S	5/2016	Kendler et al.		
D756,505 S	5/2016	Park		
D758,399 S	6/2016	Kendler et al.		
D760,288 S	6/2016	Kendler et al.		
D760,289 S	6/2016	Kendler et al.		
9,364,394 B2	6/2016	Demers et al.		
9,372,486 B2	6/2016	Peret et al.		
D760,782 S	7/2016	Kendler et al.		
D760,888 S	7/2016	Gill et al.		
9,400,873 B2	7/2016	Kamen et al.		
9,408,966 B2	8/2016	Kamen		
D767,756 S	9/2016	Sabin		
9,435,455 B2	9/2016	Peret et al.		
D768,716 S	10/2016	Kendler et al.		
9,465,919 B2	10/2016	Kamen et al.		
9,468,716 B2 *	10/2016	Hariharsan	A61M 5/14232	
9,488,200 B2	11/2016	Kamen et al.		
D774,645 S	12/2016	Gill et al.		
9,518,958 B2	12/2016	Wilt et al.		
9,636,455 B2	5/2017	Kamen et al.		
D789,516 S	6/2017	Gill et al.		
9,675,756 B2	6/2017	Kamen et al.		
9,677,555 B2	6/2017	Kamen et al.		
9,687,417 B2	6/2017	Demers et al.		
D792,963 S	7/2017	Gill		
D795,424 S	8/2017	Sloss		
D795,805 S	8/2017	Gray et al.		
9,719,964 B2	8/2017	Blumberg		
9,724,465 B2	8/2017	Peret et al.		
9,724,466 B2	8/2017	Peret et al.		
9,724,467 B2	8/2017	Peret et al.		
9,730,731 B2	8/2017	Langenfeld et al.		
9,744,300 B2	8/2017	Kamen et al.		
9,746,093 B2	8/2017	Peret et al.		
9,746,094 B2	8/2017	Peret et al.		
9,759,343 B2	9/2017	Peret et al.		
9,759,369 B2	9/2017	Gray et al.		
9,772,044 B2	9/2017	Peret et al.		
D799,025 S *	10/2017	Johnson	D24/111	
D801,519 S	10/2017	Sabin et al.		
9,789,247 B2	10/2017	Kamen et al.		
D802,118 S *	11/2017	Peret	D24/111	
D803,386 S	11/2017	Sabin et al.		
D803,387 S	11/2017	Bodwell et al.		
D804,017 S	11/2017	Sabin		
9,808,572 B2	11/2017	Kamen et al.		
D805,183 S	12/2017	Sabin et al.		
9,856,990 B2	1/2018	Peret et al.		
D813,376 S *	3/2018	Peret	D24/111	
D814,021 S	3/2018	Sabin		
D815,730 S *	4/2018	Collins	D24/111	
D816,685 S	5/2018	Kendler et al.		
D816,829 S *	5/2018	Peret	D24/111	
D817,479 S	5/2018	Sabin et al.		
D817,480 S	5/2018	Sabin et al.		
9,968,730 B2	5/2018	Blumberg, Jr. et al.		
9,976,665 B2	5/2018	Peret et al.		
10,044,791 B2	8/2018	Kamen et al.		
2001/0026292 A1	10/2001	Ishizaki		
2001/0055462 A1	12/2001	Seibel		
2002/0194933 A1	12/2002	Roelofs		
2003/0045840 A1	3/2003	Burko		
2003/0055406 A1	3/2003	Lebel		
2003/0107819 A1	6/2003	Lin et al.		
2003/0217962 A1	11/2003	Childers		
2004/0044306 A1	3/2004	Lynch et al.		
2004/0171994 A1	9/2004	Goldberg		
2005/0096581 A1	5/2005	Chan		
2005/0171491 A1	8/2005	Minh Miner et al.		
2006/0096660 A1	5/2006	Diaz		
2006/0140466 A1	6/2006	Seshimo		
2006/0146077 A1	7/2006	Song		
2006/0291211 A1	12/2006	Rodriguez		
2007/0088269 A1	4/2007	Valego et al.		
2007/0102623 A1	5/2007	Fengler		
2007/0228071 A1	10/2007	Kamen et al.		
2007/0293817 A1	12/2007	Feng		
2008/0004574 A1	1/2008	Dyar		
2008/0051732 A1	2/2008	Chen		
2008/0147008 A1	6/2008	Lewis		
2008/0147016 A1	6/2008	Faries		
2008/0154214 A1	6/2008	Spohn		
2008/0235765 A1	9/2008	Shimizu		
2008/0237502 A1	10/2008	Fago		
2008/0252472 A1	10/2008	Su et al.		
2009/0097029 A1	4/2009	Tokhtuev		
2009/0112115 A1	4/2009	Huang		
2009/0180106 A1	7/2009	Friedrich		
2009/0224638 A1	9/2009	Weber		
2009/0254025 A1	10/2009	Simmons		
2009/0262351 A1	10/2009	Erickson		
2009/0276167 A1	11/2009	Glaser		
2009/0281460 A1	11/2009	Lowery		
2010/0021933 A1	1/2010	Okano		
2010/0097451 A1	4/2010	Bruce		
2010/0114027 A1	5/2010	Jacobson		
2010/0120601 A1	5/2010	Hayamizu		
2010/0168671 A1	7/2010	Faries, Jr.		
2010/0204650 A1	8/2010	Hungerford et al.		
2010/0211003 A1	8/2010	Sundar		
2010/0217229 A1	8/2010	Miner		

(56)

References Cited

U.S. PATENT DOCUMENTS

2010/0229978 A1 9/2010 Zhou
 2010/0292635 A1 11/2010 Sundar
 2010/0309005 A1 12/2010 Warner
 2011/0004186 A1 1/2011 Butterfield
 2011/0025826 A1 2/2011 Dabiri
 2011/0046899 A1 2/2011 Paz
 2011/0060284 A1 3/2011 Harr
 2011/0125103 A1 5/2011 Rondeau
 2011/0137239 A1* 6/2011 DeBelser A61M 5/14244
 604/67
 2011/0142283 A1 6/2011 Huang
 2011/0144595 A1 6/2011 Cheng
 2011/0166511 A1 7/2011 Sharvit
 2011/0178476 A1 7/2011 Lin
 2011/0190146 A1 8/2011 Boehm
 2011/0190637 A1 8/2011 Knobel
 2011/0196304 A1 8/2011 Kramer et al.
 2011/0196306 A1 8/2011 De La Huerga
 2011/0206247 A1 8/2011 Dachille
 2011/0208123 A1 8/2011 Gray
 2011/0231204 A1 9/2011 De La Huerga
 2011/0251557 A1 10/2011 Powers
 2011/0275063 A1 11/2011 Weitz
 2011/0313351 A1 12/2011 Kamen et al.
 2011/0313789 A1 12/2011 Kamen et al.
 2011/0316919 A1 12/2011 Baldy, Jr.
 2011/0317004 A1 12/2011 Tao
 2012/0013735 A1 1/2012 Tao
 2012/0059318 A1 3/2012 Dewey
 2012/0059350 A1 3/2012 Siefert
 2012/0095415 A1 4/2012 Sharvit
 2012/0095433 A1 4/2012 Hungerford
 2012/0185267 A1 7/2012 Kamen
 2012/0197185 A1 8/2012 Tao
 2012/0238997 A1 9/2012 Dewey
 2012/0265166 A1 10/2012 Yodfat
 2012/0310153 A1 12/2012 Moberg
 2012/0310205 A1 12/2012 Lee et al.
 2013/0035659 A1 2/2013 Hungerford
 2013/0083191 A1 4/2013 Lowery et al.
 2013/0085443 A1 4/2013 Lowery
 2013/0177455 A1 7/2013 Kamen
 2013/0182381 A1 7/2013 Gray
 2013/0184676 A1 7/2013 Kamen
 2013/0188040 A1 7/2013 Kamen
 2013/0191513 A1 7/2013 Kamen
 2013/0197693 A1 8/2013 Kamen
 2013/0201471 A1 8/2013 Bui et al.
 2013/0201482 A1 8/2013 Munro
 2013/0204188 A1 8/2013 Kamen et al.
 2013/0253442 A1 9/2013 Travis
 2013/0272773 A1 10/2013 Kamen
 2013/0281965 A1 10/2013 Kamen
 2013/0297330 A1 11/2013 Kamen
 2013/0310990 A1 11/2013 Peret et al.
 2013/0317753 A1 11/2013 Kamen
 2013/0317837 A1 11/2013 Ballantyne
 2013/0336814 A1 12/2013 Kamen
 2013/0339049 A1 12/2013 Blumberg, Jr.
 2013/0346108 A1 12/2013 Kamen
 2014/0043469 A1 2/2014 Engel
 2014/0081233 A1 3/2014 Hungerford
 2014/0094753 A1* 4/2014 Mernoe A61M 5/14216
 604/135
 2014/0121601 A1 5/2014 Hoenninger, III
 2014/0135695 A1 5/2014 Grant
 2014/0148757 A1 5/2014 Ambrosina
 2014/0165703 A1 6/2014 Wilt
 2014/0180711 A1 6/2014 Kamen
 2014/0188076 A1 7/2014 Kamen
 2014/0188516 A1 7/2014 Kamen
 2014/0194818 A1 7/2014 Yodfat
 2014/0195639 A1 7/2014 Kamen
 2014/0227021 A1 8/2014 Kamen

2014/0228758 A1* 8/2014 Chi A61M 5/148
 604/132
 2014/0257178 A1* 9/2014 Lee A61M 5/16831
 604/67
 2014/0267709 A1 9/2014 Hammond
 2014/0276457 A1 9/2014 Munro
 2014/0309612 A1 10/2014 Smisson, III
 2014/0318639 A1 10/2014 Peret
 2014/0327759 A1 11/2014 Tao
 2014/0340512 A1 11/2014 Tao
 2014/0343492 A1 11/2014 Kamen
 2015/0002667 A1 1/2015 Peret
 2015/0002668 A1 1/2015 Peret
 2015/0002677 A1 1/2015 Peret et al.
 2015/0023808 A1 1/2015 Zhu
 2015/0033823 A1 2/2015 Blumberg, Jr.
 2015/0154364 A1 6/2015 Biasi et al.
 2015/0157791 A1 6/2015 Desch et al.
 2015/0219881 A1 8/2015 Munro
 2015/0238228 A1 8/2015 Langenfeld et al.
 2015/0257974 A1 9/2015 Demers et al.
 2015/0314083 A1 11/2015 Blumberg, Jr. et al.
 2015/0332009 A1 11/2015 Kane et al.
 2015/0361974 A1 12/2015 Hungerford et al.
 2016/0025641 A1 1/2016 Hammond et al.
 2016/0055397 A1 2/2016 Peret et al.
 2016/0055649 A1 2/2016 Peret et al.
 2016/0061641 A1 3/2016 Peret et al.
 2016/0063353 A1 3/2016 Peret et al.
 2016/0073063 A1 3/2016 Peret et al.
 2016/0084434 A1 3/2016 Janway et al.
 2016/0097382 A1 4/2016 Kamen et al.
 2016/0131272 A1 5/2016 Yoo et al.
 2016/0151564 A1* 6/2016 Magers A61M 5/1452
 604/152
 2016/0158437 A1 6/2016 Biasi et al.
 2016/0179086 A1 6/2016 Peret et al.
 2016/0184510 A1 6/2016 Kamen et al.
 2016/0203292 A1 7/2016 Kamen et al.
 2016/0262977 A1 9/2016 Demers et al.
 2016/0287780 A1 10/2016 Lee et al.
 2016/0319850 A1 11/2016 Kamen et al.
 2016/0346056 A1 12/2016 Demers et al.
 2016/0362234 A1 12/2016 Peret et al.
 2017/0011202 A1 1/2017 Kamen et al.
 2017/0045478 A1 2/2017 Wilt et al.
 2017/0216516 A1 8/2017 Dale et al.
 2017/0224909 A1 8/2017 Kamen et al.
 2017/0259230 A1 9/2017 Demers et al.
 2017/0266378 A1 9/2017 Kamen et al.
 2017/0268497 A1 9/2017 Kamen et al.
 2017/0284968 A1 10/2017 Blumberg, Jr.
 2017/0296745 A1* 10/2017 Kamen A61M 5/172
 2017/0303969 A1 10/2017 Langenfeld et al.
 2017/0321841 A1 11/2017 Gray et al.
 2017/0333623 A1 11/2017 Kamen et al.
 2017/0335988 A1 11/2017 Peret et al.
 2018/0028745 A1* 2/2018 Amon A61M 5/14244
 2018/0038501 A1 2/2018 Peret et al.
 2018/0066648 A1 3/2018 Kamen et al.
 2018/0080605 A1 3/2018 Janway et al.
 2018/0106246 A1 4/2018 Kamen et al.
 2018/0128259 A1 5/2018 Kamen et al.
 2018/0224012 A1 8/2018 Peret et al.

FOREIGN PATENT DOCUMENTS

CN 1986008 A 6/2007
 CN 2922921 Y 7/2007
 DE 2023027 A1 11/1970
 DE 2631951 A1 1/1978
 DE 3617723 A1 12/1987
 DE 3643276 A1 6/1988
 DE 3822057 C2 1/1989
 DE 69229832 T2 2/2000
 EP 0112699 A2 7/1984
 EP 0441323 A1 8/1991
 EP 819495 A2 1/1998
 EP 1722310 A1 11/2006

(56)

References Cited

FOREIGN PATENT DOCUMENTS		
EP	2319551	A2 5/2011
EP	2793977	B1 11/2015
FR	2042606	A1 2/1971
FR	2273264	A1 12/1975
FR	2458804	1/1981
FR	2617593	1/1989
GB	1301033	A 12/1972
GB	2020735	A 11/1979
GB	2207239	B 1/1989
GB	2328982	A 3/1999
JP	58163843	9/1983
JP	04-280582	A 10/1992
JP	3110458	B2 11/2000
JP	2007229928	A 9/2007
JP	2009298012	A 12/2009
JP	2011062371	A 3/2011
KR	1020050039780	A 4/2005
KR	1020060111424	A 10/2006
KR	1020100037914	A 4/2010
NL	7006908	11/1970
NL	8801680	A 2/1989
NL	9101825	A 5/1993
SE	376843	B 6/1975
WO	WO1981002770	A1 10/1981
WO	WO1993009407	A1 5/1993
WO	WO2000072181	A3 11/2000
WO	WO2002040084	A2 5/2002
WO	WO2002100262	A1 12/2002
WO	WO2004035116	A1 4/2004
WO	WO2005094919	A1 10/2005
WO	WO2006086723	A2 8/2006
WO	WO2008022880	A1 2/2008
WO	WO2008079023	A1 7/2008
WO	WO2009039203	A2 3/2009
WO	WO2009039214	A2 3/2009
WO	WO2009055639	A2 4/2009
WO	WO2010020397	A1 4/2010
WO	WO2010129720	A2 11/2010
WO	WO2011021098	A1 2/2011
WO	WO2011136667	A1 11/2011
WO	WO2012104779	A1 8/2012
WO	PCT/US12/71142	12/2012
WO	WO2013017949	A2 2/2013
WO	WO2013070337	A1 5/2013
WO	WO2013095459	A9 6/2013
WO	WO2013096713	A2 6/2013
WO	WO2013096718	A2 6/2013
WO	WO2013096722	A2 6/2013
WO	WO2013096909	A2 6/2013
WO	WO2013176770	A2 11/2013
WO	WO2013177357	A1 11/2013
WO	PCT/US14/29020	3/2014
WO	WO2014100557	A2 6/2014
WO	WO2014100571	A2 6/2014
WO	WO2014100658	A1 6/2014
WO	WO2014100687	A2 6/2014
WO	WO2014100736	A2 6/2014
WO	WO2014100744	A2 6/2014
WO	WO2014144557	A2 9/2014
WO	WO2014025736	A1 10/2014
WO	WO2014160058	A2 10/2014
WO	WO2014160249	A1 10/2014
WO	WO2014160307	A1 10/2014
WO	WO2015017275	A1 2/2015
WO	WO2015116557	A1 8/2015
WO	PCT/U S2017/15382	1/2017

OTHER PUBLICATIONS

Invitation to Respond to Written Opinion from the Intellectual Property Office of Singapore for Application 11201507504S, dated Nov. 23, 2015.
 First Examination Report from the Intellectual Property Office of New Zealand for Application 626382, dated Apr. 1, 2015.

Report of substantive examination from Superintendent of Industry and Commerce of Colombia for Patent Application 14155193, dated Nov. 19, 2015.

Notice of Preliminary Rejection (Non-Final) from the Korean Intellectual Property Office (“KIPO”) for Korean Patent Application No. 10-2014-7019883, dated Dec. 15, 2015.

First Examination report from the New Zealand Intellectual Property Office for New Zealand IP No. 715098, dated Jan. 12, 2016.
 “Microcomputer Intravenous Infusion Drip Controller”, Longfian Scitech Co., Ltd., Mar. 18, 2016 (retrieved). Advertisement listed as having a valid price starting at Mar. 10, 2016, 2 pgs, <http://marina.en.made-in-china.com/productimage/bKvQTtJcJEhs-2f1j00FZetfT-SdnhcU/China-Microcomputer-Intravenous-Infusion-Drip-Controller.html>.

“DripAssist Specificaiton”, Shift Labs , Mar. 18, 2016 (retrieved). 2 pgs, <http://www.shiftlabs.com/products/dripassist/specifications>.

“DripAssist Product Overview”, Shift Labs , Mar. 18, 2016 (retrieved). 2 pgs, <http://www.shiftlabs.com/products/dripassist/overview>.

“DripAssist Product Brochure”, Shift Labs , Mar. 18, 2016 (retrieved). 1 pg., <http://www.shiftlabs.com/sites/default/files/DripAssistOnesheet.pdf>.

“IUV Drip monitor”, Allison Lipper, Mar. 18, 2016 (retrieved). 3 pgs., <http://cnx.org/contents/WmaFki2-@3/IV-Drip-Monitor>.

“AutoClamp”, Ace Medical, Mar. 18, 2016 (retrieved). 2 pgs., http://ace-medical.com/2014/en/product/product/view.asp?po_no=31.

Extended European Search Report dated Mar. 3, 2016, received in European patent application No. 15192051.9, 7 pgs.

Notice of Eligibility for Grant from the Intellectual Property Office of Singapore for Application 11201507504S, dated Jun. 6, 2016, 12 pgs.

Second Office Action and Search Report dated 27 Jun. 2016, received in Republic of China patent application No. 201280069373.3, 6 pgs.

First Office Action dated 20 Oct. 2015, received in Republic of China patent application No. 201280069373.3, 4 pgs.

First Office Action dated Jul. 28, 2016, received in Australian patent application No. 2012358397, 3 pgs.

European Community Design Registration 002381699/0.01-0005, Filed Jan. 8, 2014 and published on May 12, 2016, 42 pgs.

Notification from the Eurasian Patent Organization for Application 201491218, dated Apr. 27, 2015, 2 pgs.

Second Report of substantive examination from Superintendent of Industry and Commerce of Colombia for Patent Application 14.155.193, dated Sep. 8, 2016, 18 pgs.

First Examination Report from IP Australia for Patent Application 2012358397, dated Jul. 28, 2016, 3 pgs.

Notice of Acceptance from IP Australia for Patent Application 2012358397, dated Jan. 5, 2017, 3 pgs.

English Search Report from the People’s Republic of China for Patent Application 201280069373.3, dated Jul. 12, 2016, 2 pgs.

First Examination Report from Mexican Patent Office for Patent Application Mx/a/2014/007751, dated Sep. 8, 2016, 5 pgs.

Further Examination Report from the New Zealand Intellectual Property Office for Patent Application 626382, dated Jan. 12, 2016, 2 pgs.

Notice of Acceptance from the New Zealand Intellectual Property Office for Patent Application 626382, dated Feb. 9, 2016, 1 pg.

Rule 161 Communication from the European Patent Office for Patent Application 14720397.0-1662, dated Oct. 28, 2015, 2 pgs.

Decision to Grant from the European Patent Office for Patent Application 15192051.9-1664/3006010, dated Jan. 19, 2017, 3 pgs.

Further Examination Report from the New Zealand Intellectual Property Office for Patent Application 715098, dated Jun. 13, 2016, 2 pgs.

Notice of Acceptance from the New Zealand Intellectual Property Office for Patent Application 715098, Sep. 9, 2016, 3 pgs.

Notice of Acceptance from the New Zealand Intellectual Property Office for Patent Application 723930, dated Nov. 16, 2016, 3 pgs.

Notice of Acceptance from IP Australia for Patent Application 2016225879, dated Oct. 26, 2016, 3 pgs.

First Examination Report from the New Zealand Intellectual Property Office for Patent Application 725469, dated Nov. 8, 2016, 2 pgs.

(56)

References Cited

OTHER PUBLICATIONS

AAMI and FDA, Infusing Patients Safely: Priority Issues from the AAMI/FDA Infusion Device Summit, Symposium, Oct. 5-6, 2010, pp. 1-48, AAMI, Arlington, VA, USA.

Conway, "Analytical Analysis of Tip Travel in a Bourdon Tube", Master's Thesis, Naval Postgraduate School Monterey, Dec. 1995, pp. i-89.

Darzynkiewicz, 'Cytometry', Methods in Cell Biology, 2011, Third Edition Part A, vol. 63, pp. 44-48, Academic Press, San Diego, 2001. And please see whole document generally.

"Feature Detection", OpenCV Wiki, Oct. 31, 2011 (retrieved), 7 pgs, http://opencv.willowgarage.com/documentation/cpp/imgproc_feature_detection.html.

International Search Report & Written Opinion dated Jun. 18, 2013, received in International patent application No. PCT/US2012/071142, 14 pgs.

International Search Report & Written Opinion dated Oct. 1, 2013, received in International patent application No. PCT/US2012/071490, 19 pgs.

International Search Report & Written Opinion dated Nov. 7, 2013, received in International patent application no. PCT/US2013/042350, 18 pgs.

Invitation to Pay Additional Fees and, Where Applicable, Protest Fee dated Sep. 9, 2013, received in International patent application No. PCT/US2013/032445, 10 pgs.

Invitation to Pay Additional Fees and, Where Applicable, Protest Fee dated Sep. 26, 2013, received in International patent application No. PCT/US2013/042350, 7 pgs.

International Preliminary Report on Patentability dated Jul. 3, 2014, received in International patent application No. PCT/US2012/071142, 9 pgs.

International Search Report dated Feb. 2015, received in International patent application No. PCT/US2014/029020, 7 pgs.

International Preliminary Report on Patentability and Written Opinion, dated Sep. 15, 2015, received in International patent application No. PCT/US2014/029020, 11 pgs.

Hofmann, "Modeling Medical Devices for Plug-and-Play Interoperability", MIT Department of Electrical Engineering and Computer Science, Jun. 2007, pp. 1-187.

King et al. Prototyping closed loop physiologic control with the medical device coordination framework. In SEHC 2010: Proceedings of the 2010 ICSE Workshop on Software Engineering in Health Care (pp. 1-11). New York, Ny: ACM. (2010).

Jetley et al., "Safety Requirements Based Analysis of Infusion Pump Software", Proceedings of the IEEE Real Time Systems Symposium, Tuscon, Dec. 2007 pp. 1-4.

FDA US Food and Drug Administration, "SEDASYS® Computer-Assisted Personalized Sedation System P08000", Jul. 16, 2013, pp. 1-2, www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/DeviceApprovalsandClearances/Recently-ApprovedDevices/ucm353950.htm.

Luerkens, David W. "Theory and Application of Morphological Analysis: Fine Particles and Surfaces". Boca Raton: CRC, 1991. 5-7.

Matas et al., 'Progressive Probabilistic Hough Transform', University of Surrey, Czech Technical University, 1998, pp. 1-10.

"Miscellaneous Image Transformations", OpenCV Wiki, 2011, 9 pgs., http://opencv.willowgarage.com/documentation/cpp/miscellaneous_image_transformations.

National Patient Safety Agency, Design for Patient Safety: A Guide to the Design of Electronic Infusion Devices, booklet, 2010, pp. 1-96, Edition 1, National Patient Safety Agency, London.

"Object Detection", OpenCV Wiki, 2011, 2 pgs., http://opencv.willowgarage.com/documentation/cpp/object_detection.html.

"The OpenCV Reference Manual Release 2.4.6.0", Jul. 1, 2013, pp. 1-813.

Leor at al., "A System for the Measurement of Drop Volume of Intravenous Solutions", Proceedings Computers in Cardiology 1990, pp. 405-406, Los Alamitos, California.

Butterfield, "Alaris SE Pump, Monitoring and Detection of IV Line Occlusions.", CareFusion Corporation, 2010, 4 pgs.

"Vista Basic: Instructions for Use: Software Ifvb", manual, 2002, pp. 3, B. Braun Medical Inc.

Hugli et al., "Drop volume measurement by vision." Proceedings of SPIE Electronic Imaging Conference, San Diego, Jan. 2000. SPIE vol. 3866-11, pp. 60-66.

Notification of Non-Compliance With Substantive Requirements and Invitation to Submit Observations and/or Amended Application from The African Regional Intellectual Property Organization (ARIPO) for Application AP/P/2014/007721 (J79AP), dated Apr. 25, 2017. Results of Substantive Examination from IMPI for Application MX/a/2014/007751, dated Mar. 31, 2017.

First Office Action for Chinese Patent Application 201610248658.3 (R81CN), dated Feb. 13, 2017.

International Search Report & Written Opinion dated Jul. 6, 2017, received in International patent application No. PCT/US2017/015382, 21 pgs.

Notification from the Eurasian Patent Organization for Application 201491218/32, date Apr. 19, 2017, 1 pg.

Examination Report from the European Patent Office for EPO Application No. 16 167 576.4-1662, dated Oct. 11, 2016, 6 pgs.

U.S. Appl. No. 61/679,117, filed Aug. 3, 2012.

U.S. Appl. No. 13/834,030, filed Mar. 15, 2013.

U.S. Appl. No. 61/900,431, filed Nov. 6, 2013.

U.S. Appl. No. 29/552,943, filed Jan. 27, 2016.

U.S. Appl. No. 62/288,132, filed Jan. 28, 2016.

U.S. Appl. No. 29/553,094, filed Jan. 28, 2016.

U.S. Appl. No. 29/565,908, filed May 25, 2016.

U.S. Appl. No. 62/341,396, filed May 25, 2016.

U.S. Appl. No. 29/575,316, filed Aug. 24, 2016.

U.S. Appl. No. 16/136,753, filed Sep. 20, 2018.

U.S. Appl. No. 16/162,609, filed Oct. 17, 2018.

* cited by examiner

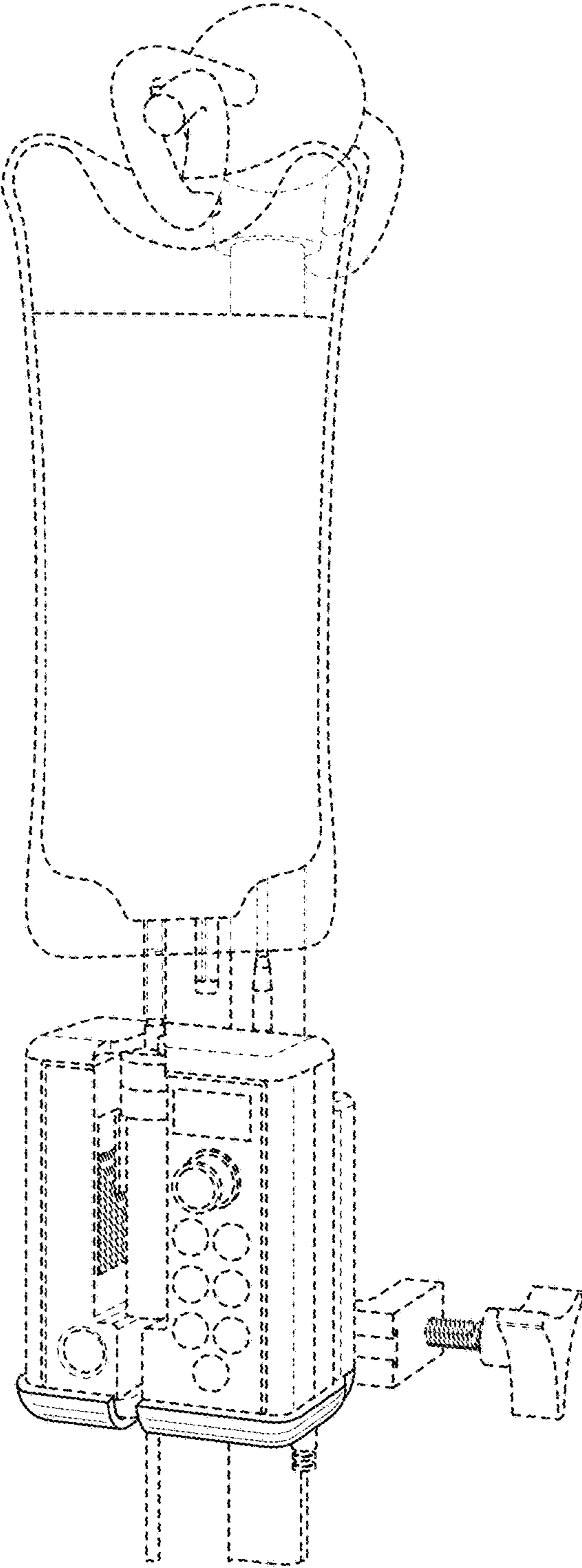


FIG. 1

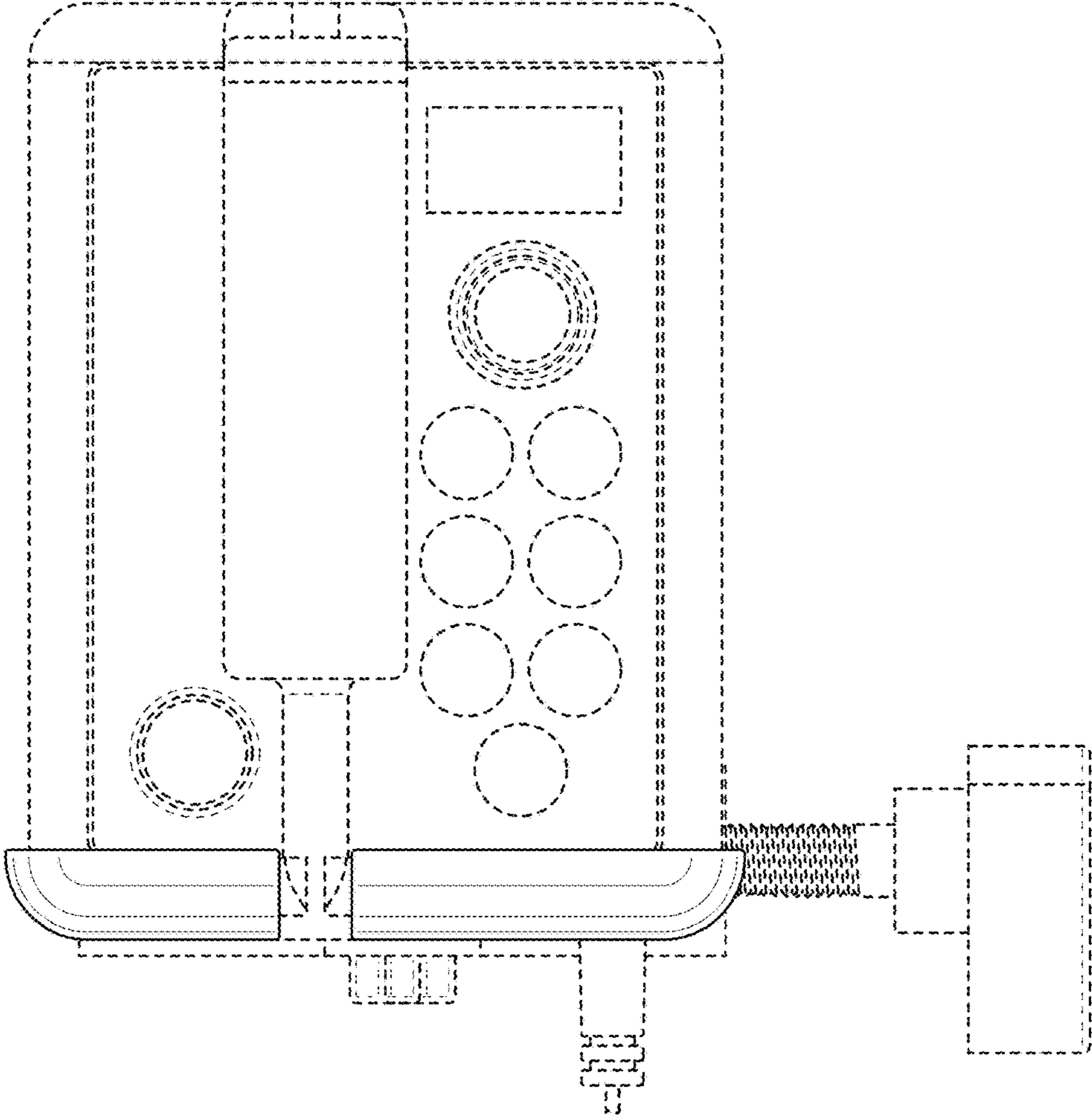


FIG. 2

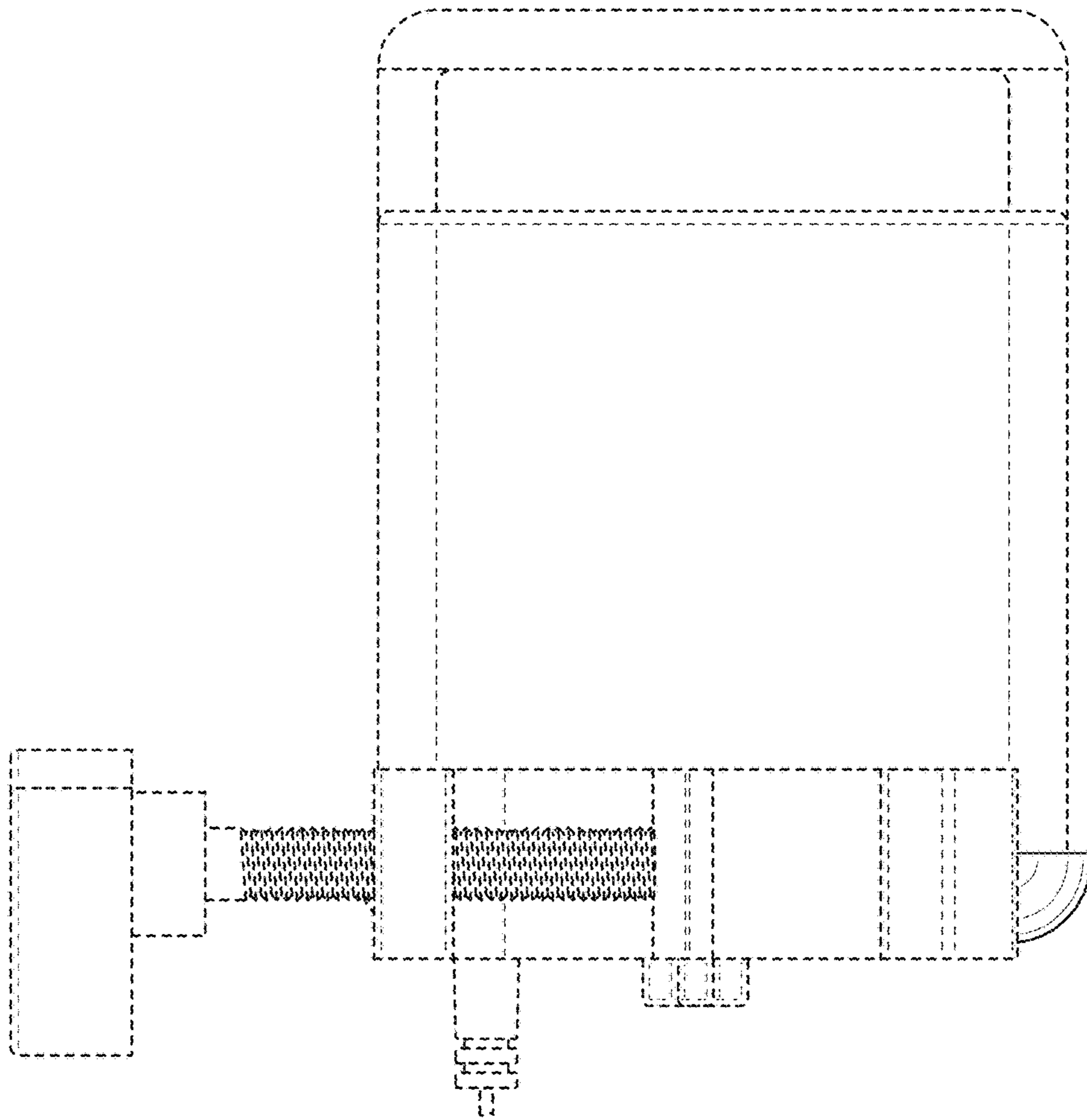


FIG. 3

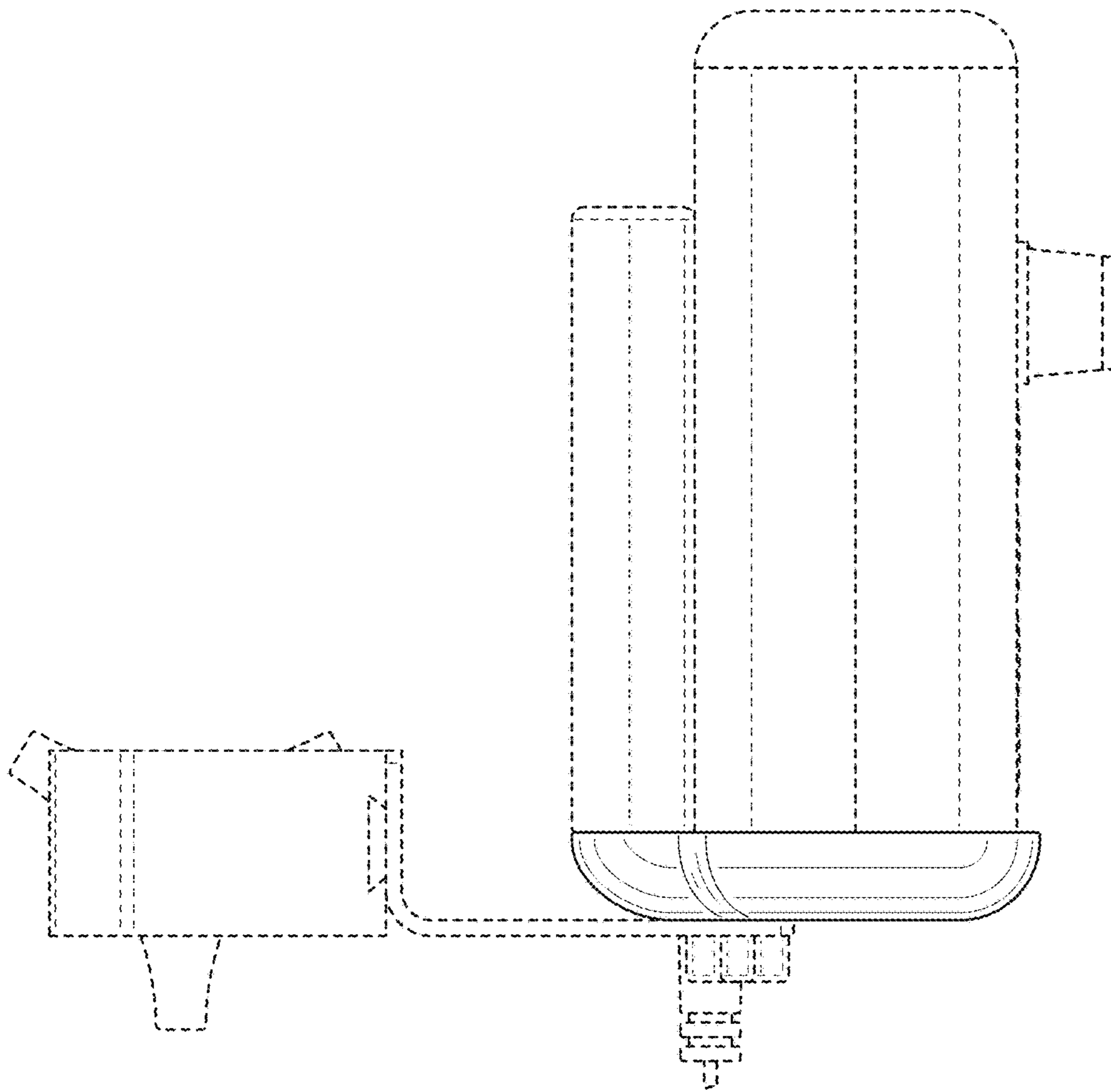


FIG. 4

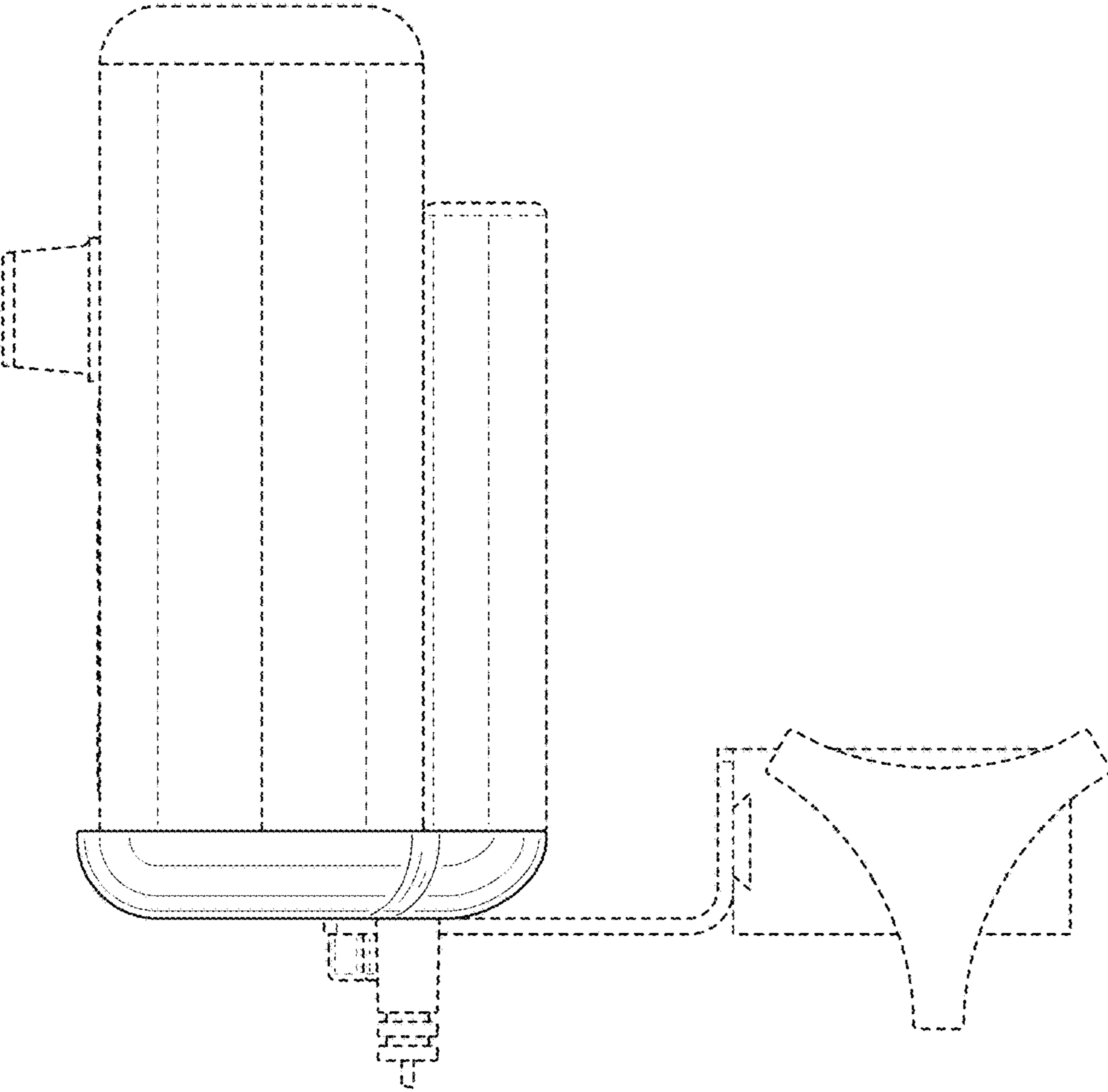


FIG. 5

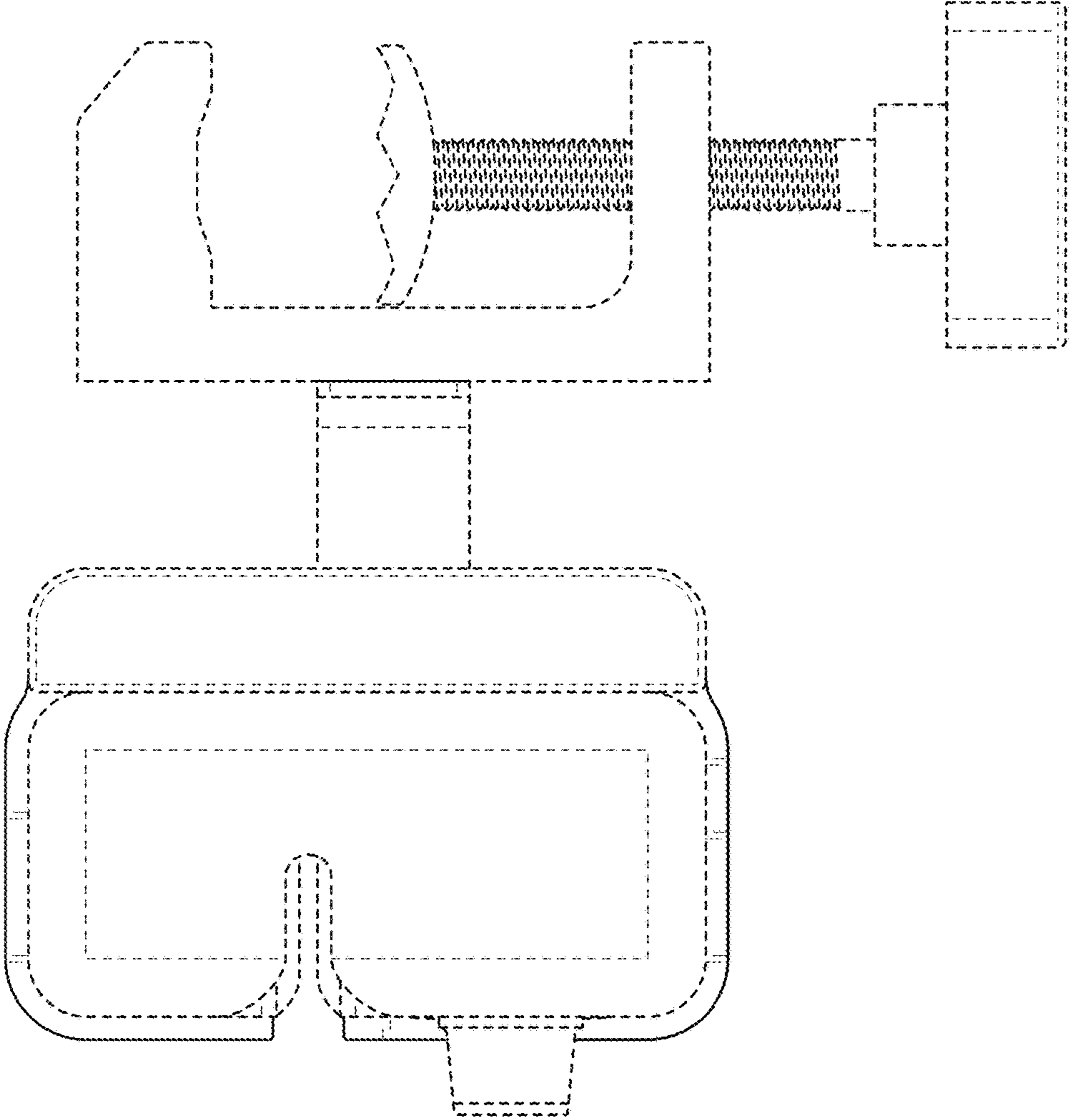


FIG. 6

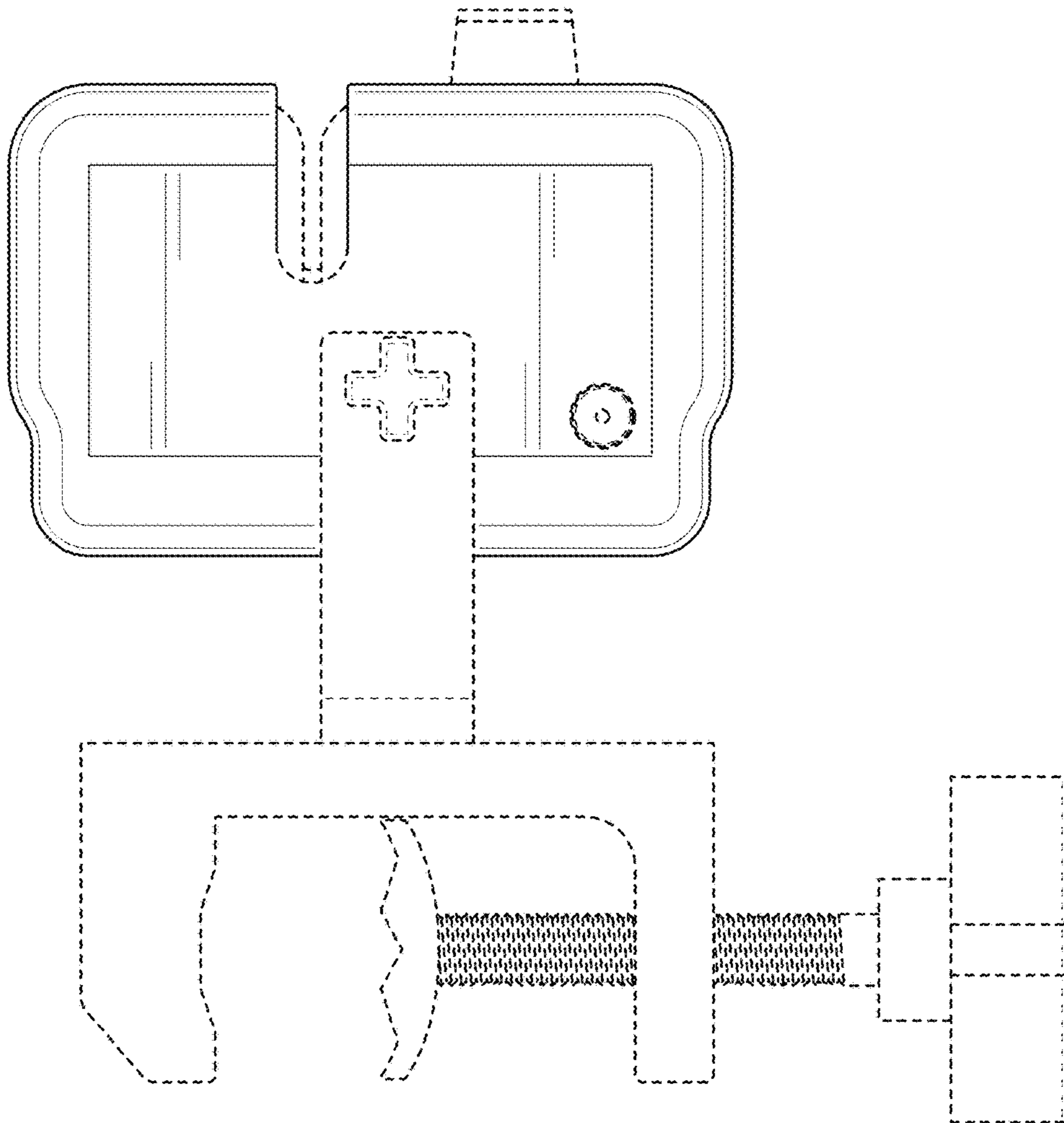


FIG. 7